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HOME GARDENING IN INTERNATIONAL DEVELOPMENT: WHAT THE LITERATURE SHOWS

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by Leslie Brownrigg, Ph.D.
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Including an annotated bibliography, and inventories of international organizations involved in home gardening and their projects

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INTRODUCTION TO THE REVIEW

In the summer of 1984, L.I.F.E. commissioned Leslie Brownrigg, Ph.D, a development anthropologist with particular expertise in agriculture, ecology and international development programming, to review the literature on home gardens and gardening projects world-wide and to document the activities of major international organizations concerned with home food production systems. The resulting review, **Home Gardens In International Development: What The Literature Shows**, is now available for distribution through L.I.F.E.

The review was researched and written with two audiences in mind; international development professionals whose programs do or could include home gardening, and other readers from the range of academic disciplines which involve the home garden who have an interest in its history and traditions at home and abroad. While the issues relevant to both audiences are related, it can be assumed that some readers will be more interested in certain topics and data resources than in others. The review's detailed Table of Contents, and the brief overview of the document given below should help the reader to identify where these are and how to find them.

Background and Purpose of the Review

L.I.F.E. undertook to document what has been learned and written about international household food and small livestock production with the support of USAID's Office of Nutrition, which funds L.I.F.E.'s programs. A consortium of the major U.S. professional societies concerned with food and nutrition, L.I.F.E. acts as a clearinghouse for developing countries for information on all aspects of food: its production, harvesting, storage, processing, preservation, marketing, and nutritional value. This review was conducted with the guidance of a 20-member committee of horticultural, agricultural and development experts, who reviewed the draft manuscript. There are two main reasons why the Office of Nutrition and L.I.F.E. considered a survey of this kind to be valuable and timely. They are worth a brief explanation.

First, while home gardening is virtually as old as human civilizations, its role in international development programming remains ambiguous. This is not because home gardens lack advocates in development circles or proof that people in developing countries value and benefit from them. By way of example, G.J.C. Terra and other noted Dutch horticulturists have made the claim that the

Indonesian style 'mixed garden,' the pekarangan, could provide "an interim measure in meeting the ever-increasing problem of feeding the (world's) growing population." This endorsement is not as extravagant as it might first appear to some. As documented in the review, surveys have shown that the pekarangan provides up to 40% of the total calories, 30% of the total protein and 65% of the fuels consumed by rural households in some areas of Indonesia. The carefully-planned Ilesha Gardens project in Nigeria, reviewed on pages 68-81 in the text, allowed Professor Terra to at least partially substantiate his claim, by demonstrating that an adaptation of Indonesia's mixed garden could be introduced with notable success to people of another culture a continent away.

To many development workers, the historical reality that some form of the home garden, like the pekarangan, is indigenous to nearly every culture on earth makes it a particularly 'appropriate' development technology. Put another way, home gardening is one of the few development technologies which comes with a pedigree: centuries of intercultural traditions which demonstrate that even the most disadvantaged populations of the world have had the skills, resources and personal motivation to adopt it. The editor of the **Indian Horticulturist** noted one way that this appropriateness can extend from the local village to the national level with the observation, "No sophisticated machine tools, no World Bank loans, are required (for families) to grow vegetables and fruits." The implications of endorsements like the ones quoted here apparently have not been lost on many national governments. The review revealed that India, Indonesia, the Philippines, Columbia, Chile, Sri Lanka, Dominica, Barbados and Honduras have all adopted home gardening as a national priority, coordinated by inter-ministerial units.

Historical facts and current trends notwithstanding, home gardening seems to remain a low priority with most major aid donors at all levels of their development programming, from research through replication. The reason why cannot be explained purely in terms of programming difficulties and project failures. Certainly, home gardening efforts have had their fair share of both, examples of which are detailed in the review and touched on below. Their problems and 'failure factors,' however, are common to a range of development programs which continue to receive widespread donor support. Home gardening's ambiguous status in development, then, stems from less obvious causes. Clearly, a review of literature and project documents written for a variety of other purposes cannot be expected to resolve this ambiguity by making a case for or against home gardening as a technology for development. But it can take an important first step by helping to clarify what creates and sustains the ambiguity itself. At a time when "feeding the world's growing population" already has shifted from an "ever-increasing" problem to a critical one, the value of taking even so modest a step appears self evident.

Second, as noted earlier, home gardening touches a broad spectrum of academic disciplines and professional interests. Issues and resource information relevant to home gardening can show up in a variety of places—from the record of a Congressional hearing

on Health and Nutrition, an FAO agricultural report or a national Anthropology journal or Botany review, to the mimeographed newsletter of a local beekeepers' association or citizens' ecology group. Understandably, these publications rarely reference one another, and individual professionals cannot be expected to hunt them all down on their own. Consequently, it is possible for people to gain considerable expertise in home gardening as it relates to certain academic and professional fields but not to others. At the same time, gardening project documents seldom include information on similar projects in the same country, much less those in other parts of the world. By researching and cross-referencing the major publications, organizational resources and project activities concerning the home garden internationally across these diverse fields, it is hoped this review will be of service to diverse readers as well.

Contents of the Review

In the first section of the main text, the reviewer discusses the different ways that the home garden has been defined in the literature, concluding with the 'operational definition' used throughout the text (page 12). In the following 43 pages she reviews the historical development of home gardening and gardening traditions within and between major world cultures, and gives for each garden 'type' a table of the major plants raised in it, in English, Latin and the local language. This is followed in Section II (55-62) by a discussion of economic and nutritional studies that have been conducted on home gardening, and their implications for home gardeners and gardening projects in the U.S.A. and overseas.

While these two sections may seem more academic or less professionally relevant to some development workers than the subsequent ones which deal directly with international development programs, it is hoped they will not be overlooked. At first glance, for instance, it may not seem important for a nutritionist working in a developing country to know that several world cultures, from the Yucatec Maya to householders in the Kharaghan region of Iran, traditionally have raised gardens in hollowed tree trunks, earthenware jars, small boxes, and ledges where their goats and sheep cannot reach--until one considers the remark of a recent health-nutrition worker in the Caribbean: "I tried promoting home gardening in-country for five months before I realized the people already were gardening." Similarly, the fact that surveys have shown that 80% of respondents in Auckland, New Zealand kept home gardens, or that gardening is considered a more popular 'sport' in Denmark than all other sports combined may seem irrelevant to the development of an impoverished country. What these facts help demonstrate, however--that home gardening does not 'disappear with development,' and that it is adopted and adapted by different people to meet different needs--is significant for a development professional to consider.

In the third section of the main text (63-99), the reviewer discusses where and how gardening shows up in international development

programs, gives detailed case histories of a major gardening project in Nigeria, Chile and Mauritania, profiles three current PVO projects in Bangladesh, Senegal and Haiti, and discusses the success and failure factors of each. The following section (100-112) elaborates on several problems common to gardening interventions as a whole, from the selection of extensionists to the availability of labor and inputs. In the fifth and final section of the main text (113-125) the reviewer highlights several special issues relevant to current and future gardening projects, including the relationship of home to school and market gardens, the role of women as home gardeners, and the type of research that needs to be undertaken to exploit home gardening's potential as a development technology.

The first Appendix to the review gives an inventory of major organizations in the developed world involved with home gardening, and notes for each the nature of its activities, resources or support, such as consultant services, publications, library facilities, grant and loan programs, research projects, clearinghouse activities and advocacy functions. The Appendix is organized into three parts: U.S. private organizations (A1-A20), U.S. public institutions (A20-A25), and organizations in other developed nations (A25-A30).

The second Appendix (B1-B30) describes, by world region and country, illustrative gardening projects in the developing world, including, as appropriate, descriptions of the organizations supporting them, relevant findings of project evaluations and reports, and cross-references to project documents contained in the annotated bibliography of the review.

The annotated bibliography (Appendix C1-C118) is a comprehensive review of the literature surveyed in the course of this project. Its entries range from publications on duck management in Papua New Guinea and vegetable farming systems in the Peoples' Republic of China to the nutritive contribution of small livestock in African diets and the use of computer technology in home garden planning.

The fourth Appendix to the review (D1-D19) is a selective "Green Thumb Guide" to the copious 'how-to-do-it' home gardening literature. It notes major guides, manuals and resource publications concerning the home garden world-wide.

The review concludes with an Index (I1-I16) organized to help the reader locate the bibliographical sources in the last two Appendices by world region and country, by garden 'type,' and by special issues raised in the text of the review, such as 'division of labor,' 'socioeconomic factors,' 'colonization' and 'women.'

Findings of the Review: Surprises and Questions

The review revealed a few surprises in three senses of the term: facts about home gardening in international development which may come as a surprise to some readers of this review; project results,

both positive and negative, which apparently surprised project planners; and programming conventions and recurrent project problems which are surprising because they raise the question: Given all that we have learned about international development, why are we doing things this way?

As the reviewer notes, it is generally assumed that home gardening projects are 'small-scale' interventions undertaken and promoted primarily by foreign NGO's and PVO's. The assumption, however, can not be taken as the rule. While it is probably true that PVO-NGO efforts averaging U.S. \$5,000-30,000 constitute the numerical majority of gardening interventions undertaken since around 1950, hundreds of other projects with gardening components have ranged between U.S. \$3-5 million. In India, the Philippines and Indonesia alone, hundreds of millions have been invested in successive gardening projects and campaigns over the years. The Intensified Home Gardens Programme of the Ministry of Agriculture in Sri Lanka, assisted by UNICEF and a number of indigenous and foreign NGO's, is not unique in using radio, T.V. and mass-media advertising in its promotions. Recently, the campaign apparently suffered an unusual "excess of success." Following the distribution of some 600,000 packages of seeds in 1980, the volume of crops produced by local households temporarily depressed the market price of beans and other vegetables in-country.

Like the health-nutrition worker in the Caribbean who failed to recognize the gardens that people were raising in boxes and tin cans, the review suggests that several gardening projects fail to perceive what actually exists at the project site and the real characteristics of the food production systems they are trying to influence. To begin with, the reviewer notes:

A number of dietary surveys which conclude that local diets lack vegetables totally omit consideration of wild food sources, thus raising a false premise that the people need to grow vegetables, or lack protein food sources...An important result of the experimental Mauritanian project (Operation Vegetable Production, page 89) was the discovery that introduced vegetables did not displace production of traditional vegetables nor the gathering of wild foods...(and an) important discovery of the screening of local vegetables in the Ilesha project was that many Nigerian foods were not as "wild" as believed. Rather, many greens turned out to be "semi-cultivars," which, with a little coaxing, were adapted for cultivation in home gardens...Project horticultural research also revealed that many of the African vegetables were less subject to insect pests than introduced species... (and other) analyses indicate that most tropical greens are much richer in proteins and vitamins than temperate types (types that are frequently introduced).

The Ilesha project's noteworthy concentration on local needs and resources at the project site, including researching local plants

and their seasonal availability in markets as well as home gardens, assessing local diet and cooking preferences and employing local Yoruba speakers as extensionists, is contrasted in the text with a gardening project in Benin which had similar objectives but a different operational approach (pages 77-78). Despite circumstances clearly beyond the programmers' control--five political upheavals during the life of the project--the reviewer states:

...it (still) seems clear that, in contrast to the Nigeria effort, the main problem in Benin was a misunderstanding of the horticultural goals and style of the local population. Notably, no sociologist was assigned (until late in the project) to analyze the "human factors" in (the experiment, and)...horticultural research focused on screening and adapting imported exotics, rather than on collecting and improving indigenous crops and the exotic imports already grown locally...It became a major task of the nutritionists assigned to the project to develop palatable recipes for the 'animatrices rurales' to teach, using vegetables totally unknown in the local diet.

Not surprisingly, the review revealed that the difficulty of perceiving needs and resources that do exist at the project site can also extend to perceiving those that do not. A Ghanaian project abandoned by its participants, lower-income housing project residents, because the gardening technique it promoted drove up their water bills, illustrates a relatively common problem discussed in the text; projects' miscalculation of peoples' actual access to water, adequate soil, land-use rights and basic inputs necessary for gardening. At the same time, while Carol Pierce-Colfer's aptly titled *Home gardens ...not so easy* (Bibliography C-72) gives a good example of how 'male bias' can negatively affect a gardening intervention, in general gardening projects provide an unusual example of 'female bias' in development programming. That is, rather than bypassing women as project participants when they should include them, projects tend to target women as participants when they should not. The issues of who gardens in developing countries, for what reasons, the role of women as home gardeners and why they are sometimes inappropriately targeted as project beneficiaries are detailed at various points in the review and referenced in the Table of Contents and the Index. It is worth suggesting here, however, that recognizing who can and will participate in gardening projects in the developing world can have implications that are not immediately obvious. A successful Foster Parents Plan project in Senegal illustrates the point. Once participating families began realizing profits from their gardens roughly equal to 20% of their average monthly cash earnings in a 'good year,' a significant change was observed in the usual out-migration pattern of the village men. Almost sixty percent of the men who normally left their families in search of wage labor decided to stay at home and work in the garden instead.

In the same vein, it is clearly of value to projects to recognize why people garden or fail to garden when they do. The reviewer observes:

The analysis that labor intensive technologies are "appropriate" for rural people in developing countries is often based on a flawed perception of the factors which trigger periods of work and leisure. A farmer may appear to be doing nothing until the sky clears and the fields can be burned...Gardening may be a recession period activity--e.g., undertaken while rubber prices are low...(or) it may be undertaken as a supplement to plantation or communal farming.

The difficulty of accurately perceiving local situations and designing projects that are appropriate to them clearly is not unique to gardening interventions. Nor are several other programming problems noted in the review, from inappropriate use of staff time to inadequate transportation. The primary issue facing planners and donors involved with most development programs, however, is: How can we avoid mistakes and problems like these in order to get the project results we want to achieve? What seems peculiar to home gardening interventions is the high level of ambiguity surrounding the question: What results are these projects supposed to achieve and how can we tell if we've got them? The project documents reviewed for this survey revealed a surprising lack of consensus at the programming level on what home gardens are for and how their value should be measured.

Certainly, the historical traditions and the results of the research, surveys, and successful projects documented in the literature provide an abundance of answers to the question of what home gardens are for from the perspective of those who benefit from them. They provide calories to the undernourished, and can upgrade diets deficient in protein, vitamins and minerals. They may constitute the only source of certain nutrients available to local households, and the major, or only, source of food-intake between harvests, when harvests fail, or when cash-crop prices fall. They can provide a new source of family cash earnings and/or reduce household food expenditures to make family income available for new enterprises or to buy necessary commodities. They can provide an alternative to out-migration. They can reduce families' debt to and dependence on traders during hard times and traditional "hungry seasons." They provide medicinals, pest-deterrents and natural fertilizers. They are a source of fuels. They fulfil symbolic, ritual and aesthetic functions. They can be maintained primarily or even exclusively with local resources. Once established, they are minimally affected by circumstances outside local householders' control, including fluctuations in world energy or cash crop prices, in currency exchange rates, or in the priorities of local governments and foreign aid donors. They can be tended by household members whose labor otherwise might not contribute to the family budget, including old people, lactating mothers and small children. They subsidize the residence of laborers in urban areas, plantations, mines and mills. They provide shade for people to gather under. The list goes on.

Where home gardens tend to show up in development programs, however,

neither clarifies the contribution(s) they are presumably expected to make nor, in most cases, allows for a clear assessment of the contributions they are making. One major reason why concerns their historical link to nutrition interventions. As the reviewer notes:

A common conceptual theme in nutrition planning is that "the causes of nutrition problems are multi-sectoral in nature, and consequently, the solutions must be developed by multidisciplinary efforts" (Lynch 1979:1). In practice, this translates into a host of simultaneous project interventions...The projects reviewed which had home or community gardening components also included an average of six additional activities directed to the beneficiary population...

These project activities, listed on pages 63-64 of the text, range from ones which are clearly complementary to home gardening promotions, such as construction of water supply systems, to those whose relationship is less clear, including the distribution of free food. The reviewer observes that, whether home gardening appears in the context of a 'nutrition,' 'rural development,' 'women in development,' or 'agriculture' project:

It is rare to find promotion of gardening or small livestock production as the exclusive activity or "output" of a project, although this does occur (in some small scale NGO-PVO efforts)...More commonly, gardening components in international development projects are only one of a constellation of project activities aimed at improving nutrition...The complexity of (these projects) makes it difficult to isolate either the cost or the effect of gardening from all the other efforts.

Given this historical link to nutrition interventions, it is significant that very little documentation exists concerning gardening projects' actual impact on nutrition. The Cebu Experiment in the Philippines, reviewed on page 65 of the text, provides a surprisingly rare example of a systematic effort to assess the nutritive contribution of home gardening against alternative interventions. Even then, the experiment concentrated on Vitamin-A intake alone, and did not attempt to assess potential advantages beyond the cost-effectiveness of providing that nutrient. To the extent that gardening interventions are, or even can be, evaluated at all, the standards used thus tend to be arbitrary, varying from project to project and including everything from the number of seed packets distributed or participants attending cooking classes to the height-to-weight ratio of children treated at clinics which serve garden-produced foods.

Exaggerating the difficulty of determining the non-economic contribution of home gardening projects, the reviewer found that the standards used to judge their economic value are often inappropriate, as well. She observes:

Generally, U.S. investigators agree to use the retail value of garden produce to measure monetary values, and they generally record cash and labor outlays. In the developing world, there may be no market to create a price for vegetables, and all the inputs may be non-monetary; thus, retail prices are difficult to interpret. Further, in the U.S., purchasing vegetables is usually an alternative to gardening. Even if people forego the vegetables they might have grown, their diet is generally adequate. In the developing world, the cost of not having an adequate supply of home-produced food may be malnutrition or economic instability, so a simple market-value/market-cost ratio may be misleading...At the same time...the economic value of a garden may be relatively greater in developing countries than in developed ones...households (in the developing world) usually spend a far higher proportion of family income on food...

The relatively complex, and apparently often misunderstood, relationship between home and market gardens in the developing world is treated at length in several parts of the text and need not be reiterated here. A subject relevant to that relationship, however, is important to mention: the relative value of growing nutritious foods for home consumption versus increasing family income for the purchase of food. The reviewer notes that, in journals which report on nutritional surveys:

...generally, household cash income is the main variable tested for its influence on diet and nutritional status ... (yet) whether home gardeners convert income from the sale of produce into food purchases that round out their diet remains an issue...literature is accumulating which criticizes the assumption that increased income leads to better diets...as are studies documenting disadvantageous "balances of trade" in nutritional terms when calorie-high, nutrient-rich tropical cash food crops are sold at low prices to buy high priced imported or processed foods. [Examples of these works in the Bibliography include: Dewey, K.C. (C24), Ferroni, M.A. (C30), May et al (C59), and Stavrakis et al (C90)]

In sum, the findings of this review appear to offer a mixed message to proponents of home food production systems. On the one hand, the factors contributing to the ambiguity surrounding home gardening as a development technology appear potentially resolvable with evaluation, research and some experimentation, and the expertise already exists to undertake these tasks. On the other hand, as long as potential donors cannot clearly see what benefits they are 'buying' if they support home gardening projects, and thus whether they are cost-effective compared to other interventions, they are likely to remain unwilling to invest heavily in them. Whether this unwilling-

ness will extend to underwriting the efforts needed to determine, once and for all, the real and potential benefit of this technology remains an open question. To the extent that the issues raised in this review and the resources it provides may help its readers to explore that question for themselves, it will have fulfilled its function.

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About the Reviewer

Leslie A. Brownrigg is a consulting development anthropologist with a Ph.D. from Columbia University. She has extensive field experience in Latin America and in development work which stresses the choice of technologies and institutional channels for development which are socially and culturally compatible with local populations. She also has special knowledge of high altitude and tropical lowland agriculture and ecology. Dr. Brownrigg has participated in the design of development projects for USAID, the World Bank, IFAD, CIDA and the Inter American Development Bank, and is a founder and principal of the consulting firm AMARU IV. She currently resides in Cali, Columbia, and is, personally, a dedicated home gardener.

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SUMMARY

The home garden is a system of agricultural production largely conducted by household members at or near their residence. Production from the plants and animals in each garden generally supplements the home gardeners' meals. Surplus may be exchanged, sold, or shared beyond the household.

Distinctive traditional styles of home gardens have been identified. Several types are influenced by the crops and layouts originally developed in the ancient Near East. These traditions include: the modern Near Eastern home garden, the Islamic garden, gardens in Europe, North America and other areas settled or influenced by Europeans, and the Luso-Latin walled garden style.

Independently, distinct home garden traditions based on multi-layered polyculture developed in south east Asia, Oceania, the Caribbean, the Amazon, and in Mesoamerica (Mexico and Central America). Among South American Andean highlanders, and among other groups who combine pastoralism and crop production in Africa and on the Indian subcontinent, home garden systems emphasize production or protection of livestock. Several societies in Oceania, Africa and the Americas have home gardens based on their prevailing mode of swidden, or "shifting," cultivation.

Across cultural traditions and different ecological zones, the produce of home gardens appears to share a common characteristic: it is consumed fresh. Home gardeners grow the most perishable forms of edible species close to the place where food is prepared. Thus, fruiting vegetables, leafy vegetables, tree, bush, or ground fruits are emphasized, and the starchy staples that are cropped in home gardens tend to be sweeter or less pulpy varieties or stages of the plant (such as the green corn form of maize, small "new" potatoes or six month cassava). Home gardens feature a diversity of plant species, and appear to be a testing ground for crops new to the society, whose use and cultivation are still experimental.

The exact economics and nutritional output of home gardens are not as well studied as the basic ecology and various layouts and crops of the different traditional styles, or as technologies used to increase yields. The potential nutritional contribution of home gardens, however, has been demonstrated in a number of controlled experiments.

In development, home gardens have been promoted as a means of improving nutrition. Hundreds of large and small scale development projects have featured a home garden component as part of a multi-sectoral approach to improve nutrition. Following an FAO-WHO initiative, the Freedom from Hunger Campaign of the United Nations and participating bilateral donors operated a series of Applied Nutrition Projects (ANP's) in the 1950's through the 1970's, many of which promoted home gardens. One of the more innovative efforts was a project in Ilesha, Nigeria, which promoted the cultivation of African crops arranged in a style of multilayered polyculture

derived from Indonesian home garden models. The ANP's in India tested a variety of approaches, including the demonstration and teaching of home gardening at institutions such as schools, clinics, youth and women's clubs, and community centers. The Indian ANP's demonstrated the need to study populations' diet and horticultural practices as locally as possible, rather than centrally. A more recent series of projects in Mauritania is expected to establish vegetable cultivation for home and market production there.

Beyond the larger gardening components and projects sponsored by agencies of the United Nations, bilateral donors, and multilateral banks, many smaller scale gardening projects have been conducted by nongovernmental or private voluntary organizations ("NGOs/PVOs"). Illustrative PVO projects profiled in this review include CARE's Chile school/family garden and Bangladesh women in development projects, a Foster Parents Plan home/market community gardening project in Senegal, and a project of the Adventist Development and Relief Agency, which demonstrates home gardening at mother/child clinics in Haiti. Other primary health or maternal-child health efforts elsewhere in the world have also turned to promoting home gardening as an enduring way to alleviate chronic malnutrition.

This review examined the literature concerning several hundred development projects which promoted home gardening. It revealed a few basic constraints which project designs needed to overcome to succeed in the establishment, popularization, or improvement of home gardens.

Gardening extensionists need to be trained with care and to be selected locally to represent the same general social, educational and economic status as the people they are trying to advise and assist. The review found that projects based entirely on community volunteer extensionists or "para-agros" were often more successful than those using formally trained agriculturalists as extensionists.

The plants and livestock selected for promotion need to be chosen after careful studies of local conditions, especially: diet preferences and nutritional needs, cultivation practices, limitations on home gardening, and local availability of necessary materials, such as planting materials or breeding stock, tools, and any inputs recommended. There can be incompatibilities between the patterns of house site use, community norms, or other aspects of production systems, and certain aspects of home garden designs. It is better to design home garden systems compatible with local conditions than to have such factors present themselves later as crippling constraints.

To garden plants, people have an obvious need for good soil, land itself, water, labor and inputs. Thus, as part of the gardening organizational effort, the intended beneficiaries' access to the various fundamental productive resources needed for home gardens must be determined, and their access must be assured.

Home gardens were found to have a complex relationship with market gardens. There is not always a strict dichotomy between subsistence

and commercial production. The character of local commercial markets influences what is raised in home gardens.

The strategy of promoting gardening at schools in order to promote home gardening appears to be ineffective in isolation. School gardens do not by themselves inspire home gardens. Rather, school gardens can play a specialized role within the larger promotion of an extension system separate from school personnel, and directed primarily at families.

Women are frequently associated with home gardening, as they spend more time than other household members near the home garden. Thus, many home garden projects have been targeted exclusively to women. In traditional settings, however, any member of a household can be found at work in the home garden, and adult men and women, children, and the elderly often have specialized roles and functions within them.

The review found that there is a need for more detailed studies of home gardens, ranging from descriptive research on actual home gardens' composition, ecology, and nutritional and economic outputs, through specialized local or national research to improve horticultural production and extension. Systems for distributing needed supplies and technical advice are generally weak in developing countries. Home gardening in the developing world thus tends to be cut off from the applicable results of international horticultural research, and even from the vast supply of information, techniques, and materials available in developed countries. Evaluation was found to be very weak. Although the potential impact of home gardening on nutrition has been demonstrated, as noted above, the assumption that improved nutrition is necessarily a project impact remains untested. More could be learned from on-going projects if evaluation methods were improved and were comparable between different projects.

In the text of this review, references to the literature are given in parentheses, rather than as footnotes. Generally, the annotations in the bibliography provide more detail, and can be consulted if the reader wishes to explore a point raised in the main text. Specific titles and project documents which refer to Benin, Burkina Fasso and Sri Lanka by their previous names (Dahomey, Upper Volta and Ceylon) are quoted verbatim in the review, but organized in the appendix section under the current names of those countries.

I. DEFINITIONS AND TRADITIONS

More people agree that the home garden is important and interesting than agree on an exact definition of what it is. Published definitions of home gardens therefore vary in what they define and what they include and exclude. Our first task is to review definitions for the forms and functions of home gardens.

1. A DISCUSSION OF DEFINITIONS

A System of Agricultural Production

The home garden is generally viewed as a distinctive system of agricultural production carried out by households. Harlan (1975) and Ruthenberg (1976) classify the home garden as a separate and unique "type" and system of agricultural production. Definitions based on this premise strive to clarify how the home garden system differs from all other systems of agricultural production.

The characteristics most commonly used to define home garden systems refer to: 1) location; 2) diversity; 3) consumption of the household agricultural production; and 4) size.

Location

a) Inclusion by Location

Most, but not all, definitions of home gardens and other modes of household production limit their location to a place near a residence. The majority of definitions distinguishing the home garden as a distinct system of agricultural production limit its location in this way. For Deneven (1980), the system surrounds the house. For Hutterer (1982a), it is adjacent to the house. For Palerm (1967) and Sanders (1967), the presence of a home garden system on house sites influences the very pattern of human settlements. For Deeven and Hutterer, "house gardens" (the term they use) are "as permanent as the house site," (Deeven 1980) or are used for the "period of time during which the house stands and is inhabited" (Hutterer 1982a). Uduwawela defines "home gardening" as "the cultivation of the balance portion of your plot of land on which your house is built," noting that the land size "will vary from a few perches of land to larger extents" (1983:4).

A number of synonyms for the home garden refer to the place on the house site where cultivation takes place, including "kitchen garden" (i.e., beside or closely related to the kitchen), "back yard garden," and "back door garden."

In Anderson's 1954 definition of the "door yard garden," location is paramount, but he does not necessarily imply an agricultural

system. The door yard garden includes all plants, even weeds, growing near a house and the spheres of activity which the plants define. The concept of the door yard garden has been used by geographers and ethnobotanists to frame descriptions of functional areas and plant-animal-human arrangements around house sites in several areas of the world.

The definition proposed for "home garden" by the Second Home Garden Seminar held in Indonesia in 1978 is similar, simply:

... a plot of land that has a residence on it, fixed boundaries, and a functional relationship with its occupants. (Soemarwoto and Soemarwoto 1979).

Possible "functional relationships" are left neutral in this definition, which is unusual because it refers neither to plants nor to agriculture.

b) Exclusions by location

Definitions which stress house site location specifically exclude off-house-site production systems. This class of definitions contrasts the home garden with all other field, orchard, pasture, or pond production systems on the basis of location. Hutterer and Devenen, in particular, exclude those shifting or swidden cultivation plots which are commonly called "gardens." Issues arising from a rigid locational definition will be discussed in some detail below (see "Moving off the House Site," and the section on swidden gardens).

Diversity

Rarely do home gardens grow only one kind of food. Even beginning or container gardens raise at least 2 - 3 food crops. In complex gardens, 50-60 kinds of fruits and vegetables are grown--some perennial, some annual--and several systems integrate small livestock production as well. Diversity is generally recognized as a cardinal trait of home gardens and household food production systems. Where definitions diverge is in specifying the nature of this diversity and additional traits related to it.

a) Permanence and ecological complexity

Linking the garden to the human habitation raises permanence as a defining trait. In turn, the notion that home gardens are relatively permanent raises the question of how diversified, permanent production is achieved. Hutterer defines house gardens by their "complex organization and (a) structure of cultivated vegetation which supplies nutrients as organic debris" (1982a). Deneven characterizes house gardens as being ecologically stable and producing sustained yields. "Soil structure and fertility is maintained by nutrient recycling. Erosion is minimized. The varied crops (grown together) have different nutrient requirements" (1980). For Ruthen-

berg, the combination of annuals and perennials in a high intensity, and density of land use represent a defining trait of "garden cropping" (1976). Writers on traditional home gardens echo this vocabulary.

The ecological characteristics of many traditional home gardens have attracted attention among proponents of sustainable or regenerative agriculture. In addition to how the structure of the garden contributes to sustainability, some recycling of household wastes and close attention to pest problems make many traditional home gardens a model for low input systems.

b) Multi-layered or "mixed" gardens

Writers familiar with South East Asia go a step beyond characterizing home gardens as diversified and ecologically complex production systems. They may specify a composition of at least three layers, or storeys, of vegetation.

Terms appearing in the literature for this configuration include "mixed garden," "multi-layered garden," and "humid tropical mixed garden" (van Eijnatten 1971; Terra 1953, 1954a, 1954b, Binkert 1981, Sommers 1978, and see Soemarwoto 1975a and Soemarwoto and Soemarwoto 1979 and 1981). In the literature, analogies are drawn between the multi-layered or "mixed" garden form and the humid tropical forest. The mixed garden is said to imitate the assemblage of highly diverse plants characteristic of tropical jungles.

A problem develops when writers alternate one of the terms for, or the concept of, "mixed garden" with "home garden" (van Eijnatten 1978, Binkert 1981, and Anderson 1980 among others). Just because home gardens in places like Indonesia, Malaysia, and the Philippines are frequently developed in the "mixed garden" style does not mean that home gardens everywhere resemble a jungle of diverse annuals, perennials, and animal life. In Mesoamerica, the production system that most closely resembles the Indonesian mixed garden is the off-house-site orchard. Elsewhere in south east and continental Asia, raised beds are an important home garden form. In temperate climates the home garden is more likely to contain annuals neatly arranged in beds with perennials in rows. The problem of raising a regional form as an archetype for the home garden will become apparent in the review of gardening traditions below.

c) Vegetable gardens

Stereotypes from other regions (China, Europe) influence another equation—the linking of home gardening with vegetable gardening. The names "family vegetable garden" or "home vegetable garden" are fairly descriptive of the annual vegetable plot that passes for a "home garden" in most of North America. The terms are not applicable on a cross-cultural basis, however. In many areas of the world, vegetables are grown as field crops, or as a cycle on out-lying fields.

A number of advocates of vegetable crops also promote home gardens as one method of providing more nutritious vegetables for households' consumption. Typically, the reasons given for promoting home gardening are based on the contribution of a particular set of vegetables to human nutrition (Yang 1976a, 1976b, 1981a, 1981b; van Eijnatten 1978; Rubert 1978). The equation of home, or "family food gardens" with vegetable gardens is an underlying premise in many gardening projects. Cross-culturally, however, the traditional home garden is not exclusively a vegetable garden, and may include food crops which are considered as main carbohydrate starches (rather than what Western horticulture classifies as vegetables) as well as fruits, fuelwood, herbs, medicinals and plants grown only for their ornamental or magical value.

Consumption

Many of the definitions which locate the home garden on the house site qualify it as producing for home consumption. This qualification serves to distinguish the home garden from the "door yard garden," which also includes other kinds of plantings, landscaping, or activities that may take place around human habitations. For Goode, "The basic idea of a home garden is the utilization of continuous production of human food, especially vegetables and fruits...(this is)...chiefly for consumption by the family, the surplus being used for barter or sale" (1983:3). Ruthenberg defines home garden production as being "for personal consumption."

Several definitions make the additional qualification that the produce of home gardens is a supplemental, rather than a main, source of food for the producers. Hutterer states that the function of house gardens is to produce supplemental food sources other than those derived from cash purchases or from other forms of agricultural production practiced by the household. Binkert (1981) stresses the non-commercial emphasis of home garden production, noting, with Goode, that some surplus may be sold. His yardstick is relative income; i.e., that the income from the house garden plot is less than income from other sources. Binkert's concept of the relatively smaller monetary value of home garden production allows us to compare the importance of home gardens between households of agriculturalists and households which derive income from wages, small businesses, or even rents and stock dividends. Van Eijnatten (1978), following Terra, does not lament over the typically low productivity of home gardens, as all the food produced in them can conveniently supplement the producing family's diet.

a) Exclusions based on consumption

Definitions which stress the use of food produced at house sites as largely consumed by the producers usually exclude market gardens. Home gardening and other supplemental house site food production methods are further distinguished from small scale farming by the criteria that home gardening is less labor- and capital-intensive, and that it is altogether less critical to families' survival than their other income and food sources.

b) Family Food Production Systems

The principal trait of a system defined by this function is that household food is produced for consumption, as opposed to any spatial or technological traits found in another class of definitions. Home gardening is regarded as just one activity possibly contributing to the broader function of family subsistence (L.I.F.E. 1976). The following definition is illustrative:

Family Food Production (home/market garden programs) refers to food produced on small family plots through vegetable gardening that is often combined with fruit, small animal and fish production. This type of approach is primarily, though not exclusively, designed for increasing family food consumption and nutritional intake with the possibility of earning extra income from sale or barter of surplus. (Ad Hoc Committee 1983:1).

In its broadest scope, home food production systems can include any form of subsistence agriculture, as well as food storage, processing, and preparation. In USDA surveys, no distinctions are made concerning the place or production style of "home produced food." Whether gardened at house sites or in community greenhouses, whether raised or gathered in the wild, all foods "produced" at home for home consumption are classified together as a category of economic activity (Redstron 1972; USDA 1983; Kaitz 1979).

As noted by Bittenbender 1983, Hart et al., household food production is being proposed as a functional sub-system for farming systems research.

Definitions of functional home production systems rarely limit the place of production to the house site, nor do they necessarily restrict the kind of agricultural production to plants. Although the spatial-technological definitions which limit the home garden to house sites and stress plant production acknowledge that raising small livestock can be integrated into the system, in illustrations of home production systems, small livestock rearing is given as a possible alternative to cultivation.

c) Small livestock rearing

Animal husbandry can be considered as an alternative to home vegetable or fruit production, when societies or individual households choose to emphasize production of animal protein over food from plants. It might also be an adjunct to the plantings in the home garden; for example, where beekeeping increases the rate of pollination, or where the wastes of small livestock are composted to enrich plant gardening. On the other hand, animal husbandry can limit the choice of plants in a garden, given the possible incompatibility of raising small livestock and plants in the same small space, even if protective fencing is used.

Theoretically, a spatial distinction could be made to analyze livestock production, separating "household small livestock production" from other forms of animal husbandry which take place in pastures or on open ranges. If we cling to the house site as defining the location of "household production," then this would have to include the rather large livestock found in societies that have house site corrals. This contrasts with the promotion of small animals (poultry, rabbits) as livestock suitable for house site production in development projects.

d) Nutrition oriented agriculture

A concept related to home production systems for household consumption is "nutrition (or nutritionally) oriented agriculture" (Pacey 1978; Nutrition Working Group 1984). Pacey includes home, as well as school, clinic, and community gardens as examples. In a number of nutrition policy documents, small scale subsistence agriculture is generally viewed as an arena for supporting improved diets and food sources. Sabry calls for nutrition interventions in "home and community farming" (1982:3). The Administrative Committee on Co-ordination of the United Nations systems directs attention to "the reorientation of extension services to family and community food production and storage" (1979:24). A USAID Nutrition policy paper recognizes the special needs of subsistence farmers in rural areas (1982:2). Recommendations for agricultural policy in West Africa strongly favor small scale farming, and producing food crops (UN University 1979). As a way of solving fundamental food problems in the world, the United Nations University is currently sponsoring research specifically on home gardens (Xerophthalmia Newsletter, October 1983).

Though the foregoing policy statements do not necessarily specify home gardening, the particular virtues of home gardens for nutritionally-oriented horticultural production have been promoted by Yang 1976a, 1976b, 1979; Binkert 1981; Bittenbender 1983a, and Rubert 1978, among others. This view is examined in the review against the evidence from the traditions of home gardening, and the efforts of international development agencies to promote gardening as a nutrition intervention.

Size

Definitions hedge on the matter of the size of home gardens, though the consensus view is that extensions are "small." In absolute terms, the size of a home garden can fall anywhere within the range of a few square meters to several thousand. In rural areas, the home garden or its analogue is generally smaller than the areas devoted to other kinds of agricultural production; for example, the fields where staple crops are grown. In urban community areas, back yard, rooftop, or balcony gardens may be the only vestige of agriculture.

2. A DISCUSSION OF TRADITIONAL GARDENS

The concept of "door yard" garden, qualified by a criterion of food production, can include a variety of home garden arrangements of plant and/or livestock production at house sites. The qualification of food production allows us to exclude "elite" shifts to purely ornamental arrangements found in similar styles and layouts.

Each broad type of traditional home garden occurs within cultural provinces, has a distinctive set of plants and/or associated domesticated animals, and is distinguished by norms of layout and design. Some of the traditions are historically related. The Near Eastern traditional garden influenced the Islamic, Luso-Latin, and European-North American garden styles. The traditional gardens of Indonesia are regarded as one variant in a regional type of multi-layered garden developed at house sites in South East Asia and in some areas of India. The Mesoamerican and the Caribbean traditions may have shared common origins, but the Caribbean garden is more influenced by European and African approaches. Various sub-saharan African, Amazonian, Oceanic, and Polynesian garden systems appear to be culturally unique, as is the Andean approach to house site food production.

Moving off the house site

Community gardens

It must be noted that, in some areas, the form and function of the "home garden" can be found somewhere else than at the house site. Constraints of space in cities, inadequate soil or water, and incompatible house site activities in rural areas are all reasons why some households locate their garden plots in community gardens. Some societies which practice swidden or shifting cultivation have garden-like production units at some distance from residences. In the review of traditional gardens, special sections discuss trends in community gardening and the criteria for interpreting swidden "gardens" as either analogues of home gardens or as field systems. However, following the canons of geographers and agrarian systems researchers, field or orchard systems of production were systematically excluded. A basic contrast must be maintained between garden and field systems. By reason of this definitional limitation, this review excludes the field production of vegetables prevalent throughout most of continental Asia and in Japan.

Institutional gardens

The chapter on gardening projects in international development considers institutional gardens as well as home gardens. There are several reasons why clinic and school gardens were included. First, gardening demonstrations on the grounds of community institutions such as primary schools or rural health clinics are sometimes justified by projects as a promotional strategy to inspire individual families to garden. Second, though institutions are not composed of

persons related by kinship, shared resources, and co-ownership as often as households are, people in institutions may eat meals together on a regular basis, and may even reside together. In order to find a group of people who are producing food for their own consumption cross-culturally, it is perfectly valid to look for groups which share an institutional kitchen and garden. Perhaps the best examples of institutional "home" gardens can be found at group residences in intentional communities such as monasteries or boarding schools.

Most market gardens were omitted from the review. The few that were included are those whose producers divided production between the market and their households, whether by accident or design.

Operational definition

Various definitions and concepts of home gardens and their functions were taken into account in selecting literature for review. On an operational basis, production for consumption was the main concept used. The operational definition of "home garden" in this review is: **a supplementary food production system by and for members of a group of people who eat meals together regularly, which takes place where those group members have land use rights.** As noted above, the search for such systems was first directed to the house site. If no food producing functions were found there (as opposed to food preparation, processing, or storage), then the search was broadened to look for possible analogues at off-house-sites.

3. TRADITIONAL GARDENS

The Near Eastern Tradition

Documentation of this tradition begins with paintings, papyrus illustrations and texts dating to the third millenium B.C. Essential features of the Near Eastern garden are:

- o walls,
- o bordering productive/protective belts of doum, date palms and figs, among other tree crops,
- o plant beds (usually rectangular),
- o planting in rows,
- o pools used to cultivate ducks and fish and as a source of water for irrigating plants, bathing, and growing ornamental waterlilies,
- o trellised vineyards, and
- o buildings such as tool sheds, gardeners' houses, and recreational pavillions (Ward 1969; Huxley 1978).

Ancient gardens were attached to temples, palaces, elite residences and, in diminutive form, to the homes of the common people.

The most humble village hut was "not complete without one or two fruit trees standing by the door....every plant (had) some commercial value for food, timber or oils. An Egyptian garden was part of the food supply. Land was too valuable to waste" (Ward 1969).

The traditional garden precinct, walled and attached to buildings, was spatially distinct from pasture areas and from the main agricultural fields where cereal grains were grown on seasonally flooded river banks or on rainfed fields. Modern day Egyptian farm families have such walled home gardens and grow the domesticates emphasized in ancient times: date and doum palms, fruit trees, herbs, green vegetables, grapes, and chickens, ducks, and pigeons. In a popular account of a young modern Egyptian (Richard Critchfield 1978), the home garden appears as an essential space for social life and production. The young man's father had planted grapes and eighty date palm trees in a walled garden: it was a private world for courtship, the last of his family's ancestral land, and the narrow subsistence and income base for his widowed mother.

The Near Eastern gardening tradition may have originated as early as the seventh millennium B.C. (Huxley 1978:9). Early Near Eastern literature contains inventories of fruit and herb crops, describes the practice of setting plants in rows, and recounts myths ascribing the origin of various garden features to lessons from supernatural beings (Huxley 1978:9). The Hittites evolved garden cities early in the second millennium B.C. Vegetable plots of two to four acres in size surrounded houses in spacious towns. The Babylonians evolved the mythic "hanging gardens," which were agricultural platforms on ziggurat terrace structures, irrigated by "Persian wheels" that raised water to the top platform. They also perfected hanging container planting. Terrace and roof gardens and hanging plant containers are solutions to gardening in dense urban settlements which can be traced to ancient Egypt and Mesopotamia. Today, terrace and rooftop home gardens are still popular in the highrise apartment and condominium buildings of Near Eastern cities (Deaver 1980:36).

Sumerians, Assyrians, Persians and Hellenistic Greeks each elaborated on the basic established model. Before the first century A.D., various garden forms had fully evolved. These included pleasure gardens with flowering plants and topiary, parkland gardens and government sponsored botanical gardens, such as the temple of Amon at Karnak in 1500 B.C. and the imperial Assyrian garden of Sennacherib in the 7th century B.C. (Ward 1969). The first peri-urban market gardens were established in Greece. The larger and more elaborate gardens included lined planting beds, walls, tiled paths, fountains and stone archways; forms well documented in archeology and literature (MacDougall and Ettinghausen 1976).

The Near Eastern garden is recognized as the ancestor of gardens in northern European and other temperate zones. The form was transmitted to Europe via the Greeks, elaborated and diffused by the Romans, and preserved through the Dark Ages at monasteries. During the Renaissance, garden forms imitated and elaborated classical models, yet laid down a new, distinctively European style of garden-

ing. Thereafter, gardening was carried as cultural baggage wherever Europeans colonized. The Near Eastern garden is also the ancestral form of the Islamic tradition, which spread into India and Spain (Huxley 1978: 14-34).

Many European and Islamic concepts of what does or does not constitute a "garden" are shaped by this common origin; patterns shared and renewed over time in corners of the world far from the Near Eastern heartland. "How-to-do-it" gardening books present the latest fashions in constructing the garden wall, preparing and designing plant beds, or aligning parallel rows. Even the salad vegetables commonly grown today include the ancient ones from this tradition: lettuce, cucumbers, onions, leeks, and radishes. Improved gardening technology is stamped on a very old template.

Table 1: Near East Gardens

English name	Latin name
(Trees, arranged in shelter belts or to shade houses:)	
Date palm	Phoenix dactilifera
Doum palm	Hyphaene thebaica
Fig	Ficus spp.
Pomegranate	Punica granatum
Olive	Olea europaea
Carob	Ceratonia siliqua
Apple	Malus sp.
Tamarisk	Tamarix sp.
Acacia	Acacia sp.
Almond, Apricot	Prunus armeniaca
Peach	Prunus persica
Plum	Prunus domestica
Pear	Pyrus communis
Quince	Cydonia oblonga
Grape	Vitis sp.
(Salad vegetables:)	
Lettuce	Lactuca sativa
Cucumber	Cucumis sativus
Egyptian onion	Allium cepa (a perennial)
Leeks	Allium porrum
Radish	Raphanus sativus
Endive	Cichorium endiva
(Herbs:)	
Cumin	Cuminum cyminum
Basil	Ocimum basilicum
Thyme	Thymus vulgaris
Marjoram	Marjoram hortensis
Mint	Mentha sp.
Garlic	Allium sativum

Sesame *Sesamum radiatum*
 Sesamum indicum

Near East Home Gardens:

Common domestic animals: poultry, including doves.

Common ornamentals: waterlily, roses, jasmine.

Major foods NOT grown in home gardens: cereals, products of bovines.

The Islamic Garden

The Near Eastern tradition originated techniques for gardening in an arid climate, which placed a premium on sources of irrigation water. Water management and the creation of a moist, controlled ecosystem were critical. Where water could not be brought up from the ground, it was transported and concentrated by irrigation systems. Trees functioned to provide shade, modify evapotranspiration, and shelter cultivation from sand storms or wind. Gardens and human habitations were annexed, as both gardens and human populations needed to cluster on unflooded land where water was available. Islamic capitals contained enormous gardens, from the 432 acres at Samarra on the Tigris planted in the mid-9th century A.D., to the gardens of the Taj Mahal at Agra, planted in 1828. Gardening was virtually absent in sparsely settled drylands where herds were grazed and dryland rain-fed crops were sown. Instead, gardens flourished in oases (Pevetz 1977), sheltered river valleys and cities, where they spread to the limits of their water supply.

Even when the Islamic garden spread with Islam away from the dry environments into more humid areas, the cultural patterns established under arid conditions remained strong. The Islamic home garden and orchard remained predominantly a phenomenon of urban or town areas where systems of water control were also concentrated. At Lake Dal in Kashmir, the Moguls constructed:

...huge, formal lakeside gardens, Nishat Bagh (Garden of Bliss), Shalimar Bagh (Abode of Love) and Naseem Bagh (Garden of the Morning Breeze)... meticulously arranged to present a sublime view of Dal Lake. Here, towering above gently sloping banks of flowers and terraced watercourses, are the ancient chinar trees, Oriental plane trees, a species brought from the Persian highlands three centuries ago. Along the edges of the gardens small apple and pear orchards, maintained continuously since the 1600's, help finance the upkeep of the luxurious walled grounds (Baird, 1983:8).

These gardens contrast sharply with the floating raft gardens ("raads") and mud-and-weed mound gardens ("dheem") of the Mirbahahri, the traditional gardeners and foragers of the same lake.

In the first known horticultural treatise of the Islamic tradi-

tion, appearing in the 11th century A.D., "Ibn-Bassal discusses water supply, manures, soil and its preparation, and describes numerous vegetables and ornamental plants, as well as aspects of tree culture, including tree grafting and seed sowing" (Huxley 1978). Islamic poets give explicit utilitarian prescriptions for placement of fruit trees, wells, cisterns and water courses, and vines (MacDougall and Ettinghausen 1976: 94-96).

The Islamic garden spread with Islam throughout the Near East and North Africa, and into the Indian subcontinent, Africa and Spain, because gardens were fundamental to urban subsistence and because gardens were linked to religious metaphysics. Though practical and productive, gardens were conceived as earthly representations of the paradise of the afterworld; choice of plants and layout had rigid symbolic meaning. The religious prohibition on pigs effectively removed a menace to successful gardening. Garden walls enclosed a private female domain where women could be at ease with their family.

The Luso-Latin Home Garden

In Portuguese and Spanish speaking America, the home garden form is historically linked to the Iberian peninsula, and, in turn, to the Islamic and Renaissance European garden traditions. The Luso-Latin home garden is related to a distinctive residential architecture. It has high walls and often centers on a well, fountain, pool, stream, or simple standpipe— aspects which link its spatial concept to the earliest gardens of dynastic Egypt and to norms of Islamic gardens. The most formal and architecturally elaborate type of Luso-Latin garden is placed in the courtyard, from which trees rise and around which hanging plants are suspended from balconies facing the court. An alternative arrangement has living quarters opening onto an exterior patio where outdoor kitchen and household activities end and gardening activities begin. Birds kept in the formal courtyard gardens are caged tropical exotics, but the birds of the backyard are more likely to be chickens.

While the walled form of the Luso-Latin home garden and many of the plants typically grown in it (citrus trees, figs, dates, herbs, and green salad vegetables), derive from Iberian and Near Eastern garden traditions, many of the fruit trees and other plants raised in these gardens were originally domesticated in the New World. Cultivation includes such fruit trees as lucuma, chirimoya, star apple, native cherries and native spices, and vegetables such as chile, sweet potato, and sweet corn maize.

In the backyards of Brazilian towns, the "quintal" extends some 15-50 meters, completely enclosed by high adobe walls. The name "quintal," or "quinta" in Spanish, derives from a measure of land equal to one-fifth of a hectare, although in practice the term refers to the house plot, which may be larger or smaller. The Brazilian quintal is divided by a wall into an inner block near the kitchen and a larger section where the following are raised for home consumption:

fruit trees, maize, sugarcane, garden vegetables such as tomatoes, lettuce and gourds, and pigs and chickens (Harris 1971:36; Wagley 1971:138). The walled gardens of Lima's low income housing projects are similarly utilized, though the space is smaller, averaging 10 square meters. Because these projects were sited as 'slum upgrades' of the spontaneous settlements which infiltrated the barren outskirts, the land is poor here. The patios more often contain small livestock than plants, which are grown in containers or on rooftops. In private, older, colonial style homes and residential institutions such as monasteries, nunneries, and older style hotels, the Luso-Latin courtyard gardens are highly ornamental. Some families residing in these elaborate urban settings have a second home at the outskirts (in Ecuador, also called a "quinta"). This resort or weekend home is set in an elaborate, practical garden abounding with fruit trees and vegetable plots behind walls. In the shanty towns outside Popayan, Colombia, each house lot fenced with only bamboo has a vegetable garden; upper class residences have formal patios with fountains and flowers, and other patios extending into the "far reaches of the rear of the house," which are used as gardens, utility areas for washing, playgrounds, and perhaps for raising livestock. The rear patios of the smaller middle class houses have one or two fruit trees or a small garden (Whiteford 1964).

In the United States, the Luso-Latin tradition of gardening was established in St. Augustine, Florida by 1565. This urban center was an orchard city, well stocked by 1763 with "fruit trees, figs, guavas, pomegranates, lemons, limes, shaddock, bergamot (orange), China and Seville oranges, and potherbs" (Huxley 1978). In California, the Jesuits (from 1697), and Franciscan missions (after 1767) both established variants of the Latin garden, introducing oranges, palms, and grapes. These introductions eventually shaped the agricultural history of the two states (Padilla 1961).

Table 2 The Luso-Latin Home Garden

English name	Latin name
(Trees:)	
Limes	Citrus aurantifolia
Seville orange	Citrus aurantium
Shaddock	Citrus grandis
Lemons	Citrus limon
Mandarin orange	Citrus reticulata
Bergamot	Citrus bergamot
Sweet orange	Citrus sinensis
Naranjilla	Solanum quitoenses (NW So.Am.)
Soursop	Annona muricata
Chirimoya	Annona cherimola
Star apple	Chrysophyllum cainito
Avocado	Persea americana
Lucuma	Lucuma biferz (coastal Peru)
	Lucuma obova ⁺ (Amazonia)
Papaya	Carica papaya

Date palm	Phoenix dactylifera
Coconut palm	Cocos nucifera
Assai palm	Euterpe edulis Mart.
Peach palm	Guilfordia gasipaes
	"Pejibaye, Pejibay, Pupuha" etc.
(and others)	

Other crops:

Maize	Zea mays
Sweet potato	Ipomoea batatas
Chile pepper	Capsicum frutescens
Sugarcane	Saccharum officinarum
"Orqano"	Origanum sp., Mentha sp.

Home Gardeners in the United States

Historical Notes

The Spanish settlements established in 1556 in St. Augustine, Florida contained gardens attached to houses (Wott 1982:314). In 1604, European style home gardens were established at a French settlement on the St. Croix River. Before 1623, a fenced community vegetable garden served the James River Virginian settlers of Martin's Hundred. By 1629, "fruitful gardens" flourished in the Plymouth and Salem colonies. U.P. Hendrick remarked in A History of Horticulture in America to 1860:

...the fact of holding title, of paying rent neither to overlord nor king, of being subject to laws he helped to formulate, gave a New Englander a love for his land that few tillers of the soil in other colonies could enjoy in so high a degree-- a feeling very conducive to planting gardens and orchards.

Fenced gardens in towns and on scattered homesteads, orchards, and kitchen and herb gardens quickly shaped the layout of American colonial settlements. All the Dutch towns along the Hudson River, even Manhattan, were notable for their gardens. Settlements set out in cleared forests, like Savannah, were checkered into houselots, each with a fenced garden. By 1760, the first important nurseries were in business. The practice of selling bulbs, pot plants, seeds and seedlings in general stores and through catalogs was entrenched by the early 1900's (Huxley 1978; Wott 1982). In the 19th century, the herb garden expanded into elaborate ornamental manor estate garden forms. Strictly utilitarian food garden plots remained a standard feature of most North American house sites.

The history of American gardening is documented in many well-researched books. American gardening is the exclusive or main subject of several popular magazines. No local newspaper is complete

without a gardening column, which even in the dead of winter will advise you to get a jump on ordering your spring seeds or to check the corms in your cellar. Gardening television and radio programs are broadcast widely. Large data sets on gardening in America have accumulated from USDA's periodic Nationwide Food Consumption Surveys (USDA, Human Nutrition Information Service), the USDA-ESCS Surveys on Home Gardening (conducted in spring 1976, winter 1977, and winter 1978) and annual surveys commissioned by Gardens for All, a non-profit organization. Appendix 1 lists some of the private national gardening associations, USDA centers, and state agricultural services and colleges that directly support American home gardeners with technical and organizational assistance.

Gardening in 1964

The proportion of all U.S. households producing any food for their own use dropped from 40% in 1954 to 34% in 1964. In 1964, 94% of all farm households consumed some of the food they produced. Fifty-five per cent of the rural nonfarm households and 22% of the U.S. urban households also registered production for home consumption. The decline in the percentage of households involved reflected accelerated rural to urban migration and the growth of metropolitan areas. Greatest declines were registered in proportions of farm households producing chickens, eggs, milk and milk products. As of 1964, home production of food was more prevalent in nonfarm households in the lowest income bracket (under \$3,000) than in those with higher income. More households in the North Central Region and the South continued to produce some food than in the Northeast and West. Tomatoes, other vegetables, and potatoes or sweet potatoes were the leading items produced (Redstrom 1972).

In the 1970's and 80's

In 1971, 25 million households in the United States gardened (Gardens for All 1978). Forty nine per cent of all U.S. households grew vegetable gardens in 1975 and the number increased in 1976 (Conolly and Utzinger 1977:70). In 1977, 32 million households, or 43% of all families in the U.S., raised fruits and vegetables on an area equivalent to 7 million acres, and each gardening family's savings on food bills averaged \$375 (Gardens for All 1978). In 1977, about 18% of the total money value of vegetables used at home were home produced (Blaycock and Gallo 1983). In 1979, 33 million households gardened, or 42% of all U.S. families (Gardens for All 1980). In 1982, gardening activities increased, with 38 million households participating. Although this represented 46% of all households, the sheer number of families involved in food gardening evoked commentary in the national news media. Journalists connected the gardening binge to economic hard times (Diggs 1982; Cook 1983). In 1983, the percentage of gardening households was back down to the 1979 level of 42%, with 35 million households involved, despite the challenges of heavy spring rains and a mid-summer drought.

As of 1983, 60% of all U.S. households in rural areas had gardens, 39% of the households in suburbs, 38% of the households in

small towns, and 31% of those located in urban settings. Food gardening was most popular with married householders and with persons over age 50. About 43% of the gardeners surveyed were 50 or over, 34% were age 30-49, and 23% were 29 or younger. Lack of suitable space or time for gardening were the main reasons survey respondents gave for not gardening (Gallup Poll survey for Gardens for All 1983, as quoted by Cook, 1983). The main reasons gardeners gave for gardening were "for fun and pleasure," and "to save money on food bills" (Leatham 1983:16).

Households in urban areas gave gardening the demographic boost it lost in the 1950's. The positive trend in urban gardening is largely attributable to the growth of community gardens, rather than use of private space such as roof tops or city backyards.

Community Gardens

Community gardening is a growing trend, but is not new. After the Panic of 1893, a period of unemployment and industrial crisis, the city of Detroit "initiated an innovative form of relief for the poor by providing garden plots on municipally owned and privately donated vacant urban lands" (Bassett 1979:4). Four hundred and fifty five acres were staked off for this purpose. A \$5,000 appropriation from the Poor Commission of the city yielded \$28,000 worth of produce. Other city governments and private garden clubs imitated the model, which came to be called the "city garden plot" movement, or "potato patches," after the most popular crop grown in the allotments.

During World War I, the National War Garden commission mobilized community and school gardening to offset food shortages. During the Great Depression, relief gardens were revived. In the period between 1930-1939, the staple foods of beans and potatoes were harvested on plots averaging 50' x 100' (Bassett 1979:6). The National Victory Garden Program during World War II was officially directed by the War Food Administration. Locally, public school Parent Teacher Associations mobilized efforts. "At peak production in 1944, twenty million Victory gardens yielded 40% of the fresh vegetables consumed in the United States" (1979:6).

In the late 1970's, organization of urban and town community gardens became a major movement. Every one of the 50 states has community gardening organizations. By the late 1970's, over 1,300 programs assisted community gardens, located in parks, school yards, church grounds, and leased vacant lots, to name a few common locations. The movement has enlisted housing project authorities and developed systems of urban trust land. The average community garden contains between 26 and 100 individually worked plots, each 100-750 square feet (Coe 1978:15, and see Naimark 1982).

Who Gardens and Why

An analysis of the 1977 NFCS and Gardens for All surveys found that gardening can produce savings for households but that the decision to produce vegetables at home is influenced by several

significant variables (Blaycock and Gallo 1983).

First, the local availability of cheap, commercially grown vegetables dampens the enthusiasm of individual home gardeners. Households in the North Central Region have the highest probability of gardening and those in the West the lowest. Across regions, rural location made gardening 18% more probable than other locations. Rural households, after all, are universally further away from supermarkets, so their transport costs for grocery procurement are correspondingly higher.

Second, households require available free labor for gardening. Even if gardening were profitable, with the "opportunity cost of labor" figured at average local wage rates, households with all adult members involved in wage labor rarely gardened. Opportunity costs were negative for female headed households. Households with only single adults, or with preschool children were less likely to garden. Non-labor income had a positive influence on gardening, due to a correspondingly larger supply of available household labor. This explains why households in upper socio-economic brackets appear among the food gardeners. When the variable of household income from sources other than wages and salaries--e.g., from rents, dividends and interest--is controlled, then clear correlations appear between household income and gardening. Gardening is then demonstrated to be most popular among households in the middle and lower income ranges. It is more likely that households with members 55 years of age will garden than any other type of household. Estimated savings on vegetable purchases were largest for households composed of older adults.

Home ownership had a significant impact on the decision to garden, increasing the probability that a household would garden by 12%.

All variables otherwise being equal (location, wage earners in household, household composition by age, home ownership etc.), Blacks were found to garden less commonly than others in the sample. A more detailed study of Black gardeners in Busby, Texas, suggests why. In this area of Texas, home gardening is a tradition, passed from generation to generation by word of mouth and demonstration (Wilheim 1975:73). Flowers are grown in "beds" and vegetables are grown in "gardens" in rows alongside parallel fruit trees. Those households who planted the least number of food crops were at both ends of the socio-economic scale, while those in the middle ranges were more likely to have food gardens. The "folk" door yard (house site) arrangement was a poverty type, featuring more beaten earth than useful plants. The "contemporary" style--just a lawn--was associated with rising socio-economic aspirations, and was prevalent among renters. A more recent study of Virginia rural Blacks also found that older, established, home owning, and generally more traditional families gardened prolifically, while neither the upwardly mobile nor the impoverished households showed much interest in gardening (McIntosh and Shifflett nd).

"Satisfaction," "enjoyment" and "pleasure" are motives given for gardening in response to various surveys (Gardens for All, 1978,1979,

1980). Members of the American Horticultural Society surveyed by an environmental psychologist reported a subjective, personal quality of peace and tranquility as the main benefit of gardening. Next most important was the sensory pleasure of the colors and beauty of the garden (Kaplan 1978). The psychological benefits of gardening are the basis of horticultural therapy, a skill taught in special university programs and applied as an occupational, vocational or recreational therapy for many kinds of people (Relf 1979:18; Coe 1978). The "community spirit" kindled by community gardening has led to other social benefits, and in housing projects, community gardening reduces tenant turnover and delinquency (Lewis 1980).

How and what Americans garden

By preference, most home gardeners in the United States use organic or semi-organic methods, avoiding pesticides. Moderate use of chemical fertilizers is fairly common (Gardens for All). Avoidance of biocides in home food gardens may represent an attempt at keeping production costs down, caution about introducing health hazards close to the house, children and pets, or the desire to produce natural organic vegetables and fruits. Such produce is esteemed, expensive, and rarely available in stores. Gardeners are undoubtedly influenced by the strong promotion of organic and recycling methods set forth in popular gardening manuals and magazines. Promises of greater yields for less work and less cost in less space "than you ever imagined possible"--as one title runs--are aggressively claimed for organic methods (See Appendix 4). Insofar as home gardening is experimental, and provides supplemental rather than basic food, American gardeners rapidly accept and try innovations in techniques and varieties.

Beginning gardeners usually start by growing vegetables, while long-term gardeners will often turn to flowers. (Kaplan) talks about the differences in rewards; vegetables offer practical rewards, while growing flowers offers the less tangible, sensory benefits of beauty, color, and fragrance (Lewis 1979:14, based on Kaplan 1973, and see Coe 1978).

The vegetables most raised by home gardeners are tomatoes, peppers, green beans, cucumbers, onions, lettuce, summer squash, carrots and radishes (*The Mother Earth News* 87 May-June 1984:150). Tomatoes, considered ornamentals and poisonous in the 19th century, are grown in almost every American garden, and have been the leading vegetable for decades. The popularity of wax or yellow beans, peppers, maize, cabbages, and potatoes has declined. Home production of vegetables is more popular than home production of fruit. Strawberries and apples are grown in about 20% of American home gardens; melons, peaches, pears, raspberries, blackberries or blueberries appear in about 15% of the gardens (Kaitz 1979:16). What is common to most home gardens is perhaps less interesting than the unusual choices and specializations. People may use home gardens to grow special foods associated with their cultural heritage or unique tastes in cooking, or to win prestige in gardening circles by producing unique

new varieties. In the South, foods prized in recipes from that region are important in home gardens there, including okra, collards, cow-peas ("black eyed peas" or "Southern peas"), and peanuts.

Table United States Garden Species by Popularity

English name	Latin name
Tomato	<i>Lycopersicon esculentum</i>
Beans:	<i>Phaseolus vulgaris</i>
Yellow, green, snap, string, French/ pole or bush	
Lima beans	<i>Phaseolus lunatus</i> or <i>limensis</i>
Peppers:	<i>Capsicum</i> spp.
Bell, cayenne, pimiento, celestial Sweet corn (maize)	<i>Zea mays</i>
Cabbage	<i>Brassica oleracea</i>
Potato	<i>Solanum tuberosum</i>
Cucumber	<i>Cucumis sativus</i>
Onions	<i>Allium cepa</i>
Lettuce	<i>Lactuca sativa</i>
Summer squash	<i>Cucurbita pepo</i>
Carrots	<i>Daucus carota</i>
Radishes	<i>Raphanus sativus</i>
Spinach	<i>Spinacia oleracea</i>
(Regional:)	
Okra	<i>Abelmoschus esculentus</i> L.
Collard	<i>Brassica oleracea</i>
Cowpea	<i>Vigna unguiculata</i>
Peanut	<i>Arachis hypogaea</i>
(Fruits:)	
Strawberry	<i>Fragaria</i> sp.
Apple	<i>Malus</i> spp.
Melon	<i>Citrullus lanatus</i> , <i>cucumis melo</i>
Peach	<i>Prunus persica</i>
Pear	<i>Prunus communis</i>
Raspberry	
Blackberry	<i>Rubus rosaefolius</i>
Blueberry	<i>Vaccinium</i> spp.

Contemporary European Gardeners

Home gardens are popular in Europe and countries settled by Europeans (Stokes 1978, 1981). Allotment gardening is an established tradition. In the United Kingdom, the green belt movement at the end of the 19th century began a trend formalized in the Small Holdings and Allotment Act of 1908. In England, demand for allotments is increasing (Kemp 1977) and more Britains now produce food in gardens than during World War II (Coe 1978:14). Standard allotments are 300 square yards, devised to permit rotations and relay croppings in units of 256 square meters each. To economize on space, allotments are intensively intercropped (Farmer 1979:24).

In 1972 there were 800,000 "Kleingarten" ("small gardens," or allotments) in West Germany, three quarters of which were managed by the City Garden Departments of municipalities. Each "Anlage" (group of kleingarten) contains an average of 50-400 allotments, each about 300 square meters. Plots are rented from the city by the square meter and there are waiting lists (Peck 1979:20).

A cross section shows the Kleingarten population consists of 29 per cent white-collar workers, 23 percent pensioners, 22 percent laborers, 19 percent self-employed. Younger people predominate in the newer Anlagen, but older people and families with children fill the established gardens. In all, 55 percent of the Kleingarten population is over 60 years of age (:22).

A quarter of the community gardens are on railway rights of way, and reserved for current and retired railway workers. Similar group gardens can be found throughout the low countries, at peri-urban locations and, as in Germany, along railroads and other rights of way.

In Denmark there are some community gardens in housing projects, but keeping home gardens is an important benefit of detached houses or garden townhouses. Since codes strictly govern architecture, creativity and individuality are expressed behind the hedgerow by gardening. Danes harvested more than \$200 million worth of food from their million home gardens in 1980 (Klougart 1981).

Home gardening is popular among New Zealanders of European descent. In Auckland, New Zealand, 80% of the respondents to a 1978 household survey maintained home gardens, and in Invergargill, 60% did; 53% reported stable production, and 37% had recently increased production. The average value of food produced was \$85/year, or 6% of a household's total food expenditure.

In the Soviet Union, home gardens are increasing in popularity as one of several types of "personal part-time farming" (Kalinkin 1981). "Private plots" are an increasing trend in Hungary (Marton and Nagi 1972), and in Poland. In rapidly urbanized Bulgaria, elaborate forms of urban gardening have taken hold. For example, grape trellises climb the walls of multiunit dwellings (personal communication, Martha Lewis).

The series of home gardening traditions which follows developed independently from the variants of the Near Eastern and European traditions described above. Any historical connections to the Western horticultural tradition happened after the 'age of discovery.' Cultivars grown in the South East Asian, Asian, Oceanic, African and New World gardens diffused from separate centers of domestication.

Indonesian Traditional Garden

The Indonesian mixed garden "pekarangan" is perhaps the best documented type of non-Western traditional home garden. The pekarangan is located at the house site in rural and urban areas of Indonesia. On Java, "garden land occupies anywhere from 15-75% of the cultivatable land" (Stoler 1978:86-87).

Importance

Studies have documented that the pekarangan is the source of up to 40% of the total calories, 30% of the total protein, and 65% of the fuels that rural households consume in some areas of Indonesia (Soemarwoto 1981). Setyati (1977:10) found lower levels: 10.8% of household intake in calories, 5.9% of the protein, and considerable ranges in vitamin A (1.0% to 126.4%) and vitamin C (3.0% to 228.0%). The contribution of home gardens to household consumption and income vary by region and by socioeconomic status.

Income and access to other agricultural resources influence strategies of crop combinations in the home garden. Stoler found that gardeners with the lowest incomes planted larger areas in cassava and other root crops, and that the sale of produce from home gardens was more critical to the household economy of the lower income Javanese (1975, 1978). The contribution to income through the marketing of garden surplus ranges from 7% to 44%. Rural home gardeners closer to towns and cities market more than those in remote villages. Some home gardens grow crops primarily for market rather than for home consumption, such as coconuts, cloves, and some fruits. Production from home gardens is particularly important during Indonesia's "hungry season" (the "paceklik"), which falls between the two rice harvests. During that time, the garden can provide up to 25% of a household's income, compared to an average of 6% during the rice harvest. Surplus produce from home gardens is broadly shared among neighbors.

Size and relation to other resources

Individual pekarangan vary in size from a few square meters up to five hectares. The smaller gardens are found in urban areas and at higher altitudes. Fifty three percent of the gardens sampled in one survey were larger than 600 square meters; 13% were about 200, and 12% about 100 (Setyati 1977). In an area of south central Java where 55% of the land was occupied by house and garden compounds, Stoler found that the size of pekarangan was larger among lower income households which owned less irrigated rice ("sawah") land (1975, 1978, 1981). Tenants, who do not own house sites, do not usually plant home gardens (Pelzer 1945:45). Terra regards individual ownership of the house site as crucial (1954, and see Binkert 1981:21).

Production characteristics

As its alternative names imply—"lumbung hidup" ("living food storage") and "apotek hidup" ("living apothecary") (Pelzer 1945:46)—the pekarangan produces food, fuel, medicinals and minor cash crops continuously (Soemarwoto and Soemarwoto 1981:2). A typical garden grows 30-50 plant species, selected from the more than 600 species generally raised in Indonesian home gardens. Gardens are structured for multistoreyed production, from canopy trees (such as coconuts) to ground creepers (such as sweet potatoes). The tallest layer, which in rural areas consists of perennials up to 20 meters high, and the lowest layer, which is only a few centimeters above the ground, combine to mitigate the impact of the intense, typically high rainfall, conserving both soil and water. In urban areas, home gardens have an altogether lower configuration, and grass lawns or concrete may surface the lower layer. Annuals and perennials are mixed, and plant production is combined with the raising of small livestock, particularly chickens (Soemarwoto and Soemarwoto 1981).

The permanance of the pekarangan is apparently achieved by three factors: the high ratio of perennials to annuals, complementary root structures, and constant enrichment with recycled household and poultry wastes, plant litter, and composts prepared with fish pond mud and animal dung. Fish ponds are not located in home gardens; rather, they are a specialized form of field production which draw on the water from irrigation systems. In Indonesia, aquaculture is mixed with the production of other livestock: ducks, chickens, goats, horses, and sheep (Djajadiredja, Jangkaru and Junus 1980; Delmendo 1980).

Hedge rows and fencing of any kind are rarely found in rural home gardens. Most have a cleared area directly in front of the house and shaded by trees (the "buruan"), which is used as a playground for children and a place for informal social gatherings. In urban areas, home gardens are typically fenced and may be walled for security.

In addition to consumed and marketed fruits, vegetables, spices, medicinals and small livestock, Indonesian home gardens include some strictly ornamental plants and caged birds. They also cultivate fuelwood for household energy needs and vegetable raw materials used for crafts (e.g. bamboo). In urban areas, aesthetic and status functions may dominate the design of home gardens, as opposed to functions of utilitarian production. Ornamental hedges and flowers are more common, and colorful dwarf chickens are kept rather than the meatier peasant chickens.

Chickens are by far the most common small livestock kept in gardens. Eggs are routinely collected and eaten. Meat is consumed in ceremonies and at ritual meals. Ducks follow chickens in popularity. In some areas, goats and sheep are kept.

Modern promotion

During the Dutch period, Indonesian home gardens were investigated as horticultural systems (Terra 1953) and were promoted (Pelzer 1945). These trends continue to the present day (Abdoellah 1977,

1978; Achmed 1980; Breure and Kabiran dan Awan 1976, among others). Colonists in transmigration schemes on outer islands have been observed to develop home gardens as a first priority. In the last few years, preparation of house sites for home gardening has become a feature of these settlement schemes (World Bank 1983; Pierce-Colfer 1981). Campaigns to assist home gardens have been mounted (UNICEF 1977), based on various theories of how to improve the horticultural techniques, layout, nutritional output, or cash cropping of home gardens (Setyati 1977; Soemarwoto 1975a; Soemarwoto and Soemarwoto 1979).

Relationships and origins

The pekarangan may be viewed as an adaptative adjunct to the flooded rice paddy or "sawah," which is the main kind of field where the staple crop of rice and occasional vegetables are produced in Indonesia. Historically, as more land was converted into permanently terraced and irrigated fields, all the crops which could not withstand flooding were grouped around the house, which, logically, remained on high ground. Hutterer regards the pekarangan and related south east Asian mixed gardens as survivals of a more ancient form of pre-rice agriculture that imitated the tropical forest. He draws this inference from the similarities between the Indonesian home gardens and the tree crop gardens of minority indigenous groups in the Indonesian archipelago (Hutterer 1982a:24). Terra attributed the Indonesian mixed garden style to the influence of particular cultural groups: the Mon Khmer, Chan, and Javanese peoples.

Table: Indonesian Home Garden

English name	Indonesian	Latin
(Trees:)		
Durian	Durian	Durio zibethinus
Jackfruit	Nangka, Cempedak	Artocarpus heterophyllus
(immature fruit and leaves eaten, mature fruit sold, and used as a source of fuelwood)		
Rambutan	Rambutan	Nephelium lappaccum
Banana, Plaintain	Pisang	Musa X spp
Coconut	Kelapa	Cocos nucifera
Avocado	Apukado	Persea americana
Mangosteen	Manggis	Garcinia mangostana
Pummelo	Jeruk bali	Citrus grandis
Jambulan, Duhat	Jambu	Syzygium cumini
Gnetum	Belinjo	Gnetum gnemon L.
(leaves eaten as a vegetable and sold for cash, source of fuelwood)		
Papaya	Papaya	Carica papaya
(Leafy vegetables:)		

Katuk	Katuk	Sauropus Androgynus
Chinese spinach	bayem	Amaranthus sp.
Long bean (lea/es)	bayung	Vigna var. sesquipedalis unguiculata
Cassava (leaves)	daun ketela	Manihot esculenta
Water convolvulus	kang kang	Ipomoea aquatica
(Root crops:)		
Cassava	ubikayu	Manihot esculenta
Sweet potato	mita-alu	
	ubi-djalar	Ipomoea batatas
Taro	talas	Colocasia esculenta
Yam		
(Others:)		
Basil	srawung	Ocimum sanctum
Black nightshade	leunca	Solanum nigrum L.
Drumstick, Horse-radish tree	kelor	Moringa oleifera
Pineapples	Nanas	Ananas comosus
Cloves	chengkeh	Syzgium aromaticum
Chili pepper	chabe	Capsicum sp.
Turmeric	kunir	Curcuma domestica Val. (cash crop)
East Indian galanggale	kencur	Kaempferia galanga
Fennel	adas	Foeniculum vulgare
Cosmos	cosmos	Cosmos caudatus H.B.K.
Cowpea	kacang	Vigna unguiculata
Lima bean	keratok	Phaseolus lunatus
Winged bean	kecipir	Psophocarpus tetragonolobus

Also common—string beans, tomatoes, peas and other legumes, and maize.

Usual range of species: up to 60 per garden, of 600+ commonly grown.

Common ornamentals: "Talas hias" (*Caladium bicolor*), hedges, bouganvillea.

Common small livestock: chickens, ducks; in some areas, goat, sheep, rabbit, carabao and in non-Muslim areas, pigs.

Major food sources NOT grown in home gardens: rice (*Oryza sativa*), fish, and soybeans (purchased).

Mixed Gardens Beyond Indonesia

Southeast and South Asia

Terra regarded the Indonesian pekarangan as just one variant of the permanent mixed garden, a system to be found in other humid tropical areas of Southeast Asia. He identified similar mixed gardens in Bengal, Kerela, every delta in India, in southwest Sri Lanka, in Malaysia, and among the Mon Khmer and other small ethnic groups of Indochina. With serious qualifications, he also identified small versions of the same system in Africa (Terra 1961:39).

Malaysia

Binkert (1981) has compared studies of Malaysian mixed gardens (Anderson 1976, 1980) with reports from Indonesia as well as the Philippines, and has found remarkable similarities in structure and crops. Anderson, who has conducted ecological studies of Malaysian gardens, regards the mixed garden as the key to self reliance and sound eco-development in the Asian tropics. The rubber tapping Paya Lebar Temuan are one example of the small enclaved ethnic groups which practice traditional mixed gardening in Malaysia, growing fruit trees and such vegetables as eggplant, a Colocasis, "tapioca" (probably cassava), cucumbers, and sweet potatoes exclusively at house sites (Gomes 1982:15). For less traditional crops, availability of seeds is a constraint to home and commercial gardening in Malaysia. Most vegetable seeds are imported (Chen, Enoch and Harun 1977) and of poor quality (Abdul Hamid 1977). On the tree crop plantations common in Malaysia, home gardens are a benefit accorded to resident laborers (Jain 1970).

Philippines

Gardens of the mixed type are widespread in the Philippines, where a 1978 national survey found that 72.9% of all households maintained home gardens, 32.6% of which were less than 10 square meters in size (Valerio et al. 1980). A study of 40 households in four Philippine rural towns found that over half the gardens were 400-600 square meters (Sommers 1978). The discrepancy in the number of larger home gardens reported by the two surveys may reflect differences between rural and urban barrios (Binkert 1981:4).

Not all Philippine home gardens are of the mixed type (Paner 1978). European style gardens occur; large community gardens have been established in urban areas where only container gardening otherwise occurs. Some Philippine regions and groups lack home gardens altogether. The Ilocos grow vegetables and fruit trees on dikes and ridges above their irrigated rice, and use house sites to tether small livestock (Nydegger and Nydegger 1966). Some forest groups practice only swidden cultivation or no cultivation at all.

In the Philippines, it is difficult to separate the impact of gardening project interventions from the continuity or revival of gardening tradition. Though the mixed style may well be traditional, home gardening programs since the mid-20th century have promoted different garden styles, including the mixed style. A steady stream of gardening handbooks has been written for the Philippines, beginning

with the pacesetter Samaka guide (Hoskins 1954). Since the 1950's, home gardening has been promoted in Applied Nutrition Projects (Cornelius 1968, Suter 1967), by governmental home economics units (Agricultural Productivity Commission 1968), and by nutrition council programs (Aguillon and Acosta 1967). Nongovernmental organizations have also been active in promoting home gardening (de la Cruz 1969; King, Wagner and Mitchel 1978; Syme and Marchant 1983).

Plants in Philippine home gardens include bearing trees such as avocado, cashew, guava, soursop, mango and jack fruit. Few fruits are allowed to ripen; instead, they are picked when green and small and eaten as vegetables (Nydegger and Nydegger 1966:27). The home grown drumstick or horseradish tree (*Moringa oleifera*), malabar nightshade or "spinach" (*Basella rubra* L.), water convolvulus (*Ipomoea aquatica*), various *Phaseolus* beans and the leaves of sweet potatoes, lettuce, mustard, amaranths, mustard and spinach have all been identified as important suppliers of Vitamin A as beta-carotenes in the Philippine diet (Solon 1979; UNICEF 1981). Other important home garden crops include bitter melon, bunga or yam beans (*Pachyrhizus erosus*), pineapple, grapes, several gourds, and eggplant (*Solanum melongena*). Eggplant, which is also grown in fields, is one of the few long-bearing vegetables prevalent during the dry season. "It is so omnipresent, especially during the last three months of the season, that parents frequently laugh about their children coming to the eating table and groaning, 'Again eggplant!'" (Nydegger and Nydegger 1966:26). Dietary staples in the Philippines not generally grown in home gardens include white flint maize, wheat flour based products, rice and fish. Bananas, coconuts, and the popular mungo beans are found at some home sites, but are largely grown as market crops.

Polynesia and Oceania

Hutterer identifies a larger area than Terra as the province for the mixed garden form. He calls it the "Indo-Pacific," and points to archeological evidence of tree and root crop domestication in the gardens of this broad region, stretching across Thailand, Sumatra, Eastern Timor, southern Sulawesi, and the New Guinea highlands during the time period 7,000-3,000 BC (1982:24-34).

It seems a little far fetched to classify Polynesian and Oceanic gardens as variants of the kind of home mixed gardens found in Indonesia, Malaysia, the Philippines and India. The ethnobotany of different Melanesian and Polynesian groups is well known, and provides a basis for fine distinctions among their horticultural and arboricultural systems (Kirch 1978). Overlaps in plant species are less dramatic than the extremes of crop emphases: for example, breadfruit may appear as a minor tree crop in Indonesia and southern India but dominates some home gardens and orchards in Polynesia.

A distinctive type of permanent, multi-layered garden is found in parts of Polynesia and coastal Malaysia, based on an approach to water resources which is diametrically opposite to that of the pekarangan. Whereas the Indonesian home garden, and related multi-

storeyed garden types of the humid tropics of south east Asia, are dry sites placed above fields flooded during wet rice cultivation, the permanent gardens of Polynesia and coastal Malaysia are deliberately placed in low, soggy areas. These gardens are built up on ridged fields set among drainage/irrigation canals along the coast or in valleys (Kirch 1978; Bennet Bronson, personal communication). Permanent Polynesian strand or valley gardens which also contain human habitations are relatively rare. There are, however, whole villages settled around such strand or valley mounded gardens.

Among Malayo-Polynesian and Papuan peoples, raised planting mounds, arboriculture, and shifting upland cultivation represent additional and more important systems of production than low lying permanent gardens, or any other house site gardening forms. The prevailing agricultural systems are swiddens where yam, taro, sweet potato, and/or banana are cultivated, and orchards (Yen 1974; Kirch 1978; Kimber 1972; Benjamin 1977; Lea 1970; Vayda and Lowman 1969, among others, and see section on swidden "gardens"). In the past, Hawaiians operated elaborate irrigation systems, some in prime spots which are now being operated by commercial irrigated plantations. More rudimentary irrigation systems are built by contemporary Malagasy for their rice and secondary field crops. In Madagascar, many women have fenced home gardens just outside their house, where they grow tomatoes, several varieties of greens, onions, garlic, squashes, beans, and other vegetables. "The vegetable gardens of most women, however, lie outside the village proper" (Kottak 1980:142), in part because they also care for pigs and poultry at their house sites. Among the Malayo-Polynesians and Papuans, as elsewhere, emphasis on animal husbandry limits the scope of home gardening, *per se*.

Humid Tropical Mixed Gardens

"Lumping" Polynesia's arboriculture with the mixed gardens of its geographical neighbors in south east Asia is a minor transgression compared to the far broader classification of all multi-layered gardens in tropical areas as "mixed gardens" (Terra 1961; van Eijnatten 1978). Most of its proponents point to similarities in the structure of layered polyculture. They can also point to overlaps in plant species grown, as there has been a convergence of garden crops across different cultural groups in the humid tropics. Certain useful plants rapidly and spontaneously diffused from their centers of origin. The best documented diffusions are of the sweet potato, Ipomoeas batatas, (O'Brien 1972; Kimber 1972, among others) and cassava (*Manihot esculenta*), both of which were New World plants domesticated before 3,000 BC. The sweet potato spread to Polynesia in pre-Magellan times and, after Columbus, both root crops were adapted throughout the humid tropics of the world. Other outstanding examples are also vegetatively propagated: bananas and plantains (*Musa* spp.) and the root crops "taro" (*Colocasia*), yams (*Dioscorea*), and the cocoyams (*Xanthosoma*). Vegetables now widely grown in the humid tropics are reviewed in Yamaguchi 1978, Oomen and Grubben 1978; Sommers 1983; and Bittenbender 1983b, among others. Bittenbender usefully provides the common names of the tropical vegetables he profiles, intimating the breadth of the diffusion of unique species.

Terra and other Dutch horticulturalists saw the Indonesian style home garden as an "interim measure in meeting the ever increasing problem of feeding the (world's) growing population" (Ruck 1968:3), and went beyond theory to set up projects which established or attempted to improve African home gardens with lessons taken from Indonesia (see the Ilesha Gardens case history, below). Binkert, Anderson and Sommers are among the more recent promoters of gardening interventions based on the mixed garden style for the humid tropics, drawing respectively on their knowledge of the Indonesian, Malaysian and Philippines variants. This promotion is conceptually linked to the "Permaculture" approach (Mollison 1979, 1981), through a stress on perennials.

Gardening can benefit from horticultural technical assistance, and the diffusion of useful plants and useful structural models for the tropics could be given a boost by systematic introductions (National Academy of Science 1979; Oomen and Grubben 1978). It is refreshing that the serious attention given to the Southeast Asian mixed garden in Western circles of horticulturalists, ecologists, and geographers is breaking down the "dogma" of gardening in rows and beds. The structure of a mixed garden may be technically ideal, or more culturally compatible, for gardening in some humid tropical places.

However, it is one thing to claim that a particular technique and style of gardening represents an ideal solution for home gardens, and quite another to claim that a few structural similarities constitute a universal and traditional "type" in the tropics, or to equate the "home garden" with the mixed garden. The "mixed garden" comprises the structures and ecological principles shared by several different traditions in the humid tropics, which are also applied to home, field and orchard market gardens, and occasionally to swidden cultivation plots as well.

Asian Community and Market Gardens

Terra identified places in continental Asia where there are multi-layered home gardens resembling the permanent mixed gardens of Indonesia (1961). This style of gardening is in the minority. In continental Asia, most vegetables are grown in fields, and fruits are grown in specialized orchards, some of which are polycultured.

The communal village and entrepreneurial market garden of the Chinese (Plucknett and Beemer 1981), Thais (Calavan 1977), Koreans and other Asian peoples are major sites for vegetable production. These systems can be generally classified as field systems for annual cropping, despite the intensity and permanence of production methods. The Chinese are premier market and peri-urban gardeners and vegetable consumers (Skinner 1978). Even in small villages, Chinese "private plot" gardens (Wang 1976) are usually placed in community gardening areas outside the main area of habitation. House site production is limited to growing one or two bearing trees and tending small livestock.

Where many communal or private commercial market gardeners are at work and distribution systems function well, home gardening is weak, almost redundant. Home or "private plot" gardening tries, on a smaller scale but in like manner, to produce for the same commercial ends. In Korea, peri-urban market gardening is assisted with simple greenhouses. In most of India, vegetables are grown as a crop on permanent dry fields in relay with major carbohydrate staple grains. Integrated production of fish, poultry and small livestock are best developed in continental Asia, and can be considered specialized variants of the communal or market field cropping approach.

Experimental "home garden models" based on bed and row production of largely annual vegetables have been developed (eg. Yang 1976b, 1979, 1981; Gershon 1983), and have been proposed for implementation in the same region where Anderson, Binkert, Hutterer, Terra, and Sommers et al. find and propose the mixed garden. These alternative technical solutions and models downscale to backyard size the Asian tradition of annual vegetable field cropping. To date, the most widespread introduction of a downscaled vegetable field to house site production has occurred on the Indian subcontinent (Venkataratnam 1973, and see sections on the Applied Nutrition Projects in India, and on Bangladesh, below).

Swidden Gardens

"The common name garden has been applied" to swidden fields "grouped around homesteads" (De Schlippe 1956). Swidden is a system which alternates dry field production with bush or forest fallow. There are examples of this vernacular use of the word 'garden' in literature about swiddens in Africa, Papua New Guinea, Malayo-Polynesian cultures, Central America, and the Amazon.

Various definitions of "home gardens" specifically exclude swidden or shifting cultivation, because swidden gardens are generally not very permanent, nor are they necessarily close to a human habitation (Hutterer 1982a; Anderson 1980; Binkert 1981). Some swidden gardens are, however, as permanent as the habitation of their cultivators--the criteria for permanence in Hutterer's definition of home gardens (1982a:144)--and the relay use of some swiddens may 'outlive' that of houses. Many of the small ethnolinguistic groups of the Amazon basin place their residence in or near a large swidden cultivation area, cleared by the entire group and then divided into family cultivation plots.

The swidden systems that have been called 'gardens' by European and American observers for the past century are those that are routinely polycultured: complexly intercropped and relay cropped. Since Western experience has been to monocrop fields and to reserve the garden for growing a diversity of plant species in a small space, polyculture swiddens, though properly a form of field production, have been called "gardens." Polyculture in "swidden gardens" among

some groups in native New Guinea involve up to 50-60 species for each use cycle, registering higher diversity than in their orchards of perennials. In several African and Amazonian swidden systems, swiddens are initially devoted to a main grain or root crop. After productivity declines, staple crop production is expanded into an adjoining area, and the old section is rotated into production of other annuals, including vegetables. In many of the Amazonian and Central American swidden systems, after initial production of grain and/or root staples intercropped with annuals, tree crop perennials are established to extend the usefulness of the clearing as a source of food long after it has been abandoned for any annual cropping.

Analysis of the garden-like characteristics of swidden fields is complicated by the presence of more intensively cultivated spots within some large swidden fields which are recognized in different languages as specialized "gardens" for herbs, medicinals, or annual vegetables. (See Podselver 1980, Wilbert 1961, or AMARU 1980 for reviews of several traditional Amazonian swidden systems, Sillitoe 1983, among others, for the dynamics of a Malayo-Polynesian system, and the section on Africa, below). Further, some groups which practice swidden polyculture also maintain home gardens (Ruddle 1974 and see Mesoamerica, below).

Other swidden systems are clearly a variant field system. In Central America, the "roza" or "milpa" is primarily for a single annual cycle of maize and beans, and is rarely extended even into a root crop cycle, due to the predation of large rooting mammals and the heavy growth of weeds. In some cases, the milpa is transformed into an orchard (see Mesoamerica, below). Except in pioneering villages, milpa are located far from residences. The initial milpa swidden is converted into a village site, which in turn can contain home gardens and orchards. Generally, the swidden field is located toward the perimeter of long fallowed or forested regions.

In the sparsely populated and still forested areas of the Amazon basin and Africa, pioneer colonists equipped with steel axes and even chain saws practice extensive rather than intensive swidden production. The relative length of time swidden fields are used compared with the time they are in bush or forest fallow is a relationship expressed by "R" ratios. Generally, swidden systems with low R ratios are the more garden-like, and those with the highest R ratios (eg. 1 year's use: 20+ years fallow) more closely resemble field monocrops.

While a thorough review of the world's systems of shifting agriculture is inappropriate here, several criteria can be raised to distinguish the "garden-like" swidden systems from the others.

1. Swidden plots can be considered the functional equivalents of home gardens if they are the only location where vegetables, fruits, spices, medicinals and other supplements to the main staple crops are gardened. When residential locations shift in relation to the use life of swiddens, the vegetable spots or cycles on swidden fields are rarely far away from the primary residence of the cultiva-

ting household. In fact, swidden field garden spots are often conveniently closer to the residence than are the community gardens used as functional equivalents of home gardens by urbanites for very different ecological reasons.

2. When the swidden plot is located at or near the sole or main human habitation, and no other kind of food production takes place closer to the residence, it is the only possible functional equivalent of a "home garden," regardless of the crops that are grown. There are, after all, societies where garden, field, orchard, and house are all temporary.

3. Swidden gardens should also be considered as potential home gardens if the life span of their usefulness can be prolonged. The fact that swidden field systems can rapidly shift into permanent gardens is demonstrated by the spontaneous adaptation in the Western Highlands of New Guinea of "hotbed mounds" for intensive production of sweet potatoes (Kimber 1972), experimental prolongations under research in Papua New Guinea (Swift 1980, 1981; Fitzpatrick nd, and Gagne and Gagne 1978-1979), and the shortening of swidden bush fallows and adoption of fertilizers or new varieties. This kind of intensification can be a response to increased land pressure. People are less inclined to move when they have access to modern fixed facilities, such as roads, schools, and clinics. In order to benefit from such infrastructures, swidden cultivators have shortened their fallows (Benjamin 1977).

In several projects, a rapid shift from swidden cycle vegetable production to permanent community vegetable gardens was accomplished by the installation of wells at the garden sites. Wells were a new resource which encouraged people to concentrate other resources (e.g. animal fertilizers and sheds for garden tools,) to enhance the usefulness of the plot.

Swiddens can be seen as a step or stage which can lead to permanent gardens, orchards or fields. Through the 18th century in northern Europe, field systems were based on shifting cultivation and 'slash and burn.' Techniques developed in the more intensive home gardens were eventually applied, with animal traction mechanization, to develop more permanently cultivated out fields. In areas of high rainfall where tropical soils are quickly leached and eroded once vegetation cover is removed, annual field cropping on permanent dry fields may be impractical on a sustainable, long term basis. However, mixed gardening, orchard polyculture, and agro-forestry offer alternatives for the more sustainable and permanent use of areas currently cropped as swiddens.

Subsaharan Africa

There are nearly as many distinctive farming systems and food crop inventories in Africa as there are ethnolinguistic groups. Subsistence activities and division of labor can vary sharply between

different ethnic groups within a few square miles (Guillaume, Bederinan, and Freville 1967). Summary treatment of African home gardening traditions and their functional equivalents is difficult. Sources of typologies and descriptions of African agrarian systems include: Allen 1965, Benneh 1972, Irvine 1949, McLoughlin 1970, Morgan and Pugh 1969, Ruthenberg 1976, and Ruthenberg et al. 1980.

Two fundamentally different agricultural complexes have evolved on the African continent: the seed agricultural complex and a complex based on vegeticultural propagation of rhizomes, tubers and cuttings particular to forested centers (Okigbo 1977). Generally speaking, the vegeticultural complex is featured in African home gardens, while crops reproduced from seeds are grown in fields. However, many swidden gardens (see discussion above) or "shamba" feature relays of roots and suckers with food crops grown from seed, and vegetatively propagated crops are also grown on cleared fields.

Of the several agrarian systems prevalent in West Africa, the compound farms or homestead gardens in forest areas are the most intensive permanent ones. Traditional compound or homestead gardens "combine aspects of mixed farming, tree crops and specialized horticulture.... There is usually an (area) on which more or less continuous cultivation of the highest intensity is practised and fertility is maintained through applications of household refuse, human and animal waste and compound sweepings" (Okigbo 1977:132). Production of bananas, other fruits, and vegetables is concentrated around dispersed houses in Uganda and between the dispersed houses of the Ewe who, like the Ada in Ghana, also had traditional fenced gardens within house compounds. In francophone African countries, small garden house site lots are often called "women's gardens" --"jardins de femmes" (Terra 1961:39). In addition, the household manages orchards, vegetable fields and bush fallow swiddens.

Plant inventories of home gardens of less than 0.5 hectare in the East Central and South Eastern states of Nigeria have found that some 50-60 species are grown. These include major staples (yams, cassava, maize and cocoyams), vegetables, tree crops, other perennial food plants, fiber plants, ornamentals, and medicinals (Okigbo 1977: 132-4; van Eijnatten 1971; van Epenhuijsen 1974; Toury 1967; Tindall 1968-1969).

Another kind of African home garden is the "kraal" garden, noted among groups which combine crop cultivation and livestock raising (Grivetti 1980). Former animal corrals, which are located near the house in order to protect animals at night, are recycled as homestead gardens--a practice strikingly similar to the recycling of old pig pen sites into home gardens in the United States' mid-West (personal communication, Martha Lewis), and the deliberate corralling of goats to make a desert spot suitable for vegetable gardening on the dry north coast of Peru in South America. Grivetti (1980) suggests that the concentration of edible plant seeds by herded animals near house sites plays a continuing historical role in plant domestication and in the very origin of gardening; a theory first suggested by archeologists working with the remains of early cultures in the Near East.

Although there are traditional sustainable home gardens in Africa, most vegetables (sweet potatoes, beans, peas and others) are grown as a cycle on swidden fields at some distance from house sites, either before or after the main staple has been produced (e.g., millet, sorghum, maize, cassava etc). These bush fallow plots, called "shamba" in much of the literature, are cultivated by individual families, and even by individual women in the case of polygamous societies where a man has more than one wife. The spatial arrangements of African swidden fields depend on the fallow cycle and the availability of land and labor (Levine and Levine 1966 on the Gusii of Kenya; De Schlippe 1956 on the Zande). Even some of the highly mobile pastoral peoples establish small gardens near a base camp of herding operations (Cloud 1978).

Wild vegetables, especially green leaves, remain a significant dietary element in many areas of Africa (Dema 1969; Dewey 1979; Waldman 1974, among others). This is also true in Central and South America and other world areas where forests and other natural flora have not been depleted. Where gathering green vegetables and fruits is possible and easy, home gardening may be less attractive or necessary.

"Community Gardens"

In West Africa, large community gardens ("les jardins" in francophone countries) are clearly distinguished from swidden fields ("les champs"). These community gardens are located very close to residences. Usufruct rights are assigned to individual families or wives. Vegetable crops such as "gombo" (okra), maize, and legume beans are cultivated and, under the direction of village authorities, units containing individual plots are annually rotated into a fallow cycle. Fallow and nitrogen fixing legume crop relays are the principal methods for sustaining the productivity of such community, peri-village gardens. Meanwhile, the main staples (varieties of rice, sweet potatoes ("patates"), cassava, and fonio) are grown elsewhere, while peanuts appear in some gardens and some fields.

In many African villages where all land is held corporately by the community (which in turn may be a lineage linked by kinship) the availability of a suitable location for community semi-permanent gardens may be a determining factor in selecting sites for new villages. Some gardening projects have misunderstood the corporate ownership and central control of the fallowing regime in such gardens as "communal," when, in fact, use rights and disposal of the gardened produce are in the hands of the smaller group or individual who works each plot.

European Influences

Home Gardens

The development of individual home gardens in Ghana has been traced by Sekyi (1977) to the 19th century. In precolonial times,

family compounds had little space for individual gardens. Missionaries to the Gold Coast introduced ornamental gardens and fruit orchards around their bungalow-style homes and at their missions. In 1890, a 160-acre Botanical Garden was established at Aburi, a popular attraction that influenced the emerging Ghanaian elite to establish home gardens. These were initially leisure gardens, featuring fish ponds, fountains, and other elaborations. Private companies began to import planting materials and Ghanaian nurseries were established.

After the earthquake of August 1969, the Housing Department began building "estate houses" (individual residences), and established stock nurseries to cater to the demand for fruit trees and ornamentals. Gardening flourished in housing developments, featuring fruit trees, backyard food gardens, hedges, and ornamental flower beds. Organizations with resident facilities, like the Police and Army, encouraged gardens in apartment buildings. Three Ghanaian universities established botanical gardens and horticultural nurseries open to the public and developed programs of horticultural studies. Since the early 1950's, corporations developing new towns for settlement have included in their plans horticultural sections with layouts which accommodate home gardens.

Currently, the Ghanaian government continues to support and promote home gardening through several agencies (see Appendix 2). Home gardening has enjoyed an upsurge of popularity since a recent drought, while the number and distribution of small private seed multiplication units and nursery enterprises has increased steadily. Most of the vegetables grown in Ghanaian home gardens are African cultivars.

Market Gardens

In the Francophone countries of Africa, market gardens have been established near the larger towns and cities (Toury 1967). Market gardens are cultivated in the intensive organic style of the Parisian "maraichere" (Stanhill 1977)--a style of organic gardening which influenced the development of what horticultural writers in English have come to call the "French intensive or biodynamic method"--and also in styles which emphasize capital investments in irrigation and inputs. In Senegal, some market vegetable gardens are at least 50 years old, and market gardeners have been organized in syndicates since at least 1945. Similar societies exist in Mali, Burkina Fasso and Niger to serve market gardeners' interests (Toury 1967). Market gardening is particularly well developed in the Ivory Coast (Accati 1983), where even school gardens are market gardens (Liebrecht 1967). Ivory Coast market gardens have well-developed export channels to Europe for vegetables and fruits out of season in the north.

In Ghanaian cities, market gardens produce European vegetables for the expatriate community and for hotels. Peri-urban gardening for home consumption and for sale to local markets is a growing trend throughout Africa (Adeboye and Abidogiu 1978; Lawson 1978).

The influence of market gardens on home gardens in Africa appears

to be beneficial, as the more commercial operations have established demand and marketing channels but have not saturated local markets. This situation creates ready outlets for the surplus produce home gardeners may wish to sell. In Africa, more than in other world regions, the local gardens promoted by international development projects fairly quickly assume the dual functions of producing for home consumption as well as for market (see Appendix 2, and the Mauritania and Senegal project case studies, below).

Caribbean Home Gardens

Caribbean gardens, like their societies, represent a synthesis of the African, European, and native cultures from which they derive. Many of the specific cultivars and spatial patterns observable in gardens throughout the islands and shores of the Caribbean are of Arawak or Carib origin (Kimber 1973). These patterns underlie other influences on home garden layout and crop diffusions contributed by several colonial traditions: French, English, Spanish, and Dutch. The contribution of the formal European manor garden to the "dooryard garden is in species, not in the organization of space or ornamentation" (Kimber 1966:116). Though techniques are more difficult to trace than crops and layouts, there are interesting convergences between Afro-Caribbean approaches to cultivating New World crops and the approaches of Africans to the same crops--in particular, cassava, maize, sweet potatoes, and previously unknown species of beans, which diffused from the New World to Africa. Tools used in Caribbean gardens are hoes, machetes and dibbles, as is also true in Africa and much of Latin America.

Influence of the Plantation Economy

The plantation economy in the Caribbean (May and McLellan 1973; Fernandez, Burgos, Roberts and Asenjo 1968) influenced gardening and diet. As elsewhere in the world, resident laborers were sometimes allocated subsistence plots (Jain 1970; Beckford 1972) and managers occasionally dedicated land areas to food crop production. These were called "provision gardens." In the Anglophone Caribbean today, this term is applied to specialized vegetable market gardens, though some people refer to their home gardens as "provision" as well as "kitchen" gardens. In Puerto Rico, where sugar plantations dominated the landscape, home gardens were a far weaker tradition than in Martinique or Guyana, for example, where cash crop plantations were restricted to certain zones and home gardening sprang up among the independent peasants (Horowitz 1967).

The Francophone islands of Martinique and Guadeloupe are more self sufficient in food production, and home gardens ("jardins de case") make an important contribution to that self sufficiency, especially in the freehold upland "momes" (Peeters 1976; Horowitz 1967; Kimber 1966, 1970). French horticulturalists took a lively interest in adapting and improving fruits and vegetables locally (Messiaen 1974).

Food imported to supply colonists and, later, plantation workers, influenced Caribbean diet more than Caribbean self reliant production did. Taste preferences were established long ago for foods which cannot be easily produced in the insular Caribbean, such as salted dried cod (a fish of northern waters) and pickled pigs'tail. As Caribbean populations have migrated to centers of wage labor in the developed countries, additional taste preferences have developed for highly processed "brand name" foods, leading to a new stage of dependency on food imports.

Nutrition education based on the nutritionally optimal use of locally available foods has encountered great success in the Caribbean (Alderman and D'Souza 1975; Horowitz 1967), precisely because adequate diets can be grown (and fished) locally, even though these foods are not always preferred.

"The Caribbean has the agronomic potential to produce sufficient rice, beans, vegetables, and a rich variety of fruits that could provide balanced intakes" (May and McLellan 1973). Many of the vegetables currently imported are also grown in small quantities in home or market gardens (Due and Gehring 1973).

The seasonal character of some Caribbean home gardens and the prevalence of easy care perennials suited the plantation economy, which drew workers into the fields for labor intensive operations on cash crops.

Characteristics of Caribbean Home Gardens

Some characteristics common to the diverse forms of gardens in the Caribbean include:

- o nutrient cycling between house and garden; a pattern which has been observed in home gardens in Mesoamerica, Indonesia and tropical Africa;
- o planting and tolerance of trees close to the house and in prime areas dedicated to plants and small livestock to provide shade, and selection of house/garden locations where one or two trees are already well established;
- o devotion of special beds or areas to the exclusive production of herbs, spices, and medicinals of the folk pharmacopoeia, possibly influenced by the European "herb garden"--an almost universal though minimal element of Caribbean home gardens;
- o limitation of food source plants to no more than half those cultivated or tolerated; some patterns include the herb-medicine beds noted above and
 - fuelwood lots, orchards, or bushes functioning as windward side windbreaks;

- living fences of yucca, logwood, galba, gliricidea, or other plants, supplemented by wire or board fences where houses are very close together or where small livestock represent a hazard for gardens;
- fuelwood production through 'pollarding'—a European technique of cropping faggots from living trees—and occasional backyard charcoal production;
- o swept, beaten earth, or paved "yards" immediately adjacent to the residence or "patios";
- o small livestock production in yard or garden areas: poultry are cooped at night, rabbits are confined in hutches, and pigs and goats are penned, tethered, or confined to fenced sections; and
- o parallel production of the same crops in home gardens and in out fields and orchards.

As in the Mesoamerican tradition, 'volunteer' wild species are tolerated and occasionally protected, so that the more vernacular home gardens are spacious and "lock chaotic" (Kimber 1966). Gardening in rows or beds, except for the herbals, is somewhat unusual. The practice varies along the continuum of formality of garden design. The row cropping practiced in vegetable market gardens also influences home gardens in their vicinity (Kimber 1966:17).

Variations Among Caribbean Home Gardens

According to Deneven (1980:237), home or "dooryard" gardens are "best developed in the densely populated islands such as Hispaniola, Jamaica, and Martinique," and these "well established house gardens are ecologically stable and very productive... some are hundreds of years old" (1967:237). This claim is currently the subject of ecological research by the Canadian geographer, Theo Hill, who calls the Jamaican home garden a "food forest" (personal communication). Kimber's studies of the types of spatial layouts and garden plant inventories on Martinique (1966,1970) and Puerto Rico (1973) are notable, distinguishing the more formal "manor" or "suburban" styles from the basic "jibaro" and other vernacular types.

In his study of Martinique, Horowitz suggests that the house site typically has several specialized production areas. These include beds where herbs and more than 100 medicinal plants are grown, seed beds used to produce seedlings later planted in fields, and the coops and hutches of small livestock—chickens, ducks, pigeons, and rabbits. In home gardens, vegetables, root crops and trees are intensely cultivated, although the same set of vegetables, roots, and productive trees are also grown in fields (1967:21-28). In her study of Martinique's "jardins de case," Peeters notes that the importance of the medicinal plants makes the home garden a largely female domain, as these plants are largely grown and used by women (1976:48). She

opens the intriguing topic that the many ornamental plants grown around houses all have symbolic meanings derived from Afro-Caribbean religious concepts and that plants are arranged to magically protect the residents from harm. She also notes that the Martiniquais were closely enough associated with the original Antillean population to conserve origin myths for particular plants.

On the island of Dominica, where home gardening is waning and disdained by the more urbanized or modern Dominicans, country-wide home garden surveys are underway as part of an improvement effort in collaboration with the Caribbean Agricultural Research and Development Institute (CARDI 1983). Market gardening among the rural population is increasingly popular, however, and some of the most intensive market gardens in the Caribbean have been established in Dominica (Williams 1980a and 1980b).

Some Central American gardens fit more comfortably into the Caribbean tradition than either the Mesoamerican or Luso-Latin, as they share the heritage of Circum-Caribbean peoples. Covich and Nickerson's study of the plantings around the dwellings of the Panamanian Choco (1966), and Palacio's study of nutrition in a Belizan Black Carib community (1980;1984) both provide examples. Housesite production is in a form strikingly similar to the yard-garden called "jibaro" in the Hispanophone Caribbean. Among the Choco and Black Caribs, root crop, vegetable, and ground fruit production for household consumption in "bush gardens" outside the residential area is as important as it is in Haiti. In these less densely populated villages where outmigration of adults is common, "disputes over rights to fruit trees and (still productive) abandoned houselots arise" (Palacio 1984:19).

Puzzles about Caribbean Home Gardening

Is it important?

While there are reports of home gardening (or at least, some container gardening) at house sites from most areas of the Caribbean, the literature consistently points to the importance of home garden areas off house sites for subsistence and cash production (Pillot 1980 for Haiti; Peeters 1976 for Martinique; Rao and Edmunds 1983). Off-house-site gardens include market vegetable gardens, orchard-like multicropped gardens, and intensively intercropped annual vegetable gardens. For Haiti, Pillot (1980) distinguishes three kinds of gardens ("jardins"): a multi-layered orchard of spices and tree crops in the 2,000 square meters around the house; a continuously intercropped garden at some distance from the house for such annuals as maize, root crops and cabbages; and a third continuously cropped garden devoted to sweet potatoes and beans, also located at some distance from the house (1980).

Because some Caribbean small farms, at half a hectare or less, are smaller than the larger home gardens found in other areas of the world, and because in form they are similar in diversity to home gardens, it is particularly difficult to draw analytical distinctions

between "farm" and "home garden" in the Caribbean. Nevertheless, the Caribbean property of roughly half a hectare which is intentionally designed as a source of full-time economic subsistence and cash production should be considered a "small scale intensive" farm (L.I.F.E. 1976, 1981). The Caribbean home garden is not intended as the main economic activity supporting a household, nor as its main source of food. A further distinction between these intensive Caribbean mini-farms and the Caribbean home garden is the mini-farm's greater labor and capital intensity, displayed in terraces, trenches, and investment in carefully confined livestock to produce income and manures for recycling into vegetable, spice and tree crop production. Home gardens are more casual and demand less labor.

Several writers question the popularity of home gardens in the Caribbean. McIntosh states flatly that the "unpopularity" of home food production has limited the demand for seeds, planting materials, feeder stock, fertilizers, insecticides, veterinary supplies and technical assistance (1983). Gardening emphasis shifts from producing food to raising ornamentals and lawns among the higher status residents of Puerto Rico (Kimber 1973) and, as noted, gardening is declining in the more urbanized areas of Dominica. At the same time, other observers have detected an increase in Caribbean households' attention to home gardening and small livestock production which they attribute to a reaction against the high price of import foods (Marchione 1979) or the failure of cash crop or wage labor strategies (Pillot 1980).

Who gardens?

The literature is contradictory on the point of who gardens in the Caribbean household. Kimber implies that Caribbean men and women of all ages garden, but elderly people produce the most varied and self sufficient gardens. The gardening expertise and ample crop repertoires of elderly women have also been noted by Martha Lewis (personal communication). This may reflect either the influences of modern life on earlier generations' pursuit of gardening, or older people's retirement from other economic endeavors. Other observers regard the home garden as a female domain. Children, however, are consistently reported to have special responsibility for the care of livestock, and to benefit from the availability of "snack food" garden produce.

The observation, and consequent assumption of many gardening project designs, that adult women are 'the gardeners' in the Caribbean may reflect the general demographic pattern of male wage out-migration and the feminization of agriculture even at the household production level. Home gardening and household small livestock production as a whole may not be as closely linked to women's role in the Caribbean as are some specialized forms of production at the housesite which survive when home garden complexity is reduced to a minimum: for example, the care of herb and medicinal plant beds. Apparently, only men pollard fuelwood garden trees and make charcoal, a function of home gardens in Jamaica and Haiti. In the Caribbean, as elsewhere, the complexity of garden functions are influenced by

wage employment outside the home, whether by adult men or women.

Several recent or on-going projects in the Caribbean region have promoted home gardens or market gardens with fairly good success. With its food import problems, island space restrictions, documented nutritional deficiencies, and tradition of home gardening, the region seems particularly ripe for garden-based self reliant development (Peat 1984).

Table Caribbean Gardens

English name	Common name	Latin name
(Trees:)		
Avocado		<i>Persea americana</i>
Bananas		<i>Musa spp.</i>
Plantains		
Breadfruit		<i>Artocarpus altilis</i>
Barbados cherries	cerise du pays	<i>Malpighia glabra</i>
Coconut		<i>Cocos nucifera</i>
Golden apple		<i>Spondia cytherea</i>
Guava		<i>Psidium guajava</i>
Hog plum		<i>Spondias moin</i>
Jack fruit	Jak	<i>Artocarpus heterophyllus</i>
Lemon		<i>Citrus limon</i>
Lime		<i>Citrus aurantifolia</i>
Mamsee apple		<i>Mammea americana</i>
Mango		<i>Mangifera indica</i>
Orange		<i>Citrus aurantium, c. sinensis</i>
Papaya		<i>Carica papaya</i>
Shaddock	pummelo	<i>Citrus grandis</i>
Soursop		<i>Annona muricata</i>
Sugar apple		<i>Annona squamosa</i>
Tangerine	Manadarin orange	<i>Citrus reticulata</i>
Papaya		<i>Carica papaya</i>
Logwood (fuel)		<i>Haematoxylum campechianum</i>
Galba (fuel)		<i>Calophyllum antillanum</i>
Gliricidia (fuel)		<i>Gliricidia sepim</i>
(Root, bulbs and corms:)		
Taro	Dasheen	<i>Colocasia esculenta</i>
Cassava	Manioc	<i>Manihot esculenta</i>
Onion		<i>Allium sativum</i>
Potato onion	Onion pays	<i>Allium tuberosum</i>
Radish		<i>Raphanus sativus</i>
Sweet Potato		<i>Ipomoea batatas</i>
Cocoyam	Tania, Tata, Tete, Yautia	<i>Xanthosoma sagittifolium</i> LSchott
Edible canna	Tulumán, tous- les-mois	<i>Canna edulis Ker.</i>
Yams		<i>Discorea alata</i> <i>Discorea cayenensis</i>

(Vegetables:)

Asparagus (Francophone islands)		<i>Asparagus officinalis</i>
Bell pepper		<i>Capsicum annum</i>
Cabbage		<i>Brassica oleracea</i>
Cucumber		<i>Cucumis sativus</i>
Eggplant		<i>Solanum melogena</i>
Green and string beans		<i>Phaseolus vulgaris</i>
Kale		<i>Brassica oleracea</i>
Lettuce		<i>Lactuca sativa</i>
Peanut		
Pigeon pea		<i>Cajanus cajan</i>
"Spinach"	"epinards"	<i>Amaranthus spp.</i>
Tomato		<i>Lycopersicon esculentum</i>
Tanier spinach		
or Tahitian taro	Calalou	<i>Xanthosoma brasiliense</i>

(Others:)

Sugar cane		<i>Saccarum officinarum L.</i>
Grapes		<i>Vitis vinifera L.</i>

(Spices:)

Allspice		<i>Pimenta dioica</i>
Red pepper		<i>Capsicum spp.</i>
Saffron		<i>Crocus sativus L.</i>
Thyme		<i>Thymus vulgaris L.</i>

Common ornamentals: bouganvillea, dahlia, ferns, gladiolas, hibiscus, lobster claw ("balisier jaune"--*Heliconia caribaea* Lam.).

Common livestock: Poultry, rabbits, goats, pigs.

Important foods in the diet NOT grown in home gardens: maize and rice, imported foods.

Traditional Gardens of Mesoamerica**Home Gardens**

Home gardens are a distinctive tradition in the culture of Mesoamerica, an area covering most of Mexico and parts of Central America. The Mesoamerican home garden is a land use found across ecological zones. Combined with the various other agricultural practices of Mesoamerican peoples, it persists among populations who are fully integrated into the national culture and no longer follow an Indian lifestyle.

In the Nahuatl ("Aztec") language, the land cultivated next to the farmer's house is called "calmil." In the cold and temperate zones of the highlands, the calmil is the most intensively cultivated of all dry, permanent fields:

The soil is constantly tilled and fertilized with garbage from the house, with dung collected from the farmyard where domestic animals are kept, and with leaves and branches. From the standpoint of cultivation, the stability of the calmil is complete. Because of the "pantry" nature of the calmil, crop rotations and mixed crops are normal techniques. The calmil is frequently used as a fruit tree nursery or seed plot for transplanting at the proper time of year (Palerm 1967:36).

Maize, an important crop in the dry fields, is also grown on the calmil or "home maize plot" as an insurance and source of green or sweet corn. Maize which is grown to be eaten green is usually a different variety than maize grown to be dried and stored for later use. The size of the calmil is limited by the amount of refuse available. The large houselots lead to a special settlement pattern, as all calmil villages are scattered ones (Sanders 1967:82).

In the humid tropics of the Peten:

.... 20 to 40 different edible species are represented in each kitchen garden....It is usually planted to the sides of each house and is about one-fifth of an acre (0.8 hectare).... Because of the perennial nature of most of these plants, little upkeep is necessary and yields are fairly predictable from year to year. It is common practice to plant certain different trees trunk to trunk. In a sample of gardens in Dolores, several recurring combinations were observed. A guayava (*Psidium guajava*) was commonly planted against a citrus tree. A jicara (*Crescentia cujete*) was often planted flush with or near an avocado (Stavrakis 1979:93).

Gardens at house sites in the humid tropics and subtropics of Mesoamerica feature useful trees and bushes, root crops and container plantings. Whole settlements in the humid tropics are spacious orchards. Among the K'etchi, more than 40 species of fruiting trees are grown in villages (Wilkes 1981). Wilkin regards the "multi-storied door yard gardens" as the "ultimate stage in forest emulations" (1977), perhaps even better developed by the ancient Maya than at the present (1970).

In the Yucatan peninsula where all rivers are subterranean and there is a pronounced dry season, home gardens are in small raised fields, called "ka'anche" or "caanche" in Yucatec Maya. These are often placed in hollowed tree trunks or small boxes. Swidden maize in "milpa" fields is produced for household consumption, plus a surplus of roughly 30-40% for sale. Traditional households subsist on products of the maize milpa, the home garden, orchards, and small livestock production (Villas Rojas 1969; Vargas 1983).

The Tarascans grow root crops exclusively in their home gardens (Thomas 1983), which also feature a number of cultivated and semi-cultivated trees and other plants. Home gardens in a Vera Cruz colonization project are planned around trees selected from the tropical forest for protection, and enriched with a variety of home garden cultivars brought by colonists from Mexico (Gispert 1981). Plants grown at house sites by the Lacandon, a forest group, have been inventoried by Nations and Nigh (1978), who found their home garden production had expanded in this century. The most intensive home gardens of Mesoamerica apparently occurred in the major ancient urban centers. The earliest chroniclers marvel at the Aztec capital's courtyard and roof gardens (in private residences) and archway and floating gardens ("chinampas"). All this ancient gardening was based on the urban irrigation systems of cities built on lakes, later destroyed when the Spanish drained these central Mexican lakes. The single continuously surviving area of floating gardens is at Xochimilco, used today for market floriculture.

A striking feature of the Mesoamerican home garden is its incorporation of useful wild plants, which are protected. Gispert (1981) reports from Vera Cruz that the following trees of the primary tropical forest are protected: cedars (*Cedrela odorata* L.), zapote-mamay (*Pouteria sapota* Jacq. or *Calocarpum sapota*), a pepper (*Pimenta dioica* [L.] Merrill) and palo mulato (*Busera simaruba* [L.] Sarg). Of the secondary forest formation ("acahua"), such plants as an amaranth ("bisquelite"—*Amaranthus spinosus* L.) another pepper ("alaja"—*Piper autium* HBK) and a root ("apichi"—*Xanthosoma robustum*) are protected. General lists of plants cultivated in Mesoamerican home gardens are difficult to compose, because some species of plants which are wild (or perhaps simply feral) and protected by some groups are cultivated (propagated and tended) by others. Among the Huastec, Thomas reports several fruits as "semi-cultigens" or "wild collected plants"—e.g. papaya, mango, guayabo, *Annona* sp.—and root crops which elsewhere are clearly domesticated (cf. Palerm 1967; AMARU 1980:39-41). He also reports as "semi-cultigens" plants such as pitaya—*Hylocereus undatus*—which elsewhere are wild and only gathered.

In Mesoamerica as elsewhere, house site gardens accumulate by accident as well as design. Seeds or planting materials are discarded and, if a useful volunteer is noted, it then becomes protected and cultivated. Strictly wild food sources are also important in many areas (Thomas 1983; Wilkes 1981:328-333; Wilken 1970, among others).

Fruits and roots, consumed almost exclusively by the producing household, are the main crops of lowland Mesoamerican home gardens. Gardens also produce a variety of non-food economic species which contribute to household subsistence—medicinals, construction materials, dyes, containers (calabash tree), fish poison and beauty aids, as well as ornamentals, and vegetable materials used for rituals. Plants used for rituals include "cempoalxochitl" (*Fajetes erecta* "flower of the dead"), used to decorate tombs on November 2, and copal, a resin from protected conifers used as incense in traditional ceremonies. Production of medicinal plants is important.

Gispert found that medicinal species (97) outnumbered food plant species (72) in Vera Cruz gardens (1981:178). The ample literature on the Mesoamerican ethnopharmaceuticals suggests that the total variety of herbal remedies known and used there is as great as the number known to the Chinese.

House site small livestock production

Apiculture is traditional in Mesoamerica and is expanding with modern methods into international markets. Hives are generally but not exclusively located at house sites where there are ample supplies of nectar from selected flowering trees which produce one fruit or another continuously throughout the year.

Grassy commons in settlements are kept clear by communal labor to graze the few equines used for animal transport and to provide a place where small livestock can range. Where small livestock is kept at house sites, the vegetables and medicinals of the home garden must be grown in protected containers, such as hollowed raised logs, tin cans, or more ad-hoc structures created from scrap material. Pigs, poultry, and dogs typically forage by day in and near villages and are eventually consumed by households (Wilkes 1981).

In more humid tropical Mesoamerican areas, ducks are a favored and better adapted small livestock. Turkeys are the traditional poultry of the highlands. Chickens are the only domestic fowl kept by the Huastec of San Luis Potosi (Thomas 1983). Among the K'etchi Maya, chicken and duck flocks are kept by women, "who tend them in every way except for building the fowl coop.... (Women) are entitled to keep whatever money they may earn from selling eggs or birds." As they must obtain corn for poultry from husbands, and turn to them to build or repair the coops, women are not therefore entirely independent in managing the flocks. "This is why so much of the eggs and meat produced ends up being eaten by the family rather than sold" (Wilkes 1981:312-313). The pig herds of the K'etchi and their neighbors in Southern Belize, the Mopan, are owned by men or women by strictly individual entrepreneurial choice. Hunted wild food or poultry contribute more animal protein to the diet than do pigs, which are sold to traders.

Division of Labor in the Home Garden

At house sites and within village settlements, home gardens are primarily managed, maintained and harvested by women and the children who are in their care. Women have exclusive responsibility for small areas literally just outside the kitchen, which may be a small building separate from the sleeping and living quarters. Certain "women's plants," which include some medicinals, fiber, and dye plants, are cultivated only by women, who are also the main tenders of the small livestock they own. Men commonly help feed pigs or poultry before or after they go out to their fields, and may devote special attention to particularly useful trees that they are cultivating or encouraging. Gispert makes the point that the home garden orchard is an important family recreation area which extends the intimate sphere

of the close living quarters into the outdoors.

Off-House-Site Mixed Gardens in Mesoamerica

Because home gardens at house sites constitute a very clear system of land use in Mesoamerica, the home garden can be distinguished from several other traditional intensive polyculture systems which also produce vegetables, fruits and small livestock. There are also locations and rotations in field systems which produce "garden" crops.

Orchards

Orchards very similar to the arrangements found within settlements in the humid tropical areas of Mesoamerica are also found outside villages. Small orchard production combines crop layers of a) coconut and papaya, b) bananas or citrus, c) maize, beans, or vegetables, d) spreading cover crops such as squash or sweet potatoes, and e) below-ground roots, tubers, and bulbs. After relay production of the above- and below-ground annual crops (c-e), low trees and bushes such as coffee, cacao, and annato (*Bixa orellana*, also called "achiote") are installed to create a totally perennial polyculture. The Lacandon, for example, plant up to 75 species on one hectare for 5-7 years, then allow the natural forest to gradually reclaim their "planted tree gardens," which continue to produce rubber (*Castilloa*), cacao, citrus, and avocado as the forest regenerates (Nations and Komer 1983:235).

These orchards are functionally but not necessarily spatially attached to households. There are other relationships which connect these orchard gardens to the house site, however. In many cases, these outlying orchards are former house site home gardens. As houses in the more forested areas are often self-reliantly produced from timber and thatch (Villers Ruiz 1981), tree crops may outlive the usefulness of the house. Some native species continue to fruit for 40-50 years; thus, home garden tree crops can outlive the usefulness of the adobe houses typically built in the drier, deforested areas. Although the house is reconstructed at a new site, the mature trees at the old house site continue to be used. In areas where long forest fallow swidden is practiced with extremely high "R ratios"—e.g. used in years 1, 15-18 then not again for 40-70 years (Wilkes 1981)—these isolated orchards may eventually be reoccupied and thus become "home gardens" again.

Placing orchards at some distance from settlements allows them to function as bait for animals which are hunted—a system called "garden hunting" in descriptions from Central America. Ripening cacao, for example, attracts droves of the large land rodent *Cuniculus paca* (Wilkes 1981:279), while vegetables in outlying fields attract deer. Conversely, some animals limit tuber and root crop production in outlying fields. Peccaries (*Dicotyles tayacu*) and agoutis are hunted as food, but where wild populations abound, root crops must be drawn into the home garden to prevent predation. In some Mesoamerican arrangements, even where peccaries are no longer

common, the home garden remains devoted to cassava, sweet potatoes, jicamas, and various yams (Thomas 1983).

Raised field polyculture

A system called "chinampas" or "camellones chontales" has been revived in the Mexican states of Tabasco and Vera Cruz. On these intensively cultivated fields raised from and enriched with swamp muck, basic intercrops feature 25 species or more, including tree crops--papaya, bananas, tree spinach or "chaya"--which stabilize the edges of the agricultural platforms. Commercial market vegetables--tomatoes, onions, radishes, garlic, and the Mexican staples of maize and "beans" (*Vigna* sp. and *Phaseolus* sp.)--are cropped continuously with transplanted seedlings. Comparable in size to the larger home gardens of the region, chinampas represent intensive small farms, producing for family needs and market (Gliessman, Garcia and Amador 1981; Nations and Komer 1983:234-235).

Vegetable production as field cycles

Mesoamerican field systems include a variety of semi-terraced and terraced arrangements and various swiddens (shifting slash and burn and, in annually inundated areas, slash and mulch) which depend on bush or forest fallows of varying lengths (Palerm 1967; Deneven 1980; AMARU 1980). Maize, the primary source of calories and vegetable proteins of the traditional diet, and beans are the main crops of fields. Field production is primarily by male work groups. However, in many of the semi-terrace or swidden field systems, vegetable gardens are placed in favored "strong" spots of unusually rich soil. Among the K'etchi, cohune palm (*Orbignya cohune*) logs and stumps are used as container gardens within "milpa" swidden fields (Wilkes 1981:293). Women can be involved with these vegetable garden spots, initiating the choice of vegetables to be cultivated, and tending these spots when they make their very occasional visits to the fields.

In areas not menaced by peccaries and agoutis, after the main seasonal maize crop, intercrops of starchy tubers or edible greens may be harvested. Vegetables produced on "milpa" include various species of beans (*Phaseolus*), chiles (*Capsicum*), sweet potatoes, jicamas (*Pachyrhizus*), yuca or cassava, and tubers (*Colocasia* and *Xanthosoma*). Fields in some areas are extended by banana intercrops and eventually converted into orchards.

An annual mixed garden form called the "conucos" is practiced among some Maya groups, where watermelons (*Citrullus*), macal (*Colocasia* and *Xanthosoma*), cassava, bananas, and other fruits and vegetables are grown. Though primarily for subsistence production, the conuco is a field, rather than a "home garden" system, as it occurs where people also maintain distinctive kitchen gardens. The distinction between field crop systems and garden systems can be further blurred by the extension of swidden by banana intercrops, and their eventual conversion into multistoried orchards.

Unmodified lakeside and river levy land is used to produce seasonal vegetables as well as maize. These prime alleuvial areas are underwater part of the year and thus are obviously not suitable as house sites. In Mexico City, tens of thousands of part-time gardeners cultivate seasonally at the edge of receded lakes (personal communication, Frank Masson). This makes the lake shores into unique inner-city, seasonal, informal, community gardens. In the lowland tropics of ancient Mesoamerica, drainage and raised field earthworks supported far higher population densities (10x) than exist in the same areas today.

Fish culture is a somewhat interrupted tradition. Though the semicultivation of fish is apparently an ancient technique, fish ponds, weir semi-cultivation of crustacea, and fish runs are experiencing a revival with new methods and introduced species. Fish ponds, weir traps and the fishing or gathering of edibles from streams and lakes can be judged as special forms of communal production, as several households may share a pond or rights from a bank. Though not a form of house site production, when settlements are located beside freshwater streams and lakes, these resources can be closer than the small village stores which sell packaged foods. The "finca integrada" promoted by INIREB and other institutions in Mexico and Central America integrates poultry, tree crop, and fish pond production as an elaborate and large home garden.

The Andean Tradition

Home gardening and house site production in the Andean countries today combine elements of different traditions: the Luso-Latin tradition, particularly on the coast and in towns and cities, the Caribbean tradition, along the north coast of South America, and the Amazonian approach, in the lowlands beyond the Andean chain. The results of on-going field research and literature review in Peru (Ninez 1983) will soon clarify some of these patterns.

A distinctive Andean system of house site production survives in the highlands and in some coastal villages and towns. The Andean system is linked to a need for irrigation and the priority of small livestock production. Most vegetable and fruit tree production is in irrigated fields. Irrigation systems, by design, rarely pass through settlements; rather, villages are located on unirrigatable land, as in the "pekarangan" of Java. Where irrigation systems do pass through or at the edge of highland villages, home gardens are installed on irrigated, walled-in terraces (Freeman 1963; Brownrigg, Harman, and Rasnake 1979:32).

Virtually all of the comuneros had irrigated plots that were continuously cultivated. These were usually located nearby the houses. Such plots were scattered throughout the town of Chinchero (in the southern highlands of Peru). These plots were not managed according to community-oriented rotation patterns and were called "canchones," a term which

connotes the independent manner in which they are cultivated. Lesser crops such as tarhui, quinoa, and onions were mixed with broad beans and other field crops. Early potatoes can be grown on these irrigated canchones also. Both barley and oats may be cultivated to provide green forage during dry months.... Because garden plots in Chinchero were used for both field and secondary crops, these plots have been recorded as cropland in Chinchero (Freeman 1963:73-74).

In the case of coastal settlements where irrigation systems terminate in or sufficiently near human habitations to alter the water table, town or peri-urban gardening sometimes occurs, and can feature sunken gardens dug to exploit groundwater seepage. In the large ancient cities of the coast and in palaces, elaborate gardens at residences were a mark of high status. This status function of urban gardens survives in the Andean nations, though today the gardens are of the Luso-Latin form.

Andean agriculture combines crop and livestock production. Aboriginally, livestock was limited to guinea pigs and native poultry (Muscovy ducks, turkeys) which were raised in towns and at house sites, and to the cameloids, raised on the high pastures as a source of meat, fiber, and transport (Wing 1975). Andeans avidly adopted European livestock, particularly pigs, goats, sheep, new poultry, and cattle (Bolton and Calvin 1975:1) but did not adopt barns. Corrals were limited to the house sites of specialist herders in the high pastures. Villages themselves, and house sites within them, contain corrals. Pigs are corralled at night, scavenge village refuse by day, and are attended as they root and range in pastures. In some places, llamas, alpacas, sheep and goats are similarly corralled every evening; in others, they are brought into the village corrals only for fattening prior to slaughter. Villages have large communal corrals where visiting llama trains are corralled and where the livestock grazed on communal pastures are occasionally herded for counting and marking, or during transshipment to market.

The use of villages and house sites as animal stockades makes vegetable gardening impractical, to say the least. It is even difficult to protect trees. A spatial choice was made to confine livestock within the walls near houses and beyond the reach of the cultivated irrigated fields, except when these are intentionally opened to livestock to graze on their stubble (Brownrigg, Harman and Rasnau 1979).

In the Andes, livestock production not only takes place at the house site, but in the kitchen as well. Guinea pigs (*Cavia porcellus* L.), called "cuys" are raised in hutches, which double as benches in urban and rural kitchens throughout the region (Gade 1967).

Although raising cuys seems to be a Pan-Andean phenomenon, covering a vast region between southern Colombia and northern Argentina, the degree of

involvement with these animals varies from community to community as well as from household to household within communities. At one extreme are...communities in Bolivia (where) cuys are absent (or are found in only 1-20% of the households). At the other end of the spectrum, one discovers many communities in which nearly everyone raises cuys.. No one has satisfactorily explained the geographical distribution of cuys in the Andean highlands. One relevant factor, undoubtedly, is the availability or lack of grasses suitable for feeding to cuys, and another is the substitution of other sources of animal protein (Bolton and Calvin 1975:6-7).

The need for grasses to feed guinea pigs daily and for the periodic fattening of other livestock strongly influences the allocation of irrigated areas near villages and cities to the production of alfalfa (*Medicago sativa*) and grasses. The size of guinea pig flocks declines at the onset of the dry season and increases when grasses are luxuriant. Grass is commonly cut in the evening. Children may be sent on this errand or, when children are fed and bedded, couples may go out on a stroll to cut the grass fed into the cuy hutches.

Guinea pigs rarely leave the kitchen, and scurry about by day eating such scraps as potato peelings. Kitchen scraps are also fed to pigs and poultry. Unlike other parts of the world where the resource of kitchen refuse is used to enrich kitchen gardens, in the Andes it is recycled into animal protein production.

Consumption of meat is not a daily event for most Andean households and is timed for special celebrations, such as saints' days (birthdays), baptisms or communal festivals, when all eat common meals. The size of guinea pig flocks is coordinated to produce meat for the major points in the ritual cycle; however, families can conveniently convert guinea pig production to guinea pig consumption without ever leaving the kitchen. Guinea pigs, eggs, poultry, and dried meat ("charqui") are the main sources of home produced animal protein that are occasionally eaten. Most of the protein in the traditional Andean diet derives from vegetable products, including a large selection of protein rich legumes, tubers, and grains grown as field crops, most of which are virtually unknown outside the Andes. Of their many protein rich cultivars, only a few varieties of potatoes (and of these, only varieties with low protein content have diffused) and Lima beans have gained importance elsewhere in the world.

Animal protein is relatively scarce in the Andes because it derives almost exclusively from domesticated animals. Wild life is scarce in the highland, the densely populated river valleys, and coastal deserts. The Andean choice to produce the relatively scarcer animal protein under the close protection of households, rather than more plentiful vegetable foods, is significant. In many gardening projects, the presence of small livestock around the house appears to be a serious constraint (e.g. Van Eijnatten

1969, on goats in Nigeria) or a practice which so undermines home gardens as to virtually contradict them (e.g. Laumark 1983, on chickens in Bangladesh). The Andean choice is rational in terms of the resources available for the traditional diet. A similar choice is made in other areas of the world by peoples who depend on livestock production--for example, in some parts of Africa (Grivetti 1980), and in the Himalayan foothills (Minturn and Hitchcock 1966).

II. SPECIAL STUDIES

1. THE ECONOMIC ANALYSIS OF HOME GARDENING

The economic results of home gardening can be analyzed in terms of the yield to gardeners (preferably measured in both monetary and physical units) or by the broader consequences of gardening for households' income-producing activities and budgets. On the other hand, some authors use a causal analysis--that is, how monetary or commercial factors affect home gardening, where it occurs, and its variations.

Analysis of Yields, Developed Countries

In the U.S., a minor genre of gardening literature concerns the market value of trial home-style gardens. Utzinger and Connolly (1978) report from Ohio that 150 square feet produced \$90 worth of mixed vegetables, as valued by Ohio food stand and supermarket prices. This took 38.8 hours' work and a \$48.71 investment--a return of \$1.03 per hour. The Georgis Cooperative Extension Service (n.d.) harvested \$334 from 10,000 square feet, having invested \$80 (not including transport or labor). Cleveland (1981, 1982) is in accord with the majority of sources when he estimates a low (by U.S. standards) but positive hourly return to labor of \$1.33 in Tucson, Arizona. His garden produced \$158 for a monetary investment of \$40. Leatham (1983) provides an interesting variant on this type of analysis by estimating the hourly return to labor by crop and by the space each kind of crop requires. Zucchini squash tops the list with a return of \$36/hour, closely followed by spaghetti squash at \$24/hour. Cucumbers, carrots, onions and tomatoes all fall in the range of \$10 to \$16 per hour, while less than \$2.25/hour accrued to gardeners planting snap beans, radishes, potatoes, celery, peas, cauliflower, and corn. Wishetsky and Cash (1976) said that they grew green beans and tomatoes in Michigan at about one-half of local road-side prices, though they did not count labor, land, or capital costs.

In general, these studies show that the retail value of home-style trial gardens in the U.S. is between 1.5 - 4 times their monetary costs, and the return per hour of labor is positive, but low by U.S. standards. If the gardener drives a car to get supplies, then the return is less. If he or she concentrates on high-priced crops, then the return is greater.

Analysis of Causes, Developed Countries

The USDA's 1982 national survey of food consumption establishes an important point for students of economic development: gardening does not disappear with development. In the United States in 1977 (USDA 1982), 32 percent of households reported eating home-produced food. This accounted for eight percent of the value of food consumed in rural households, three percent in suburban households, and one

percent in urban households. The general U.S. average per household was to consume 6.83 pounds of vegetables per week, of which 1.17 pounds, or 17 percent, were home-produced (p.13). In households in rural areas, by contrast, 31% of the vegetables consumed were produced at home. This document, which has data on each kind of vegetable, is worthy of considerable attention.

Analysis of Consequences, Developed Countries

These trials of home-style gardening only demonstrate that U.S. families might benefit from gardening. Gardening families actually save approximately 78 cents on weekly household vegetable expenditures. This translates into approximately 22% of the vegetable expenditures reported by nongardening households (Blaylock and Gallo 1983:727, based on the U.S. Department of Agriculture 1977 Nationwide Food Consumption Survey).

Analysis of Yields, Developing Countries

When we turn from the United States to the developing world, we find both methodological and empirical barriers to evaluating the economic value of gardening. First, despite variation among the formulae and factors considered, generally U.S. investigators agree to use the retail value of garden produce to measure monetary values, and they generally record cash and labor outlays. In the developing world, there may be no market to create a price for vegetables, and all the inputs may be non-monetary; thus, retail prices are difficult to interpret. Further, in the U.S., purchasing vegetables is usually an alternative to gardening. Even if people forego the vegetables they might have grown, their diet is generally adequate. In the developing world, the cost of not having an adequate supply of home-produced food may be malnutrition or economic instability, so a simple market-value/market-cost ratio may be misleading. At the same time, as will be discussed, the economic value of a garden may be relatively greater in developing countries than in developed ones. For example, gardening can allow a household to undertake new commercial activities that otherwise would be impossible (e.g. because family funds are entirely consumed by food purchases). In the developing world, households usually spend a far higher proportion of family income on food. Therefore, any displacement of the costs of buying food leads to more visible gains in the household budget.

Several articles report on test gardens in developing countries. In India, small beds cultivated in the biodynamic method were reported to have yields equivalent to 21,000 kilos per hectare (including 16% of area left for paths) and harvest times of less than 100 days (average for all crops/beds from Shri AMM Murugappa Chettiar Research Centre 1981). On poor soil in New Guinea, the average yield for two years at a test garden ("site-stable agro-forestry composted-contoured ridge garden"—a type of French intensive garden) was 9,400 kilos per hectare of traditional-style crops (Swift 1980). The garden also produced wood, though shading is mentioned as a reason for low yields. The estimated yield of an Hawaiian "typical current garden, no nutrition consideration," is .71 pounds per day, using

300 square feet (including 120 sq. ft. for spacing); if such a yield could be continued 365 days per year, it would be the equivalent of 41,864 kilos per hectare (Rubert 1977, Table 3, reporting on Yang 1976). For a lower range of yields, Van Eijnatten (1978) cites Terra (1976) on Javanese gardens: "In the drier parts with poor types of home gardens, the yield may only reach 500 to 1,000 kg per ha per year."

Two reports give monetary returns in local currency. An Asian Vegetable Research and Development Center study (AVRDC 1983) provides data on four types of trial home garden. Totaling their data for the four types (their Table 1) gives an apparent yield of 2,366 kg per hectare/year (but cf. the "VII" index that appears in Table 3). The cash-value to cash-outlay ratio is 1 : 3.50, which is within the range of U.S. data. The return per hour of family labor is 3.3 in kilos of produce, and the cash return (vegetable value / cash outlay) per hour of family labor is US \$0.69 (based on Taiwanese dollars \$26.4 at a 1982 exchange rate of NT\$38.17 = US\$1.00). The report proposes further detailed trials, including farm budgets, for the small number of farmers participating in trials. The second report is about Java, where, based on a 1973 exchange rate that varied around rp400 = US\$1, households' gardens produced around US\$280 to US\$919 per hectare, or about US\$0.10 per hour of family labor (Stoler 1978:93).

The gardening literature pays more attention to the economics of market gardens than it does to home garden yields, and interested readers are referred to the proceedings *Acta Horticulturae* for practical insights into managing commercial gardens in developing countries. Although their circulation is often limited, journals of developing countries also carry occasional articles on market gardens. To cite one interesting case in Uganda, Will (1972) describes "a small overhead sprinkler-irrigated vegetable garden" of .3 hectares (cropping .18 ha annually) which produced the equivalent of 7,496 kg per hectare in its first year (2,249 kg on the 0.3 ha), and the equivalent of 28,333 kg in its fifth year. The fact that the yield increased in each intervening year, and that the crop mix changed to increase profitability, underlines the need to consider farmers' learning when evaluating gardens.

Analysis of Causes, Developing Countries

The most common instances of causal analysis--that is, how monetary or commercial factors affect home gardening--are off-hand remarks about gardeners' inability to pay for some input. A common example, treated elsewhere in this report, is the inability to buy fencing to keep out goats.

Of the articles that mention land availability as a factor related to gardening, Stoler (1975, 1978, and also see Binkert 1981) studied gardens as an integral part of household economies. She found that the Javanese families having less land tended to devote what land they had to gardens (as opposed to rice production) and that the less land they had, the more they produced per hectare. However, the

families with less land had to supplement home production with outside work. Land tenure is a factor cited by Pelzer (1945, quoted in Binkert 1981), who noted that a tenant who does not know where he or she will be the next year cannot be expected to plant fruit trees.

The relation between home gardening and commercial gardening seems to vary from region to region. Within each region, it is possible to discern a relationship that is of great importance to a development project. Gardening may be a recession period activity (e.g., while rubber prices are low—Romanoff 1983). It may be undertaken as a supplement to plantation or communal farming (Ahmed n.d., Spinks 1964, Benjamin 1977). It may be mixed with market gardening, which is a common pattern: Adegboye (1978) found part-time farmers were motivated by a mix of desired outcomes, including family food, money, and employment for relatives. Gardening may also compete for resources: Ahmed found an inverse relation between the area under cash crop and level of household food consumption. The allocation of scarce household resources between subsistence and market gardening is discussed elsewhere in this report.

Analysis of Consequences, Developing Countries

Consequence analysis for developing countries is a research area that is at least as important as yield analysis. Several reports note that home-grown food is an important part of family budgets. Solon et al. (1979) reports that garden produce represents the equivalent of three percent of income in the Philippines, or eight percent in rural areas. Immink, Sanjur, and Colon go beyond simply presenting household budget data, to ask if gardens reduce food purchases or increase food consumption. They conclude that among their small sample of Puerto Rican households, self-grown foods did not reduce food expenditures; in fact, during the harvest season, gardening households spent more on food than did households which did not garden or that gardened few crops (1981:194). For their sample, they conclude that the gardens augmented diet rather than saved money, and that children were the specific beneficiaries. (This result raises the possibility that home gardeners are generally more conscious of the importance of adequate diets than others in the general population.)

Another economic function of family gardens in developing countries is to subsidize members of the family who live in a city. To cite only one example, in Port Moresby, Papua New Guinea, low-income residents receive weekly canoe-loads of food from their home villages. Still, approximately 73 percent of the urban residents' income goes for food, indicating that, without a subsidy, it would not be possible for many of them to remain in the city (Spinks 1963).

Some sources report that food security must be achieved before smallholders will engage in any risky commercial agricultural production. For development planners, who are often primarily concerned about commercial production, this may be a very strong reason to consider promoting home gardens in conjunction with cash-crop extension. For Java, Stoler says that food security is a prerequisite

for converting from subsistence to cash-producing gardens. Those households which are self sufficient in rice are able to increase their garden productivity by planting capital-intensive plants or fruit trees which represent a long-term investment, since their gardens do not represent subsistence guarantees (or part of their survival strategies) as much as sources of extra cash earnings (1978:95).

For lowland Bolivia, Romanoff (1983) reports that episodic food crises and insufficient food production are the primary reasons why farmers go into debt, spend most of their money on food, and fail to make the productive investments that, paradoxically, are necessary for them to be successful farmers.

For Bangladesh, Chen et al. (1979) describe seasonal variations in food production and then continue:

During the lean months, pressures of survival among the rural poor may be such as to accelerate the transfer of food production assets from the disadvantaged to the wealthy.... Programs that can ensure basic minimal needs to poor families during these critical periods could mitigate the tendency toward the concentration of assets to a small minority (185).

Thus, in both Asian and Latin American cases, smallholder economic development would benefit from home-garden promotion.

Discussion

As reported in several U.S. studies and in two developing country studies, the monetary equivalent of garden yields per hour of labor is low. Per hour returns of sixty-nine cents (for Taiwan experimental home gardens) or ten cents (for Indonesian traditional home gardens) may seem insignificant until it is considered that, in many developing countries, the rate for a full day of unskilled manual or agricultural labor (8-12 hours long) is in the range of US\$1 - US\$4 per day. In many rural areas, opportunities to earn even this low daily wage come only a few times a year, leading people to seek wage labor opportunities far from home. This makes a return of \$.10-69/hour seem more attractive, particularly as the lower figure for Indonesia includes the return to children's labor. And, as Deneven notes (1980), if the garden is next to a residence, travel time to the work site is "nil."

Garden production has some economic advantages over purchasing the equivalent amount of produce in a market. The purchaser spends no time or cash fares going to market, and moreover, the just-picked produce is fresh. Van Eijnatten notes that home garden yields are generally lower than market gardens', but the food is always there (1971).

Causal analysis of economic factors and gardening shows that all

classes garden and that home gardens do not disappear with development. The relation between labor-intensity and land-holding is raised by Indonesia scholars.

Several articles reviewed suggest that the economic value of gardening is to be found in its broader consequences. When gardens provide subsistence security, peasants can take commercial risks, or at least hold onto their land. In both Java and Bolivia (and presumably in Bangladesh), the alternative source of food security is debt and dependence on a trader. This status is incompatible with the ideal of the smallholder held by many Western planners. Gardening can subsidize residence in urban places or at isolated plantations, mills or mines, where wage labor opportunities exist, but the cost of living, and food, is high. By improving diets, gardening avoids the costs of malnutrition: loss of effective work time and of life. The monetary savings demonstrated by U.S. surveys may be presumed to exist in developing countries as well, though detailed microeconomic studies of this issue should be encouraged to fill in a "data gap."

2. THE NUTRITIONAL YIELDS OF GARDENS

As in the economic analysis of gardens, we may distinguish among yield studies (garden output in nutritional terms), consequence studies (broader nutritional results of gardening, such as contribution to total diet), and causal studies (how nutritional needs affect gardening). In general, we will not review the many nutrition tables that describe typical vitamin, protein, or caloric content per 100 grams of the edible portion, unless the article also reports the production achieved by the garden.

Yields

The most frequently cited analysis of yields in terms of nutrition is Yang's (1976—cited, for example, in Goode 1983, Rubert 1978). By choosing among vegetables, Yang's 300 square foot test garden would satisfy family needs for vitamins A and C. Yang (1979) stresses that by choosing indigenous vegetables, garden output can supply calories, protein, and vitamins, and he ranks crops by all-around yield. Gershon (1983) summarizes AVRDC Thailand test garden results, claiming, for a family of five, adequate production of vitamins C and A, substantial satisfaction of iron and calcium needs, and contribution of some protein. Other AVRDC studies provide detailed yields from several kinds of gardens. King (1971) gives a variant of the "yield x vitamin content" table, using U.S. yields but comparing them to Haitian dietary needs. Bittenbender (1983) also gives data on yield, uses, and nutritional value; his article is notable for its bibliography.

Yield studies include descriptions of general mixed gardens, of gardens with crops selected to meet a broad category of nutrient

need (e.g. protein), and of gardens designed to meet very specific needs. Vitamin A interventions are prominent among the latter class, of special concern as Vitamin A deficiencies cause blindness in a substantial percentage of the Philippine population. Tsou et al. (n.d.) notes changes in provitamin A activities depending on the plant environment and season. Yang (1979) ranks vegetables by outputs of nutrients (mustard greens, water convolvulus, pak choy, carrots and amaranth produce the largest amounts). Solon et al. (1979) reported that fortifying monosodium glutamate was a less costly way of increasing vitamin A serum levels than was a broad-based intervention which included gardening. The gardening intervention, however, had the additional positive effect of better height-weight and "Gomez III" indices, although costing \$2840 (see also review in Xerophthalmia Club newsletter 1979).

The literature is notably insistent on the benefits of eating tropical leaves (e.g. Oomen 1978). Though we have avoided reviewing the nutrition-per-100 gram tables, Kelly (1975) usefully shows the nutritional content differences among same-species varieties from different parts of the world.

Consequences

Binkert (1981:15-18) reviews studies of the contribution of mixed gardens to nutrition in Southeast Asia, and states:

There seems to be a general agreement that garden production is primarily a supplementary source of nutrition, contributing 15-30% of the R.D.A. (Recommended Daily Allowances) of calories and proteins and a large amount or all to the R.D.A. of vitamin A, vitamin C, some vitamin B-complex, iron, and calcium. Additionally, the medicinals grown in mixed gardens are further contributing to the physical well-being of the members of a household.

In support of his generalization, Binkert cites Ochse and Terra (1954), Sommers (1978), Setyatti (1977), and Stoler (1975). He also raises the issue of self sufficient garden production (as opposed to gardens that supplement other sources), which would require large (and possibly uneconomical) labor inputs.

A study of Puerto Rican home gardens and diet concludes:

Home gardens may have the effect of increasing the total food supply of the household during certain seasons. Preschoolers seemed to benefit nutritionally more from horticultural production than homemakers. Higher intakes of vitamin A by homemakers were positively associated with the availability to the household of self-grown foods, particularly of fruits, of starchy vegetables, and of legumes (Immink 1981:198).

The contrast between the sources on year-round gardening for southeast Asia and for Africa are striking. (In Senegal, a seasonally parched country, Soon Young Yoon (1983) notes the need for seasonal preservation to reduce variation in consumption. Note also Chen 1979 on Bangladesh, which gives data on seasonality of agriculture, diet, and illness, though he does not discuss gardens explicitly.)

For the United States, the dietary surveys of 1964 and 1977 offer excellent opportunities to analyze the dietary contribution of gardening (Redstrom 1972, 1982, plus other USDA research reports based on the surveys). There are a large number of unpublished nutrition surveys commissioned by the Food and Agriculture Organization and kept at the Gelman Library; individuals with access to that archive in Rome may find substantial data on gardening. Some of this material is reviewed in the annotated bibliography of this report (FAO 1979, 1980, 1981), but most of it was not available for review.

Analysis of causes

In the economic analysis of gardening, causal analysis showed that economic factors influence when and how people garden. There are few analogous arguments in the literature reviewed, but we might propose that gardening will differ by a hierarchy of nutritional functions—e.g. (hypothetically) taste, vitamin supply, protein supply, emergency security, calorie supply, and complete subsistence. Stoler's report that poor Javanese who rely on garden production grow cassava (a high yield, dependable starchy root) and dark green leafy vegetables (low risk, fast return) is an illuminating example of causal nutritional analysis (1978:96-97). Another type of causal analysis involves showing that food needs result in gardening—for example, food shortages due to drought revived interest in gardening in one part of Senegal (Soon Young Yoon 1983:136).

Discussion

The literature on yields usefully emphasizes that, by carefully selecting crops, we can design gardens to meet the outstanding nutritional needs of particular populations, although, for some specific problems, a different kind of intervention may be less expensive. Local varieties and (to outsiders) unappetizing portions may prove to be nutritionally desirable (and satisfactory to local tastes).

Real-world consequential and causal studies are not well developed in the "gardening" literature. A large number of the nutrition surveys conducted every year either do not report on gardening, or do not gather the needed data. The studies that were reviewed show that gardening contributes to nutrition and responds to nutritional needs.

III. GARDEN PROJECTS IN INTERNATIONAL DEVELOPMENT

1. CONTEXTS AND CONVENTIONS OF GARDENING IN PROJECTS

Promotion of home gardening can be found in a variety of project contexts. It can appear as a component of rural development, health, applied nutrition, or women in development projects. School gardens are promoted in education and training projects. Primary health projects can include clinic gardens as a demonstration and training center for home gardening. Gardening components in urban projects, however, are rare.

Promotion of home gardening or house site small livestock production is usually justified as an attempt to improve a population's nutrition or health. While dietary improvement may be a secondary objective of community market garden projects, these are usually justified as a way to increase participants' income from the sale of produce.

It is rare to find promotion of gardening or small livestock production as the exclusive activity or "output" of a project, although this does occur in some of the small scale projects implemented by private voluntary agencies or international volunteers. More commonly, gardening components in international development projects are only one of a constellation of project activities aimed at improving nutrition.

A common conceptual theme in nutrition planning is that "the causes of nutrition problems are multisectoral in nature, and consequently, the solutions must be developed by multidisciplinary efforts" (Lynch 1979:1). In practice, this translates into a host of simultaneous project interventions (Sabry 1982; Gwatkin, Wilcox, and Wray 1980). The projects reviewed which had home or community gardening components also included an average of six additional activities directed to the beneficiary population, as listed below:

- a. nutrition education,
- b. demonstration of cooking and recipes,
- c. introduction of new foods,
- d. distribution of supplemental food,
- e. vitamin supplementation or fortification,
- f. construction of potable water supply systems,
- g. education about environmental sanitation,
- h. establishment of primary health care,
- i. distribution of vermifuges and other medicines,
- j. growth monitoring of children, and
- k. promotion of schemes to improve family income.

Programs mounted at the regional level also commonly included:

1. training of extensionists and community-based para-

- professionals (e.g. nutrition, horticultural or health extensionists and village level workers),
- m. technical assistance to establish health or nutritional status monitoring, and
- n. research (in health, nutrition, diet, or horticulture)

Efforts at the national level occasionally included:

- o. technical assistance to influence national food crop pricing policies, and
- p. establishment of national nutritional coordinating or policy committees.

The most common additional components in projects with gardening components were nutrition education (a) and training extensionists (b). Combinations of the sixteen other typical components varied according to the general type of the project. Thus, agricultural or rural development (RD) projects with gardening were more likely to include nutrition education and extensionist training (a and l) plus research (n) (particularly in applied horticulture), construction of potable water supply systems (f), education and other efforts in environmental sanitation (g), work on food crop pricing (o), and perhaps establishment of primary health care (h). Women in Development (WID) projects with gardening were more likely to feature nutrition education (a), demonstration of cooking and recipes (b), distribution of supplemental foods (c), and promotion of schemes to improve family income (k), as well as training of extensionists--especially community volunteers identified as leaders (l). Applied Nutrition (ANP) projects surround gardening with the greatest number of additional components. Of the sixteen listed above, ANPs would only exclude those more explicitly related to local health delivery (h and i) and to national food price policies (o). ANPs also added components which were atypical of projects of other general types. Conversely, health projects obviously emphasized health delivery components (h, i, and j), distribution of supplemental foods (d), and training (l), with an emphasis on the training of village health workers.

The complexity of international development projects with gardening components makes it difficult to isolate either the cost or the effect of gardening from all the other efforts. Evaluations of these projects do not provide concrete evidence of the nutritional impact of gardening. This is related to the policy that calls for a multifaceted approach, in which no single component is regarded as sufficient. By this view, any concrete measurements of changes in the nutritional status of the beneficiary population can only be attributed to the set of simultaneous project interventions, or perhaps only to "long-term secular trends" (Sabray 1982:5). And while evaluation of any complex project is difficult, the kind of evidence gathered for nutritional impact also varies by type of project.

ANPs: The final reports and post-hoc evaluations of most applied nutrition projects with a gardening component are content to report summary activities (number of persons attending nutrition classes,

number of gardens established, etc.). Measurements of nutritional status changes, if any are made, are based on a sample population selected from the target group. For ANPs which also include distribution of supplemental food, the recipients of this food are the most accessible for measurement, so the sample can be biased to the segment of the population receiving the most concrete benefits.

Health: Health projects which include gardening components usually generate growth monitoring data or information about the incidence of malnutrition among children. Home gardening promotions at nutritional rehabilitation units (NRUs) or at clinics in areas where childhood mortality from malnutrition is high report reductions in the percentage of rehabilitated children who later die of severe malnutrition (Pacey 1978; personal communication, Commander Quaye; Syme and Marchant 1983; OXFAM internal documents). This constitutes important evidence, as the case load comes from clinically malnourished and vulnerable populations. However, even in these cases, other approaches are applied (supplemental food distribution, intensive medical care, personal counseling of the mothers of affected children).

RD and WID: Projects with an agricultural production or other income generating focus rarely collect any information about changes in the nutritional status of the beneficiaries. Although the projects examined justified home or community gardening in part as a nutritional intervention, no project of this type was found which included any method for testing this assumption.

The Cebu Experiment

A refreshing exception to the general absence of information in project literature on the cost or impact of gardening alone as a nutrition intervention came from an experimental project at Cebu in the Philippines. This applied research project tested three methods to increase Vitamin A consumption (Solon et. al. 1977, 1978, 1979). Baseline studies of the population were scientifically adequate. The population involved in the gardening approach was clearly separated from groups participating in other methods. The test group for gardening was provided with seedlings and cultivation advice for those crops commonly grown in home gardens judged to be richest in Vitamin A. Another group received massive dose capsules of Vitamin A. A third group received monosodium glutamate (MSG) fortified with Vitamin A (MSG was selected for fortification as dietary studies had determined it was the most common food additive in the region). Although there was no control group receiving no intervention at all, participants in the three experimental groups were about evenly distributed in three different kinds of living situations: in urban barrios, in rural barrios near population centers, and in more remote rural barrios. None of the barrios chosen were close together.

Decreased incidence of severe malnutrition and increased weight to height ratios were registered for the children of gardening households in both urban and rural areas. For Vitamin A alone, documented clinical outcome and cost effectiveness of the MSG fortification was

rated as superior to either gardening or massive dose capsule applications. The gardening approach was a close second to fortification in clinical outcome, but was much more expensive: about \$P 2840 per barrio intervention, compared to only \$P 60 for MSG fortification. The clinical examinations of the participating population demonstrated, however, that the benefits of home gardens were not limited to correcting the single deficiency.

In character, the Cebu project was rather like an elaborate controlled scientific experiment, though it definitely piloted innovative methods. More nutrition projects need to apply and measure a single strategy and to monitor and evaluate control groups as well as beneficiaries. The principal investigator, Dr. Solon, continues to advocate improvement of home gardens as a sustainable route to good nutrition in the Philippines.

Feasibility Studies

Common steps in the feasibility stage of "gardening for better nutrition" projects involve: identification of populations' nutritional problems through dietary surveys, background measurements of nutritional status, and selection of cultivars for gardening that could produce needed nutrients. Guidelines for these steps are part of staff-training even for small scale Peace Corps or PVO efforts. Larger projects devote more resources to such feasibility studies, and gaps in the information produced during the feasibility stage may be filled by additional studies during the course of the project (see Mauritania case history, Vegetable Feasibility Study). In the majority of projects reviewed, people targeted as project participants did produce and consume the foods identified for special promotion in the feasibility studies. Insofar as the nutritional needs and cultivars to supply those needs were identified correctly, some needed nutrients flowed to beneficiaries.

International Agencies' Experience Reviewed

The review of project experience is biased in favor of agencies with the most accessible documentation. As research for the review took place in Washington, D.C. and with the cooperation of USAID, documentation of the project experience of USAID and USAID-funded PVOs were most accessible for review. Two other United States development agencies opened their files for our research; the Interamerican Foundation and the Peace Corps. The Peace Corps appears to be a leading agency in promoting home and community gardening and small livestock production. However, documentation of the Peace Corps' experience is limited to a few case histories (see the Peace Corps' Small Vegetable Gardens Resource Packet Part C, 1982), internal documents, and occasional articles written by former volunteers.

A special effort was made to review Applied Nutrition Projects assisted by the Food and Agriculture Organization. FAO's administrative reports on microfiche represent perhaps the largest body of well-indexed documentation available to the public on the subject of gardening as a project practice. A sample of these microfiches

were obtained from Rome for review.

Gardening components on projects sponsored, financed, or assisted by other international development agencies were not reviewed systematically. Information on projects of other agencies was included as encountered in the general literature. Among the other agencies which have mounted gardening components are: the regional development banks for Latin America, Asia and Africa, the World Bank, UNICEF, WHO, regional health organizations such as the Pan American Health Organization, the bilateral assistance agencies of European countries, and European or indigenous nongovernmental organizations. A review could be vastly expanded by examining in-house documents held at the EEC, UNICEF, the donor banks, and the major European NGOs. Special reviews of government files and fieldwork to conduct post-project evaluations in countries that have been particularly active in promoting home gardening would also contribute to the thoroughness of a review.

A common misconception about gardening projects is that they are small scale and implemented by PVO-NGOs. If it were possible to take a 'head count' of all gardening projects undertaken since 1950, it would probably demonstrate a numerical majority of projects funded on the order of US \$5,000-\$30,000 (plus staff or volunteer expenses). However, hundreds of larger scale projects with gardening components have cost in the range of US \$ 3-5 million (calculated by 1983 US dollar conversion rates). Whole countries have sought to transform the subsistence base of households by promoting home gardening. Notable in this regard are Sri Lanka, India, the Philippines, and Chile. Successive projects, campaigns, and programs in India, the Philippines, and more recently, Indonesia have cost hundreds of millions over the years.

Given the multitude and diversity of gardening projects, the review selected a few projects or project series as case histories. These constitute the next section. The primary criterion for selecting a project as a case history was quality of documentation. A secondary concern was to illustrate a variety of scales, approaches, and regional differences. Appendix 2 reviews projects by region and country, giving brief profiles. In this review, a few of the major historical efforts are noted, although the emphasis is on recent or current efforts. In many cases, the information on projects listed in Appendix 2 derives from brief mentions in the implementing agencies' or PVOs' literature. Reports from and on gardening projects dominate the bibliography (Appendix 3).

The body of project documentation gathered reveals certain common themes and problems. Following the case histories, there is a section on the major constraints to success which appear in projects along the continuum of scale. This is followed by a section which raises some special issues concerning project experience and the patterns of traditional gardening.

2. CASE HISTORY #1: THE ILESHA GARDENS OF NIGERIA

A: The Ilesha Project

The Ilesha Gardens project in Nigeria was one of more than sixty Applied Nutrition Projects (ANPs) assisted by the Food and Agriculture Organization of the United Nations during the 1960's and 1970's. The project attempted to "improve nutrition through the establishment of home gardens, thus increasing the production and consumption of supplementary foods, especially legumes, leafy vegetables, and fruits" (van Eijnatten 1971:1). The innovations of Ilesha included:

- o the conscious introduction of the Indonesian style mixed garden into an African context, and the acceptance of this model by many local people;
- o horticultural research to increase production and solve pest problems for a large number of indigenous African vegetable and fruit crops;
- o effective, direct nutrition education and gardening extension to local women, as well as men, through native speakers; and
- o piloting of one of the first home gardening demonstrations at a community-controlled nutritional rehabilitation unit.

Project Area

Ilesha is a 2540 km² (950 square mile) area in the Western State of Nigeria. The area has a mean annual temperature of 75-80° (26°C) and mean annual rainfall of about 45 inches. A distinct rainy season occurs from May through October (van Eijnatten 1971), with an occasional relatively drier period in August. The natural vegetation of the region is humid rainforest. Average elevation is 1,200 feet above sea level (Eijnatten 1969:6).

At the time of the project, Ilesha had a population of 418,000, mainly speakers of Yoruba. Population density varied from 330-400 inhabitants per square mile. The population lived in large villages, but dispersed to farm houses during the cropping seasons. Land for food crops was limited, as the region was devoted to cocoa production and other cash crops. Food crops raised were primarily yams, maize, cassava, okra (*Hibiscus esculentus*) and melon seed ("egusi"—*Coccythia citrullus*), various leafy vegetables, and beans. A large number of minor crops were known. Cattle raising was rare, limited by the tsetse fly; raising chickens, goats, and sheep was more important (Wijnhoven and ter Heersche 1969; Van Epenhuijsen 1974:5; van Eijnatten 1969:7-8).

Nutritional problems

Malnutrition was a problem in the Ilesha area, especially among children, and was a cause of childhood mortality. The 'ecology' of childhood malnutrition was studied in 1962 by Collis, Dema and Omolulu, who identified dietary deficiencies in protein, riboflavin, iron, and folic acid as chronic to severe. Local health clinics were continually faced with clinically malnourished children.

One of the first steps of the Ilesha gardens project was to survey the population's nutritional status and study their diet to determine food preferences, dietary deficiencies, and popular foods which could produce the nutrients they needed. Caloric intake varied between 1900 and 2100 calories/caput (per head)/day; crude protein intake was 78% of estimated requirements, at 49-51 grams/caput/day. Root crops supplied 54-59% of the calories; animal protein intake in the project area was only about 6 grams/caput/day.

Project Design and Financing

The project "Home Gardens for Improved Human Nutrition" began in 1966. Funds were provided by NEDERF (Dutch Foundation for the Planning and Execution of the Home Gardens Projects), established by NOVIB, the Dutch organization for international cooperation under the Freedom from Hunger Campaign of FAO. The Dutch horticulturalists, Professor G.J.A. Terra of the Royal Tropical Institute, C.L.M. van Eijnatten, and C.W. van Epenhuijsen, were involved in the design and management of the project. After his experiences in Indonesia, Professor Terra published the first literature in European languages on the mixed gardens he had observed, studied, and improved there (Binkert 1981), and advocated the development of Indonesian style mixed home gardens for other areas of the tropics (Guerts 1971). A first attempt in Benin (see below) was less successful. The greater success of the Nigerian project can be explained in part by its greater attention to horticultural research on indigenous cultivars, the integration of these familiar food sources in the design of the home garden and in nutrition education, and extension work undertaken in Yoruba by local villagers trained by the project, and by women with post-secondary agricultural training, trained in nutrition by the project.

Why local vegetables?

"Analyses indicate that most tropical greens are much richer than temperate types in proteins and vitamins. The vitamin (mainly A and C) and mineral content (calcium) in tropical leaf and fruit vegetables is also generally higher than that of temperate vegetables" (van Epenhuijsen 1974:5; see also Oomen and Grubben 1978; Okigbo 1977). Though European vegetables were grown on the cool Jos plateau in Nigeria largely by expatriates, foreign vegetables required special cultivation methods and did not produce seed well, if at all, in the tropics. Moreover—critical for Yoruba taste—few European varieties were bitter, and bitter tasting vegetable fruits and leaves were definitely preferred. Project horticultural research also revealed that many of the African vegetables were less subject to insect pests than introduced species (van Eijnatten 1971:11).

A 1965 study in Ilesha (Dema 1965) had analyzed the protein contribution of local green vegetables to the diet at 17 to 26 grams/caput/day. A project premise was that increased consumption of local vegetables from easily maintained home gardens at housesites could improve basic caloric and protein intake (van Eijnatten 1969: 9).

Prior to the project's introduction of home gardens, vegetables were grown on fields after main crops of maize, cassava, or yams. Vegetable greens were also collected from roadsides, from abandoned cocoa plantations and from the bush, where they grew spontaneously with human protection. "It is apparent that many Nigerian vegetable varieties (Igbagba, Osun, Ewedu varieties, Laulau, Alubosa, etc.) do not grow wild or do so only with difficulty. Most grow only in a semi-artificially created environment" (van Epenhuijsen 1974:4). An objective of the horticultural research was to discover the ideal growing conditions for the various vegetables which figured in the Yoruba diet, and how to develop a system for continuous production, given the fact nearly all the Nigerian vegetables are annuals. The flowering and fruiting characteristics of perennials collected were carefully studied, as was the seasonality for cropping hedge leaves (van Eijnatten 1971:9-10 Table 5 and 16, Table 8). Annuals were screened to select those which could produce for the longest periods.

Lists and characteristics of cultivars deemed valuable for home gardens in Nigeria are given in van Eijnatten (1969, 1971) and van Epenhuijsen (1974). Though indigenous fruits and vegetables were stressed, exotics were adapted as well, especially in the search for productive shade trees (for example, 24 cultivars of *Mangifera indica* and 14 citrus species were analyzed).

Project Methods

A 30 acre central garden and project headquarters were established at the Farm Institute of the Ministry of Agriculture and Natural Resources. Nigerian agronomists and horticulturalists were assigned as counterparts and trainees in all phases of research. The central garden was divided up for specific purposes. Three acres were for the research collection of hedges. Six acres were devoted to fruit tree research. Six terraced acres constituted the seed multiplication unit. An eleven-acre terraced garden grew special collection, two acres of which were in demonstration home gardens, and five acres of which were arranged as model mixed home gardens. Additional demonstration home gardens were located at the "Mothercraft Center" (see below).

The basic garden design was multi-layered and fenced. The garden was shaded by temporary and permanent trees surrounded by largely edible hedges. The goal was to shield the garden microenvironment from intensive rainfall during the wet season and from sun during the dry season in order to protect the annual vegetables. Fences functioned to protect the plantings from local goats. Particularly valuable local plant resources used in the design were climbers such

as Worowo (*Crassocephalum bialafrae*) and Iroko (*Telfairia occidentalis*), which were trained on a trellis, and the creeping vegetable Elegele (*Cucurbita maxima*). Two to four elegele plants can cover a 10 square yard area and produce for six months. Research on mixed garden models carried out at the central garden varied garden sizes and cultivar compositions to determine optimal mixes. Insights came from the actual home gardens of early adopters. Adoption proceeded fairly rapidly, allowing feedback to horticultural researchers at the central garden. Six home gardens were established the first year; 177 the second, and 258 the third (Van Eijratten 1969). By June 1970, a total of 638 home gardens had been established in ten pilot villages.

A 1969 survey of the home gardens in four of the pilot villages found that garden size averaged 35 square yards, and ranged from 8 to 50 square yards. In a 1970 study covering 619 home gardens, garden size was found to have increased to an average of 42 square yards. Eighty per cent of the gardens established by local people featured the temporary shade plants that could be quickly established—banana, pawpaw (papaya), bitterleaf, and pigeon pea—and 79% had permanent shade plants. Guava, avocado and cashew were the more commonly preferred permanent shade trees, though mango (9%), breadfruit (5%), and orange (1%) were also represented. About half (48%) of the gardens were fully hedged. In 1969, only 2 - 4 green leafy vegetables were cultivated in half the gardens, and only 18% of the gardens produced more than 9 varieties. By 1970, an average of 4 - 8 green leafy vegetables were cultivated in about half the gardens.

Constraints on Home Gardening for Ileshans

Goats

Goats were "a part of the village community....It proved useful to bring goats into the Central Garden to study their behavior, the efficiency of the various hedges (to deter goats), and any (goat) feeding preferences" (van Eijnatten 1969:20). Tethering goats and feeding them banana leaves produced in home gardens was one solution. Another was hedge plants thorny enough to deter even a goat.

House site use of space

Some house compounds were structured as corrals for small livestock, so gardening was incompatible with this or other uses of house site space. House compounds in the central villages were more congested, so the first home gardens were located at the edges of towns, where there was space to expand.

Cultural ideals of house site space

Some villagers resisted the concept of home gardens "in the project style," arguing that growing plants so near the house increased the danger of snake bites, and that trees could damage walls (Guerts 1971:8). As stripping vegetation near the human habitation is common

practice in African areas inhabited by the tsetse fly, it is perhaps more unusual that the people of Ilesha accepted such a "culturally radical" concept of home site use at all.

Dry season problems

Gardening declined during the dry season. Those who abandoned home gardens did so in this season. The first of the annual vegetables chosen for promotion were those formerly grown on fallow. These tended to wither during the dry months. During the dry season, other activities competed for gardeners' time, and took them away from their home base. As the number of varieties grown in the gardens increased and shade cover stabilized, dry season attrition was less of a problem. Nevertheless, many local people felt that home gardening was impractical during the dry season when water needed to be carried to the gardens. They preferred to grow vegetables in humid, low-lying spots.

Lack of manures

The research design of the model home garden called for recycling household wastes and manuring to enrich soil fertility. Less than half the local gardeners ever used manures. Composted chicken manure was the research choice, but insufficient quantities were available. Villagers resisted this use of human household wastes as "unhygienic" (Guerts 1971:8). The weak technical solution to this problem was to promote crop rotations which could enrich the soil.

Labor and Produce

In 1969, it was found that children were maintaining 34% of the home gardens, adult men 35%, and adult women 31%. By 1970, the share maintained by adult men had increased to 39%, the women's share had dropped to 26%, and the children's to 31%. The remainder of the gardens were jointly cultivated by several family members. The average size of families with home gardens was estimated at six persons, and ranged from two to eight individuals, or more.

The majority of home gardens' produce was consumed by the household. Only 29% of the home gardeners sold some of their produce at local markets. Home garden produce supplied 60-70% of participants' vegetables; other sources came from local markets (11-14%) and from the vegetable cycle on "farms" outside the residential villages (20-27%). By contrast, a control group without home gardens who were surveyed obtained 60% or more of their vegetables from local markets, 31-35% from their farms, and about 8% from their neighbors' home gardens. "The establishment of the home gardens, therefore, clearly alleviated the task of housewives in making leafy vegetables available near the house and reduced the need to purchase vegetables from the market" (van Eijnatten, 1971:30).

Extension and Education

Extension of home gardening was carried out by local villagers trained at the central garden and hired by the project to work in their home villages. Seeds and seedlings were supplied to extensionists from the central garden, and were distributed there to visitors. Only a small percentage of the total plant materials went to gardeners in the ten pilot villages. The wider spontaneous replication of home gardens or cultivation of the distributed species beyond the pilot area was not monitored.

Nutrition education and extension was closely related to the promotion of home gardens, but reached a wider and different audience than the participating home gardeners and pilot villages. The original nutrition extensionists provided as counterparts by the Nigerian Government were six young women with two years' post secondary education in agriculture. They were trained by the project in nutrition education. Local assistants were later hired and trained. Nutrition education was squarely based on the preparation of nutritious foods from vegetables available locally, both those cultivars promoted for home gardening and others sold in the markets. Availability, prices, and weight of vegetables sold in local markets were monitored by the project nutritionists. The demonstration recipes used in cooking classes were modified according to the cost or seasonality of ingredients.

Nutrition training and cooking demonstrations were initially given on-site at various government and private voluntary health clinics in the Ilesha area. Mothers whose children showed signs of nutritional deprivation were the original target group for outreach. As more Yoruba-speaking local women were trained, more nutrition education classes and cooking demonstrations were held inside family compounds in the villages. Local women, (the female leaders of compounds) invited an extensionist and groups of 10-15 women to their homes. They provided all the ingredients and equipment for cooking demonstrations. Very late in the project, some attempts were made to introduce the improved stoves that extensionists sometimes carried along with them.

The project's technical assistance in nutrition addressed the design of a dietary regime for the nutritional rehabilitation of clinically malnourished children. Two nongovernmental organizations operating in the Ilesha area cooperated--the Wesley Guild Hospital and Save The Children Fund. A feeding program based on Latham's 1965 standards was worked out, using locally available foods. A nutritional rehabilitation unit was established at the hospital. In order to involve more local women's participation and to demonstrate the relationship between the home gardening model promoted and the NR regime, a "Mothercraft Center" (MCC) was built off hospital grounds.

The Mothercraft Center was built in the style of local houses and equipped with typical kitchen facilities by the Local Council of Ilesha. The center could accommodate up to twelve mothers and their children as temporary residents. The Ilesha project established a demonstration home garden at the site. The MCC functioned as a nutritional rehabilitation unit, one of the first in Africa to have

an attached home garden. This model was replicated (see Pacey 1978 for a review of gardening at NU's). At the MCC, women received nutrition training. Mothers and children were housed while the children's diets were supervised and mothers were taught how to plan and prepare balanced diets.

The records of children treated at the MCC provide one quantitative analysis of the project's explicit nutritional results, although the sample is biased toward children who were clinically malnourished on arrival. Approximately 80% of the children responded to the therapy, registering significant weight gains during rehabilitation and in follow up weight checks after they left the center. Six percent of the children treated later died, and 4% later required hospitalization. These results are similar to those of a more recent "gardening for nutrition" intervention in Nigeria, where death from malnutrition among participating gardening families was reduced from 10% to 6% in three years (Personal communication from Commander Quayle of the Salvation Army in Nigeria, February 19, 1984).

Costs of nutritional rehabilitation were underwritten by the Dutch. Save the Children Fund contributed the services of a supervisory nurse, and the Wesley Hospital contributed the services of a pediatrician. Fifty-nine per cent of the operating costs went for salaries, 19% for fuel and food purchases. One reason why project nutritionists closely monitored local vegetable prices was to keep procurement costs low. The garden at the MCC was not a "clinic garden" in the sense that it was intended to produce sufficient vegetables for nutritional rehabilitation. Rather, it was deliberately scaled to the size of typical home gardens, so that the mothers would not be overwhelmed by a large "institutional" garden. It was a demonstration garden where the women could learn a model they could easily replicate.

Cost/Benefit

Project outputs through 1970 included a horticultural research station which produced professional publications, trained counterparts, and instigated a line of research into indigenous crops that has continued in Nigeria to this day. It also adapted practical cultivars, assisted 638 project home gardens, and influenced an unknown number of visitors who took planting materials home. Some 5,000 child-days of nutritional rehabilitation took place. Nutritional education reached thousands of women. Project costs between 1965 and 1970 totaled \$378,323 net of government contributions. (This amounts to \$1,058,131 when converted to 1983 US dollars.) Government contributions brought the total cost up to \$514,000 (in 1970 dollars). It is not justifiable to weigh all project costs against the documented home gardens the project established, considering all the other enduring benefits of the project. However, if all project costs are divided by the number of documented gardens, the index of cost per garden would be \$1,658.51.

Afterwards

No follow up studies of home gardens in the Ilesha area were found. The Nigerian government requested the establishment of a far larger center for vegetable and fruit tree research before the close of the project. The Ministry of Health and the local council continued to support the MCC. Egharevba (1977) reports on the continued home garden extension efforts of the Ministry of Agriculture and Natural Resources in the Western state. The most commonly grown vegetables remained the indigenous ones. Gardening in wet valleys (Akuro) and near demonstration fish ponds were being encouraged. Illustrations of gardening projects in Nigeria include some efforts which predate the Ilesha experiment, and others which began afterward (see appendix).

The Ilesha Gardens project resembles the methods and objectives of some other FAO ANP's. One must look to the massive and long term ANP series in India for a similar combination of inter-institutional cooperation among governmental agriculture, home extension and health agencies, and similar complexity of extension methods and targets (see below). More typically, FAO and its ANP co-financiers (UNICEF, UNDP, and others) undertook interventions in nutrition with gardening primarily through government agencies charged with home economics, agriculture, or education alone, and rarely developed as close a relationship to health agencies as occurred in Ilesha.

The pioneering innovations of Ilesha were dispersed into other projects, especially those assisted by FAO, the cooperating nongovernmental agencies and the Government of Nigeria. A similar contemporary home garden project in Ghana piloted at a housing project for civil servants was one in a stream of activities which has firmly established home gardening in that country.

Table: Nigeria Home Garden Crops

English	Common Name (Yoruba)	Latin
(Leafy vegetables:)		
Malabar spinach	Anunututu	<i>Basella alba</i>
African spinach, Amaranth	Seje-soro	
Celosia	Tete	<i>Amarantius</i> sp. (hybrid)
Jute	Soko	<i>Celosia argentea</i>
African leaf cabbage	Ewedu	<i>Corchorus olitorius</i>
Mustard		<i>Brassica chinensis</i> L.
Fluted gourd (leaves eaten)	Iaulau	<i>Brassica juncea</i> (L.) cass.
Sierra Leone bologi	iroko	<i>Telfairia occidentalis</i>
Surinam Spinach	Worowo	<i>Crassocephalum biafrae</i>
	Gbure funfun	<i>Talinum triangulare</i>

(Fruit vegetables:)

Okra or gumbo	Ila	<i>Abelmoschus esculentus</i>
Local eggplant	Ikan	<i>Solanum incanum</i>
Roselle	Isapa	<i>Hibiscus sabdariffa</i>
Tomato	Tomati	<i>Lycopersicon esculentum</i>
Snake gourd	Tomato elejo	<i>Trichosanthes cucumerina</i> L. var. <i>anguina</i>
Melon, seed	Egusi	<i>Colocynthis citrullus</i>
"	Ito	<i>Cucumeropsis edulis</i>
"	Ibara	<i>Citrullus lanatus</i>
Squash	Eleyede	<i>Cucurbita maxima</i> Duch. ex Lam.

(Legumes:)

Cowpeas	Ewa, ewa ebeji	<i>Vigna unguiculata</i>
Lima beans	Awuje	<i>Phaseolus lunatus</i>
	Otili	<i>Spenostylis stenocarpa</i>
Locust bean	Iru	<i>Parkia biglobosa</i>
Pigeon pea		<i>Cajanus cajan</i>

(Spices:)

Bell pepper	Tatase	<i>Capsicum annum</i> L.
Red pepper	Sombo	<i>Capsicum frutescens</i>
	Atawewe	
Basil	Efiri	<i>Basilicum</i> sp.
Shallot	leaf Alubosa	<i>Allium ascalonicum</i>
Sesame	Ekuku	<i>Sesamum radiatum</i>

(Trees:)

Cempedak jack		<i>Artocarpus integer</i>
Breadfruit		<i>Artocarpus communis</i>
Pitanga cherry		<i>Eugenia uniflora</i>
Avocado pear		<i>Persea americana</i>
Cashew		<i>Anacardium occidentale</i>
Bananas		<i>Musa</i> X spp.
Papaya		<i>Carica papaya</i>

(Others:)

red Gbure pupa	<i>Talinum paniculatum</i>
Igbo, Igbagba	<i>Solanum gilo</i>
Ikan, Igba	<i>Solanum nigrum</i>
Osun	<i>Solanum aethiopicum</i>

Important dietary elements NOT typically grown in home gardens in Nigeria: cereals, tubers (cocoyan, yam, cassava), plantains.

Sources: van Epenhuijsen 1974; van Eijnatten and H.C. Bittenbender, personal communication.

B. A Similar Project: Benin

A project similar in concept to the Nigerian Ilesha gardens was initiated by FAO and the Dutch in Benin. It was formally known as FH/DAH 4 "Improvement of Nutrition in South East Dahomey by the Development of Home Gardens," and called locally "le projet hollandais"--the Dutch project (D'Almeida 1967). The Benin effort lasted from 1961 through 1970, cost about half a million dollars (\$1,219,608 in 1983 dollars), and employed ex-patriate professional horticulturalists and nutritionists, and a large local staff. It was notably unsuccessful. Although establishing home gardens was the main project objective, by June 1968, only 104 local gardens existed, including six market gardens and three pre-existing market gardens which adopted the techniques demonstrated (van Eijnatten 1969). If total project costs are indexed by the number of home gardens established, (our rough measure for home garden cost/benefit), each home garden cost \$13,837.

Nutrition research carried out by the Benin section of "Nutrition et d'Alimentation Applique" (SDANA) in 1961 documented low protein and vitamin intake. Vegetables were selected to meet the nutritional deficiencies identified. Varieties of these vegetables were imported and subjected to adaptive research at a central garden at Ouandan near Porto Novo. The 32 hectares of the central garden and project staff compound were purchased from 123 separate owners as no government land was available (Terra 1967)--an indication of the density of population. In the later years of the project, a second central garden was established at Pabegou, Djoudou.

The central garden was operated as a horticultural research station. As van Eijnatten, who served as project manager at Ilesha and later in Benin remarked, the Ouandan central garden lacked the "basic philosophy of demonstrating home gardens" (Ruck 1968:5). The garden had high labor requirements, which were met with a local staff of 77-105 and volunteers from the low countries. Horticultural research focused on screening and adapting imported exotics, rather than on collecting and improving indigenous crops and the exotic imports already grown locally. Terra gives a list of the vegetables (1967: 9-14), which included strains from India, the United States, Indonesia and Europe. The choices of beans illustrate the point: *Phaseolus radiatus* from the United States, *lathyroides* from Bombay, mungo from Cuba, and several commercial varieties of *lunatus* (Lima bean)--LY3, Forhook 242, Henderson, Bush and Dwarf, from Lima. It became a major task of the nutritionists assigned to the project to develop palatable recipes for the 'animatrices rurales' to teach, using vegetables totally unknown in the local diet.

Local people expressed more interest in semi-commercial or commercial gardens than home gardens per se. Peri-urban market gardening was already established in the area, with classic "maraichiere" techniques rather than the mixed garden style that was extended. Although an impressive number of seeds and seedlings were distributed from the central garden (e.g. 38,532 green leafy vegetable, 17,405 dried bean, and 6,135 papaya or maize starters in 1967 alone), uptake

of the garden technique was, as noted, extremely low.

By 1970, with a new central garden established in an isolated region of the north, FAO embarked on an alternative: the "fermette: jardins potagers familiaux irrigue" (irrigated family food gardens). The fermette was intended as a small family farm enterprise, mixing production of livestock, staples, and vegetables for self sufficiency and for sale. Each fermette was centered on irrigation by animal traction from "dalou" wells built for the farmers. By 1972, only 25 fermettes, each with a dalou, had been installed and of these, eight were not functioning. Of the large number of potential vegetable crops extended (Van Heck 1972:22, 25), very few were accepted.

The Benin home garden project experienced problems unrelated to its design, including five political revolutions between 1962-1968, which resulted in the instability of the counterpart and extension staff, as well as unspecified personnel problems and disagreements among the staff (Ruck 1968). However, it seems clear that in contrast to the Nigeria effort, the main problem in Benin was a misunderstanding of the horticultural goals and style of the local population. Notably, no sociologist was assigned until 1970 to analyze the "human factors" in what can be deemed an expensive experiment.

C. Ilesha in the Context of FAO ANPs

The Ilesha and Benin garden projects, financed by Dutch bilateral aid, and a 1966-1972 project in Ghana, financed by Misereor (German), the German Freedom from Hunger committee and Entraide et Fraternite (Belgian), were among the few Applied Nutrition Projects technically assisted by FAO that had establishment of family gardens as their primary objective. FAO's role in the Ghana project was to establish school and clinic gardens and assist a nutritional educational campaign; it did not have any central involvement with the project's successful improvement of home gardens in a housing project for civil servants. (FAO, Plant Production and Protection Division 1972). This kind of effort has been frequently replicated in Ghana (see appendix).

In most of the more than 60 FAO-assisted Applied Nutrition Projects (McNaughton 1983), establishment of home gardens was an incidental or tertiary objective, at best.

Types of FAO-UNICEF ANPs

Three types of FAO-UNICEF projects included horticulture (Wagneur 1969).

Applied Nutrition (AN) projects stressed nutrition education and, in conjunction, taught improved horticultural practices through school, family, or community projects. These projects were typically implemented through national ministries of agriculture, "young far-

mers" clubs or associations, or an applied nutrition or rural home economics extension unit of the MOA. Examples of AN efforts with horticultural components include projects in the Comoros Islands, Lesotho, Malawi, Swaziland, Zambia, and Tanzania (Wagneur, 1969). In the Tanzania project piloted at Hombolo (1963-1966), the MOA was the lead ministry, and departments or ministries of home economics, education, and community development collaborated to install school and community gardens and a central nursery, and to train community volunteers. The project was handed over to a Nutrition Unit in the Ministry of Health, which replicated the project in other areas (Robinson 1967).

Home Economics (HE) projects acted through women's associations, youth clubs, and social services to instruct young women and mothers in homemaking skills. Some of these projects involved home or community gardening and small livestock production, though nutrition education, food preparation and preservation, and sanitary homemaking practices were the main skills taught. Community Development Departments were the usual lead ministries, employing extensionists trained in general methods of encouraging people to improve their standard of living and teaching the specific subject matter of the intervention, such as nutrition or gardening. Where gardening or small livestock production was included in the promotion, these workers were generally expected to install model gardens or small livestock units at their residence in the area assigned to them for extension work. FAO-UNICEF projects in Burundi, Kenya, Malawi, Mauritius (Wagneur 1969:5-6), Iran (Pederson 1967; Eaton-Evans 1969), South India (Atkinson 1967), and Morocco (Parisot 1968) included home, community, or club gardens and/or small livestock units.

Education and Training (ET) projects were through schools, from the primary through the university level. Training in nutrition, home economics, general agriculture and related disciplines, and school feeding programs were the central aims of these projects. The Ministry of Education was the common lead ministry though, in Rwanda, the Department of Community Development and Family Life and a Catholic school implemented an ET for young women. Examples of FAO-UNICEF ET projects with horticultural components included: a Madagascar project which featured school farms rather than "school gardens" (a concept which had been struck from the curriculum after a difficult colonial experience) (Wagneur 1969; Rasanjiferahasina and Ranaivoson 1977); school market gardens promoted in the Ivory Coast (Wauters 1969); and school gardens used to produce food for school feeding programs in Kenya (Maxwell 1968-1969), Senegal (Claessens 1970), Burkina Fasso (Uriodain 1971), Sri Lanka (Gratch 1967), Mauritania (Roumeas 1969), and Sudan (Hamad 1970). The Bureau of Public Schools was the lead ministry for pilot ANPs in the Philippines in Bayambang and Bautista (1964-1967), Cebu (1966), and Bukidon on Mindanao (1968): this Philippine pilot was one of the few school-centered projects with gardening for improved nutrition that also established family and market gardens (Cornelius 1968).

Whatever the reputation of the FAO-UNICEF ANP project series, these efforts were by no means tests or prototypes of home gardening.

The India ANPs

The FAO-UNICEF-WHO Applied Nutrition Project series in India overcame ministerial compartmentalization by establishing coordinating committees at the national and state levels involving the relevant ministries or departments of education, agriculture, home economics, community development, and health (Purvis 1969). Gardens were established at clinics, hospitals, schools (Rao 1975; Blumenfeld 1968 and 1970a), and "balwadis" kindergarden preschools (Atkinson 1967). Gardens were also established for "panchayat" communities (Hegdekar 1977), for youth and women's clubs, and for families (Menon 1975; FAO-based on Blumenfeld 1970; Stewart 1970).

The internationally sponsored India ANPs reached 5% of India's population. The India pilot ANP began in four states in 1959, and expanded to sixteen states and six union territories by 1969 (Purvis 1969). The UNICEF-FAO Applied Nutrition Project between 1963 and 1970 represents a major effort of international sponsorship. By 1966, 2,300 school gardens of 1/4 acre each, 29,000 home gardens of 1/20th acre each, and 1,000 one-acre community gardens were functioning in 10 states of India. The ANP experienced multiple problems. Gardeners were hired to tend school gardens, to the loss of pupil interest and participation. Community gardens were poorly kept because responsibilities were poorly defined. When the ever erratic supply of free seeds, tools and other inputs for the home gardens ended, people stopped gardening the introduced vegetables (Swartz 1980:2). Nevertheless, gains made in nutrition education in this phase of the project achieved long lasting effects.

Identification of these problems led to a re-examination and redesign of the ANP effort, correcting problems such as the hiring of gardeners, and decentralizing to each state research in local crops, cropping patterns, and attitudes. The design of specific programs was also decentralized to the states, as they could adapt more flexibly to India's culturally heterogeneous and regional diets, (systematically inventoried in the course of the earlier pilot ANP) (Gopalan 1969 a and b, 1971/1976/1978). Training for ANP extension was made a function of state agricultural colleges, building their institutional capacity for horticultural research and education. Nutrition education was carried out by even more decentralized community health or development workers. These village level workers organized the established community councils for gardening efforts, brought mothers and youth into gardening clubs, and generally promoted home gardens. School gardening continued in the state ANPs, but the more serious efforts were directed at adults. These features contributed to the sustainability of gardening as a nutrition intervention in India. Today, there are numerous programs sponsored by state governments, primary health care programs, agricultural research groups, and area development programs.

The Link to Health

In retrospect, very few of the FAO-assisted ANPs sought direct

institutional connections with health agencies. The projects which did have a connection with health agencies include: the Ilesha Garden project, through its pilot nutrition rehabilitation unit; the Indian and Philippine ANPs which involved the World Health Organization and national and state or provincial health services; and the Tanzania Hombolo pilot project. The Hombolo project was handed over to the Ministry of Health, although this ministry was not originally involved in its implementation. What is striking is the resultant compartmentalization of nutrition education--a major effort in all three kinds of FAO ANPs--as an effort separate from national health programs.

UNICEF, with WHO, PAHO and other national or multilateral agencies, has co-sponsored other ANPs and nutrition programs which have resulted in the establishment of home gardens as part of community based health programs. In these efforts, the demonstration of gardening techniques and training commonly took place at health clinics. FAO has provided occasional technical assistance in horticultural training for some of these projects.

The next case history reviews the establishment of home gardens through two programs implemented in the same country, Chile. The principal program described was implemented through the Ministry of Education. It is notable that an earlier effort to promote family gardens implemented through the Ministry of Health with international assistance was relatively more successful.

3. CASE HISTORY #2: CHILE--SCHOOL FAMILY GARDEN PROGRAM

A. Background

Family gardens

Family gardens have been promoted in Chile since 1973, when the Chilean National Health Service (SNS) began a pilot Regional Rural Integrated Development Program in a region where large numbers of rural indigeneous poor were concentrated (region IX). By 1979, SNS had expanded the program to three other regions (IV, VII and VIII) with assistance from the United States Peace Corps and a small grant from CONPAM. Between 1973-78, SNS had trained 476 rural residents as Rural Garden/Health Community Developers, each operating a "rural integrated development center" where gardening was demonstrated. SNS claims to have initiated 5,000 family gardens with local community resources and to have reached half a million rural residents with nutrition education. The SNS approach featured a special kind of "village health worker," trained in gardening and nutrition at rural clinics, who extended the new knowledge throughout local communities (Efides 1983).

School Gardens

A school garden program was carried out between 1954 and 1969

under UNICEF's Plan PASE (Agriculture, Health, and Nutrition Plan). In 1975, a Ministry of Education pilot project for school gardens was initiated in Linares Province (Region VII) following the Plan PASE model and using materials developed by UNICEF or by FAO for the earlier effort. An aim of the MOE program was to have school gardens produce food for use in the school feeding program, as well as to introduce nutritional and agricultural topics into the school curriculum. School garden produce, therefore, was clearly intended for this specific use. The main rations of school feeding programs consisted of food stuffs supplied through the national government and originating in part from stores of foreign relief food such as PL 480. In Region VII, school gardens harvested an estimated \$20,000 worth of food, and the value of produce in 1979 was estimated between \$ 35,000 and \$40,000—all used to supplement and enrich children's meals at the participating schools. The United States Peace Corps became involved in the Linares pilot project around 1976. Because Peace Corp volunteers also working concurrently in the SNS family gardening project, the secondary objective was adopted of disseminating gardening to families through the school garden demonstration. A particular volunteer is credited with laying the basis for what eventually emerged as a national school/family gardening program (Efides 1983; Boylson 1980; USAID 1979 PD-AAH-982).

B. CARE Involvement

The U.S. private voluntary organization CARE entered the program in 1977 to assess the pilot project, and in 1978 fielded personnel to directly assist 240 school gardens in Region VII, as well as to promote the idea of expanding the pilot to other areas of Chile through the Ministries of Education and Interior. In June 1979, CARE/Chile presented a project proposal to headquarters proposing a three-year involvement (CARE, internal documents). As elaborated at CARE headquarters, this proposal was adopted, and USAID provided an operational program grant of \$150,000 for CARE's 1981 efforts. Although a large number of Chilean government organizations were involved in the program, these proposals reflect the process, plans, and expectations of CARE with Peace Corps and USAID support, as highlighted below.

1. The Ministry of Education was to develop and implement a curriculum for nutrition education and gardening in the schools and to train teachers as "school garden monitors." Teacher training was to be provided through INACAP, a specialized National Training Institute, and funded by SNCE, the National Employee Training Service, responsible for upgrading the skills of state employees. CARE expressed hope that SNS (National Health Service) and CONPAN (National Council for Food and Nutrition) would remain involved in the demonstration national project by expanding demonstration gardening to other rural clinics.

2. The program addressed the identified problem of malnutrition, assessed at 35% among rural youth, compared to the national average of 14%. Studies in Chile suggested that families with as little as one acre of land could achieve nutritional self sufficiency using intensive farming and small animal breeding techniques if they fol-

lowed good nutritional practices.

3. A needs assessment mechanism was developed to select schools where gardens would be located, and a dietary questionnaire was developed to select crops on the basis of the nutritional needs of the student population. Forms for periodic assessments were also designed.

4. The targets of the CARE intervention called for 1,750 primary school gardens to be in production by October 1, 1982, from which 60,000 students would receive daily rations from school gardens or small livestock production. CARE also anticipated that, as a result of the gardening demonstration at the schools and SNS clinics, 14,000 families would start family gardens, which would be feeding 100,000 family members daily by 1982. Family gardens were to be promoted informally through parent/teacher associations, by the formation of school gardening committees, and by encouraging other forms of parent involvement--models which had proven effective in the Linares pilot school/family gardening project. INACAP and SNS were to be responsible for adult education courses in gardening, health, and nutrition.

5. CARE was committed to providing the materials necessary to start up school gardens in new Chilean regions, including tools, seed, fertilizer, and other inputs such as netting for fences. It also assumed the overall administrative responsibility for coordinating the many national institutions involved in the project. CARE-administered Food for Work was used to reward community people for clearing land for school gardens and caring for the gardens during summer vacations.

6. Indicators of project success were selected. These included: inclusion of specific nutrition or agriculture studies in the primary curriculum, student test results in these subjects, and the existence of functioning school and family gardens. No formal studies of nutritional status were performed in relation to the program, though several special nutritional needs assessments from the National Council on Food and Nutrition and surveys previously carried out by professional nutritionists were available to advise program designers (USAID 1979 PD-AAH-982 and PD-AAH-985).

The many institutions involved in the Chile School/Family Garden Program are listed in Appendix 2. Briefly, though professional and volunteer nutritionists and agronomists provided technical and direct support to the program, the main implementation agents selected were schoolteachers trained as "garden monitors." American volunteers' efforts focused on coordination, procurement, and obtaining supplies for the demonstration school gardens.

Policy and Politics

Changes in Chilean government policy affected the implementation of the program. On one hand, the Government of Chile officially provided enthusiastic material, technical, and logistical support for

the educational aspects of the program. In April 1980, Decree #3171 formally established the School Garden Program for all Chilean schools where "appropriate infrastructure" (i.e. land available for gardens) existed, and Decree #4474 in August 1981 formally integrated the norms and guidelines of the program into the curriculum of all rural schools. The Rural Education Institute developed a Horticultural Manual for use in training teachers, and began to publish advice regularly in its magazine, *Nuestra Tierra*, which was distributed to all participating teachers. SNCE of the Ministry of Labor provided over \$150,000 in scholarships to cover the expenses of school teachers' training as "garden monitors," and the Chilean Institute of Nutrition performed special studies (Efides 1983).

On the other hand, in 1980, in the midst of the expansion of the program, Chile began a process of decentralizing its school system. Schools were transferred from the national government (Ministry of Education) to the local municipal governments. This transfer changed the ownership of school facilities, financial responsibility for raising school budgets, and employment of teachers and other school staff from the national to the municipal governments. By March 1983, 87.5% of the schools in Chile had been so transferred (Efides 1983 :8). This led to far-reaching changes in the administrative structure of individual schools. National contributions to and logistic support for the school feeding programs began to phase out, in part in reaction to diminished levels of foreign subsidy food supplies, and in part as an aspect of the school decentralization. Finally, diplomatic relations between the United States and Chile were strained to the breaking point. The Peace Corps, PL 480, and USAID involvement in Chile were withdrawn as a consequence.

Scope

In school year 1983, the last year of any United States assistance to the program, CARE distributed 3,760 hand tools, 2,509.6 kg of seeds for 14 kinds of vegetables in small sealed packets, 18,800 kg of fertilizer, and 3,800 manuals to 1,687 school gardens in nine regions. As of April 1983, 1,580 school gardens were functioning and a grand total of 1,650 teachers had been trained. In 1982, 144,884 children ate from the produce of school gardens. However, there were only 1,185 family gardens functioning in the entire program as of April 1983--a point explored below (Efides 1983).

Gardening Methods Taught

School gardens averaged 40m² in size and typically produced beans, peas, lettuce, cabbage, carrots, spinach, beets, coriander (a spice), onions, radish, and eggplant. In some schools, the food supply was further diversified by raising rabbits, and fruit trees and by apiculture.

The horticultural techniques most universally taught featured cultivation of vegetables grown in rows, using hand tools and fertilizers. Between 1978 and 1981, when the Peace Corps abruptly departed from Chile, as many as 35 volunteers were assigned to the Ministry of

Education to work directly with the school garden program, and additional volunteers were assigned to cooperating agencies. Volunteers contributed to the diversification of the program, carried out the actual distribution of fruit trees, and distributed supplementary educational how-to-do-it booklets. Peace Corps volunteers demonstrated model gardens at sites other than schools and clinics, including parish houses, student dormitories and hospitals. They also demonstrated and provided technical assistance for techniques not included in the standard gardening curriculum, such as composting, hotbeds, and improved fencing.

Appropriate technologies

Within the context of the general promotion, some of the innovative pilot projects which were assisted by cooperating Chilean NGO's and the U.S. Peace Corps involved groups using technologies more appropriate to Chile's varied situations than the main techniques disseminated. Among the "special projects," greenhouses, in particular, represent a response to variations in Chile's climate. In many colder parts of Chile, gardening needs to be in some form of protected enclosure, for which there are several proven technologies in addition to a variety of low cost greenhouses. It is unclear how seasonality affected the basic school garden program, as school vacations in Chile are timed for the prime agricultural season, "summer," but the time of greatest food scarcity is in their cold winter.

Greenhouse construction, particularly in Regions VI and VII, emerged from climatic constraints faced by the program. Chile's climate is generally temperate with cold winters, but in the higher altitudes and zones closer to Antarctica, there are prolonged periods of snow and cold weather. To achieve the program garden design's ideal of continuous crop production, and even to make horticulture itself "practical," greenhouses offered a solution in the more severe climates, such as at Tierra del Fuego. Diakonia, a private organization, CARE, and Peace Corps volunteers all became active in developing greenhouses. Although CARE viewed greenhouses as technically difficult to support, it eventually assisted with the construction of nine of them. CARE regarded the greenhouses as laboratories to introduce materials and techniques to children and the community, and as seed beds to raise plants for delivery to local school and family gardens.

Sources vary on the point of whether 13 or 19 greenhouses were built through the project. In some cases, greenhouse production was sufficient to establish a revolving fund to stimulate community economic support from the sale of seedlings (EFIDES 1983:44). Greenhouses attracted extraordinary interest from the communities and were all well maintained. On the basis of its experience, the Peace Corps was planning to establish community greenhouse projects as the next step in its contribution. Later on, in the 1980's, the Inter-American Foundation began providing grants to communities and cooperatives to help install new greenhouses, and this agency continues to receive grant applications from Chile requesting funds for new green-

houses.

Coordination of Input Supplies

In an independent evaluation, CARE is credited with providing basic stability for the program at a difficult time, and it was also largely responsible for the international procurement and local distribution of the input supplies. Peace Corps volunteers were also deeply involved in actual distribution, hand-carrying seedlings to school and family gardens from nurseries. Beyond producing seedlings in school and rural clinic gardens and at the popular greenhouses, no mechanisms for 'Chileanization' of the essential tasks of coordination and input distribution were in place at the close of the program. CARE and Peace Corps efforts were probably critical to the program's achievements, as many other projects have failed in these tasks. It remains to be seen how Chile will develop ways to continue the supply systems which ended when US assistance ceased.

Limited Replication of "School Gardens" as "Family Gardens"

The number of family gardens begun under the program was unexpectedly low—not the 14,000 set as an output (10x the number of projected school gardens) but, as of April 1983, only 1,185. As school teachers were encouraged to establish private gardens for their own families as additional demonstration gardens, this number can be accounted for by school teachers' gardens alone. It is in fact less, by several hundred, than either the number of school gardens or of teachers trained. All school teachers trained as garden monitors were expected to establish their own family gardens. Apparently, this did not happen. It is significant that in their final report to USAID, CARE referred to the program as for "school," rather than for "school/family" gardens.

Costs

The basic cost of a garden starter packet of hand tools, seeds, fertilizers, and other supplies provided by CARE had a market value of about \$150/garden. However, the major costs of Chile's School/Garden Program were in training school teachers, producing technical assistance, manuals and curriculum materials, and administration of the complex program. The Government of Chile's costs between 1980 and 1983, were reported at \$1,877,500, primarily for teacher training. This works out to more than \$700 per school garden in place by the end of this period. In addition, the program benefited from technical assistance from Peace Corps volunteers and national NGOs which, together with teachers' time, may be estimated at a worth of several thousand dollars per school garden year. Together with institutional overhead costs of CARE, USAID, the Peace Corps and the Government of Chile's cooperating ministries and agencies, the total cost per initial school garden year works out in excess of \$6,000. While no systematic measurement was made of the value of school garden produce after the Linares pilot, it seems unlikely that a 40

square meter plot could return this initial investment in less than a decade, providing the garden survived and that there were no teacher retraining or other extraordinary on-going operational costs. Volunteerism made an important difference.

The start-up costs associated with the school garden would not be considered high if the school gardens had also fulfilled their function of demonstrating, and so inspiring, replication as family gardens. An interesting aspect of the program is that it did foster continuity for the school feeding program at a time when national and international support was phasing out. Though originally intended to enrich and supplement the school lunch program, the school garden program ended up providing a fall-back strategy and a substitute for former food subsidies for a particularly vulnerable population.

Discussion

The school/family garden program continues under Chilean implementation. It would be premature to deem the program either a success or a failure for several more years. Nutrition education and school gardening were provided a firm basis in the Chilean school curriculum, and this represents a base from which innovation and replication can spring. The decentralization of the school system, though disruptive to the program, may actually enhance community involvement under municipal management.

One of the nongovernmental Chilean organizations which participated in the program, an outreach effort of the Pontificia Universidad Catolica, has been remarkably successful in recent years with a family garden project. Spontaneous replication of home gardens was established via neighbor-to-neighbor assistance.

4. CASE HISTORY #3: MAURITANIA

A. Background

Mauritania is one country where vegetable gardening projects have a high potential for direct positive impact on the nutritional status of the population. "It can be stated unequivocally that vegetable production in the region is largely for the consumption of the farmers and the villages" (USAID PD-AAF-646-A1:65).

Some vegetable gardens in Mauritania are small rainy season household gardens ("le petit jardin villageois"), swidden gardens producing for home consumption the local "neiba", sweet potatoes, okra, peppers, "berei," and a melon, the seeds of which are eaten like peanuts. Planting materials for these family gardens are preserved in the household. There is some off-season vegetable production in all regions with minimal rainfall or adequate groundwater (:72)--that is, around oases and in the permanent "mares." Even pastoral nomads grow cabbage for household consumption. The Adrar tradition of small scale vegetable farming was established before the drought. The most sophisticated vegetable production units are commercial operations in the 6th region, which are equipped with pumps and sprayers, and use pesticides and imported European seeds (:73). Vegetables, including gathered wild vegetables, are a popular food, largely eaten fresh, though some are sundried or pickled. European varieties are imported from the SAED vegetable operations in Senegal and elsewhere.

Until the Sahelian drought, much of the Mauritanian population was engaged in nomadic pastoralism. The productive basis of the traditional diet of milk, meat, and cereals was eroded by the drought, when millions of head of livestock died or were slaughtered for emergency rations. Legumes and niaba' beans provide vegetable protein to complement the cereal-based diet.

Nutritional problems

In 1978, the population was estimated to have a caloric intake limited to about 1900 calories/caput/day, despite distribution of emergency food relief supplies. Vitamin A deficiencies are apparent in the prevalence of night blindness.

Studies of nutritional status in Mauritania were "often conjectural--i.e. "assumed from (a) sketchy look at the diet:" (USAID 1980 PD-AAG-144:15). Assessments of protein-calorie malnutrition based on measurements of children under five showed that 40% weighed below 60% of the standard weight for their age or height. Existing data was "generally not defined in terms of cultural groupings, seasonal changes, weaning and family food habits, or interactions with endemic infectious diseases" (:16), limiting its usefulness for project intervention designs.

Historic UNDP-FAO Efforts

The United Nations Development Programme and UNICEF sponsored a school feeding and nutrition education project in Mauritania during 1963-1968, before the crisis of the drought. It included a school gardening component. Although 122 school gardens were established, gardening was rare and lacked technical support. The project largely focused on nutrition education in the schools as a result.

Regional sources of technical support for horticultural crops has improved since that time, with the establishment of vegetable crop experiment stations in the Sudan, at Amado Bello University in north-

ern Nigeria, and at IRAT in Senegal, in ecozones that approximate Mauritanian conditions. These stations have received support from international and bilateral donors. The development of market gardens in Senegal apparently diffused to Mauritania.

B. Operation Vegetable Production

In 1974, USAID provided a \$600,000 grant to establish garden plots among the resettlement centers of former nomads. The former nomads were supplied with water pumps, seeds, fertilizers, and garden tools. Eight hundred families in six regions planted a total of 180 hectares and produced 1,500 tons of vegetables, including potatoes. Irish potatoes were introduced after the drought as a famine food supply. Sweet potatoes and local vegetables were produced beside the rivers. "Beref," melon, local and European vegetables began to be produced beside resettlement houses: these were the first "home gardens" in the definitional sense of food gardens associated with house sites. The gardening model which was promoted featured mulching and manuring. In some settlements close to rivers, a model approaching the mixed garden was piloted with fruit and other shade trees. Kiffa was the main site for this "accelerated impact vegetable production intervention."

An important result of this experiment was the discovery that introduced vegetables did not displace production of traditional vegetables nor the gathering of wild foods. Rather, all the increased production supplemented these other diet sources. Although the Mauritanian ex-nomads gardened enthusiastically, they were unfamiliar with many of the vegetables promoted, and innovated with modes of preparing vegetables which resulted in less than optimal recipes. The frying of lettuce, for example, is mentioned in several reports.

C. Vegetable Production Cooperatives

The International Voluntary Service (IVS) operated a cooperative vegetable gardening project financed by church funding near Nouakchott for 30 women, called Groupement Pre-Cooperatif Tind Sourilene. While the formation of cooperatives had been weakly promoted under the French colonial government, the cooperative movement and concept was not well institutionalized by the independent government, and not particularly popular among Mauritanians. The IVS project featured the establishment of ten vegetable communal plots of six acres each, divided into two acre plots. Three women were assigned to cultivate each of these two-acre plots. Women reacted by subdividing the plots and producing independently. The Haitian IVS volunteer insisted that all produce be sold collectively. He banked half the sales and divided the remainder equally among the participants. This led to some resentment among the women, who felt some had produced proportionately more than others, while everyone received an equal share of the profits. IVS' insistence on communal vegetable production also troubled another of its projects in Botswana.

Although IVS focused its efforts exclusively on women, the participation of women in vegetable production cooperatives varies in

Mauritania. Among the Toucouleurs of the 5th region, women have formed cooperatives separate from the men's. In Kiffa, women and men associate in the same vegetable production cooperatives. In the 6th region, where such cooperatives have been less successful due to occasional 'dumping' of SAED-produced vegetables from Senegal, men and women also work together.

C. Oasis Development Project

Oases inhabitants numbered some 100,000 in 1980, or 8% of Mauritania's total population. Oases are concentrated in the north; all are located on wadis or stream channels that carry surface waters once or twice a year (USAID 1980 PD-AAG-144:21). As a result of the Sahelian drought, water tables dropped below the root systems of the palms, and aquifers were not recharged. The northernmost oases of Adrar were slowly dying. Efforts to irrigate and keep oasis agriculture alive further depleted ground water. Inhabitants began leaving.

A pilot USAID project in a few oases granted \$5,991,000 to Mauritania to introduce 18 improved varieties of palm, new cultivation techniques for date palm, diversification into vegetable gardening, woodlot windbreak shelter belts, improved water management, and "living fences" to separate oasis agriculture from livestock. Dune invasion of date palm orchards and oasis shelter belts were addressed in a related USAID project for Renewable Resource Management. French bilateral assistance had tested the biological control of date palm scale--ladybugs--which the pilot oasis project disseminated, along with other improved techniques. As the oases were located far from the main market centers for vegetables, the emphasis of the oasis project was to induce vegetable production primarily for auto-consumption (USAID 1980 PD-AAG-144:9).

The vegetables selected for the initial auto-consumption promotion were the familiar onions, sweet potatoes, hot peppers, squash and watermelons widely grown in Mauritania. The need to include more nutritious food sources was recognized. Slated for trials at Sani oasis were: lentils, peanuts, a variety of beans (winged, broad, dry, hyacinth and mung), pigeon peas, cowpeas, chick peas, and citrus.

Women were regarded as the primary beneficiaries of the project, as they commonly supervised date palm production and were assumed to be the most likely to take up the cultivation diversification. Men spent their days grazing livestock, and many had migrated for wage labor. Livestock production out from the oases remained central to their economies. Goats and sheep were returned nightly to village corrals. The pilot project design tested ways to turn the hazard that goats posed for gardening into a potential resource. Methods tested included the use of living fences, using composted manures as fertilizers, and the use of animal traction to draw water.

D. The Vegetable Production Feasibility Study

This entire project was conceived as a study to test vegetable production as a way of improving nutrition in Mauritania. The goal of the project was to upgrade the welfare of the Mauritanian population (USAID PD-AAF-646-A1:68:2). Designed as a first stage effort, the project was to work out both the sociocultural and horticultural aspects of feasibility. The economic analysis was based on the notion that any vegetable production could enhance the Mauritanian economy by displacing food imports, and that markets for the gardeners could eventually develop. Economic feasibility was not belabored as is often the case in projects which are exclusively for "market" gardening. The social analysis reported the expectation that "vegetable produce will be largely, as it is now, auto-consuming" (USAID PD-AAF-646-A1:68). The concept that the increased vegetable production might end up in markets or the family cooking pot is realistic.

USAID granted Mauritania \$1,470,000 for the project. A good share of the grant was used to set up trials in three different Mauritanian regions (3rd, 5th and 6th). Technical assistance was provided for horticultural research, studies of consumer acceptance of vegetables, country-wide nutritional surveys, and a system for the nutritional surveillance of a 3,000 families. The Peace Corps co-financed by providing seven volunteers at a cost of \$405,000. PCVs acted as agriculture extension cooperative agents. Women volunteers trained in home economics were "vegetable preparation agents" assigned "to change vegetable preparation behaviors."

This project built upon the experiences of the earlier "Operation Vegetable Production," the work of IVS, and excellent sociocultural studies conducted in Mauritania by USAID. These studies detailed the characteristics of the different regions, cautioning the implementation plan about likely problems and varying acceptance to be expected from Mauritania's several ethnolinguistic groups, each of which has a distinctive social organization and approach to land use (USAID 1978 PD-AAC-847-B1:59-75).

One uncertain assumption of the project was whether small farmers could be organized into vegetable production cooperatives which could eventually function as market gardens. For this reason, the project area was narrowed to the 5th and 6th regions, in areas near the Senegal river constituting the most fertile agricultural lands of Mauritania. Though these regions contain some drylands, requests for projects beyond the wetter zones were not expected to be included. Thus the 3rd region, where the earlier operation had introduced family vegetable gardening at Kiffa, was the only remaining area of drylands left in the project. In the spirit of the feasibility study, just as it was expected that certain cultivars would emerge from horticultural research as most regionally appropriate, so it was expected that the exact form of productive social organization would be studied as well. Home gardens (at house sites) remained an option but not an emphasis of the project.

A project evaluation in 1981 (USAID 1981 AAJ-317) reported that at least 600 farm families were participating in vegetable demonstration gardens, that the agronomic research was on target and that

satellite gardens had sprung up spontaneously (:19). The nutritional studies were not completed. Peace Corps volunteers were more interested in moving directly into action (qua production) than in carrying out the roles assigned to them in the feasibility work. The single agronomist was stretched thin supervising horticultural trials at widely dispersed points.

5. PROFILES OF THREE CURRENT GARDENING PROJECTS OF PRIVATE VOLUNTARY ORGANIZATIONS

A. Bangladesh: CARE's Women's Development Program

Background

Traditionally, women in Bangladesh irrigate and harvest small fruit and vegetable plots near the house and tend animals, especially poultry. Vegetables are grown during the winter season, from mid-December to mid-February. Vegetables are grown at homesteads or in yards, though some plots are located in crop fields as winter is a fallow period. Vegetables are also grown on "ails," at roadsides, or at tank reservoir banks. Fruits are usually cultivated in home gardens or at the nearest available vacant space near residences (Ahmed nd). Common crops are given in the table below.

Table: Bangladesh Home Garden Crops

English Name	Bengali	Latin
Amaranth	lal shak	Amaranthus spp.
Spinach	palong-shak	Spinacia oleracea
Malabar spinach	pui-shak	Basella alba
	rai shak	
Radish	mula	Raphanus sativus
Carrot	gajar	Daucus carota
Turnip	shalgam	Brassica campestris
Hyacinth bean	seem	Lablab purpureus
Bitter cucumber	kankrol	
	kankur	
Jute, Jew's mallow	Patt shak	Corchorus olitorius
Pumpkin	Kumra	Curcubita pepo
Bottle gourd	lau	Langenaria siceria
Ash gourd	chal kumra	Benincasa hispida
Sweet potatoes		Ipomoea batatas
Eggplant	brinjal	Solanum melongena
(Spices:)		
Ginger		Zingiber officinale
Turmeric		Curcuma longa

Hot pepper	Capsicum sp.
Lemon grass	

(Fruits:)

Bananas	Musa X spp.
Jackfruit	Artocarpus Altilis
Papaya	Carica papaya
Mango	Mangifera indica
Lemon	Citrus limon
Pineapples	Ananas comosus
Guava	
Bael	bel borui
	Aegle marmelos
Pomegranate	Punica gianatum
Lichi	Litchi chinensi

Project Actions

The Women's Development Program (WDP) in 90 villages of Tangail District initiated by CARE in 1980 in cooperation with the Ministry of Health and NORAD funding, encourages women to cultivate winter vegetables and fruit trees and raise poultry. Approximately 450 tons of vegetables (radish, carrot, cabbage, cauliflower, tomato, "palong shak," and "alal shak") were grown by 2,815 participating village women, at an estimated total value of US \$55,000. Most participants were able to meet family needs for vegetables from their gardens.

Extension workers encourage village women to make kitchen gardens near homesteads and to decide which of the seven types of vegetable seeds or seedlings they wish to cultivate. Cauliflower, cabbage, and tomato are distributed. Seedlings are produced at the CARE compound. Women purchase the planting materials by depositing into a Development Fund set up for each village and managed by an elected women's secretary. Help in cultivation is provided by Gram Saker officers and village women leaders, who receive a five-day training course from CARE. These women act as "model farmers" (like the "master gardeners" of Cooperative Extension in the United States) and receive additional on-site training. Handout instructions are provided to all participants. Demonstration gardens are also placed in plots near primary schools.

Results

Laumark (1982) surveyed 140 participants. Two thirds had grown some type of winter vegetable before. Nearly all planted gardens very close to their houses: no vegetable garden was more than 25-30 meters from the house, and most were placed within courtyards behind dwellings. Ninety six percent of the women said they supplied all the labor themselves. Assistance from husbands was for plowing larger plots further from the household. Hand irrigation of the plots from water carried in earthenware pots was the main routine

task of gardening.

The majority (56%) of those surveyed said they planted entirely for home consumption. Only 1 out of the 140 interviewed stated she planned to sell all her produce. Most (64%) were satisfied with their levels of production and noted that their neighbors became interested in gardening from their example.

Problems

CARE staff regarded the lack of fencing as a major problem. The majority (78%) of the gardeners surveyed did not follow the recommendation to fence their plots, citing as reasons cost or lack of need, as they had no animals or because the garden could be seen from the house. At most, a "kacha" fence of bamboo sticks, banana leaves and straw was thrown up despite a concerted campaign by extensionists to promote fencing. Considerable damage from the ravages of goats, chickens, other domestic fauna and children were observed by CARE workers (13). Where chickens were raised more intensively, not even a well-made fence could prevent poultry predation. Chickens even overflowed a 1.5 m fence to eat vegetables.

Laumark recommends against household vegetable gardening where poultry is raised by the free range methods usual in Bangladesh. She notes that "the most successful winter vegetable cultivation occurred in a Hindu village where the villagers kept no chickens or goats in their homesteads."

The great number of shade trees around household compounds also detracted from vegetable gardening success. Laumark notes that the common components of household production--poultry, fruit trees, and gardens--are "competing," and in some cases are "mutually exclusive rather than complementary."

B. Senegal: Foster Parents Plan to Improve Nutrition and Increase Income through Market Gardening

(This project profile is quoted from a summary of a longer evaluation report (Fiksel 1983) which Mary Fiksel provided in February 1984.)

Project Background

"In November 1982, Foster Parents Plan in Senegal --"Plan Senegal"--proposed a community market gardening project for five villages in Rao District, south of St. Louis in the north of the country. When project staff first met with villagers to learn how their skills, interests, and local resources could best be utilized with Plan support, villagers promoted the concept of market gardens.

The five villages are in an area of sandy, semi-arid, undulating terrain. Vegetation is sparse. The climate is Sahelian: hot, dry,

and dusty, with an average annual rainfall of under 400 mm. When rainfall drops under 300mm, as it did in 1983-84, crop and livestock losses can be catastrophic. Subsistence farming and herding no longer provide an adequate livelihood. Imported food, mainly rice, takes 35% of family budgets. Most households have at least one member working outside the area, and rely on remittances.

Project Actions

In February 1983, Plan Senegal launched the first of the existing 30 gardens. Local leaders organized management committees and the donation of land, labor, and funding. Plan Senegal employed well diggers, and supplied materials such as cement, iron bars for the construction of wells, and basins for the gardens. Participating families were supplied with vegetable seeds, 4-6 watering cans, a rake, 2 hoes, 2 transplanters, a shovel, and a hoe-fork. A local government agricultural agent gave extension lessons on the use of insecticide and gardening techniques.

At each step in planning and implementing these gardens, two basic precepts were stressed. First, villagers were expected to organize activities and participate in project realization as much as possible. This required decision-making at the local level and mobilization of local leadership, involvement and responsibility for project activities in response to community needs.

Second, this approach required villager commitment to community improvement through contributions in kind. Plan was the catalyst which provided the framework and foundation for the gardens. Villagers were responsible for obtaining the skills, gathering the funds and continuing with community organization to institutionalize and maintain the project on their own.

Technical Details

Each garden averages between 3 and 4 hectares, subdivided into individual plots averaging 780 square meters each, varying according to family size. Each garden is equipped with 4-6 wells and pulleys, ropes, and pails to draw water. Despite low rainfall, only one of the 200 wells ran dry. Gardens initially produced tomatoes, carrots, red peppers, eggplant, ochra, cowpeas, sweet potatoes, sugar beets, squash, kohlrabi, mint, and melons. In the second planting, cabbages and onions predominated--crops which have a higher local market value.

Villagers gardened throughout the rainy season, which is least suited for vegetable production due to intense heat, insects, and disease. Although many villagers were gardening for the first time, they were successful.

Immediate Results

After the first four months of gardening, Plan staff observed that 90% of the participating families were consuming vegetables

grown in the community gardens, and 77% of the women participants were marketing some produce. They reached markets 6-13 km away on foot or in horsecarts. Some marketed produce 41 km away in the town of St. Louis, travelling by bus. Profits averaged \$6.42 per family, equal to 20% of a typical family's monthly earnings in a good year. The gardening had an impact on seasonal migration: 60% of the village men who usually migrated outside the village decided to remain and work in the gardens.

Problems

The first evaluation identified the following as major problems in the gardens:

1. Tools distributed by Plan were underused.
2. There were heavy losses from insects, pests and diseases, in part due to poor timing in the delivery of insecticides.
3. The work of drawing water from the wells, carried out mainly by women, was exhausting, especially in the case of the deeper wells.
4. Technical support was inadequate.
5. There were no mechanisms to support marketing.
6. There was insufficient follow up to report problems with wells, seeds, or other local needs.
7. Water was insufficient.
8. Participation was low among the minority ethnic groups.

Once identified, some of these problems were addressed by Foster Parents Plan. Unused tools were redistributed and villagers were retrained in their use. Technical support was expanded to train villagers to prepare seed beds, transplant vegetables, and control insects and plant diseases. Hand pumps are being considered on a test basis. Extension has been increased, targeted at communities with low rates of participation.

Some spontaneous initiatives by the communities included repairing tools, building tool storage sheds, distribution of materials and meetings to discuss problems."

Comment

This is a very new project, apparently off to a good start, with enthusiasm running high on the part of the villagers and the PVO. The location of family plots in community gardens, in locations which can be served by wells, represents a practical adaptation of the concept of "home garden" to environmental contingencies. This step requires a community organizing approach which can lead to the sustainability which Foster Parents Plan obviously sought from the

outset. The idea of community market gardens was piloted in Senegal by other projects (see Appendix 2) and, as the previous case study of Mauritania shows, in neighboring countries as well. Knowledge of these precedents may have influenced the villagers in their initial selection of gardening as their own choice of how they would like Plan Senegal to assist. Gardening is providing a concrete alternative to traditional agriculture, which is no longer viable, and to wage labor.

Promotion of domestic consumption of produce was one stated project goal (Fiksel 1983:12). "Although improved nutrition per se was not a specific objective of the project, it may be a significant by-product of increased vegetable consumption" (:40). From village to village, the ratio of vegetables sold to those consumed at home varied (:43-43, Tables 18-45) though generally more vegetables were consumed at home than were sold, despite the impressive gains of the vegetable marketing.

C. Haiti: An Adventist Clinic-Based Home Gardening Project

Background

Haiti is the poorest nation in the western hemisphere. Malnutrition is the leading cause of morbidity and mortality in the country. With 700 persons per square kilometer of arable land, much of which is devoted to export cash crops, local food stuffs are inadequate.

Project Actions

A Seventh Day Adventist World Service project in Haiti "is designed as a complementary health education primary health care/ mother-child health outreach," (Syme and Marchant 1983:106) and is one of several projects in different countries that are partly supported by a USAID matching grant. The project's goal is to reduce childhood malnutrition, a serious problem in Haiti, and a strategy toward this end is to establish home gardens.

SAWS' Haiti project is launched from ten training centers which served, as of June 1983, 2,125 children under five. The intervention involves training nutrition assistants, who work as auxiliary community health workers, and the mothers themselves. Mothers are organized in self-help groups at each center where they receive classes. They are taught to identify the early signs of malnutrition, to interpret "road to health" charts, to prepare nutritionally balanced meals in a sanitary manner, to understand basic food groups and to improve environmental sanitation. The program is an extension of the long-running PL 480 Title II program, so also involves distribution of food supplies.

At SAWS Haiti nutrition clinics, milk is served with a demonstration meal, and rations of bulgur, milk/cornmeal and oil are distri-

buted. The total monetary value of the food distributed amounts to about \$60 per year, or \$12 per capita. The daily energy calories available to the family unit average 3,069, and the grams of protein, 118--theoretically 26% of the nutritional requirements of the family unit served (Harrison and King 1983:27-28). There are no statistics to compare the relative contribution of the home gardens.

Results

After three years, 389 of the 1,040 mothers in the program were growing at least two vegetables, so the "output" objective of establishing 500 family gardens by 1985 is on target.

The progress of 2,125 children in the program has been carefully monitored and measured, so definite results can be reported:

For all under-five children in all entrant categories of nutritional status, 82% showed an improvement in weight for age after four months in the program. Improvement rates were as high as 98% in one rural area, 93% in an urban area, and as low as 35% in another urban area.

70% of these children continued to improve in follow-up....

Of third-degree entrants, 69% improved to second or first degree levels; 95% improved their weight for age during the four month program; and none died. (Syme and Marchant 1983:106)

An independent evaluation of the project notes, "SAWS appears to be saving a number of third-degree malnourished children from death" (Harrison and King 1983:23), and interprets measurements in terms of a number of variables, possible to determine because the record-keeping is excellent for such indices at clinics.

This evaluation skips lightly over the kitchen gardens planted: "Since no data are gathered on amounts planted or harvested in the demonstration or home gardens, we have concluded that the amounts produced, while they add quality and variety to the meals given at the centers and to home diets, do not merit the labor involved in compiling production and distribution data for use as an impact indicator" (:27).

SAWS, however, considers establishing home gardens or small live-stock production among beneficiaries as an important aspect of its approach (personal communication, David Syme). Such components are featured in several SAWS-related projects--in Ghana, in the Pare Mountains of Tanzania and in Zimbabwe, where SAWS' "Solusi Scientific Method" is extended; in the Philippines, where they have achieved a 70% increase in the number of homes with 100 square foot garden plots at one of three sites; in the Beni, Bolivia; in Honduras; and in their Community Health Aide Nutrition Extension Training Programme in

St. Lucia, which is conceptually closest to the Haiti program (Syme and Marchant 1983).

Comment

SAWS is in the same position as a number of other PVOs that have included home gardens as part of their nutrition intervention for maternal/child or primary health care. For similarly structured projects in Jamaica operated by Catholic Relief Services in Hanover, Portland, and St. Thomas (1971-1976), and in St. Catherine's and St. Andrew's (1977-1981), Peat (1976, 1984) reports success in promoting home gardening and success in the progress of childrens' nutritional status, and notes that the "link between agriculture and nutrition is logical."

What is needed is a PVO which has obviously succeeded in establishing home gardens and has good health-monitoring records to correlate these variables.

IV. **OVERCOMING THE MAJOR CONSTRAINTS TO SUCCESS IN GARDENING PROJECTS**

In analyzing documentation of gardening projects, several problem areas appear common. There are no automatic or inevitable constraints to gardening projects; rather, choice and strategy in designing project activities prove critical to the outcome.

A. Selection of gardening extensionists

Gardening extensionists need to be selected among those best able to reach the intended beneficiary population (Chaney and Lewis 1981). The Ilesha project was blessed with close to ideal choices. Their first stage extensionists were young women with graduate education in agriculture, whom the project trained in nutrition. Their second stage choice (once several hundred house site gardens were operating), were local youths, both men and women, who spoke the local language and were from the communities to which they were assigned. They were trained at the central garden and by the 'seasoned' senior extensionists. They were clearly supported with supplies of seeds and technical advice by the staff. The extensionists were cordially received by the communities in settings that the foreign and nonlocal national staff could not have entered (Wijnhoven and ter Heersche 1969).

On a number of less well financed projects, the gardening extensionists were volunteers trained by the project staff (Pevetz 1977; Syme and Marchant 1983). They were provided with technical advice to enhance their role as master gardeners, and occasionally managed access to a revolving fund to cover the start-up costs for home gardens (See Appendix 2).

Where gardening extension is a feature of primary health care, several projects have evolved a strong and effective method of extending home gardening. Either "para-agros" (agricultural auxiliaries) assist established village health workers (community health aids) or VHW's are themselves trained to extend gardening (Harrison and King 1983; LeSar and Danforth 1983; Pacey 1978; Peat 1984). This combination links home gardening to nutrition counseling, assisting mothers to monitor their childrens' growth and health, and the dispensing of vermifuges and other medicines. All of these activities are placed at the community level. It is unfortunate that record-keeping in such operations is generally poor, but it may be more important that local people are given the means to implement and measure visible improvements in their well-being than that such data reach organizational headquarters.

What these extension systems feature is swift involvement of local people in actual home gardens. Home gardening is an activity taken up by individual households, which can proliferate through spontaneous replication as neighbors learn from each other (Pontificia Universidad Catolica 1983a and b). The organization of community

gardens requires even more participation of local people from the earliest design stages, as the decisions to allocate land and resources require group consensus.

Status problems in demonstrating gardening

Many gardening projects feature a "demonstration garden;" a showcase of gardening techniques placed before the community of intended beneficiaries. It may be at a school, at the home of an extension worker, at project headquarters, at a clinic, or a central village location. A formula for failure is to have the actual work of demonstration gardening performed by either an outsider or by a hired laborer. The "outsider" may be an educated, more urbane national--for example, a school teacher, or agricultural or home extension government worker--or a foreign volunteer. In either case, such a person is regarded as someone of higher status and of a background exotic to the community. Alternatively, where a gardener was hired from among the pool of agricultural day laborers, the gardener's status was relatively lower than typical community members', and the impression was conveyed that gardening was a low status activity. Both kinds of gardeners burdened local peoples' perception of gardening with unfortunate attributes, and gave the impression that gardening was not for people of typical community status, but for those of higher or lower status.

In cases of failed gardening projects, the high or low status demonstration gardeners also had very little practical experience in horticulture, particularly in comparison with local people. A few weeks of training can get people started, but hardly qualifies them as experts. Reports cite the resentment or frustration of school teachers or home economics extensionists with their gardening or small livestock demonstration duties (Cornelius 1968:11; Efides 1983).

School teachers appear to be a particularly poor choice as local gardening extensionists; one reason why school garden projects usually fail to inspire home gardens (see below, Special Issues: School Gardens). Many of the problems faced by the Chile School-Family gardens program stemmed from the selection of school teachers as the primary agents for disseminating gardening. Few teachers had a horticultural background; most were from urban backgrounds. Although the school teachers welcomed the curriculum enrichment of nutrition and agricultural/biological principles, they were personally uncomfortable in the position of garden monitor. The characteristically high teacher turnover required training new teachers for the program every year. When the program went nationwide, teachers failed to enlist parental support, though this had been a strength of the pilot project (Efides 1983). Peace Corps volunteers associated with the Chile project commented that when school teachers were brought on line as gardening extensionists, the program orientation shifted from production for supplemental school feeding to just teaching about nutrition and agriculture in the abstract. Exactly the same outcome was noted in a Mauritanian project (Roumeas 1969).

In several clinic or hospital garden projects, nurses, physicians, sisters, priests, or laborers did the actual gardening, producing some food for use in nutritional rehabilitation, but inspiring little imitation (Pacey 1973; see Appendix 2). In some cases, gardens at health centers functioned as institutional gardens primarily to produce food for rehabilitating malnourished children or to help feed patients. Very early in their experience with promoting home gardens through such clinic gardens, health workers realized that the gardening had to be decentralized to the places where people normally resided. After this step was taken and outreach workers were in place, significant positive changes were registered in the rates and degrees of malnutrition among clinic users (Pacey 1978).

The most typical scenario of low risk, low cost, low gain small scale garden projects involves foreign volunteers who arrive with seeds in their backpack, and set up a house and garden. Though seeds and seedlings are pressed on any interested neighbor, few display interest. After the volunteers leave, the only home garden in the area disappears (Direct International Development 1978; Gallagher 1976). Though other problems are illustrated in this scenario, status incompatibility contributes to the outcome.

Early on in India's series of ANPs, laborers were hired to be gardeners ("mali") at school and village demonstration gardens. The mali "automatically diverts responsibility from the children" in school gardens (Blumenfeld 1968).

Resolution

Home gardening needs to be quickly installed at the housesites of local people or, in the case of the community garden model, on land contributed and worked by the community. It may be better to skip the step of having gardening extensionists set up a separately worked demonstration garden, and concentrate instead on finding at least one local person willing to put the "demonstration" on his/her own plot in a spirit of experimentation and cooperation. In places where traditions exist of home gardens, or of raising the same crops or livestock selected for home gardens, these should be taken into account, and the better local home gardeners should be enlisted.

Demonstration gardens should not be considered surrogates for central gardens. Horticultural research stations where adaptive research on cultivars and locally appropriate garden designs take place, seed multiplication units, and nurseries have an important role to play in more complex gardening projects. Such operations require both well qualified technical staff and manual laborers--a mix of higher and lower status people--but are regarded as institutions of the project staff rather than of the community. The demonstration gardens which emerge from research at such sites can also be used as training centers.

B. Choice of plants and livestock

Larger, better funded projects analyze local diets, perform food consumption surveys, and may screen local cultivars or carry out adaptive horticultural research locally before settling upon what is to be gardened (D'Almeida 1967; Davis 1981; Eaton Evans 1969; Food and Agriculture Organization 1966, 1979, 1981; FAO based on Blumenfeld 1970; Hughes 1981). Smaller scale, less amply funded projects skip these steps and immediately introduce vegetables, fruits and small livestock usually exotic to the locality (familiar only to project staff) or a predetermined set of crop compositions. No matter how theoretically nutrient-packed and economical species and combinations selected may be, they face two hurdles; their suitability for cultivation or husbandry under local conditions, and their acceptability in the local diet.

Projects that skipped the feasibility analysis of local diet, nutrition, and horticultural practices, or that performed these studies poorly, were more likely to introduce home garden combinations which did not meet peoples' needs. Two important considerations, rarely present in the diet surveys and feasibility studies of typical ANPs, were the "hungry season" when stores of foods are scant (Miracle 1961; Chen, Chowdhury and Huffman 1979; Ogbu 1973; Pagezy 1982) and the role of wild foods in the diet. More often than not, analyses of the local diet were extrapolated from annual country data on food consumption or were based on 24-hour recalls. These methods cannot reveal the seasonal aspects of food availability which, ideally, should be taken into consideration in selecting species and varieties for home gardening.

Home garden designers stress the need to design gardens which will produce as continuously as possible (Chaney and Lewis 1981; van Eijnatten 1978; Yang 1976 a and b, 1979, 1981a; Gershon 1983; Sommers 1983, among others) and, ideally, tide families through the identified "hungry season" (Carp 1983). Tiding families through times when stores of grains are exhausted and the next harvest is months away is a basic function of many traditional home gardens in the humid tropics, where continuous yield designs can be accomplished with lower cost technologies. Where the hungry season corresponds with periods of drought or cold weather, appropriate designing is more challenging, requiring searches for starvation food of last resort, more costly technologies (such as gardening under the cover of greenhouses) or more long term alterations of the landscape.

A number of dietary surveys which conclude that local diets lack vegetables totally omit consideration of wild food sources, thus raising a false premise that the people need to grow vegetables, or lack protein food sources. In many world areas where the natural vegetation and wild animal life has not been destroyed by human impact and where long term human manipulation has encouraged the economically useful plants, wild foods remain an important part of the diet (Cloud 1978; Irvine 1949). Green leaves, fruits, nuts, seeds and tubers, as well as animal protein sources, are seasonally available for gathering, fishing, or hunting. Curiously, the concept of wild foods as "home produced" appears in routine USDA classifications, but not in the usual dietary studies of countries where wild

foods are more important. If wild foods are available, there may be less need to cultivate vegetables or raise small livestock than analysts have recognized. An important discovery of the screening of local vegetable foods in the Ilesha project was that many Nigerian foods were not as "wild" as believed. Rather, many greens turned out to be "semi-cultivars," which, with little coaxing, were adapted for cultivation in home gardens (Guerts 1973; van Eijnatten 1971; van Epenhuijsen 1974).

Local feasibility studies are an absolutely necessary step. Once problems are correctly identified, a variety of resources can be tapped to help even projects too underfunded to afford adaptive horticultural research. There are guides to food plants by ecological zone (Duke 1983; Herklots 1972; Bittenbender 1983) and by nutrient content (Christian 1981, Yang 1981a, 1979; Yamaguchi 1978; Okigbo 1977) which open up possibilities more creative and appropriate than lettuce and carrots. A few regionally adapted guides to gardening also exist (Venkataratnam 1973; Vickey and Vickey 1978; Rees 1967; UNICEF 1967; Sommers 1983). There are a number of well researched model home gardens which have not yet been widely implemented in overseas projects (described in Mollison 1981; Chen, Gershon and Huang 1983; Hagar 1983; Cleveland, Ferguson and Orun 1981; Community Environmental Council 1976, see L.I.F.E. 1981, among others). Moreover, many resource organizations can be enlisted for long distance technical assistance (see Appendix 1 and 2).

C. Seeds and planting materials

Successful gardening projects set up sustainable local mechanisms for the procurement, production, and distribution of seeds and other planting materials, hand garden tools and other inputs, and for technical assistance. Troubled, and more costly, gardening projects leave the procurement and distribution of these items to project staff, thus consuming staff time in errands. One project's home garden component consists of setting up a two-person distribution unit in the MOA to sell packets of donated seeds at a subsidized price that only partially covers the cost of operations. Like a number of the ANP's, the highest capital cost is for motor vehicles used to ferry packets of vegetable seeds and tool kits to recipients (USAID 1979 PD AAP 452 B1).

Project reports complain about the lack of seeds and planting materials. In many cases, the complaint reflects the rarity of the plants selected rather than an absolute lack of local vegetables, fruits, or small livestock. One study goes so far as to recommend the presence of "local seed production and distribution facilities" in target areas as a precondition for gardening projects (Schwartz 1980). This recommendation would rule out most of the developing world. The government sponsored horticultural research, mass marketing and abundance of nursery and seed multiplication businesses that facilitate amateur gardening in North America, Western Europe and Japan is plainly absent in the developing world, or merely incipient (i.e. in Ghana). The flow of seeds to home gardeners and commercial growers for Japan, Taiwan, and the Philippines is charted

by Ho (1977) and, in Malaysia, by Chin, Enoch, and Harun (1977). Abdul Hamid (1977) conveys farmers' and gardeners' complaints: seeds are costly imports, sold in lots with many dead or broken seeds infested with fungi and insects, and supplies are not conveniently located, causing transport problems.

Traditional gardeners do not face these constraints. They save, multiply, and exchange cultivars between one another. The disadvantage of vernacular seed multiplication is a lack of pure strains. This disadvantage is usually compensated for by the advantage of varying resistance to climatic fluctuation or disease among heterogeneous strains that are planted together. In Rwanda, bean fields contain up to 30 varieties. Ecological research in Papua New Guinea has proven the logic of the traditional practice of growing up to a dozen varieties of sweet potatoes or taro: some will survive almost any epidemic (Swift 1981).

A solution dozens of gardening projects have arrived at independently is to establish nurseries, seed multiplication units, and seed beds locally under local control. One of the most productive uses of institutional gardens (maintained by the community as a whole or by schools) is as nurseries or seed beds serving home gardeners (de la Cruz 1969; Robinson 1967). An alternative in projects more closely linked to Ministries of Agriculture is to establish seed multiplication units for vegetables or nurseries as government agencies or as parastatals. One example is the Ghana Seed Company, which is assisted by the USAID MIDAS project. Its main task is to multiply and sell the seeds of staple crops, particularly rice. At the same time, it also produces popular vegetable seeds. In Ghana, a free enterprise sector of independent nurseries and seed centers has been developing in tandem with the expansion of home gardens.

In order to overcome the in-country constraint of planting materials or breeding stock, projects often import them. This is an unfortunate short cut. If the project staff plays an instrumental role in actually importing seeds and other materials, no sustainable supply lines are established. Whether the project staff observes the complex procedures for seed imports and phytosanitary certification and respect plant patents, or whether they simply smuggle in the seeds, the result is the same.

Barriers to the international shipment of seeds, living germ plasm and, in particular, nursery planting materials (which often include the root system and soil or planting media) exist for the protection of agriculture. The Animal and Plant Inspection Service (APHIS), and the Foreign Arrival Baggage Inspection and Port of Entry Inspection of USDA effectively protect American agriculture from the accidental spread of hazardous plant insects or diseases. The nursery and seed multiplication business sector was instrumental in establishing APHIS, and strongly supports this service. However, the procedures involved in state and federal plant quarantine and phytosanitary certificates are deterrents to the aggressive pursuit of overseas markets for American producers. These procedures are regarded

as uneconomical except for very large export shipments. Other countries have been encouraged to participate in international plant protection measures. Often they have complied with simplistic procedures which pose insurmountable barriers. Lacking a capacity for qualified inspection of materials at ports of entry, overseas custom officials may either automatically confiscate and destroy planting materials or simply wave them through, regardless of the materials' certifications. Even fumigated treated seeds can get caught in red tape. American agribusiness does not want to sacrifice the protection from pests they have gained, but the barriers to expanded export of American nurseries and seed multiplication need to be re-examined. There are many possible solutions. Co-ventures could be entered with national firms to transfer the technology to a new entrepreneurial location. Restrictions on small quantities of labeled certified seeds could be rethought. A program to educate agricultural inspectors assigned to custom duties in countries participating in plant protection agreements could be accelerated.

Even if these barriers to exportation did not exist, not many of the commercially available fruit and vegetable seeds of North America are suitable for very wet or very dry climates. European seed producers have a large comparable share of the export market. Historically, European nations (France, Holland, Belgium and the United Kingdom) established horticultural research stations in the difficult climates of the tropics, so their businesses now have more suitable cultivars.

As long as distribution mechanisms for disseminating improved cultivars are inadequate, the vegetable research underway at a number of world centers will remain exercises in the horticulturally possible but not the probable. A need exists for more horticultural research, especially in-country adaptive research, as a prelude to any large scale horticultural efforts. Home or any other kinds of gardens and orchards can eventually benefit from germ plasm collections of tropical cultivars (International Board for Plant Genetic Resources 1982). Considerations of where and how many centers to locate are based on the capital and operating costs required to assemble adequate teams of professionals (Technical Advisory Committee 1979). However, both the need to assure plant protection internationally--which tends to confine planting materials within jurisdictions--and the eventual market--which will expand with every home garden established--must be considered.

Tools and supplies

Home gardening can be accomplished with dibble sticks, hoes, and knives; millions garden at home with no more equipment. More elaborate horticultural methods require tools, materials and inputs that are typically in short supply. The Intermediate Technology Development Group (1983) has reviewed the "backward linkages" of gardening to needed support facilities, such as village based production of hand tools, fencing, animal hutches, and seeds in village banks. "Forward linkages" to support post-harvest vegetable and fruit gardening operations suggested by ITDG were village level production

of solar dryers, other food processing equipment, and vehicles. Introduction and import of simple hand tools, such as spades, can require complicated transcultural communications and transnational procedures (Direct International Development 1978).

A commentator attributed the lack of seeds, gardening tools, inputs, and technical assistance in the Caribbean region to the lack of demand--so low that supply sources cannot be justified as a government expense nor support businesses (McIntosh 1983). Yet in PNG, the "supply side" approach worked for one appropriate technology center that helps fund its staff, research, and publishing by operating a small store which sells imported (thus scarce) hand tools, inputs, and vegetable seeds. Sale of seedlings, rather than produce, is one avenue taken to produce income from home and school gardens.

D. Fences and other lifestyle incompatibilities

Gardening project reports commonly note the constraint that proper fencing is prohibitively expensive or that home gardeners are reluctant to fence despite extensionists' advice. The need for garden fences or walls has innumerable rationales, but the garden fence is an integral "part of the garden" in the Near Eastern-Islamic-Euro-American template. In other places, fencing, no matter how functional in protecting the garden from animals, children, and neighbors, may be incompatible with the cultural ideals about the space around residences (Kimber 1966, 1970, 1973) or the functions of house site space (Soemarwoto and Somemarwoto 1979 and 1981).

The image of the home garden that mixes plant and small livestock production in a harmonious system (Binkert 1981; Anderson 1980) derives fairly narrowly from the Indonesian home garden and related South East Asian mixed garden types. The Indonesian chicken that, reportedly, feeds on grubs and garden insects, and miraculously not on the main garden produce, deserves in-depth study. Excepting this remarkable Indonesian chicken, whose diet opportunities are reduced by the large number of vegetatively propagated plants in the home garden, small livestock elsewhere are consistently reported as the main ravagers of gardens. It may be more effective to confine (eg. fence, coop, hutch, pen) the livestock, rather than to fence the garden.

The drive to introduce gardening may ignore the greater importance of small livestock production for household consumption, of which the traditional Andean pattern is a good example (and see Chale and Carloni 1972 for Africa and Epstein 1955). There is probably no greater incompatibility with gardening than free range production of pigs or goats, but both convert waste and unpalatable vegetation into food.

The analytical framework of the "do yard"--which studies all the plants around human habitations and the functions assigned to space marked by plants and structures around houses--gives some of the best reports on traditional home gardens (Anderson 1954, 1967; Brierley 1977; Covich and Nickerson 1966; Fleckenstein 1978).

Studies document the varied functions at housesites (Brodber 1975)--- any one of which might potentially conflict with allocating space to a home food garden, especially a fenced one. This geographer's framework offers a method for analyzing how home gardens can, or cannot, be worked into house sites. Other constraints, however, may make an off-house-site gardening location more workable. A major potential constraint of this kind is water.

E. Access to productive resources:

Water

Intense rainfall or drought has set back or ended several gardening projects, even after several years of success. Technical solutions to water problems must be centrally addressed if gardening projects are to succeed in the long run (Eaton-Evans 1969). In areas of high intense rainfall, canopy layers are one solution. In India, not even biodynamic double dug beds--which have among their other properties better drainage than conventionally dug beds--withstood one extraordinary monsoon (Shri AMM Murugappa Chettiar Research Centre 1981). Raised beds and drainage canals solve the problem of rainfall intensity and flooding for traditional gardeners in Polynesia (Kirch 1978) and Mesoamerica (Nations and Komer; Vargas 1983). Protection against unseasonal and intense rainfall is one function of cloche and other "under glass" gardening aids.

Drought, or the assurance of a minimal supply of water for gardening in very arid lands, can also be accommodated. Digging simple wells and installing artisanal irrigation are the main features of ongoing projects in Sahelian countries (See Annex 2 by country). Horticultural techniques which conserve soil moisture are known, ranging from terracing and semi-terracing earth works (Deneven 1980), to trenching (R.T. Mazibuko, personal communication), "deep" mulch (Stout 1971), and surface mulch, including living mulch of ground cover creepers. Special designs for arid land gardens are in experimentation (Cleveland 1982, Nabban 1983) and arid adapted varieties of garden crops are known (Vietmayer ms).

Experimental home gardens have measured water requirements for the technique demonstrated and indicated costs. No general requirement of home gardens per unit space can be stated because the water needs vary both by specific cultivars and the general horticultural method selected. One study points out that low water charge pricing is the greatest subsidy that U.S. agriculture, including home gardening, receives (Cleveland 1982). Permaculture advocates (Mollison 1981) and others designing gardens for arid conditions are very critical of the presumption that a garden hose will be near to hand, and of the extravagance of irrigating lawns.

Several reports note that water became a constraint to home gardening under other circumstances than the extremes of drought or intense rainfall. In the Ghana project profiled, lower income residents of the housing project assisted could not afford the rise in their water bills that accompanied the home gardening technique

disseminated (Ruck 1968; FAO Plant Protection 1972). Foster Parents Plan identified drawing water for gardens as the most onerous task of the garden project profiled above. Hand irrigation was itself found to consume about three quarters of an hour a day for small plots in Taiwan (Chen et. al. 1983). A five-year experiment in Uganda reported by Will (1972) found the capital costs of sprinkler irrigation uneconomical for small (0.3 hectare) market gardens, and feasible only for gardens over 2 hectares. Where water for hand irrigation had to be drawn from wells, standpipes, or streams, watering became the main maintenance task of gardening (Laumark 1982).

To avoid the task of fetching water, which in some places takes up to three hours a day of household (women or children's) labor, the tendency is to reduce intakes for all human consumption and cooking, and to take people and clothes to the river to wash rather than taking the river to them, bucket by bucket. Even where potable water systems have been installed, their capacities are typically low. The most common kind of potable water supply system in the developing world is based on standpipes. One standpipe for every 50 people is considered a fancy system. It is fairly obvious why gardening styles which required even a few gallons per bed to tide out dry weather were rejected where water supplies were not as convenient as the garden hose.

The water constraint can call into question the location of gardens at house sites. Part of the logic of locating traditional gardens off house sites is to locate them on optimal spots where water seeps even in the dry season, or drains well in the wet. (See review of gardening traditions, Mesoamerica, and Ilesha garden case history for examples, and Egharevba 1977 on Nigerian "akuro" wet valley gardens). The convenience of house site production may be outweighed by the inconvenience of fetching water or the extraordinary costs of installing water supplies closer to home. In a Save the Children project in Burkina Fasso, gardening in the "as fonds" (low lying wetter spots) was intensified. With double digging, living mulch, fencing and manure enrichment, these once seasonal gardens now produce throughout the year (personal communication, Marny Smith 1983).

However, what solves the water constraint for home plants, helps solve the drinking water problems for humans and small livestock. A potential development package could release domestic labor from the tedious, repetitive task of drawing and carrying water and immediately rechannel that labor into a more interesting and productive activity--home gardening. To date, however, links between village water supply projects and gardening projects are weak.

Soil

Absolute lack of soil is a rare, but serious constraint. Technical solutions include composting materials to create a growing medium, importing soil, or establishing hydroponics. The costs or complications of transporting soil and compostable materials to sites

are a major problem for U.S. urban community gardens on vacant lots (Tricia Gabany and Neil Seldman, personal communications, 1984.) The problem of heavy metal contamination at long-occupied urban sites can be lessened by building up eight to twenty inches of garden soil atop old hardpans. Lack of soil is a constraint on sandy atolls. In an experimental garden on Tarawa, Save the Children dug two-foot trenches lined with plastic to hold mixtures of compost and sand (Marny Smith, personal communication 1983). In a project in French Polynesia, chemical and liquid vegetable manures were poured on sand to establish low cost hydroponic gardens.

More commonly, soil is simply poor. Erosion, compaction, and non-organic debris can be problems at house sites. Solutions include gardening in containers--anything from large raised and walled beds to tin cans--accelerated composting, and the slower deliberate planting of trees as "nutrient pumps," among others. Soil-less media in stackable containers is a new and high cost alternative.

The poverty of soil can be deceptive. Soil testing for trace nutrient content is a step easily taken by gardeners in developed countries, but less easily taken in developing ones, where soil testing laboratories are not widely distributed. Kits and automatic meters for soil testing are relatively costly. In examining the detailed costs for several PVO and Peace Corps gardens, fertilizer costs were higher than seed and sometimes tool purchases, and fertilizers had been universally prescribed without any soil-testing of particular garden sites.

Land

Situation

Cross-culturally, ownership of land appears to be a significant inducement to gardening. In several formal land tenure codes, the house lot or homestead and its gardens are recognized as a special or protected type of land holding. "The kampong (Malay), the Kandyan garden (Sri Lanka), homestead land among the Meru (Kenya) and in Lesotho...regularly seem to be owned by individual families. This little area around the household, planted with a few trees, spices, and vegetables, is usually excluded from other tenurial rules. In Sri Lanka they are, even today, exempt from land ceiling laws" (Noronha and Lethem 1983:16). In the United States, home ownership has been demonstrated as a significant predictive variable influencing, and correlated with, home gardening (see section above on American gardening).

Land ownership is not, however, an absolute prerequisite. Lewis (1979, 1980) and Coe (1978), among others, report the beneficial effects when tenants in housing projects in the United States have community gardening areas, or are involved in landscaping. Social benefits include improvements in the general upkeep of the housing, tenant stability, and tenants' self esteem. In developing countries, urban community gardens and peri-urban gardens, which offer security

of tenure to allotment (plot) holders or through land purchase, are responses to the limitations of space for gardening in cities, and to restrictions on tenants' use of space. On many plantations, garden space is an important benefit extended to resident workers that stabilizes the work force, subsidizes low wages, and helps create community spirit (Jain 1970, Ahmed nd).

Limitations on the use of land are a constraint. Landlord restrictions can be viewed as a special class of limitations placed on use rights that can affect gardening. Pelzer, Stoler, and Terra concur that Indonesian tenants do not install home gardens. The perennials important in Indonesian home gardens require more security of tenure than Indonesian tenants enjoy. In a recent USAID project in Java to improve nutrition among the poorest Indonesians, landlessness and tenant status was identified as a constraint excluding home gardening as a strategy (USAID 1979). Peat reports from Jamaica that some landlords prohibited gardening by tenants (1983). In Ghana, low income residents lodging with relatives could not garden.

Other limitations on land use may arise from community, legal, or cultural norms. Space for home food production is less a constraint than are cultural and community enforced norms of how space is to be used near residences. There are ample technical solutions to gardening in small spaces (see Appendix 4). Legal and sociocultural prohibitions are not as easily overcome. House site ownership rights are abridged by zoning laws, health regulations, covenants, and the informal pressure of neighbors. Thus, raising small livestock is generally prohibited within incorporated metropolitan areas in North America and Western Europe. The crop relay and fallow cycles on gardens and terraced fields where vegetables are produced under irrigation are regulated by the community that maintains the irrigation system in highland Peru (Freeman 1963). Where land is owned communally by a corporate village or kin group, or by an institution, the access of individual households to garden areas or their control of produce may meet with restrictions similar to those faced by tenants. To garden in such conditions may require negotiations with the local political authorities (village council, titular kin group head) or the institution's management.

Despite landlessness and tenure security so weak that it is uncertain whether what is planted can ever be harvested, people still garden. "Guerilla" gardening on vacant spaces along canals, roads, and installations can be observed in Indian, Philippine, and Indonesian cities. One attraction of peri-urban unregulated "squatter settlements" in Latin America is the chance to plant a few fruit trees and vegetables and raise some small livestock (personal communications, ASP/URB and AEP/URB staff, and observation).

Resolution

Arrangement of adequate access to land and security of tenure should be a primary consideration in the design of projects which promote home or community gardens, as is true for other kinds of agricultural production development. In order for community gardens

to thrive in North America and in Europe, permanent organizations have been established to regulate access to gardens, both as community non profit associations and as offices of local governments. Some gardening projects in developing countries have been judged as more participatory in nature (ITDG 1983; Fiksel 1983; Goode 1983) because the step of organizing a local group was necessary to allocate land for gardening in the first place, and this group later assumed additional duties. The authority to allocate land for home or community gardens may be lodged, however, with individual owners, landlords, estate managers, the formal or informal planning boards of settlements, or various other bodies, depending on the situation. Since simple access to land and security of tenure will affect the success of gardens--allowing a technical strategy based on either perennials as well as annuals or a plan for constant improvement and enrichment of the garden plot--some consideration should be given to creating a permanent local body for this purpose, which could also assume some of the distribution and technical assistance functions.

Labor and Inputs

Most actual home gardens make a compromise. Gardeners opt for lower than possible yields to keep labor and input costs low. Higher yielding gardens require either greater labor intensity or more costly inputs. The issue of whether or not people in developing countries have enough "spare" time to garden depends on the gardening technology recommended and the specific labor requirements of the garden cycle in relation to the householders' typical daily rounds and their seasonal and annual cycles. Will there be a time when no one is at home to care for the garden or feed the chickens? Most traditional gardening practices and many of the experimental gardens currently being promoted have low labor demands: a few days' work for preparation, less than an hour a day for maintenance and harvesting. The analysis that labor intensive technologies are "appropriate" for rural people in developing countries is often based on a flawed perception of the factors which trigger periods of work and leisure. A farmer may appear to be doing nothing until the sky clears and the fields can be burned; a freak wind may send all available labor to rescue a crop (Brownrigg, Harman, and Rasnake 1979).

Home gardeners who find a regular market for their surplus or who lack other productive resources for income are more willing to intensify or capitalize their operation (Stoler 1978, 1981; Fiksel 1983). If projects' assumption is that people who garden at home in their spare time consume what they produce, costly inputs and labor intensive methods are unlikely to be popular. Though credit and revolving funds to extend capital resources for home gardening have been established in home gardening projects, return through sale of surplus or displaced food expenses needs to be clearly demonstrated. Lack of credit to install gardening is a common constraint in gardening projects, but even the small amounts of cash needed to get started may represent too much of a risk.

V. SPECIAL ISSUES

Market Gardens versus Home Gardens?

The final constraint discussed above raises the paradox of an opposition between home and market gardens.

In Chile, a given plot can easily grow the 35 species of vegetables, the fowl and fish to keep two women and five children in good health. But the same plot can be farmed as a truck garden which supplies a farmer's market with quality produce. Income thus generated can enable the seven people to survive... In the first case the hoe becomes the symbol of a new subsistence; in the second, of..."participation" and economically measurable growth. The two A.T. (Appropriate Technology) gardens represent opposite visions of the good life, opposite expressions.... (Borremanns 1983:4)

This review uncovered (and systematically omitted) detailed technical and economic studies on market gardens in developing countries. It is our impression that far more is known and has been written about market gardens than home gardens.

The project approach to market gardening differs sharply from the design of home gardens. Market garden projects stress tighter cost/benefit analysis, and survey market potential by crops, including those with export potential. Home garden projects first look at what local people eat, and what they would or should eat more often. In real life, these dichotomies are not so sharp. Market gardeners generally take some produce home to eat, or to exchange or barter with their neighbors. If management of communal market gardens prohibits this, the scheme can fall apart (see Mauritania case history and Botswana in Appendix 2, for examples of this crisis in two PVO projects).

From reports of home gardens established as far afield as Nigeria (van Eijnatten 1978), Guatemala (Hoyt and Stout 1976), and Senegal (see Appendix 2), observers note that within a year, some produce from the home gardens starts appearing in local markets or restaurants. The relative emphasis which home gardeners will place on gardening for market versus gardening for home consumption seems to be based on the local opportunity structure. Home gardeners close to urban markets have been observed to sell more in Indonesia (Stoler 1981) and the Philippines (Solon et al. 1978), decreasing the garden's nutrient value for home consumption because fruits and vege-

tables are left to ripen and picked less frequently. Where market gardening is very well established (Peoples' Republic of China, Thailand, francophone West Africa), vegetables and fruits are plentiful and relatively cheap (Calavan 1977) and the local market may be too saturated for miniscale home gardeners to compete. Those who garden where vegetables are plentifully available seem to do so to avoid purchase costs. Where there is no precedent for marketing garden produce and likely markets are far away, the goal of market gardening—some income production from home gardening—is overwhelmed with difficulties, as described by Pierce-Colfer (1981). A situation apparently ideal for home gardening that also produces income is one in which some market gardens and local outlets are well established but demand is high. Home gardeners have pre-existing outlets for any amount of surplus they choose to sell. This situation appears to be common throughout subsaharan Africa and in much of Latin America. It encourages a certain portion of successful home gardeners to shift into a market orientation, changing their cropping patterns and time and capital investments in response to the demands of the market as their income from garden sales increases (Accati 1983; Lawson 1977). An impressive example was the promotion of home gardeners in a nutrition program in Colombia which ended up, unexpectedly, as an important source of income for participating families.

Whether home gardeners convert income from the sale of produce into food purchases that round out their diet remains an issue. Reports on the disposition of income from small scale market gardens established by projects suggest that income is spent on medicines and consumer durables (cooking pots in one case, school books in another, transistor radios and bicycles in a third) rather than on food (ARDA nd, and see Appendix 2). More generally, literature is accumulating which criticizes the assumption that increased income leads to better diets (see Dewey 1979 for a review), as are studies documenting disadvantageous "balances of trade" in nutritional terms when calorie high, nutrient rich tropical cash food crops are sold at low prices to buy high priced imported or processed foods (Fernandez et. al. 1968). A miniature version of this syndrome would be to sell the home grown mango to buy a soda pop. On the other hand, households emphasizing gardening in Indonesia may sell fruits and vegetables to buy or barter for rice.

Resolution

The case histories of Mauritania projects, the project profile of Foster Parent Plan's work, and several other projects noted in Appendix 2 document a sensible middle ground bridging the dichotomy between home and market gardens. If home gardens grow locally cultivated, accepted, and marketed produce, "consumer acceptance" is likely both at home and in the market place.

In areas where there are very few (or poor quality) perishable fruits, vegetables, and animal products available in the market, home gardening may also be regarded as a stage in the development of commercial market gardens. As gardening skills and a taste for a variety of new foods become more widely distributed in a population,

it appears some people specialize in either garden produce or planting materials, gradually evolving into a market garden and nursery small business sector.

Home gardens continue to play a role even where market gardens are well established. Quite different economic and cropping strategies for home gardens are appropriate, depending on the prevalence of market outlets and commercial production. It appears that certain kinds of produce seems to move into commercial production after their popularization in home gardens, or because production is better suited to commercial scale. In sum, relationships between home and market gardens are complex and generally complementary.

School Gardens

Most school gardens have not inspired or assisted the establishment of home gardens during the life of the project. The benefit of the doubt is that, years later, the pupil gardeners may apply what they have learnt to their own home gardens, but this is speculation. No follow up studies were found which indicated pupils who gardened at school later took up home gardening.

Sources vary in their opinion about whether school gardens produce sufficient amounts of food to improve school feeding programs. Blumenfeld, reflecting on his experience with school gardens in India, states that the school garden experience is only educational (1972). School gardening can enhance nutrition education and diet consciousness. In the Chile school garden program, apparently significant amounts of food were produced, and in Senegal, sale of school gardens' produce helped to subsidize school operations (Claessens).

Resolution

School gardening may have a place in a total gardening program, as one of several channels for reaching youth, but is not recommended as a tactic for establishing home gardens. In passing, we have noted ways that school gardens can play useful roles in relation to a home gardening promotion--especially by producing seedlings in seed beds or nurseries and demonstrating new techniques. But these links can be made only if a home gardening program is in process.

Is Home Gardening a Women's Issue?

The assumption that women will be "the gardeners" is a common theme in gardening projects. This assumption is implicit in the choice of projects' implementing agencies, such as home economics departments (Aghevli 1967, Southerland 1967) or mother-child clinics. Quite often it is explicit as well in project's documentation and choices--e.g. naming women as the main beneficiaries and choosing women as gardening extension agents.

Home (and school) gardening often appears in projects as a complement to the distribution of supplemental relief food, such as PL 480 (McNaughton 1983). In cases like the USAID Indonesia project (USAID 1979), gardening can be viewed as a substitute for the use of these food supplies. In cases like the Chile School Family Garden program, gardening provides a transition when supplies of international food are cut. As a result of relief food distribution in projects which also promote gardening, the strong patterns that U.S. bilateral and U.S. PVO projects have established for distributing this food have influenced how gardening is promoted, and to whom. Established relief food distribution and feeding centers--schools, clinics, mothers' clubs, and food-for-work community organizations (Field 1980; Gwatkin et. al. 1978, Marchione 1982)--are used to launch gardening promotions. Women, who are targeted to receive food rations in view of their maternal roles in preparing family meals, are also targeted to take up gardening. The principal "logic" of the assumption that women will garden is to preserve the structures established for PL 480: adding food production in the form of gardening to food distribution organizations.

Several recent food policy statements portray home gardening and food crop production more generally as a women's issue (Ahmed 1983; Swartz 1980; Ad Hoc Group for Family Food Production 1983). In the case of projects located where home gardening is traditional, the assumption that women will take up gardening may be tested against observations of existing gardening labor arrangements (Laumark 1982; Ahmed nd). Specific pre-project social analysis to determine whether or not women in the target area were likely to take up gardening was rare in project literature. Menon and Prema (1975) usefully made such an analysis in the course of the Kerala ANP, and concluded that gardening was a family affair. Some studies of traditional gardening which detail women's home gardening role in particular settings--Stoler (1975, 1977), Stavrakis and Marshall (1978), for example--urge that this role be reinforced by development projects. On the other hand, post-hoc evaluations have pointed out errors in the assumption that women would adopt gardening, which affected project success in Casamance, Senegal (USAID 1980), and in an Indonesian transmigration project (Pierce-Colter 1981). In both cases, the involvement of women in main field crop agriculture was undercalculated. Related to the assumption that women will garden is the question of whether women in the developing world have enough time to garden, as they are already burdened with the double-day of wage or field work, plus domestic duties. The latter include carrying water and firewood, processing field grown carbohydrates with time-consuming, rudimentary technologies and caring for children.

The assumption that women are 'the gardeners' does not hold up in all areas where home gardening is traditional. Although adult women play major roles in home gardening and small livestock production, so do adult men, children, and the elderly of both genders. In Indonesia, Mexico, and Central America, all householders play special roles in house site food production. In Kerala State, India,

where an ANP targeted women as the potential home gardeners, women who did not garden complained they had no time to take up the activity, but families who did have home gardens affirmed that gardening was a creative and productive use of leisure time, and good exercise, for the whole family (Menon and Prema 1975). In Sri Lanka, even adolescents were found to be involved in deciding exactly what would be grown in home gardens (Axelson, Cassidy, de Colon and Rawlings 1982). In the Philippines, the Caribbean, and Texas, older people kept the most elaborate gardens. In the Ilesha project, women were originally intended to be the main beneficiaries of home gardening promotion. Over the life of the project, however, their contribution to actual gardening activities declined, displaced by men's work in the gardens as village men joined the ranks of the gardening extensionists. Children's contribution held steady, at about a third of all householders' time spent gardening.

Where plowing or well and pump irrigation are needed to prepare or sustain gardens, men play an important role, though they may not take the lead (Eaton-Evans 1969). In projects primarily aimed at women as gardeners in the Gambia and Senegal, men's participation in digging wells was critical (see Appendix 2), and husbands and brothers plowed for the larger home gardens in a CARE Bangladesh project (Laumark 1982).

There are also exceptions to the generalization that women are usually involved in household small livestock production. Among Rajputs of Uttar Pradesh, the women are total vegetarians and will not tolerate any animals in their sex segregated "purdah" compounds (where only sacred plants and shade trees are grown), so it is the men, in their own compounds, who keep chickens and milk cows (Minturn and Minturn 1966). In Martinique, rabbits are raised by children (Horowitz 1967:21). In the Andes, everyone in the household takes turns in the task of raising guinea pigs (Bolton and Calvin 1975).

Thus, the assumption that women garden and raise small livestock does not hold up cross-culturally, and must be examined in the context of particular societies and particular social and ecological arrangements. Rather than list exceptions, it is more meaningful to examine the cultural source of this assumption for American development planners.

The image that women keep the kitchen or food garden and the "barn yard" poultry and small livestock is strong in North American culture. A lady in Albany, New York in 1758, emphasized in her memoirs that gardens were a female province:

Everyone in town or country had a garden. Into this garden, no foot of man intruded after it was dug in the spring....A woman in very easy circumstances and abundantly gentle in form and manners would sow and plant and rake incessantly (Huxley 1978).

Among the Black gardeners of Bushy, Texas, it was noted:

The woman usually makes most, if not all, gardening decisions and performs the instrumental role. The man in the household has the expressive or supportive role, usually emphasized in plowing, fertilizing, and planting the garden. The aspects of family roles opens many theoretical possibilities as to family structuring, power and authority. And it should suggest further research on the possibility that gardening, as controlled by the women of the household, has played a major role in the origin and dispersal of world agriculture (Wilheim 1975:92).

Wott (1982) sees the feminist movement as important in shaping gardening in the United States. "While European and Continental gardens were led and controlled by men, American women have long been in the forefront of gardening and gardening organizations" (:315). "Kitchen gardens" and house site small livestock production are somewhat the traditional province of rural women in Europe as well as in North America. Since the 1900's, men have moved avidly into gardening urban, peri-urban, suburban, and town locations, perhaps as a substitute for farming. Projections based on American rural sex role divisions of labor have affected farming systems research, which to date has emphasized field operations and male production. The association of home gardening with women "lumps" it with all the other unpaid tasks of domestic labor which are so often discounted in analyses of productivity and value. Perhaps because of this, and because much gardening in the United States is devoted to ornamentals and lawns rather than food production, home gardening is even viewed by some as a largely leisure activity, an act of economic consumerism rather than of production (see **HortScience** special issue, June 1982), despite the 10 billion dollars worth of home consumed food produced in 1980, or the \$16 billion produced in 1982 (Gardens for All statistics).

On the positive side, coupling nutrition education with advice and assistance for home gardening and small livestock production is evidently a more powerful approach, as it does recognize women as the producers, not just the preparers, of food.

The main aim of the nutrition and health programmes proposed for women has been to teach them how to balance their diet, use the resources available, and manage the household budget. As a whole, these programmes have not been a great success.... The main cause of failure lies in the fact that women have never been considered full fledged producers (Savane 1981:3).

The danger of assuming that women will be the home gardeners

is that it obscures their more central roles in producing food for households--both as processors of grain (Basson 1982) and root staples (operations which are more time consuming than production), and as the main producers of food crops consumed by their families and sold at local markets, especially in Africa (Berleant-Schiller 1977; PAG 1979; Lewis 1978). One reason why it is difficult to find house site gardens in Africa may be that the women are not at home; they are working off house sites, producing the main staple food crops in "shamba" or swidden fields (LeVine and LeVine 1981; Accati 1983; Allen 1965; Cloud 1978; DeSchlippe 1956, among others). Where women are better integrated into outside wage labor and small businesses, even their role as food preparers--let alone as food producers--slides. In the Philippines where, as noted in the review of traditional gardening, 76% of all households keep home gardens, a significant study revealed that the children of mothers who worked outside the home had a higher rate of malnutrition. This was traced to the practice of older children feeding for themselves for noon and afternoon meals, heating easy to prepare porridges rather than the richer stews that 'stay-at-home' mothers prepared (Solon et. al. 1979).

In several agricultural and rural development projects, home gardening has appeared as the "women in development" component (Chaney and Lewis 1981; USAID 1980 AAG-177-B1). While any sincere attempt to reach rural women (who have been sorely bypassed in mainstream agricultural development projects to date, as noted by Epstein (1983) and Savane (1975), among others) is to be commended, home gardens should not be seen as a 'quick fix' which will integrate women into development or alleviate their problems.

In summary, before women are selected to be the principal beneficiaries of home gardening or house site small livestock production projects or project components, the assumption that they will garden should be examined by more careful sociocultural analysis of household roles in the project area. Careful analyses--for example, Cloud 1978; Chale and Carloni 1972--always reveal surprising patterns likely to modify assumptions and lead to a better identification of beneficiaries and successful ways to reach them. The Peace Corp's "Local Agricultural and Nutritional Assessment Tool" (Part A2 of their Small Vegetable Gardens Resource Packet) sensibly takes these factors into account, along with others which affect both gardening and nutrition.

The Role of Research

Several lines of research need to be encouraged to resolve some basic questions about home gardens.

Nutritional contribution

There is insufficient evidence of the actual and specific nutri-

tional contributions that home gardens make to the diets of producer-consumer households. There are hypothetical models of the nutritional output of garden designs. Examples include: Muthukrishnan and Ramadas 1974, Paner 1978, Singh Thandi 1977, Yang 1976a and 1976b, Chen, Gershon, and Huang 1983, and Cleveland, Ferguson, and Orum 1981, among others. No matter how promising these models are, they represent theories and designs, not evidence of performance.

There is fragmentary evidence of increased vegetable consumption as a result of particular projects' gardening promotions--for example, Fiskel 1983, Hoyt and Stout 1976, Wijnhoven and ter Heersche 1969, Schubert et al. 1982, Robinson 1967 and Pontifica Universidad de Chile 1983a--and of increased consumption of animal protein (Chale and Carloni 1972). Fiskel provides village-by-village and crop-by-crop information on the increased vegetable consumption resulting from the Senegal project profiled above, and a table of the nutrients found in locally grown vegetables (1983, Table 17). However, she wisely cautions:

No specific information is available as to nutrient quantity obtained per family. In some cases, only traces of a given nutrient occur. Consumption of vegetables alone does not guarantee nutritional benefit. Among factors which influence the degree of such benefit to the consumer include his health and nutritional status, age, sex, amount of intake, cooking time and method, and freshness of the vegetable (:40).

Studies comparing the nutritional status of members of households with and without home gardens are rare. The evidence from the studies reported by Immick, Sanjur, and Colon 1981, and Solon et al. 1978 and 1979, document benefits for children of gardening households. It would be unwise to project their results until such studies are replicated in other areas.

Intensive, microlevel research on households needs to be carried out, using the methods of village nutrition studies (Schofield and Lambert 1975) and selecting samples from among gardening and nongardening households. Households should be matched by status variables and age/sex composition. The nutritional status of all members of the sample households should be clinically assessed before and after the study period, and their diets should be monitored for at least one year. A lone investigator, backed up by a team to perform clinical assessments, could carry out such a study, rotating the point of observation and diet data collection among subject households to sample all seasons of the year. Data should be collected on strict protocols, tabulated and analyzed. Some economic data on the costs of food to gardening and non-gardening households could also be collected, along with observations of labor devoted to gardening.

It cannot be expected that such studies will emerge in the

natural course of nutritional research. The 1978 and 1979 reports by Dr. Solon and his colleagues were the only articles appearing between 1972 and 1982 in the **American Journal of Clinical Nutrition** directly related to home gardening as a nutrition intervention. Articles considering the source of food "income"--whether purchased, home produced, received as a gift, or bartered--as a variable in nutrition and diet were not found in AJCN or in two other major journals reporting nutrition research. Generally, household cash income is the main variable tested for its influence on diet and nutritional status.

A second approach to obtain exact evidence of the nutritional outcome of home gardening would be to analyze the growth monitoring records of health projects with gardening components. As noted in the review of SAWS' Haiti clinic gardening project above, such records are commonly kept by clinics concerned with nutrition, but are analyzed only in the aggregate, as an indication of general impact. Subjects would need to be classified by the type and rate of nutrition benefits received. There are obvious ethical problems involved in denying client populations benefits other than home gardening alone, or enlisting a sample to be a control group which receives no benefits at all. However, if data sets are large enough, and each subject's benefits and growth records are monitored well, then statistical factor analysis methods can be applied. These methods can factor, and thus test, the relative contribution and efficiency of home gardens compared with other kinds of nutrition benefits, such as supplemental food or health care.

Several PVO's or clinics in national systems supported by USAID funds could receive modest grants to prepare their records, utilizing a data input record which could be centrally designed. They would later forward this data for central processing and analysis, and participate in the final interpretation of the results. Groups operating clinics in developing countries could receive small grants to support additional personnel time in the field and to invest in systems to keep more exact records. Preference could be given to groups which could easily compile or collect the data required without major charges in their current procedures.

Nutrition projects and health projects devote a small percentage (2-5%) of their budgets to evaluation, preferring to dedicate every penny to remedial action. It is difficult to compare evaluations of gardening projects, because project record keeping and the indices used for evaluations differ among, and within, organizations. To overcome this problem, a framework for evaluating the impact of gardening projects is required. Such a framework would standardize the baseline studies of nutrition status and the collection of nutritional use-values from a sample of home gardeners assisted by projects, and begin to collect the information needed to test and weigh the importance of variables on outcome such as time budgets, food preparation, and household economics, as well as to compare the acceptance of horticultural techniques and particular home garden crops.

Economics of home gardens

The economics and labor requirements of home gardens need to be studied in a larger context. Ann Stoler's work in Indonesia (1975, 1977, 1978) is a pioneering example, though some of the Indonesian cash value measurements she adopted make it difficult to compare her results with indications from other studies (cf. Binkert 1981). The "larger context" among rural and agricultural populations could be determined by farming systems research. Hart 1982 and Bittenbender 1983 favor looking at home gardens within the research approach of farming systems. Chen, Gershon, and Huang 1983 append an inventory of economic analyses which could be applied to farm level data gathered with a view to separating the operations of home gardens. It seems that a perspective on home gardening and other forms of home food production is developing within the various schools of farming systems research. However, home gardening, particularly as allotment gardening, is important in urban areas as well. In some cases, the remittance of food supplies from rural to urban areas (Spinks 1963) may be as important as the better studied remittance of cash from urban family members to members of their families still residing in rural villages (Basson 1982; Palacio 1984). In countries where there are large sets of data on household consumption and production, tests of the methods and hypothesis of economic analysis developed by Blaycock and Gallo (1983) for the United States would be productive.

Economic studies of home gardens in the U.S. currently use the standard of the cash exchange value of their produce (i.e. as if the produce were bought and sold). The use value of home garden produce, however, requires a more subtle analysis, prominently in terms of nutrients not otherwise available as consistently, or in similar quality. Catching such subtleties also involves researching the larger context of food availability and quality, as well as market costs.

Descriptions and ecological analysis

Descriptive studies of the arrangement, technologies, ethnobotany and other aspects of traditional home gardens are the best developed type of research on European and North American gardens, outside of historical studies. However, the spatially defined "door yard" or "house garden" paradigm has been applied in only a few world areas—notably the New World and South East Asia. Only one study from East Africa was found which explicitly used these terms (Simoons 1964-5).

J. N. Anderson has proposed lines of research appropriate for studying the mixed garden style and the claims that have been raised for them. The lines of research he suggests include:

1. " (description of) the dimensions, structure, composition, spatial distributions, and functioning...by climatic region, ethnic affiliation of the population, and principal occupation and socio-economic status of the cultivator household;

2. "research into the reputed energetic efficiencies of the traditional mixed garden systems;

3. "research into the reputed economic and human ecological effectiveness of the traditional mixed gardening systems;" and

4. research on "adaptive economic and social properties," including tests of hypotheses (Anderson 1979:12-24, reprinted as appendix C in Binkert 1981).

Anderson's proposal is framed with South East Asian mixed gardens in mind, and requires the specific expertise of anthropologists and biological scientists. Others with agendas for researching ecological aspects of the "mixed" (multi-layered) garden include a group associated with the East-West Center in Hawaii, and participants in the home garden caucus and seminar of the Congress on Human Environment.

In the coming years, we can expect more reports describing home garden arrangements, ecology, and produce. There is reason to hope this kind of research will reveal a wealth of information about neglected cultivars (Wilkes 1977, Okigbo 1977). In both horticultural and nutritional terms, cultivars now known only to local groups may prove as promising or more promising than those currently promoted in "standard" home or institutional gardening projects (Pacey 1978). The existing body of reports on traditional home gardens already identifies ways gardening could be improved. For example, despite how cleverly intricate the mixed home gardens of Indonesia and South and Central America are, even such elementary techniques to increase productivity as pruning and grafting fruit trees are not widely applied (Setyati 1975, and fieldwork observation).

Technological research

a) Gardening techniques

Research to develop designs and new technologies for home gardens has also gained an independent momentum. (See, for example, L.I.F.E. 1976, 1981, Mollison 1981, Greene 1976, Maingay 1977, McLamey 1977, Zweig 1980, Shri AMM Murugappa Chettiar Research Centre 1981, I.T.D.G. 1983, journals such as **Gardening** and **The New Farm**, and Appendix 4.) This kind of research may even be considered an 'appropriate horticultural technology' movement. The new techniques change the requirements for land, labor, and inputs to produce similar outputs. All the techniques will require adaptive research in particular settings in developing countries.

b) Research on cultivars

Horticultural research on specific cultivars is well established at several centers (see Appendix 1). As noted above in the section discussing seeds and planting materials as a constraint, problems occur in the systems intended to disseminate the varieties and give

advice. This is a problem even in some developed countries (Klougart 1981); in all but a few developing ones, the problem is endemic.

Many cultivars developed for market gardening do not serve the home garden well, and vice versa. For example, in the home garden, small amounts of produce are ideally harvested over a long time—a pattern of maturation which would pose problems for market gardeners. Eventually, horticultural research needs to accommodate the conditions and requirements of home garden production.

Once home gardening is widespread in a region, the further need develops to monitor the problems which arise, solve them through applied research, and extend the solutions to home gardeners. In El Salvador, where home gardens and small cooperative market gardens proliferated during the 1950's, tomatoes were a leading crop until a rare blight hit. As there was no horticultural research capability at the time to investigate and solve the problem, local gardeners simply abandoned tomato production (personal communication, John McHigny.)

c) Research on animal husbandry

Research on every possible aspect of poultry is advanced, but is not particularly well adapted to low-cost applications where flock size averages only a few brooders. Nor is it centrally available, or efficiently shared among researchers in different countries. Electronic data-base networks and print bibliographical updates from several sources have constructed systems for sharing information about aquaculture in tandem with the growth of aquacultural research. Aquaculture, and polyculture systems integrating aquaculture, are generally of a scale which is incompatible with back yard gardening (but cf. Zweig 1977 and 1980), and are more appropriate as farm or community enterprises. The biggest research gaps concern the small livestock traditionally raised by households in the developing world which are not a common source of food in developed countries. Guinea pigs and guinea fowl are examples. The case of guinea pigs is ironic. A great deal is known about guinea pigs as they are extensively used as experimental laboratory animals, yet there have been no efforts to apply this scientific knowledge to improve how guinea pigs are raised in the Andes, where they are an important source of animal protein and are exclusively raised as "kitchen" stock.

In several proposals, technological research is justified as a contribution to the promotion of household food production in general or home gardens in particular. It seems appropriate first to resolve some fundamental issues about the efficiency of home gardens in nutritional and economic terms by studying the home gardens that exist all over the world. Promises and hypothetical models do not constitute the evidence required to adopt a "no holds barred" pro-home gardening policy as a strategy for nutrition interventions. Better ways to share information which already exists are also needed, from the international level of electronic data bases down to the local level of gardening extension services.

The Role of Policy

Many strategists believe the cross-sectoral nature of nutrition interventions (Schmitt 1979) requires national and inter-agency policy and coordinating units. Successful gardening promotions require coordination of personnel trained in the disciplines of agriculture, nutrition, health, and social sciences—who, in many countries, are employed in separate government agencies. The need for central policy units to promote gardening as well as other kinds of nutrition interventions has been suggested by the Ad Hoc Committee (1983) and the Administrative Committee (ACC/UN 1979), among others.

In several countries, home gardening has been adopted as a national priority, coordinated by inter-ministerial units. The incidence of gardening households, and households gardening with improved methods or new crops, has increased in countries which have adopted such policies. Examples include India, the Philippines, Colombia, Chile, Indonesia, and, more recently, Sri Lanka, Dominica, Barbados, Honduras and (apparently) Mauritania.

While national policy can assist gardening promotions, smaller scale, more localized, projects and nongovernmental programs have been the main way private voluntary agencies have promoted gardening. Such programs are not defeated by the absence of pro-gardening government policy. Rather, their successful results can eventually influence national policy, and simultaneously provide field-tested models of extension and technology. South Africa provides perhaps the most dramatic examples. Food Gardens Unlimited, operating mainly in urban areas throughout the republic, has inspired and assisted some 100,000 new home gardens, and Africa Tree Crops, operating in Natal, has also registered impressive gains. Neither organization enjoys the support or encouragement of the government of South Africa. The gardening activities encourage self reliance in the face of a government policy of structural dependence, and gardens are often located at residences which the government prefers to regard as 'temporary'. Nevertheless, both organizations are riding a tide of popular enthusiasm and support from other nongovernmental organizations, the general public, and even local level government employees (See Appendix 2).

Home gardening is only one measure among others (cf. Sevenhuysen and Burgess 1980) which fit into a reoriented approach towards meeting the basic needs of any population for adequate and nutritionally balanced food. The social, cultural and economic factors related to such a reorientation are complex (Savane 1981, Sanjur 1982, Protein-Calorie Advisory Group 1972; NEG 1984).

In the long view of human history, from the ancient origins and organization of states to the present day, societies have struck different balances in arranging access to what anthropologists call 'strategic resources'—e.g. resources which permit people to fend for themselves and to produce their own shelter and food. The basic concept of home gardening as a strategy to help resolve the food

crisis is the opposite of a "bread and circuses" or relief food grant approach. It requires participation, and that people work for themselves. But it also demands as a precondition that people have access to certain productive resources; that they not be denied access to a patch of land, or water, or advice from government extension agents, or be forbidden to trellis beans from the balcony of their housing project homes. Gardening can change the spatial arrangements of whole settlements, as the "green belt" movement in the United Kingdom illustrates.

Spatial, infrastructural and social arrangements to permit gardening are most critically needed in urban, rather than rural, areas. Cities are where people are cut off from the alternative of foraging for survival food, except for garbage or by theft, and where dependency on public food programs is acute. In the unregulated "squatter" settlements, home gardens exist. As urban infrastructure improves, ironically, opportunities for personal urban gardens fade with development. To reverse this trend and improve the subsistence base and appearance of the rapidly expanding cities of the developing world, policy measures are required at the level of urban and peri-urban planning.

Perhaps the best testimony to the prospective sustainability of the strategy is the continuity of gardening and its modern resurgence in creative land tenure and organizational forms in developed countries. Gardening is a skill which, once developed, seems to be prized.

APPENDIX A: RESOURCE ORGANIZATIONS**Part 1: UNITED STATES: NON-PROFIT, VOLUNTARY, OR MEMBERSHIP ORGANIZATIONS PROMOTING OR SUPPORTING GARDENING****Adventists Development and Relief Agency**

6840 Eastern Avenue
 Washington, D.C. 20012
 Phone: (202) 723-0800
 Telex: 89-580 in U.S. and Canada
 Cable: ADVENTIST WASHINGTON DC
 Contact: David Syme

Religious PVO operational overseas. For current projects in gardening see Haiti profile and Zimbabwe, Appendix 2. Formerly known as Seventh Day Adventist World Service, Inc. (SAWS).

Africare

1601 Connecticut Avenue NW
 Washington, D.C. 20009
 Phone: (202) 462-3614

Overseas operational private voluntary organization. For projects with gardening see Niger and Upper Volta, Appendix 2.

American Association of Nurserymen

1250 I Street NW
 Washington, D.C. 20005
 Phone: (202) 789-2900

Membership professional association of nursery businessmen and horticulturalists. Provides horticultural training, supports horticultural research and publishes on horticultural topics. Also publishes a membership directory and newsletters for members.

American Community Gardening Association

PO Box 93147
 Milwaukee, WI 53202
 Phone: (414) 224-4866
 Contact: Steve Brodman (1984)

National umbrella organization of regional and local groups promoting community gardening in the United States. Publishes the **Journal of Community Gardening** and **Shoots and Roots**. Networks U.S. local groups to identify and provide technical assistance via telephone. Can identify individuals capable of assisting community gardening projects.

American Freedom from Hunger Foundation, Inc.

1625 I Street NW
 Washington, D.C. 20036
 Phone: (202) 254-3487

A United States affiliate of international Freedom from Hunger groups which support the United Nations Food and Agricultural Organization, this foundation raises funds to support FAO and cooperating voluntary agencies' projects which "alleviate hunger, improve nutrition, and increase agricultural production in developing countries" 501(c)(3).

American Friends Service Committee

1501 Cherry Street
Philadelphia, Pennsylvania 19102
Phone: (215) 241-7000 (1978)
Telex: 7106701617
Cable: ASERCO PHILADELPHIA

Overseas operational PVO with long history implementing animal husbandry and gardening projects, among other activities. See Mexico in Appendix 2.

American Horticultural Society, Inc.

Mount Vernon, Virginia 22121
7831 East Boulevard Drive
Alexandria, Virginia
Phone: (703) 768-5700

Publishes **American Horticulturalist**, handbooks, data files.

American Society for Horticultural Science

PO Box 109
St. Joseph, Michigan 49085

701 North Saint Asaph Street
Alexandria, Virginia 22314
Phone: (703) 836-4606

Mr. Cecil Blackwell, Executive Director

Publishes **HortScience** and **Journal of the American Society for Horticultural Science**.

American Society of Landscape Architects

1750 Old Meadow Road
McLean, Virginia 22101

1733 Connecticut Avenue, NW
Washington, D.C. 20009
Phone: (202) 466-7730

Publishes **Landscape Architecture News Digest** (monthly) and **LATIS** (technical information series).

Asia Foundation

PO Box 3223
San Francisco, California 94119

550 Kearny Street
 San Francisco, California 94108
 Phone: (415) 982-4648
 Overseas operational PVO. Provides small grants to programs in Asian countries, including those designed to "increase availability and intake of nutritious food." 501(c)(3). Incorporated in California. Private donor.

Auroville Association

212 Farley Drive
 Aptos, California 95003
 Phone: (408) 688-4173
 Supports the community of Auroville, Tamil Nadu, India, where a variety of experimental approaches to agriculture are practiced. These include garden and farm projects which "serve as model integration units to increase local production of legumes, pulses, and dairy"; fish ponds, organic control of pests, and nutritional education. Volunteer staff includes a horticulturalist (TAICH 1978: 61). 501(c)(3), incorporated as a non-profit association in California.

The Avant Gardener

PO Box 489
 New York, New York 10028
 Publishes **The Avant Gardener (The Unique Horticulturalist News Service)** monthly. Each issue is devoted to a special topic, such as a compendium of commercial and public sources of seeds and nursery stock in the United States.

Bio-dynamic Farming and Gardening Association, Inc.

PO Box 253
 Wyoming, Rhode Island 02898
 Phone: (401) 539-2328
 Publishes **Bio-Dynamics** quarterly (NRCM 82/08 PUB 69-114).

Boston Urban Gardeners (BUG)

Statler Office Building Room 831
 20 Park Plaza
 Boston, Massachusetts 02116
 Contact: Charlotte Kahn (1983)
 Local community organization promoting urban community gardens. Has published a general guidebook based on its experience.

Bread for the World

6411 Chillum Place, NW
 Washington, D.C. 20012
 Phone: 722-4100
 Contact: Lorette Hanson (1984)

32 Union Square East
 New York, New York 10003
 Phone : (212) 260-7000

Publishes **Bread for the World** (monthly newsletter). Church related organization seeking to influence public policy on behalf of the hungry people in the United States and abroad (NRCM 08/82 PUD 69-19512; verified 01/84). A West German organization with the same name (Brot fur die Welt), finances some home garden projects of operational nongovernmental organizations.

Bronx Frontier Corporation

1080 Leggett Avenue
 Bronx, New York 10474
 Phone: (212) 542-4640

Local community organization, managing large-scale community composting/recycling operations and gardens in the South Bronx.

CARE, Inc.

660 First Avenue
 New York, New York 10016
 Phone: (212) 686-3110
 Cable: PARCELUS NY
 Contact: Tim Aston

2025 Eye Street, NW
 Washington, D.C. 20006
 Phone: (202) 223-2277
 Contact: Marianne Leach

Overseas operational PVO, long active in promoting school and home gardens, and other forms of community self help. Several current (1983-1984) projects feature vegetable farms, school gardens, seed banks, farm demonstration plots, distribution of hand tools, and other inputs. 501(c)(3), incorporated in the District of Columbia as a cooperative, and registered in New York as a non-profit organization. Has overseas affiliates. See Chile case history and Bangladesh project profile in text, and, in Appendix 2, Honduras, Philippines, India, Sri Lanka and Belize.

Caribbean Council

2016 O Street NW
 Washington, D.C. 20006
 Phone: (202) 775-1136
 Contact : Walker Williams, President (1984)

Overseas operational PVO. Trains Peace Corps volunteers in development of Caribbean agribusiness, including raising and selling local vegetable crops. Piloted Antigua community vegetable production project. 501(c)(3), District of Columbia.

Catholic Relief Services (CRS)

1011 First Avenue
 New York, New York 10022
 Phone: (212) 838-4700
 Telex: 224241 or 667207
 Cable: CATHWEL NEWYORK

Overseas operational PWO. 501(c)(3), District of Columbia. See Jamaica, Burkina Fasso, Philippines and Niger (Caritas) in Appendix 2 for illustrative projects with gardening focus.

Center for Neighborhood Technology

570 West Randolph Street
 Chicago, Illinois 60606

Local community organization. Provides informational resources for solar, urban or commercial greenhouses.

Civic Garden Center

2715 Reading Road
 Cincinnati, Ohio 45206
 Phone: (513) 221-0991
 Contact: Karen Bass (1983)

Local community organization promoting gardening.

Cheyenne Solar Community Greenhouse

Bell Building, Suite 400
 Cheyenne, Wyoming 82001
 Phone: (307) 635-9340
 Contact: Shane Smith

Local community organization which manages a greenhouse.

Chol-Chol Foundation for Human Development

1307 North Ode Street
 Arlington, Virginia
 Phone: (703) 525-8844

Contact: James Mundell, Director (703) 522-9456
 Overseas operational PWO. Assists Chile, "encourages development of vegetable gardens, fruit orchards and beekeeping projects; provides technical assistance in the art of fruit and vegetable preservation;" conducts experiments on high protein beans; gives classes in nutrition and food preparation (TAICH 1978: 93-94). Sponsors a "revolving fund" with loans of seeds, animals, tools or cash, to be returned with "interest," in order to enable the poor to grow their own food and feed themselves, and provides direct technical assistance (TRANET). 501(c)(3), District of Columbia. See Appendix 2, Chile.

Church World Service

475 Riverside Drive
New York, New York 10027

Phone: (212) 870-2257

Telex: RCA 224579 or TWX 710-581-5981

Cable: DOMINICUS NEWYORK

Affiliate: CROP (Community Hunger Appeal of CWS), Elkhart, Indiana 46515

Overseas operational PVO, participating in the distribution of PL 480, Title II food distribution. Serves as the "development, refugee, relief and rehabilitation arm of the National Council of Churches" and has promoted experimental gardens and nutrition education. Affiliate CROP publishes **CROP Service News**; monthly (TAICH 1978: 109-112). 501(c)(3), incorporated in New York. See Appendix 2, Niger.

Churches of God, General Conference, Commission on World Missions

4324 Austin Drive
Fort Wayne, Indiana 46806

PO Box 926

Findlay, Ohio 45840

Phone: (216) 447-1994

Assists Haiti, Bangladesh, and India; helps establish family gardens; maintains "nutrition centers where children receive protein-rich foods and their mothers are given instruction in its preparation; provides training and nutrition education." (TAICH 1978:112). Overseas operational PVO. 501(c)(3), Pennsylvania.

Claretian Fathers (Missionary Sons of the Immaculate Heart of Mary, Eastern Province)

221 West Madison Street

Chicago, Illinois 60606

Phone: (312) 848-2076

Has operated home garden projects and assisted government nutrition education projects. 501(c)(3), incorporated in Illinois.

Community Environmental Council

Santa Barbara, California

Operates the Mesa Project, an experimental station for organic community gardening, bee-keeping, poultry-raising, and other technologies. Conducted the Mirasol Project through 1974. Publishes occasional reports.

The Community Self Reliance Center

101 North Geneva Street

Ithaca, New York 14850

Local community organization. Manages Project Growing Hope.

Publishes **Community Garden Updates and Spouts**, a newsletter.

Conservative Mennonite Board of Missions and Charities Inc.

9220 Rosedale-Milford Center Road

Irwin, Ohio 43029

Phone: (614) 857-1366

Cable: MENN MISSION IRWIN

Assists Columbia, Costa Rica and Nicaragua; assists in gardening, crop improvement and animal husbandry; sends community development volunteers abroad; publishes **Brotherhood Beacon** and **Delegate** monthly. (TAICH 1978:123-124). 501(c)(3), Pennsylvania.

Coordination in Development, Inc. (CODEL)

79 Madison Avenue

New York, New York 10016

Phone: (212) 685-2030

Coordinates and serves as a central staff for 41 mission societies and church-related member organizations, some of which are involved in experimental gardens, animal husbandry, aquaculture, and nutrition education. Acts as a clearinghouse for guiding the policy, program and project goals of member organizations, and raises funds; publishes **CODELnews** bi-monthly (TAICH 1978:127-128). 501(c)(3). Incorporated in Massachusetts.

Cornucopia Project

33 East Minor Street

Emmaus, Pennsylvania 18049

Phone : (215) 967-5171

Telex : 847338

Since 1980, Cornucopia has been organizing, supporting and publishing regional studies to identify ways that food procurement systems can be changed. Publishes a manual to orient local Cornucopia research and action groups and a newsletter, both with information on community gardens, greenhouses, composting, land trust arrangements and other models and technology. The Cornucopia method represents a participant approach to social, economic and technical feasibility studies which could well be integrated into gardening projects in developing countries.

Denver Botanic Gardens

909 York Street

Denver, Colorado 80206

(313) 575-3751

Contact: John Brett (1983)

Maintains research collections and operates an outreach community gardening project.

(2)

Direct Relief International/ Direct International Development

Box 30820
 2801-B De La Vina Street
 Santa Barbara, California 93130
 Phone: (805) 637-3694
 Cable: RELIEF SANTABARARA
 Telex: 71 371 8227 ITT Box 499-1561
 (NRCM 08/83 PUB69-14315)

Operational overseas PVO. See Appendix 2, Ecuador, and Guatemala.

Eastern Mennonite Board of Missions and Charities

Oak Lane and Brandt Boulevard
 Salunga, Pennsylvania 17538
 Phone: (717) 898-2251
 Cable: MENMISSION SALUNGA
 Contact: Joyce Schwartz

Operates demonstration garden plots in projects in several countries.
 501(c) (3), Pennsylvania.

ECHO, Inc. (Educational Concerns for Hunger Organizations, Inc.)

RR #2 Box 852
 North Fort Myers, Florida 33903
 Phone (813) 997-4713
 Dr. Martin Price, Director

Researches and demonstrates garden methods (no-till, roof-top gardens, rain forest techniques). Maintains a seed bank for under-exploited crops and varieties for tropical conditions. Trains "Christians of any denomination who are working in behalf of the world's hungry."

Ecology Action of the Mid-Peninsula

5798 Ridgewood Road
 Palo Alto, California

Ecology Center

1403 Addison Street
 Berkeley, California 94702
 (415) 548-2220

The Farallones Institute

-Rural Center
 15290 Coleman Valley Road
 Occidental, California 95465
 Phone: (707) 874-3060

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-Integral Urban House
 1516 Fifth Street
 Berkeley, California 94710
 Phone: (415) 525-1150

Conducts research, and provides training and consulting services in organic gardening, biological control, recycling sanitation (such as composting toilets), among other community-based technologies related to home gardens. Has developed training materials on appropriate, low cost technologies currently used by the United States Peace Corps, and has provided in-service and in-country training in past years. Cooperates with RECAST in Nepal through United Nations funding. Cooperates with the Hesperian Foundation to develop self-help preventative and curative medical guides and programs, including nutrition education through community volunteer health workers. Provides consultant services through an affiliate, Farallones Consultants, which arranges for services of Farallones members. Operates ECONET, a microcomputer information sharing network for appropriate technologies, and publishes the **Farallones Institute Journal**.

Farms, Inc.

123 West 57th Street
 New York, New York 10019
 Phone: (212) 246-9692

"Provides assistance and training in general agriculture, with specialization in vegetable and fruit production, and raising and care of laying hens; ...assists fish, livestock and poultry projects; publishes **Agricultural Evangelism** quarterly." Countries: Bolivia, Costa Rica, Haiti, India, Sri Lanka (TAICH 1978:157). Overseas operational PVO, incorporated in New Jersey. 501(c)(3).

Food for the Hungry Inc.

Box E
 Scottsdale, Arizona 85252
 Phone: (602) 941-0307
 Cable: HUNGERHELP SCOTTSDALE
 Contact: Darrow L. Miller (1981)

"Assists fish, livestock, poultry and vegetable-growing projects; operates nutrition programs; (TAICH 1978:159). Overseas operational PVO, founded in 1971. Incorporated in California, 501(c)(3).

Food Research and Action Center (FRAC)

1319 F Street NW
 Washington, D.C. 20004
 Phone: (202) 393-5060

Legislative advocacy group, primarily concerned with United States federal food programs (NRCM 08/82 PUB69-18224).

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Food Web Design Team

41-874 Laumilo Street
Waimanalo, Hawaii 96795

Contacts: Barry A. Costa-Pierce and Calley O'Neill, Co-Directors
(1981)

Designs integrated farming ecosystems on the backyard, community and village scale (TRANET).

Foster Parents Plan International

PO Box 400
Warwick, Rhode Island 02887
Phone : (401) 738-5600
Contact: Ed Turcotte

Overseas operational FWO. See Senegal project profile in text.

Frank P. Graham Experimental Farm and Training Center / National Sharecroppers Fund

Anson County, North Carolina

Garden Club of America

598 Madison Avenue
New York, New York 10022

The Garden Society

Botanical Garden
Bronx, New York 10458
Phone: (212) 220-8657 (Magazine)

Membership society and a division of the New York Botanical Garden. Publishes **Garden** magazine quarterly. Institutions forming the society include: the **Chicago Horticultural Society**, the **New York Botanical Garden**, **California Arboretum Foundation**, **Horticultural Society of New York**, **Horticultural Society of the Indianapolis Museum of Art**, **Missouri Botanical Garden**, **Queens Botanical Garden Society**, and the **University of British Columbia Botanical Garden**.

Gardens for All

180 Flynn Avenue, Department p45G
Burlington, Vermont 05401
Phone: (802) 863-1308
Contact: Larry Sommers, Lynn Ocone (1983)

Gardens for All, Inc.

The National Association for Gardening
Shelburne, Vermont 05482

National membership organization promoting home and community gardening. Commissions and publishes annual surveys of gardening in the United States, a newsletter, and handbooks such as **The Community Garden Book**.

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Garden Resources of Washington (G.R.O.W.)

1419 V Street NW, Room 300

Washington, D.C.

Phone: (202) 797-9284

Contact: Tricia Gabany, Director

Local community group founded as an outgrowth of the Interfaith Conference Task Force on Hunger in 1981. Organizes and provides technical assistance to new neighborhood gardens on the leased land of vacant lots in the metropolitan Washington area. Publishes **Growing**, a newsletter, a garden calendar annually, and technical leaflets. Non-profit membership association, incorporated in the District of Columbia.

Glad Foundation

Room 1236

230 Park Avenue

New York, New York 10164-0156

This charitable foundation makes grants to local groups in the United States to organize new community urban gardens, and for other activities promoting community gardens.

Global Outreach

PO Box 1

Tupelo, Mississippi

Phone : (601) 842-4620, -15

Contact: Vance Burham

Overseas operational religious voluntary organization. Promotes kitchen gardening and small livestock production as an aspect of vocational education, health and nutrition projects, and self-help community development. Assists Uganda, Haiti, Honduras and Belize. Formerly operated as Agricultural Missions Foundation Ltd. 501(c)3.

Green Guerrillas

417 Lafayette Street (TRANET-471)

New York, New York 10003

Phone: (212) 542-4640

Contacts: Liz Christy, Dory Daly, Tessa Huxley

Local organization working for the greening of New York City, with information and organizational resources for intensive urban agriculture, community gardens, windowboxes, etc. Publishes a newsletter.

Institute of Cultural Affairs

4750 North Sheridan

Chicago, Illinois 60640

Phone: (312) 769-6363

Contact: Donna McClesky

Non-profit organization. Assists implementation of community designed, comprehensive integrated development plans. Gardening

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and nutrition education are a common element of community health plan. ICA's are separately incorporated in several countries. See Kenya and India. 501(c)(3), Illinois.

International Voluntary Services, Inc. (IVS)

1424 16th NW
Washington, D.C.
Phone: (202) 387-5533
Cable: VOLSERV WASHINGTON DC

Overseas operational PVO. Recruits and places skilled technicians as volunteers, including horticulturalists who have promoted village or home gardening in Botswana and the Sudan. Supported by various USAID OPG's. Founded in 1953, incorporated in the District of Columbia. 501(c)(3). See Appendix 2, Botswana and Papua New Guinea and Mauritania case history.

International Tree Crops Institute U.S.A., Inc.

Dept. TMEN
PO Box 888-M
Winters, California 95694

Secretariat in the United States for the Permaculture Institute and Network, based in Tasmania. Distributes **Permaculture 1 and 2**, and performs research on tree perennial crops.

Kansas City Community Gardens

3200 Wayne Street
Kansas City, Missouri 64109
(816) 924-2055
Contact: Bert Monroe

Local community organizers for urban gardens in Kansas City.

League for International Food Education (LIFE)

915 15th Street NW, Suite 915
Washington, D.C. 20005
Phone: (202) 331-1658
Contact: Albert Meisel, Director

Maintains a roster of individuals and organizations who can provide technical assistance for home gardening and home small livestock production from which referrals are available on request; maintains a core library of holdings on home food production. Publishes a newsletter monthly and conference proceedings occasionally. Coordinates and directs the efforts of cooperating professional organizations toward the solution of the world food problem; organizes conferences. Answers inquiries. Has performed a series of contracts for USAID Office of Nutrition. Incorporated in the District of Columbia. 501(c)(3), founded in 1968.

Lutheran World Relief, Inc.

360 Park Avenue South
 New York, New York 10010
 Phone: (212) 532-6350
 Telex: 620651
 Cable: LUTWORL NEWYORK

Overseas operational PVO with extensive project experience in experimental and demonstration gardens, duck ponds, fisheries, animal husbandry, nutrition education" (TAICH 1978:259-261). See listing under Tanzania and Niger in Appendix 2. 501(c)(3), founded in 1945, and incorporated in New York.

Meals for Millions Foundation/Freedom from Hunger

Western Office:

1644 DaVinci Court
 PO Box 2000
 Davis, California 95617
 Phone: (916) 758-6200
 Cable: MEALFOMIL, DAVS
 Telex: 176330
 Contact: Jane Nyhuis, Program Horticulturalist

Southwest Program:

298 East 16th Street
 PO Box 42622
 Tucson, Arizona 85733

Eastern Office:

815 Second Avenue, Suite 1001
 New York, New York 10017
 Phone: (212) 986-4170
 Cable: MEALFOMIL, NEW YORK

Overseas operational PVO currently (1984) implementing an applied nutrition matching program grant in Sierra Leone, Kenya, Thailand, Honduras, Ecuador and Antigua, and, with its own funds, similar programs in Korea, India and the U.S. Southwest. See country listings for those MFM projects with gardening aspects. Operates a demonstration vegetable garden in California to experiment with horticultural techniques. The 1984 garden had five separate gardens displaying crops from regional program areas--Africa, Asia, Latin America, the Caribbean and U.S. Southwest. Staff are trained at this demonstration garden. Publishes newsletters, **Branching Out--News from the Test Garden, Connections, The Mail Bag**, annual reports and occasional papers. Provides technical and material assistance to increase food resources and to test and develop high protein food derived from low-cost vegetable and oil seed sources. Has designed and built appropriate technology for food processing. Trains food technologists and nutritionists at MFM's Training School in the United States. Provides nutrition education with emphasis on utilization of available food resources (MFM documents, 1982 Annual Report, 1983 report to USAID and TAICH 1978: 270-271).

Medical Missionaries of Mary (M.M.M)

563 Minneford Avenue
 City Island, New York 10464
 Phone: (212) 885-0945

501(c)(3) Massachusetts. Places sisters abroad in hospitals and clinics and gives assistance for the "provision of gardening tools; rabbit-raising." Motherhouse is Our Lady of Lourdes, Drogheda, County Louth, Ireland (TAICH 1978: 273-274).

Mennonite Central Committee

21 South 12th Street
 Akron, Pennsylvania 170501
 Phone: (717) 859-1151
 Cable: MENCLNCOM AKRON

Religious PVO incorporated in Pennsylvania. For illustrative activities overseas, see in Appendix 2: Ghana (under Mennonite Board of Missions listing), Bolivia and Botswana. 501(c)(3).

Men's Garden Clubs of America (MGCA)

5560 Merle Hay Road
 Des Moines, Iowa 50323
 Phone: (515) 278-0295

National membership society of local gardening clubs. Performs research and development, publishes, and serves as a clearing-house of gardening information.

Mother Earth News / Eco-Village

PO Box 70
 Hendersonville, North Carolina 28791
 Phone : (704) 693-0211

Contact: Emerson Smyers, Director of Research Department
 Publishes popular magazine six times a year, featuring articles on home food production techniques and experiences. At Eco-Village in North Carolina, supports research on intensive organic gardening, greenhouse cultivation, pond trout aquaculture, and composting based on horse manure, among other experimental technologies. The expanded 1984 garden will perform an experiment to compare the efficiency of biodynamic French intensive, modified French intensive (prepared by rototilling rather than double-digging,) and the Stout deep compost trench methods with conventional row crop vegetable gardening. Offers short training courses and technical information to the public during the summer months for a modest fee, and longer training seminars for special groups. "Mother's Bookshelf" is a mail order source for how-to-do-it books on topics of home food production and other self sufficient technologies. The organization enjoys broad public support among American households converting to greater self sufficiency.

National Academy of Sciences

Science and Technology

Constitution Avenue NW

Washington, D.C.

Phone: (202) 334-2692

Contact: Noel Vietmeyer

Publishes occasional monographs on promising tropical food, fuel or forage crops, and on nutrition.

National Association for Gardening--see Gardens for All, above.

National Council of State Garden Clubs

4401 Magnolia Avenue

St. Louis, MO 63110

Publishes **The National Gardener** (bimonthly); answers inquiries.

National Council for Therapy and Rehabilitation Through Horticulture (NCTRH)

Mt. Vernon, Virginia 222121

701 North Street, Asaph Street

Alexandria, Virginia

Phone: (703) 836-4609

Publishes newsletter; answers inquiries.

National 4-H Council

150 North Wacker Drive

Chicago, Illinois 60606

4-H International Programs

7100 Connecticut Avenue, NW

Washington, D.C. 20015

Phone: (301) 656-9000

Cable: NAIFOUR WASHINGTON

Operates International 4-H programs through the Cooperative Extension Service of the state land grant universities and United States Department of Agriculture, and arranges for exchanges with 4-H and 4-H type organizations in other countries (TAICH 1978:294-295).

The National Society of State Garden Clubs, Inc.

4401 Magnolia Avenue

St. Louis, Missouri 63110

Neighborhood Open Space Coalition

110 West 34th Street

New York, New York 10001

(212) 736-8439

Contact: Tom Fox

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New Alchemy Institute

-237 Hatchville Road
East Falmouth, Massachusetts, 02536

-Woods Hole, Massachusetts

Non-profit, membership research and action institute for alternative agriculture and energy systems. Operates an experimental, adaptive research project in Costa Rica. Publishes a journal documenting results of experiments.

Organization for Tropical Studies, Inc.

North American Office
PO Box DM
Duke Station
Durham, North Carolina 27706
Phone: (919) 684-5774

Maintains three research stations in Costa Rica: La Selva, Las Cruces and Palo Verde. Answers inquiries; provides training in tropical ecology, agriculture and biology; publishes a newsletter.

Partners of the Americas

1424 K Street NW, 7th floor
Washington, D.C.
Phone: (202) 628-3200

Contact: Martha Lewis, Director, Women in Development
Overseas operational PVO, matches "partners" in North American states and Latin American countries to carry out projects. Several projects under development will involve home gardens.

Partnership for Productivity

2441 18th Street NW
Washington, D.C. 20009
Phone: (202) 483-0067

Penn State Urban Gardening

SE Corner, Broad and Grange
Philadelphia, Pennsylvania 19141
Phone: (215) 276-5182
Contact: Libby Goldstein (1983)

The Permaculture Institute and Network

(see Tagari, New Alchemy, Institute for Local Self-Reliance and other member organizations of the Permaculture Network).

PLENIY

The Farm
156 Drakes Lane

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Summertown, Tennessee 38483
Phone: (615) 964-3574/3992

3309 16th Avenue NW
Washington, D.C. 20010
Phone: (202) 232-4094

In the context of long term volunteer involvement in community development, PLENTY researches experimental garden methods, demonstrates gardening, and introduces soy based foods, among other endeavors. Nutrition education has a vegetarian focus. Countries where PLENTY has sent volunteers from The Farm (an intentional self sufficient rural community practicing organic food production techniques) include: Haiti, Guatemala, Mexico, and Bangladesh. PLENTY affiliates are also incorporated in Canada and Botswana.

Presbyterian Church in the United States

General Assembly Mission Board, Division of International Mission

341 Ponce de Leon Avenue NE

Atlanta, Georgia 30308

Phone: (404) 873-1531

Cable: LIBERATE ATLANTA

"Promotes new crops, kitchen gardens and the use of improved seeds,"
(TAICH 1978: 337-339). 501(c)(3), Georgia and Tennessee.

Rodale Press, and Rodale Experiment Station

33 East Minor Street

Emmaus, Pennsylvania 18049

Phone: (215) 867-5171

Publishes **Gardening** (monthly), **Prevention** (monthly) and **The New Farm** (bimonthly); answers inquiries; maintains a library of + 12,350 books and bound periodicals, subscriptions to 800 journals, and files on subjects related to its publications. Library is open for on-site use. Performs research in organic gardening technologies; cooperates with the National Academy of Sciences' germ plasm collection and research for leguminous trees and amaranths, by conducting field tests. Rodale consulting services to foreign governments have been facilitated by the U.S. State Department.

RAIN: Journal of Appropriate Technology

Information and Referral Center

2278 Northwest Irving Street

Portland, Oregon 97210

Phone: (503) 227-5110

Publishes bi-monthly journal; answers inquiries, and maintains 4,000 volume library, open 3 days a week. Conducts workshops.

Rural American Women (RAW)

1522 K Street NW

Washington, D.C. 20005

Phone: (202) 785-4700

(67)

National membership organization of rural women.

Salvation Army

National Headquarters
120 West 14th Street
New York, New York 10011
Phone: (212) 620-4900
Cable: NASALWONAL NEWYORK

Salvation Army World Service Office
1025 15th Street NW
Washington, D.C. 20005
Contact: Director of Overseas Programs

United States affiliate of the International Salvation Army, which administers its overseas projects and national affiliates in developing countries through an International Headquarters in London, England. See Appendix 2, Nigeria.

San Jose Community Gardens

635 Phelan Avenue
San Jose, California 95112
Phone: (408) 287-2290
Contact: Steve Radoservich (1983)

Save the Children Federation, Inc. / USA

Garden Projects
48 Wilton Road
Westport, Connecticut 06880
Phone: (203) 226-7271
Cable: SAVCHILD WESTPORT
Contact: Mamy Smith, Coordinator (1981)

Seventh-Day Adventist World Service, Inc.

see: Adventist Development and Relief Agency.

Sisters of Mercy

Buffalo Motherhouse
South 5245 Murphy Road
Orchard Park, New York 14127
Phone: (716) 662-9836

Places sisters in the Philippines; "assists new crop programs; operates agricultural clubs, experimental gardens and animal husbandry program, provides nutrition education" (TAICH 1978:280). 501(c) (3), New York.

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Trust for Public Land (TPL)

82 Second Street
San Francisco, California 94105

Fosters community-owned gardens and parks; publishes TPL updates (3x/year); answers inquiries.

United New Conservationists (UNC)

PO Box 362
Campbell, Georgia
Phone: (408) 378- 5380?

Publishes **Common Ground** newsletter and papers on issues; promotes community gardens and organic agriculture; answers inquiries.

Urban Gardening Project

724 North Union
St. Louis, Missouri 63108
Phone: (314) 367-2585
Contact: Ann Rochers (1983)

Volunteers in Technical Assistance (VITA)

PO Box 12438
Arlington, Virginia 22209-8438

1815 North Lynn Street, Suite 200
Rosslyn, Virginia
Phone: (703) 276- 1807

Answers inquiries from developing countries, from its library of over 30,000 books, pamphlets and reprints. Provides training for information resource center librarians. Refers, for a fee, its expert volunteers in many areas of technology, including intensive gardening, aquaculture, pisciculture and small livestock production. Publishes **VITA News**, a monthly newsletter describing particular technologies and development project experiences, and occasional handbooks. VITA is a membership organization, supported by its volunteers, grants from corporations, and grants from USAID. VITA is a member of the Socially Appropriate Technology Information System, coordinated from the Netherlands.

Winrock International Livestock Research and Training Center, Inc.

Petit Jean Mountain
Route 3
Morrilton, Arkansas 72110
(501) 727-5435

Major purpose of overseas assistance is "to provide research and training in animal agriculture complementary to cereal and crop production, with particular emphasis on the needs of smaller producers and the efficient use of the ruminant species." Fills a gap in the research of small livestock, such as goats. Conducts

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training, workshops and conferences; implements projects on contract, bids competitively for USAID contracts; publishes occasional papers. Government grants and contracts are a major source of support.

World Neighbors

5116 North Portland Avenue
Oklahoma City, Oklahoma 73112
Phone: (405) 946-3333
Cable: NEIGHBORS OKLAHOMA CITY

"Provides revolving loans to programs which fund individual income or food-producing projects; provides assistance for experimental gardens, animal husbandry, fish farming and poultry;" produces visual aids, such as filmstrips; publishes **Close Up** (monthly,) **Soundings** and **World Neighbors in Action** (quarterly,) and occasional documents for use in training courses overseas, in English, French and Spanish language versions (TAICH 1978:406-408). See Appendix 2, Mexico and Guatemala.

World Vision Relief

Affiliates operate in Ghana and Botswana. See Appendix 2.

PART 2: UNITED STATES: PUBLIC INSTITUTIONS (FEDERAL AND STATE AGENCIES, UNIVERSITIES)

This section features institutions which are sources of expertise or information for gardening and home livestock production. Selected organizations are currently actively involved in fruit and/or vegetable research, gardening extension, or farming systems research approaches which include "home" production and consumption studies, and in disseminating information on those topics.

Arizona State University

Division of Agriculture, Room 221
Center for Arid and Tropical New Crop Applied Science and Technology (NEWCAST)
Tempe, Arizona 85287
Phone: (602) 965-1260

Develops new crops for arid / tropical zones--jojoba, guayule, euphorbia, canaigria, gum tragacanth, rubber. Publishes technical reports; organizes conferences.

University of Arkansas Extension

PO Box 4007
Pine Bluff, Arkansas 71601
(501) 541-6751
Contact: Tom Vaughns

Sponsors an outreach program in community gardening and is a regional center for the American Community Gardening Association.

University of California:

Common Ground Garden Program
 Cooperative Extension
 University of California
 Los Angeles, California

Environmental Studies—Agroecology Program
 University of California at Santa Cruz
 Santa Cruz, California 95064

Clark University
Center for Technology, Environment and Development (CENTED)
 950 Main Street
 Worcester, Massachusetts 01610
 Phone: (617) 793-7283
 Consortium of interdisciplinary research groups.

College of the Virgin Islands
 Virgin Islands Agricultural Experiment Station
 PO Box 920, Kingshill
 St. Croix, Virgin Islands 00850
 Phone: (809) 778-0246 / 778-0058 / 778-1043
 Performs applied research in horticulture and animal science,
 focused on tropical fruits and vegetables, sorghum, tropical legumes,
 and freshwater tilapia for aquaculture. Publishes **Gardeners Fact-**
sheets.

Cornell University
Working Group on Household Food Production Systems
 Ithaca, New York
 Contacts: Ed Oyer, International Agriculture
 Milt Barnett
 Norman Uphoff
 Ruth Klippstein, Women's Center
 Bille Jean Isbell, Department of Anthropology
 Interdepartmental committee which sponsors a seminar and encourages
 interdisciplinary research on "HFPS" among faculty and students,
 especially foreign students.

University of Florida
Institute of Food and Agricultural Sciences
Center for Tropical Agriculture
 3028 McCarty Hall
 Gainesville, Florida 32611
 Phone: (904) 392-1965
 Provides technical assistance overseas in tropical agriculture; pub-
 lishes monographs; answers inquiries (NRCM 04/83 PUB69-16747).

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**East-West Center
Environment and Policy Institute (EAPI)
Resource Systems Institute (RSI)**

1777 East-West Road
Honolulu, Hawaii 96848
Phone: (808) 948-8728 / 948-6705

Researches tropical ecology and inter-relationships between food supply, energy and raw materials among Pacific and Southeast Asian peoples and ecosystems. Supported by the United States National Science Foundation and several Asian countries (NRCM 11/81 PUB69-18668, 69-19301).

**Hawaii Institute of Tropical Agriculture and Human Resources (HITAHR)
Cooperative Extension Service
College of Tropical Agriculture and Human Resources**

University of Hawaii
Krauss Hall 107
2500 Dole Street
Honolulu, Hawaii 96822
Phone (808) 848-7538

Publishes bulletins on tropical horticulture (NRCM 01/82 PUB69-2334).

Interamerican Foundation

1515 Wilson Boulevard
Rosslyn, Virginia

Public corporation funded by the United States Congress, which operates a program of grants to communities, non-profit organizations and cooperatives in Latin America for self-help development, and a fellowship program. Several grantees' projects involve gardening and small livestock production. Publishes the **Journal of the Interamerican Foundation** quarterly, an annual report, and occasional monographs describing experiences of their grantees and fellows.

**Michigan State University
Cooperative Extension Service**

East Lansing, Michigan 48824

Publishes a series of **Extension Bulletins / MSU Ag Facts**, including titles on home gardening, in cooperation with USDA. Single copies are free to residents of Michigan and available to others for a modest price (eg. \$.15/copy).

**University of Missouri-Columbia
College of Agriculture
Department of Agricultural Economics**

200 Mumford Hall
Columbia, Missouri 65211
Phone: (314) 882-3545
Contact: Albert R. Hagen

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**The State University of New Jersey, Rutgers University and the
Cooperative Extension Service Newark Urban Gardening Program**
101 Warren Street
Newark, New Jersey 07102
Phone: (201) 648-5958
Promotes urban gardening; publishes a newsletter, **The City Harvester**.

New Mexico State University
Department of Horticulture
Box 3530
Las Cruces, New Mexico 88003
Phone: 546-1521

Researches fruits, vegetables and native plants; answers inquiries on gardening, greenhouse grown crops, urban agriculture, solar greenhouses, and other topics; provides consulting services for a fee (NRCM 08/83 PUB69-9424).

University of Puerto Rico

University of Puerto Rico
Department of Horticulture
College of Agricultural Sciences

Mayaguez, Puerto Rico 00708
Phone: (809) 832-4040, extension 3004
Provides teaching, research and extension for tropical and sub-tropical fruits, vegetables, root and tuber crops; publishes a quarterly journal; answers inquiries, and distributes pamphlets (NRCM 07/82 PUB69-9416).

University of Puerto Rico
Puerto Rico Agricultural Experiment Station
College of Agricultural Sciences
Venezuela Contract Station

Rio Piedras, Puerto Rico 00927
Phone: (809) 767-9705
Researches tropical horticulture, animal husbandry, rural sociology and other topics at branch stations; maintains a library of +80,000 books and +18,000 bound periodicals covering over 800 journal titles, and more than a quarter million additional documents; answers inquiries (NRCM 10/81 PUB69-1244).

Missouri Botanical Garden

PO Box 299
4344 Shaw Boulevard
St. Louis, Missouri 63166-0299
Phone: (314) 577-5110
Herbarium has over 3 million specimens, particularly from the New World and Old World tropics. An excellent resource for botanical identification and taxonomy. Library answers inquiries; laboratories

analyze data (NRCM 121/82). Member of the Garden Society.
Texas A&M University System

**Texas A&M University System
 Department of Agricultural Communications**

College Station, Texas 77843
 Phone: (713) 845-2211

Disseminates information related to the work of the Texas Agricultural Extension Service, Texas Agricultural Experiment Station, and the College of Agriculture, including information on gardening, nutrition, crop and animal sciences, sheep and goats; answers inquiries and prepares material for mass media--newspapers, radio and television; publishes occasional papers (NRCM 04/82 PUB69-6637).

**Texas A&M University System
 Food Protein Research and Development Center
 Texas Engineering Experiment Station**

Faculty Mail Box 183
 College Station, Texas 77843-2476
 Phone: (409) 845-2741
 Contact: E.W. Lusas, Director

West Virginia Department of Agriculture Information Division

State Capitol
 Charleston, West Virginia 25305
 Phone: 348-3708

Answers inquiries and provides references. Area of interest is agriculture as practiced in West Virginia (NRCM 09/82 PUB69-16532).

United States Department of Agriculture (USDA)

**United States Department of Agriculture
 National Agriculture Library**

Beltsville, Maryland

"NAL" holds the largest collection of documents related to agriculture in the United States. Maintains AGRICOLA, a computerized data base which is available through several commercial vendors and at landgrant universities. Publishes occasional comprehensive bibliographies, available free as long as supplies last. Reference services are available, inquiries are answered, and on-site visits allowed from 8am-4:30 pm on federal work days. USAID maintains a resident consultant service to answer inquiries from USAID agricultural and rural development mission staff, which will copy and send NAL-held materials.

**Department of Agriculture
 Agricultural Research Service
 Tropical Agricultural Research Station**

PO Box 70
 Mayaguez, Puerto Rico 00708

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Phone: (809) 832-2435
 Research on new crops for the tropics, horticulture on beans, maize, sweet potato, and tomatoes; germ plasm collection; publishes technical reports; answers inquiries; provides advisory services.

**Department of Agriculture
 Cooperative Extension Service**

Several of the universities which serve as centers for this service, which has locations throughout the states and territories, are noted above. Service publishes and distributes many handbooks and manuals devoted to gardening and garden crops, small livestock, and other related topics. Operates the Master Gardeners program, whereby community volunteers are trained for 50 hours in horticulture and, in return, pledge 50 hours of voluntary service to assist other gardeners in their own local neighborhoods. Master Gardener programs in the District of Columbia, Chicago, Illinois, New Jersey, and Northern Virginia, among others, are tailored to the needs of urban, community gardens.

PART 3: ORGANIZATIONS IN OTHER DEVELOPED COUNTRIES

Australia

Permaculture Institute

Tagari (Permaculture Institute and demonstration community)
 PO Box 96
 Stanley, Tasmania 7331, Australia
 Phone: (004) 581105 10-4 pm
 Contact: Bill Mollison

Permaculture Journal

37 Goldsmith Street
 Maryborough, Victoria 3465, Australia
 Contact: Terry White, Editor

Tasmania is the center of a growing worldwide network of institutions dedicated to "Permaculture" (a registered trademark). The Permaculture concept is based on low cost, energy efficient integration of perennial agriculture and animal husbandry, set forth in two manuals. The Institute offers technical design assistance, preferably for whole communities and residential settlements, and networks communications through its journal and the exchange of Apple computer disks. Permaculture has produced self sufficient agricultural designs for communities as diverse as the camps of Australian aborigines and Brazilian factory workers' housing settlements. Several space intensive designs are suitable for individual houses or apartment buildings in crowded Asian cities. Founded by a former CSIRO ecologist, Permaculture's experts give training courses and technical assistance in

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exchange for expenses and very low fees. Affiliates are listed by country of location. See Mollison 1979 and 1981.

APACE Rural Development Center "Sunfarm"

Federal via Lismore
New South Wales 2480
Australia

Canada

City Farmer

#801- 318 Homer Street
Vancouver, British Columbia V6B 2V3, Canada
Contact: Michael Levenston, Director
Researches and demonstrates urban food gardens; publishes newspaper, booklets and calendars, and sponsors workshops: source of information and training for urban agriculture.

IDRC

Contact: Hubert Zanstra, University of British Columbia (NOTE HR)

Permaculture Canada

261 Albany Road
Toronto, Ontario, M5r 8TR, Canada
Contact: Bob White

France

Association Francaise des Volontaires du Progres

French "Peace Corps" type organization, which places volunteers. Many projects have involved gardening. See Appendix 2, Niger, for an example.

**Groupement d'Etudes et de Recherches pour le Developpement de l'Agro-
nomie Tropicale (Research and Study Group for the Development of
Tropical Agriculture - GERDAT)**

42 rue Scheffer
75116 Paris, France
Phone: Paris 704 32 15

The group is composed of specialized research institutes, including an institute researching tropical fruits and vegetables (IRFA) and tropical animal husbandry (IEMUT). The documentation department maintains a computerized data base in French on fruits and agro-industry technologies in warm regions, known by the acronym FAIREC. Publishes a variety of journals, reviews, technical reports (NRCM 10/83 PUB69-17375).

**Institut de Recherches Agronomiques Tropicales (Institute for
Research in Tropical Agronomy and Food Products—IRAT)**

45 bis, avenue de la Belle-Gabrielle
94130 Nogent-Sur-Mame, France
Phone: 873 52 02 or 873 52 04

Conducts research at its own applied agronomic experimental stations

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in the West Indies, Guiana, French Polynesia, New Caledonia, Burkina Fasso, and Reunion and, in cooperation with national research organizations, in Brazil, Cameroon, the Comoros Islands, Peoples Republic of the Congo, Madagascar, Mali, Niger, Senegal and Togo. Primary attention is focused on field crops such as wet and dry rice, sorghum, millet, maize and the food legumes. Maintains a 25,000 volume library and answers inquiries. IRAT is partially funded by the French and foreign governments. Publishes in French **Agronomie Tropicale** quarterly, as well as technical reports, bibliographies, and other occasional documents (NRCM 09/81 PUB09-17007).

Terre Vivante

6, rue Saulnier
75009, Paris, FRANCE

Non-profit association. Publishes magazine **Les Quatres Saisons du Jardinage** bi-monthly, and books related to organic gardening, health, nutrition and subjects specific to developing countries. Maintains a documentation center for alternative agriculture, and is setting up a consultants' group.

Italy

Food and Agriculture Organization of the United Nations (FAO)

via delle Terme di Caracalla
00100 Rome, Italy

Contact: Millicent Fenwick, U.S. Ambassador to FAO, who serves on the FAO Garden Committee

Reference and Documentation Information Section publishes microfiches of current bibliography on food and agriculture topics, broadly defined, and can provide print copies or microfiches of FAO documents and publications. Provides assistance to developing countries in all areas of food, nutrition and agricultural research and development. Provided technical assistance to a series of applied nutrition projects, some of which appear in the case history on Ilesha gardens in the main text. See also Appendix 2 for historical ANP projects assisted and documented by FAO.

International Board for Plant Genetic Resources

via delle Terme di Caracalla
00100 Rome, Italy

Coordinates 17 international agricultural centers' and universities' base collections for vegetable germ plasm; publishes studies and inventories on amaranth (1981), cruciferous crops (1981), tomatoes and their wild relatives, allium, capsicum, okra, eggplant and cucurbitaceae.

The Netherlands

International Agriculture Center

Postbus 88, 6700 AB
Wageningen, The Netherlands

Royal Tropical Institute

Department of Agricultural Research
 63 Mauritskade
 1092 AD Amsterdam
 The Netherlands
 Phone: (020) 924949

Contact: Dr. Geurt, Fruit and Vegetable Research

Museum maintains over 300,000 titles, 120,000 English abstracts, and a computerized data base of 30,000 abstracts in English (for works since 1952) available via SDC as TROPAG on a broad range of tropical agriculture. Publishes **Abstracts on Tropical Agriculture** monthly, and other documents and serials more occasionally. Answers inquiries; provides consulting, reference, literature searching, and current awareness (SDI) services (NRCM 07/82 PUB69-11743). This source is particularly recommended as a repository of works written by Dutch horticulturalists who have been describing the configurations, ecological characteristics and particular crops of Indonesian mixed gardens since the early 1900's.

Socially Appropriate Technology Information Service (SATIS)

Mauritskade 61a (entrance on the garden)
 1092 AD Amsterdam
 Amsterdam, The Netherland

SATIS coordinates a network of documentation centers which distribute information on small scale, low cost technologies, including a broad range related to home gardening. Publishes and distributes information in French, English and Spanish. Materials distributed on gardening and small livestock production are limited to a few handbooks.

New Zealand**Permaculture New Zealand**

164 King Street
 Rowgiova
 Christ Church, New Zealand

Permaculture New Zealand—Haiaia Tane

Glen Gairn Road
 Twizel, Aoraught, New Zealand

Sweden**International Seed Exchange (SESAM)**

c/o Uplinder Frodingevan 1
 S-112 56 Stockholm, Sweden

Contact : Larsolov Rosenstrom, Chairman

Provides information on seed production. Members preserve, multiply and disseminate vegetable seeds.

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Switzerland**International Foundation for Development Alternatives (IFDA)**

2, place du Marche
1260 Nyon, Switzerland
Phone: 41-22-81 80 82

Publishes **IFDA Dossier** bi-monthly; provides consulting services and referrals. Supported by the Swedish International Development Authority, Dutch Directorate General for Development Cooperation, Algerian Ministry of Planning, the Norwegian Foreign Ministry, Government of Kuwait, and the Presidency of Venezuela (NRCM 08/82 PUB69-19464).

Permaculture Switzerland**Okó Journal**

9128 Bachli, Switzerland
Contacts: Peter and Leslie Brenner

United Kingdom**Intermediate Technology Development Group (ITDG)**

9 King Street
London, WC2E 8HN
United Kingdom
Phone : 01-836 9434 / 39 ; 836 6379
George McRobie (Chairman)

Inspired by the Schumacher principle of "small is beautiful", ITDG is well known for its design and testing of new hardware technologies designed with the needs of developing countries in mind, including hand tools and small scale food processing machinery. The Appropriate Health Resources and Technologies Group (AHRTAG), a specialized member of the group, has monitored nutritional concerns. ITDG has recently (1983) proposed to embark on a series of market gardening projects in several of its priority "countries of concentration." This effort was proposed on the basis of a limited internal review and critique of "gardening as a nutritional intervention" projects (see bibliography). From this effort, the group apparently decided that commercial cash income gardening should be launched in a series of pilot projects. ITDG publishes **Appropriate Technology** and AHRTAG publishes **Diarrhoea Dialogue**, both monthly, as well as occasional technical reports and monographs. ITDG is a registered charity, the equivalent of a United States 501(c)(3). An affiliated organization, ITDG Consultants, provides group staff as consultants.

International Bee Research Association (IBRA)

Hill House, Gerrards Cross
Buckinghamshire SL9 0NR, England
Phone: (02813) 85011
Telex: 23252 monref g 8390

Contact: Eva Crane, Director; M. Nixon, Information Officer for Tropical Apiculture
Promotes the scientific study of bees. Publishes **Journal of Apicultural Research** (original research papers), **Bee World** and **Apicultural**

Abstracts, summarizing the world's scientific literature on bees, and authoritative textbooks, pamphlets, reports, visual aids, bibliographies, reprints and other materials. Convenes international conferences, and cooperates with the FAO and national associations of beekeepers and apiculture scientists. Founded in Britain, IBRA dedicates its profits to fulfill Association aims, and has proposed to enlarge its functions in order to serve as a world monitoring and liaison center for the advancement of apiculture in developing countries through enhanced liaison, training, research and production of extension leaflets in several languages.

OXFAM-UK

274 Banbury Road
Oxford, OX2 7DZ, England

Operational overseas charitable trust organization (non-governmental). Publishes booklets related to home gardening and has funded a number of local food gardening projects, especially in anglophone Africa. See Appendix 2, Brazil, Burkina Fasso, Ethiopia, Zaire, Bangladesh, Pakistan.

Permaculture British Isles

6 Loughborough Park
London, SW 9 8TR, England

Permaculture United Kingdom

32 St. James Street
London, SW1, England

Save the Children Fund

Mary Datchelor House
Grove Lane
Camberwell
London SE 5 8RD, England

Private charitable organization, operational overseas. For examples of projects with gardening, see Appendix 2, Burkina Fasso and Swaziland.

**University of Sussex
Institute of Development Studies**

Brighton, England
Phone: 0273 686261

Development Studies Library of +170,000 volumes provides advisory, consulting and reference services at cost to some users, and free to international organizations and governments in developing countries (NRCM 06/83 PUB69-19809).

APPENDIX B: ILLUSTRATIVE GARDEN PROJECTS AND PROGRAMS BY REGION AND COUNTRY

AFRICA

WEST AFRICA

[** indicates members of Groupement des Aides Privees (GAP)]

Benin

1984 Peace Corps project will dig three wells for schools in Bembereke district, so that they can become self supporting through gardens, orchards and small livestock production. Supported by USAID small project individual activity agreement 3-680-007.

FAO developed home gardens of the mixed type, integrating native cultivars in an ANP. Project featured a central garden, horticultural extension, and introduction of grain legumes in first phase (through 1967). The Garde Dahomey was enlisted to extend nutrition improvements in the third phase (through 1973) which featured radio broadcasts on gardens, trials of new varieties and rabbits, demonstration gardens, and distribution of 30,000 fruit trees. See D'Almeida 1967; Ruck 1968; Terra 1967; Geurts 1973 and Van Eijnatten 1969, and project case history in main text.

Burkina Fasso

Centre de Recuperation et d'Education Nutritionelle Yako

At the Gourcy Center for Nutrition Recuperation and Education and the Yako regional hospital, the mothers of malnourished children are taught to grow vegetables and prepare nutritious meals while the children are treated. **Africare, Catholic Relief Services, OXFAM** (1973-1979), the Peace Corps, French Volontaires du Progres and the Government assisted. (See Nutrition in Primary Health Care Programs 1981 L.I.F.E:36.) A mark of program success is the reduction of children requiring nutritional rehabilitation: 350 in 1973-4, down to 80-100 year as of 1979 (OXFAM internal documents).

Gorum Gorum

Food for a nutritional rehabilitation program sponsored by **Save the Children** is grown in a clinic garden and clinic poultry unit where mothers are taught production techniques.

FAO assisted an Applied Nutrition Project which established school gardens for horticultural production, and carried out production and

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consumption studies. See Uriodain 1971 (FAO Report 13428-71).

Cameroons

USAID 625051000 provided a grant to the **Catholic Relief Service** for 12 rural community development projects. Outputs of the USAID 6310010 1977-1979 North Cameroon Pilot Community Development Project were to have included food and cash crops, increases in per capita protein and calorie intake, and an animal production center.

Central African Republic

FAO assisted CAR with an ANP. See Wagneur 1969.

Gabon

Applied Nutrition project included promotion of school gardens. See Yang 1967.

Gambia

USAID Project 6350203 1979-1983--Mixed Farming and Resource Management--promoted production of small ruminants, animal health and improved feeding, and expanded a poultry unit at Abuko. Women herders were primary beneficiaries.

Ghana

FAO Freedom from Hunger Pilot Home Garden Project ended in 1972. See FAO, Plant Protection 1972.

Council for Scientific and Industrial Research Food Research Institute

Accra, Ghana

In researching methods for food preservation, a low cost solar dryer was developed for home gardeners. Extension to date has been limited.

Ghana Rural Reconstruction Movement (GhRFM)

PO Box 2338, Accra, Ghana

Yensi Center, PO Box 14, Mampong-Akwapim, Ghana

Pilot project in Mapong Valley includes production enhancements for poultry, rabbits, pigs, sheep and goats. "Farmer-scholars" are trained at the center, where nutrition classes are also given; they then demonstrate techniques to fellow villagers. This on-going project was organized with the help of the International Institute of Rural Reconstruction and USAID funding.

Bawku District Gardening project at Bawku Nutritional Rehabilitation Center failed to entice participation of mothers. Mothers were

more expert gardeners than center staff, who introduced unsuitable vegetations. At Garu health center and NRC, a more successful approach was demonstration gardens, tended by a full time gardener, which were of great interest to visiting mothers.

Mennonite Board of Missions

PO Box 5485, Accra, Ghana
Mennonite agronomist and nutritionist volunteers promote basic food production.

Ministry of Rural Development and Cooperatives

Arranges loans and technical assistance for rural groups organized as cooperatives. In some areas, home gardeners have organized as cooperatives to gain access to credit and horticultural services, selling enough produce to pay back loans.

Ministry of Social Welfare
Community Development Department
Home Economics Division

Accra, Ghana
Promotes and extends advice on home gardening.

The Salvation Army

Territorial Headquarters
6 Osu Avenue/ PO Box 320, Accra, Ghana
Operates training programs for women and youth in small scale food production, animal husbandry and integrated nutrition at more than 100 centers. Program began in 1922, and cooperates with the Salvation Army in the United States, Canadian International Development Agency, OXFAM (UK), Tear Fund (UK), World Vision International, the Government of Switzerland and World Vision Relief.

Seventh-Day Adventist World Service

PO Box 1016
Accra, Ghana
Phone: Accra 23720
Contact : M. Bediako
Operates project in Agona, Kwanyako, Central Ghana and another in Zangum to increase dry season crop production. Irrigation facilities are under construction.

World Vision Relief International

2 Okodan Link, Accra, Ghana
Cable: Worvis, Accra
Phone: 76193
Contact: Rev. (CDRE) P.F. Quaye, Director
Community development program initiated in 1978, which stresses nutrition and food production, working through a staff of over 230 Ghanians. WVR funded five new projects in 1982 which will be implemented by the Salvation Army in nutrition, hygiene, family planning and family food production, all directed to children under five and their mothers.

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Young Mens Christian Association (YMCA)

Community development program in the Eastern region organizes unemployed youth to begin producing and marketing food stuffs cooperatively.

Ivory Coast

FAO ANP with UNDP technical assistance in 1960's, featured demonstration school gardens and school poultry units to teach a model of market gardening and small livestock production for sale, horticultural experiments and school feeding program at canteens. See Lierecht 1967 (FAO Report No.02021-67) and Wauters 1969 (FAO Report No. 06229-69).

Liberia**Cuttington University College**

USAID OPG to the Protestant Episcopal Church #669- 0153 (1977-1983) is establishing a rural development institute for mid-level training of para-professional agricultural extension workers. Horticulture, fruit and vegetable cultivation and practical application of knowledge to traditional subsistence agriculture are among the topics emphasized.

Mauritania

USAID Grant 682-0204 to the Government of Mauritania (1978-1983) in cooperation with the US Peace Corps is a first phase project for Vegetable Production. Project activities include the testing of major agronomic options and the collection and analysis of information on economic and marketing variables, present practices and consumer acceptance/ nutritional data. See AID PD-AAJ-317.

USAID project for the Integrated Development of Oases 68202007 introduces vegetable production for nutritional benefits. See AID PD-AAG-144.

FAO through UNDP Technical Assistance operated a school feeding and nutrition project in east Mauritania, ending in 1969. School gardens were established at primary and secondary schools. See Roumeas 1969 (FAO Report No. 06075-69).

Niger**Africare**

PO 10.534

Niamey, Niger

Phone: 73-37-95

Project locations include Tara (Gara), where an irrigation agriculture project (1975-1981) included vegetable gardens; Dosso in Birni-

Ngaoure District where vegetable gardens were established or improved for 350 women (at a cost of US \$300,000 over the three year life of the project); Dogondoutche, where a vegetable gardening project is currently in the planning stage; and Koubu, where a vegetable gardening project is currently being identified. Provided nutrition education through implementation of the Village Health Team concept, on USAID #683-0214 (1976-1980) and #683-0208 (1978-1982). Cooperation and funding from the government of Niger, Lilly Foundation and United Methodist Committee on Relief.

Association of French Volunteers — Association Francaise des Volontaires du Progres (AFDP) **

Projet Jardins Villageois
Niamey, Niger
Phone: 72-30-69

At Madaroufa/Guidan Rounji in Province Marandi, AFDP operates a long term Village Gardening Project to improve production from existing dry season market vegetable gardens by introducing the chadouf water drawing system for smaller gardens and the dalou system for larger ones. Introduced new varieties--carrots, lettuce, onions, cabbage, mangoes, guavas and lemons, "to extend villagers' range from traditional market vegetables of tomatoes, peppers and local aubergines" (OXFAM). Local plants used to make a sauce have also been promoted, and, more recently, the planting of fruit tree seedlings produced at an Agadez nursery. "The newly introduced vegetables and fruit trees have largely remained within the family diet, rather than (being) used as sale items," and vegetable produce sold is impacting food habits in Guidan Rounji, where salads, cabbage leaves prepared with millet and carrots as snacks are now common and popular, according to an internal report (Niger 24) of OXFAM, which funded the 1976-1981 efforts. AFDP's financial support is primarily from French donors.

Caritas-Niger **

Boite Postale 2381
Niamey, Niger
Phone: 73-53-00

Project locations include Diffa and Nord-Ouallam, where irrigated vegetable gardens were improved, and Agadez tree nurseries. Staff of 13, budget +75,000 CFA/year.

Church World Service **

Boite Postale 11-624
Niamey, Niger
Phone: 73-21-49

Projects have been: Marandi school gardens; Agadez and Doungou vegetable garden irrigation by traditional irrigation; an Agadez date palm plantation, and small animal husbandry efforts. Cooperates with AVDP, US Peace Corps, and Netherlands Volunteers, among others.

Groupement des Aides Privees (GAP)

Boite Postal 10.424
Niamey, Niger
Phone: 73-39-07

Since 1975, GAP has performed as the Government of Niger's registrar

and clearing house for foreign nongovernmental organizations. Most NGO/PVO's operating in Niger are GAP members, paying an annual fee and 5% assessment of their operational budget for the country. GAP directs outside funding to projects proposed by the local population, approved by local government (sous-prefet) officials and reviewed by relevant ministries, which can become locally self sustaining after about three years' assistance. Among the 100 or more projects so financed by GAP member NGOs each year, a number feature vegetable gardens, irrigation for gardens and fruit tree nurseries.

Lutheran World Relief **

Boite Postale 11.624

Niamey, Niger

Phone: 73-21-26

Operates 13+ Madaoua vegetable garden infrastructure and well digging projects, some co-financed by USAID. Cooperates with CARE, CWS, Brut fur die Welt, and the Governments of France and Niger.

Projet Tapis Vert

Nigerian National Agricultural Research Institute (INRAN)

Boite Postale 429

Niamey, Niger

Integrated development project in the Dallol Bosso region has introduced year round gardening using mulch, compost and irrigation from newly constructed wells, has introduced new varieties of chickens and is attempting rabbit raising. Funders include USAID via an operational program grant to Catholic Relief Service, and **Strategies for Responsible Development**, a Dayton, Ohio, project of the Society of Mary (TAICH 2/80).

Sudan Interior Mission

BP 10.065

Niamey, Niger

Phone: 73-38-35

Operates a farm center at Marandi and teaches "food gardening" in connection with its well drilling projects. Cooperates with the Governments of Niger, Canada, France and the Netherlands.

(Sources: Information for this section on gardening developments in Niger was drawn from the AMARU/AHRTAG 1982 document Niger: NGO/PVOs in the Health Sector, the TAICH country report on Niger 1981, and personal communications from Mr. V. Massoni, who visited Niger non-governmental organizations in December 1982.)

Nigeria

International Institute of Tropical Agriculture (IITA)

P.M.B. 5320

Ibandan, Nigeria

Phone: in Ibandan, Nigeria, 23741-48

"Conducts research on all phases of tropical food crop production, with emphasis on grain legumes, root and tuber crops, and cereals of the humid tropics; develops hybrid varieties and distributes improved

plant materials; researches and disseminates more intensive farming systems. IITA is supported by a number of bilateral development agencies (USAID, CIDA, United Kingdom Overseas Development Ministry), by the Ford and the Rockefeller Foundations; by the governments of Nigeria, West Germany, Belgium, and the Netherlands, and by the World Bank" (NRCM PUB69-17377). IITA provides consulting services to national agricultural research and extension agencies in other African countries, and functions as a secretariat for the International Association for Tropical Root Crops, which in turn publishes annual conference proceedings, and guides germ plasm collecting activities.

Ilesha Home Gardens-FAO & NEDEF 1966-1970 project is profiled in text. See Van Epenhuijsen 1974, Van Eijnatten 1969b (FAO Report 06789-69) and 1971 (FAO Report No. 16487-71), Ter Heersche 1969 (FAO Report No. 07726-69), Ruck 1968 (FAO Report 02789-68), Geurts 1973 (FAO/FFHC/NI 25100E1).

Senegal

UNICEF, FAO and the UNDP collaborated with the Ministry of Education for an applied nutrition project in the schools, which included the installation of school gardens and canteens. See Prosper 1969a (FAO Report 09233-70) and 1969b (article in **Nutrition Newsletter**) and Claessens 1970 (FAO Report 12576-70).

In the context of an integrated rural development project, women's garden groups were linked to daycare services by ministry concerned with community development and health. See Young Yoon 1983.

USAID small projects fund (685-0270) finances two gardening projects assisted technically (1984) by Peace Corps volunteers. In the village of Bandandar in the Sine Saloum region, a women's group gardened in the dry season of 1980-81, purchasing anti-malaria medication and cooking pots with their profits (1981-82). The project will help them deepen their wells to assure an adequate water supply and will provide gardening tools. For another gardening group, the Women's Organization of Ndioungoum, wells and cisterns will be repaired and equipped with a motor pump to run water to the community garden of Tia Thiofior.

Casamance Vegetable Growers USAID WID project (1976-1980) established seven women's community vegetable gardens out of the 13 promoted. See USAID 1980 AA6-177-B1.

Plan Senegal Foster Parents Plan

Rue Thierno Ousmane syx Ecole Senefobougou Saint Louis
Boite Postale 239
Phone: 61649

See main text.

Sierra Leone**Tikonko Agricultural Extension Centre**
Integrated Health and Agricultural Project

PO Box 86

Bo, Sierra Leone

Demonstration garden projects in six villages to improve and increase vegetable production in an area where most families already have home gardens.

Safronko Limba Chiefdom

Ministry of Agriculture, Meals for Millions/Freedom from Hunger, Catholic Relief Service, USAID.

Safroko Limba Chiefdom, Northern Province, (identified in a 1978 nutritional survey as the most severely affected by malnutrition), is location of an ANP. Community vegetable gardens were launched in Bombalibana during 1983 with USAID supplying cuttings of improved cassava and sweet potatoes from the Adaptive Crop Research Extension Program (ACRE) and CRS supplying the handtools. Groundnut, maize, watermelons and vegetables are also grown. "Since these plots are some distance from the community and their impact on improving the nutritional status of children is questionable, MFM staff plan to identify mothers with malnourished children, then assist them to establish gardens close to their home to produce a variety of foods which can be incorporated into the family diet on a regular basis" (MFM 1983:21).

FAO assisted a Family Nutrition and Home Development project with the goals of applied nutrition, reducing illiteracy, teaching home economics, and demonstrating family gardens. See Asare 1969 (FAO Report 08171-69).

EAST AFRICABotswana**Camphill School for the Handicapped**

At this school for 36 handicapped children, 70% of operational costs are met by production at the school; in 1981, a volunteer student of theology was the gardener and a Danish volunteer worked the school farm.

International Voluntary Service (IVS)

USAID Operational Program Grant 633-0215 (1978-1983) funded IVS assistance to Community Development Associations and Government of Botswana to expand commercial and subsistence horticulture production ("HC"). HC research focused on cabbage, onions, carrots, potatoes, tomatoes and greens.

Kweneng Rural Development Association

IVS assisted the establishment of a commercial vegetable garden, which the KRDA divided into 40 family plots in 1980. KRDA is a project of the Botswana Brigade.

Mahalapye Development Trust

PO Box 291, Mahalapye, Botswana
Individual garden plots (+100) facilitated by the Trust have been more successful than the five group gardens (for more than 70 families) which were promoted by Ministry of Agriculture, USAID funding and IVS volunteer. The Trust, a national NGO, provides nutrition education at the Baiteredi Family Center.

Mennonite Central Committee

PO Box 33, Gaborone, Botswana

Horticulturalist was working with vegetable growers in Selebi-Pikwe in 1982.

World Vision Relief

Community development project in Selebi-Pikwe (Pihikwf) and Komole-kome includes gardening, nutrition and primary health care in cooperation with the Government of Botswana. Program was begun in 1981.

Burundi**Buye Hospital Nurses Training Centre and Centre d'Entreaide et de Developpement**

Centers train student nurses and village level health workers in gardening, among other public health subjects. Trainees tend demonstration gardens at the centers. Demonstration gardens are planned for all rural health centers in the country, which will be tended by VHW's, with help from mothers who visit maternal-child health clinics. A working example is the **Musenyi Health Center**, where soya and green vegetables are grown and seeds are distributed. These efforts were supported in part by OXFAM (Pacey 1978).

Burundi Home Economics ANP under the Ministry of Agriculture had model gardens. ANP results were generally poor. See Wagneur 1969.

Comoros

UNICEF and the French Bureau de Developpement de la Production Agricole trained rural teachers and progressive farmers in a successful 1960's project which created home gardens. See Wagneur 1969:3.

Ethiopia

Kebele Vegetable Gardening Project

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OXFAM (UK) assisted this government program, which provided seeds and tools from 1976-1979. Unemployed men from the Kebele units raise vegetables on nationalized land near Addis Ababa.

Kenya

Environment Liason Centre

PO Box 72461, Nairobi, Kenya

Phone: 340849

Telex: 23240 ENVICENTE

A membership network of environmental groups cooperating with the United Nations Environmental Programme, ECL publishes a monthly newsletter, **Ecoforum**. Among other activities, the center is promoting urban community gardens, for example in Nairobi and Lusaka (Zambia), and is cooperating with the Urban Resource Institute (USA) in documenting urban and peri-urban gardening in Africa. Newsletter carries occasional articles on gardening projects and techniques.

Institute of Cultural Affairs

PO Box 21679

Nairobi, Kenya

Phone: 56 7728

Cable: ICANBI

Holistic community development project in Kamweleni includes home vegetable gardening as a health and nutrition intervention and income generating activity. Participating villagers are trained at a "Human Development Training School."

Meals for Millions/ Freedom from Hunger

Conducted Food and Nutrition Training Program (1981-1982) training 25; reports 23 community projects were begun by training, involving: vegetable gardens (14), raising rabbits (2), poultry (2) and bees (2) or combinations of these forms of home production (3). One trainee expanded Kabiro-Kawangware backyard gardens from 5 to 100 as her practical community project. Baseline studies for an ANP are slated for 1984.

UNICEF initiated a Mothercraft-Homecraft and Community Development Project in 1956, which branched into home gardening "as the need to improve human diet became evident." (Wagneur 1969:8). By 1967, courses at district training centers were reaching 6,000 a year. FAO assisted this UNICEF project and an ANP project for "Agriculture in the Kenya Secondary Schools" in the late 60's. See Maxwell 1968-1969 (FAO Report CF/ 05546) and Wagneur 1969 (FAO Report 08857-69).

Lesotho

Thaba Khupa Farm Institute

PO Box 929

Maseru, Lesotho

Supported by more than 50 foreign charities, this vocational school stresses market gardening and intensive livestock production for its

small (25 per session) resident students.

ANP (1962-1969) established home, school, young farmer club and communal gardens throughout the country. Success was attributed to the government's support of the effort and the population's favorable reaction (Wagneur 1969:3).

Madagascar

FAO conducted a Freedom from Hunger Campaign project (MAD 56) demonstrating agricultural techniques at school compounds, deliberately avoiding "school gardens," which had been a resented feature of colonial era schools. See Rasanjiferahasina and Ranaivoson 1977 (FAO Report 40635-77).

Malawi

In an FAO ANP, Community Development workers trained at a center in Magamero. Center was equipped with model home sites with poultry units and vegetable gardens used for teaching. Once fielded, workers demonstrated vegetable and fruit growing near their own houses (Wagneur 1969).

Mauritius

FAO Home Economics ANP intercropped vegetables in sugar cane fields and organized young farmers' clubs (Wagneur 1969).

Rwanda

FAO Education and Training ANP operated through the Ministry of Family and Community Development, training home economics staff (Wagneur 1969). In later developments of resettlement colonization projects, this extension structure was used to promote intensive allotment gardening for colonist households outside main cash crop areas.

German Technical Assistance (GTZ), Swiss bilateral aid, and French bilateral projects in central and southern collines are currently piloting small scale regenerative intensive farming, based on alley tree crops, terracing, recycling manure from stables as compost for garden crops, fruit tree and banana plantings to recycle shallow pit latrine sites, and relay intercrops.

The International Potato Center is adapting potato germ plasm and cultivation techniques to low input conditions. Potatoes, in Rwanda as elsewhere in Africa, are a common garden crop.

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South Africa**Africa Tree Crops**

PO Box 90
 Plessislaer 90
 Natal, South Africa
 Contact: R.T. Mazibuko

For 50 years, R.T. Mazibuko has promoted arid land adapted gardening techniques in the rural African homelands. In these enclaves, each family is allocated only one-quarter acre which, with any outside wage labor, must provide their total subsistence. Homelands are dry, denuded of trees, eroded and hilly. Approach features a "trench system" to accumulate residues to support home gardening of cabbage, carrots, lettuce and other vegetables. Poultry is confined in trench runs to compost then recycle their manures. Alley tree crops along hillside trenches stabilize the terrain. Fruit trees are planted in corners of property; children are taught to tend them and pick and eat the ripe fruit. Some adopters have been able to sell surplus food.

Food Gardens Unlimited (FGU)

P.O. Box 41250
 Craighall, Johannesburg 2024
 Phone: 646 - 4706
 442 - 6835 (after hours)

Contact: Pauline Raphaely

FGU promotes home gardening, by training "multipliers"--school teachers, nurses, health inspectors, lay health workers, social workers and members of voluntary organizations (such as Boy Scouts, Girl Guides, The Leprosy Mission, churches and local community organizations). Since 1977, it has reached 100,000. Sixty Soweto schools have demonstration gardens. The Carers, a lay health organization, demonstrates home gardens at clinics. FGU publishes a quarterly newsletter with seasonal gardening advice and writes articles published in texts for newsletters, newspapers, and magazines. Operates a mail order service for "right for the season" seeds, packed by workers at a center for the handicapped and sold at cost (5c); the May 1981-December 1983 volume was 55,051 packets. Provides advice by mail and phone and distributes technical bulletins. FGU works primarily in urban areas. Its modest budget (about 13,000 rands/year) has been financed by a South African charitable foundation and stretched by in-kind donations and work contributed by volunteers.

Sudan

FAO/ UNDP ANP 1966-1970 concentrated on school gardens and poultry units where water supply was limited, though project was originally designed to include community gardens as well. See Hamad 1970 (FAO Report No. TA 2886 AGP: TA/180).

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Swaziland**School Garden Scheme**

Initiated and originally assisted by ODA and SCF(UK), the 1970-1981 program had schools apply to begin school gardens where children could produce for their lunch program. After the Ministry of Education assumed responsibility, the program declined, and eventually ground to a halt.

Tanzania**Lutheran World Relief**

USAID Operational Program Grant #6210160 "Village Environmental Improvement" (1980-1984) will feature a subproject to increase food production through establishment of irrigated home gardens, related to the primary effort of developing village water supply in six pilot villages in the Singida region. Buried pot and drip irrigation techniques will be introduced. Gardens will initially be planted with familiar, local vegetables, then improved seeds and new varieties will be introduced to "increase diversification and the nutritional value of the gardens" (AID-DIHF abstract, see also PD-AAG-066-A1, ISN=17522). Beekeeping and fruit tree cultivation will be introduced through a forestry effort in the same pilot villages (subproject 04, 6210160).

Chakula ni Uhuia ("Food is Life") Campaign

Over 1.5 million have participated, and over a thousand group projects (especially gardens producing cabbage, tomatoes and lettuce) have resulted from this national nutrition education campaign. Small adult study groups listen to radio broadcasts together, discuss the lessons, and plan group projects to promote better nutrition.

Dar-es-Salaam - urban community gardens

FAO and UNICEF assisted an applied nutrition and training project 1963-1966 recommending school gardens for women and youth and broad agricultural training for farmers. See Robinson 1967 (FAO Report 00506-67).

Applied Nutrition and Training Project 1964-1966 in Hombolo division of Dodoma district involved large scale distribution of fruit trees, school and community gardens. Pilot was extended district wide in 1965, and program was assumed by a nutrition unit in the Ministry of Health in 1967 (Wagneur 1969:4-5).

Uganda**Global Outreach**

This US religious PVO is in the process of identifying a Uganda mission. The group typically establishes school and home food production efforts.

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Zaire

OXFAM (UK) has supported gardening projects through the Venga Baptist Hospital, CEMEKI Agricultural Programme at Ngidinga, and at Kananga (soya bean development), and has sent an advisory team to Kikwit (Pacey 1978).

Zambia

Lusaka urban community gardens since about 1977.

School beekeeping units are assisted by the Forestry Department's beekeeping unit. See Mulenga 1977.

FAO and UNICEF assisted a Zambian ANP in the 1960's. See Wagneur 1969.

Zimbabwe**Adventist Development and Relief Agency (ADRA)**

Conducts the Solusi Scientific Gardening Project from a mission school, boarding and training villagers for two months to garden vegetables such as lettuce, tomatoes, cabbage, broccoli, onions, bell peppers, chard, carrots, Japanese radish, zucchini and other primarily temperate zone introduced vegetables. Horticultural curriculum at mission school has produced graduates who enter vegetable market gardening. See ADRA nd. a, b, and c for periodic evaluations. ADRA has a core operational program grant from USAID.

ASIA—SOUTH EASTIndonesia

Among the indigenous non-governmental organizations promoting the improvement of mixed home gardens are: **Bina Desa, Dian Desa, Walki**, (an NGO coalition for the environment with an outreach program in home gardens), **YIS**, and **Lembaga Ekologi**, a group of university-based researchers, home garden activists and spokesmen, headed by Professor Soemarwoto.

The Government of Indonesia and the World Bank are currently developing gardening areas as an integral part of house site development for transmigration and irrigation/drainage colonization projects (for example, Swamp Development 2). In earlier transmigration or colonization projects it was observed that settlers devoted up to two years clearing and installing home garden plots before addressing field cultivation of the major crops planned for the settlements. This was because adult males needed to do the heavy labor of plot preparation, although, once installed, the home gardens were

tended largely by adult women. Colonists bring seeds and seedlings from Java. Systems for technical assistance, inputs and tools for gardening, however, are not entirely in place.

USAID Village Family Planning/ Mother-Child Welfare Project 4970305 (FY 1980-1985), with BKIBN, the National Family Planning Coordinating Board of the Government of Indonesia, will provide village nutrition services to mothers and children under five years of age. Project will include promotion of home gardening and cooperative food production, nutrition education and regular assessments of children's nutritional and health status.

Philippines

Binhi Agricultural Development Services and Farm Assistants
Non-governmental organizations, currently promoting home gardens in the Philippines.

UNICEF and CARE operated the Isabela Applied Nutrition Project which, in addition to food distributions, promoted demonstration school gardens with citrus trees donated by the **Philippine Red Cross**, and fish ponds. See Suter 1967. The Philippine Red Cross has also supported increased food production by establishing seed banks at public and private schools. See de la Cruz 1969.

The government's Agricultural Productivity Commission promoted vegetable gardens and small livestock production. See Salazar 1967, with the complaint that people were "too lazy" to plant vegetable seeds or to save these seeds from year to year. The Home Economics Program promotes women's backyard food production through seed banks, seedling exchanges, distribution of fruit trees and "share for progress" gardening kits and creation of "pig chains". See Agricultural Productivity Commission 1968. Governmental Nutrition Councils also sponsored applied nutrition projects; in 1967, only two out of 22 were specifically for home gardens (Aquilon 1967).

FAO assisted the Bayambang ANP, installing demonstration school and family gardens and a demonstration farm. See Cornelius 1968 (FAO Report No. 02406-68).

Catholic Relief Services

Has sponsored or supervised over 100 projects in the Philippines which include gardening, beekeeping, pig and poultry efforts, as well as other small scale development schemes. See Villareal 1970.

Thailand

Meals for Millions/ Freedom from Hunger Foundation

Carried out baseline studies in 1982 for an Applied Nutrition Project. In coordination with many other agencies, also began promotion of "backyard gardens" and pond aquaculture, among other acti-

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vities.

Asian Vegetable Research and Development Center

(See listing under Taiwan). Is introducing, with USAID support through the Kasetsart University and the Ministry of Agriculture, its model of the Thailand home garden and AVRDC-researched market gardening techniques. See Gershon 1983.

Taiwan (Republic of China)

Asian Vegetable Research and Development Center (AVRDC)

PO Box 42
Shanhua
Tainan 741, Taiwan
Phone: Taiwan 064-837801

Researches and publishes technical reports on ten tropical vegetables: tomatoes, Chinese cabbage, sweet potatoes, soybeans, mungbeans, radish, mustard greens, common bean (*Phaseolus*), pepper and cauliflower. Develops model home gardens and model intensive vegetable small farm units. Maintains a library devoted to vegetable crop research, including +8,000 monographs, 947 serial titles, 8,000 bound volumes and documents pertaining to the crops listed above. Also maintains a large collection of seeds for these crops, and is developing computer tapes of skeletal germ plasm data. Answers inquiries; provides advisory, consulting, training and reference services. Publishes **Centerpoint** as a popular news magazine, and technical bulletins, bibliographical compilations and other documents. A list of publications, which are free to anyone in a developing country, is available. (NRCM 08/83 PUB69-17030). Consult **AGRICOLA** for a list of AVRDC publications. AVRDC has measured and modeled the nutritional output of its demonstration ("model") home gardens. AVRDC transfers its research and plant propagation materials through training courses and conferences held at the center, and to ministries of agriculture of cooperating countries in the Asia region which, together with USAID and private US foundations, support AVRDC. See Gershon 1983.

SOUTH ASIA (SUBCONTINENT)

Bangladesh

CARE

Operates several projects in Bangladesh. The Kashimpur Agricultural Development Project, with BARC and Agrani Bank promotes vegetable gardening, poultry/egg production and root crops, among other activities. In an experimental component, 130 landless farmers will be provided with seed, fertilizer and extension services on a loan basis to grow vegetables on plots which CARE rents. Deep Tubewell Irrigation Credit--Pilot component features CARE female extension workers assisting women in 30 villages to begin raising poultry, cultivating

home gardens and fruit trees. Primary Health Care, with MOH, demonstrates to and trains women in cultivating fruit trees and Vitamin A rich vegetables, raising and vaccinating poultry and improving nutrition and child care practices, including oral rehydration techniques, in 110 villages of thanas (districts) of Tangail, Kaliakoir and Mirzapur. CARE also encouraged villagers to substitute more nutritious vegetables in their established home gardens (Schwartz 1980). Promotion of home garden establishment or improvement has been particularly successful in the Women in Development components added by CARE to integrated rural development projects. See Laumark 1982.

OXFAM

Has supported gardening projects of the Seba Sangstha Rangpur Medical College students' dispensary, the Haluaghat (Mymensingh) community program, and the Peoples' Health Centre at Savar, near Dacca. This hospital produces soya and sells soya milk and biscuits. Two outreach "para-agros" trained at the center who work with paramedics tend each demonstration garden in the villages, together with one hired agricultural laborer (Pacey 1978).

India

Karnataka State

Rural development projects of diverse sponsorship have introduced sericulture based on mulberry trees, generally planted near houses for income production, and have organized or helped to finance the digging of wells used to hand irrigate intensive orchard and vegetable gardens, especially after a disastrous drought in 1965, followed by flooding in 1966 which devastated the tank (reservoir) system of irrigated field crop cultivation in the state. The shallow straight sided wells (roughly 35 per side) could be dug by village labor forces working with hand tools.

Kerala Composite Program

Operated by CARE and the Department of Rural Development and Local Administration, the program includes kitchen gardens, poultry units and nutrition education (CARE internal documents).

Institute of Cultural Affairs

13 Sankli Street
Byculla, Bombay, India 400-008
Phone: 373741

Maliwada was pilot village for a model of auto-development extended by volunteers to 232 other villages in the state of Maharashtra. Home gardens are one option offered villages, which elect in their own plans to remedy health and nutrition problems.

Murugappa Chettiar Research Centre

Madras 600-41, India
Technologies transferred to rural farmers include biodynamic intensive kitchen gardening, solar dryers, and other appropriate technologies related to gardening.

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Permaculture Bombay

2 Flower Mead
w Field Est. Bhulabai Road
Bombay, 41126, India
Contact: Shankar Ranganathan

India's unit of the Permaculture Institute and Network designs and promotes gardening on several scales with perennials.

Applied Nutrition Projects

Historically, India conducted one of the most massive series of ANPs in the world. With the assistance of FAO, UNICEF, WHO and other agencies, India began a pilot applied nutrition program in 1959 in four states, which expanded in the first decade to 16 states and 6 union territories (Purvis 1969). Documentation includes Hegdekatee 1977 on the school and community gardens of Mysore state; Rao 1975, and Blumenfeld 1968 and 1970a discuss school gardening aspects of the ANP. Menon 1975 profiles attitudes towards home gardens in Kerala. General evaluations include Blumenfeld 1970b (FAO Report 10658-70) and Stewart 1970 (FAO Report 10184-70).

Nepal**Pakhribas Agriculture Centre****Horticulture Section**

In a northeast Nepal resettlement area, gardening is introduced through a modified T&V (or "Benor" training and visitation system). Unemployed youths are trained at the center, then employed, with modest wages, to introduce gardening. Some of these village level horticultural workers manage demonstration gardens and yard nurseries to produce seedlings. Government subsidizes the distribution of seed packets sold. The summer packet of 10 vegetables contains substantial amounts of Amaranthus and bitter gourd; the winter packets feature carrot, swiss chard, etc. Broccoli and other introduced vegetables have become popular. About 40% of area farmers have kitchen gardens—which are unknown elsewhere in the area. The purchase of seeds and use of relatively scarce animal manures for the gardens where no market opportunities exist demonstrate the high priority settlers place on the value of garden produce for home consumption. The horticulture program is one activity of the Center's comprehensive agricultural program. USAID is providing technical assistance.

Lalitpor Community Health Programme

United Missions to Nepal introduces kitchen gardens.

His Majesty's Government of Nepal and USAID Resource Conservation and Utilization Project 3670132 (FY 80-85)—Subproject includes planting fruit crops on marginal land and distribution of vegetable seeds to farmers with technical support.

LATIN AMERICA AND THE CARIBBEAN

Anguilla

Vegetable Garden Team

Blowing Point, Anguilla, West Indies

Contact: Eudine Romney, Administrator

Supported by a small grant from the Interamerican Foundation to cover the cost of purchasing fencing and gardening material, this group has organized two local projects to promote backyard gardening and vegetable production, and to teach unemployed youth to earn their living (IAF AG-001).

Antigua

Antigua Applied Nutrition Program (AANP) Meals for Millions/ Freedom from Hunger Foundation

PO Box 846

St. Johns, Antigua, West Indies

Contact: Ruth Spenser

Since 1982, has performed baseline studies for an applied nutrition project, developed three large community vegetable gardens and backyard gardens "involving 24 people" and given "comprehensive training in beekeeping" to 14 beekeepers, according to MfM literature and self-evaluations. The three large gardens were in fact developed on an earlier Caribbeana Council project. AANP is funded in part by a matching grant from USAID (PDC-0206-G-SS-2045-00). Grants from the Interamerican Foundation AN-009 have financed gardening projects in three schools, two community clinics and six neighborhood plots, and three area water supply projects through the Cooperative Farmers Association, Ltd., a legal cooperative established with MfM assistance. Representatives from six community gardening organizations constitute the cooperative, which trains their 70 members and provides financial assistance for gardening start-ups (IAF AN-009 1982).

Antigua Planned Parenthood Association

PO Box 419

St. Johns, Antigua, West Indies

Contact: Dr. Gweneth O'Reilly, President

Interamerican Foundation grant AN-010 supports small scale gardening and food preparation program designed to provide employment, increase nutritional standards and increase home food production.

BELINAH (Better Life Nutrition and Health Care Foundation)
Provides gardening workshops.

Caribbeana Council

Through 1982, studied feasibility of community vegetable gardens and demonstrated vegetable market gardens. Produce was first consumed as needed by gardeners to meet their families' nutritional needs and

surplus was marketed to local hotels on contracts arranged by this PVO, which is currently training Peace Corps volunteers who will be stationed in the Caribbean to promote similar undertakings.

Belize

Belize Honey Producers Federation

5 Authur Street
Orange Walk, Belize

This federation of local cooperative beekeeping societies collects and markets honey for member groups. The high quality honey is primarily sent to Europe as a flavoring for weaker, European honey. Maintains a central carpentry shop to produce hive boxes and boards, and organizes technical assistance. In Belize, bees are usually kept near house sites, and largely tended by men. Federation marketing has allowed honey to emerge as an important agricultural export. The Federation has received grant support from the Interamerican Foundation (BE-030), which also has assisted one of the federation's member cooperatives, the Stann Creek Beekeepers (BE-016).

CARE/ REAP

Belize City, Belize

CARE's Rural Education Agricultural Program (REAP) (1977 to the present) has established school gardens in the context of implementing an experimental curriculum to teach rural children agriculture. Peace Corps volunteers assigned to the program actually set up the gardens. In 1983, a gardening curriculum relevant to urban students (U-Reap) was piloted at St. Mary's school in Belize City and in Punta Gorda Town. Community organizations and USAID/Belize small project's fund have provided financial assistance to establish urban and town school gardens, and Peace Corps volunteers continue to garden. A new program will train school leavers from the REAP program to enter agro-businesses, including market gardening and beekeeping, and will provide a revolving fund for their use. Few family gardens have resulted.

Global Outreach

Vocational Technical School
Belize River, Belmopan, Belize

Opening in September, 1984, this vocational school for primary school leavers (boys) will teach gardening, among other appropriate technologies, and assist graduates to lease and develop 50 acres of land for their own farms, or to enter trades.

Ministry of Natural Resources

Belmopan, Belize

With financing from the International Fund for Agricultural Development, MNR will implement a marketing and production project for small farmers in Toledo District which includes a home garden component in the farm model. Existing house site production of fruit trees, pigs and poultry, and mixed agroforestry will be assisted. Project goals include improvement of the nutritional status of population, which

will be monitored in coordination with an on-going primary health care pilot project in the district.

Bolivia

Central Committee of Mennonite Volunteers

For several years, has promoted kitchen gardening and nutrition education through primary health care village level preventative systems. See Brownrigg, Harmen and Rasnake 1979.

Consejo Cultural de Promotores Campesino

Casilla 1064

La Paz, Bolivia

Organization of young Aymara men and women has developed vegetable and small livestock (chickens, rabbits, sheep, alpaca) projects in the altiplano with the assistance of the Interamerican Foundation (BO-085).

UNDP provided extension, research, a demonstration center and school gardens for an Applied Nutrition Project in the 1960's. See Perlaza 1967 (FAO Report No. 00782-67).

Brazil

OKFAM

Has supported three urban community gardening projects: at Teresino, Piaui (an experimental garden), a communal garden in a housing project in Parnaiba, Piaui, and at Mossoro, in Rio Grande do Norte (Pacey 1978).

An Applied Nutrition Project in Parnaiba worked mainly through 41 school gardens, although some 600 home gardens (some with fruit trees and chickens) were also promoted. See Stefanini 1969.

Chile

The following Chilean governmental organizations play or have played a role in the national school/family gardening program:

Ministry of Education

INACAP (National Training Institute)--trained teachers to be "school garden monitors," and provided educational materials. SNCE (National Employees Training Service)--provided scholarships for teacher training.

Ministry of Agriculture

IER--produced horticultural manual used in training, and provided training and its own facilities.

COMPAN (The National Council for Food and Nutrition)--sponsored pilot projects, and provided technical assistance and training for teaching nutrition.

Ministry of Health

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SNS (Servicio Nacional de Salud--National Health Service)--develops demonstration gardens at health clinics.

Others

INDAP--provided technical assistance to teachers and community members.

SAG--provided technical assistance to school and family gardens.

CONAF--provides technical assistance and materials for forestry.

SNA--provides technical assistance and, in certain areas, the magazine **El Campesino**.

CONIN--provides technical information and materials in home gardening and nutrition.

CORPRIDE--provides training and technical materials.

CEMA--contributes to the promotion and support of family gardens.

Women's Secretariat--promotes family gardens, trains women for gardening and supports projects.

Rural Foundation, Catholic University Diakonia--special projects and greenhouses.

International agencies financing or assisting the national campaign included: (1978-1981 only) US Peace Corps; (1975-1982 only) CARE; (1979 only) USAID through an operational program grant to CARE for Project 5130314 School-Family Garden (PD-AAH-982, PD-AAH-983, PD-AAH-984). Earlier efforts were assisted by FAO, UNICEF and WHO.

Nongovernmental organizations currently involved in home production promotions, among other activities, are noted below.

Chol Chol Foundation

Implemented a Mapuche Nutrition Education project with a small grant from USAID (see PES for project 513-0311), and continues to work in Chile.

Cooperativa Campesina San Nicolas de Hijuelas

Poblacion San Nicolas, Casa 3

Provincia de Quillota, Hijuelas, Chile

Contact: Rolando Pacheco Allendes, President

Women members of the cooperative established loan fund from the proceeds of an Interamerican Foundation Grant (CH-223), so that 100 families could begin home gardens and the production of small livestock to improve family diets.

Comision Coordinadora de Talleres Femininos de Coyhaique

Calle Subteniente Cruz 80

(Casilla 400)

Coyhaique, Aysen, Chile

Contact: Carmen Montiel, President

Committee conducts training courses for over 1000 members, organized in 40 women's workshops, in the areas of vegetable gardening, nutrition, and food preservation, among other topics. Receives grant from the Interamerican Foundation (CH-356).

Fundaciones de Vida Rural

Pontifica Universidad de Chile

Facultad de Agronomia

Sanitago, Chile

Mid-way evaluation of a home gardening project finds that 100% of the target families adopted the technique of continuous production as demonstrated, and an additional 2.7 families beyond the target group adopted spontaneously. Supported by grant funding from the Interamerican Foundation (CH-253).

Instituto Juan Ignancio Molina

Embajador Doussinague 1716

Santiago, Chile

Contact : Luis E. Pena, Director

Experimental farms at the institute demonstrate organic and subsistence farming to campesino and rural workers' families in the colina (hill) areas outside Santiago. The Interamerican Foundation provides grant funding (CH-285).

Colombia

Socas 1978 reviews FAO efforts, which included school gardens in Vereda de Taguales and Valle, and formation of a rabbit producers' association. (FAO Report No. 40400-78).

The production component of a now largely completed World Bank Nutrition project in Colombia evolved into an income generating and self financed and sustained effort for the beneficiaries. The original goal of promoting gardening to improve family needs was met, and the families so engaged gradually sold sufficient extra produce to give their enterprises important market garden aspects. (Personal communication, Joanne Leslie.)

Dominica**Giraudel Farming Centre School AnRoNat Farm (Andrew Royer Natural Farm)**

Giraudel, Dominica

Contact: Andrew Royer

1.2 acres (0.5 hectare) farm demonstrates intensive recycling farming techniques and trains a small number of students. Techniques involve horticulture and livestock production. The unit is not only self sufficient, but produces vegetables, eggs, herbs, flowers and other products for the market. Training aspects are supported by Interamerican Foundation grants. Publishes **Small Farming Newsletter** and is the first link in CARINET, a computer network for development information, sponsored by Partnership for Productivity, a US PVO. AnRoNat Farm has received additional support from Barclays Bank, the Dutch Rabobank International, and Youth with a Mission, Hawaii.

Caribbean Agricultural Research and Development Institute (CARDI)

3 Turkey Lane

Roseau, Commonwealth of Dominica

Contact: Herman Adams

Intervenes with on-farm experiments to design and establish a self

sustaining system producing food for farm kitchens (eggs, meat, and vegetables). Recently completed a survey of home gardening and nutritional studies, and expects to improve home gardening through extension agents.

Dominican Republic

Asociacion San Jose

Finca de Auto-Suficiencia Comunitaria
El Canal
Sierra Prieta, La Vega
Dominican Republic

The Peace Corps and USAID small projects fund are collaborating with the association's efforts in the development of gardens and production of penned ducks and cooped chickens.

Frente de Mujeres "Amantes al Progreso"

Parra
S.J. de Ocoa
Peravia, Dominican Republic

Another Peace Corps-USAID small project will assist 50 women on an integrated farm to produce small livestock, gardens, energy resources and edible tree products to improve nutrition and food production, with a possible eye to marketing surplus.

Fundacion para el Desarrollo Comunitario, Inc. (FUDECO)

PO Box 366-2, Centro de los Heroes
Santo Domingo
Dominican Republic

FUDECO's "Centros de Agricultura Organica y Tecnologia Apropiada" (CAOTACO) are funded by Save the Children (US), the Interamerican Foundation (DR-048) and other agencies. Gives four-day workshops to local country people on topics including raised bed vegetable gardening, composting, intercropping, poultry raising and non-chemical pest control.

Instituto para el Desarrollo del Suroeste (INDESUR)

Azua, Dominican Republic

Provides technical assistance to producer associations, including groups raising goats, keeping bees, and involved in other forms of food production and processing. Grant funded by Interamerican Foundation (DR-072).

Plan Sierra

San Jose de las Matas
Contact: Director, Blas Santos
Coordinator: LIC. Imaculada Adamas

Ecuador

Benson Institute/ Ministry of Public Health
 Pilot "small scale agriculture" project in the Portoviejo valley of Manabi Province has taken advantage of unseasonally profuse coastal rains to install vegetable production based on row cropping in field systems rather than house site gardens (Benson Institute Quarterly 1983:6:26-27).

Direct Relief Foundation

Volunteers implemented a mid-70's demonstration organic gardening project in Guayaquil and Milagro (Gailager 1976).

Ecuador Applied Nutrition Project—Meals for Millions/ Freedoms from Hunger Foundation

Casilla 5402

Guayaquil, Ecuador

MfM/FFH program supported by a USAID OPG is primarily sited on the Santa Elena peninsula. Program initiated a revolving loan fund (Andrade 1983), developed chicken raising at 23 sites in 1981, and, like the Benson Institute project, took advantage of heavy rains to encourage production of soy and maize with certified seeds on the peninsular desert. MfM's reports give little detail on the home gardening (per se) though they apparently cooperate with the Rotary Club of Salinas (Meals for Millions 1983:44), and 30 home gardens and three community gardens are cultivated by community women with assistance from MfM (:44). Six Peace Corps volunteers were assigned to this project in 1983.

Pre-Cooperativa Miraflores Quishuarpanba

Chimborazo, Ecuador

Feed for a rabbit and guinea pig communal enterprise is grown in a 15 hectare alfalfa field. Investments were made in: New Zealand and German silvered rabbits, 44 native Andean guinea pigs as breeding stock, construction of pens and hutches, and in alfalfa seeds. The Peace Corps assists (1983-1984), and USAID small projects fund provides financing.

Guatemala**CEMAT (Mesoamerican Center for the Study of Appropriate Technology)**

Apartado Postal 1160

Ciudad de Guatemala

Guatemala

Contact: Luz Mariana Delgado

Community development efforts include promoting family and community gardens, evaluating local edible and medicinal plants, and demonstrating composting and other appropriate technologies. Publishes manuals, guides and a periodic newsletter in Spanish. Performs research and development prior to extension--for example, recent research on an experimental aquaculture micropond technique was

deemed too costly and risky to extend. Receives broad support from European appropriate technology sections of development agencies, and the United States public foundations, ATI and IAF. CEMAT's documentation center for appropriate technologies is the most complete in Latin America, and is a source for manuals and "how to do it" leaflets in Spanish.

Chinese Technical Agricultural Mission
Embassy of China
7a Avenida 1-20 Zona 4
Edificio Torrecafe 12 nivel
Guatemala

Currently operates "pilot home gardens" and dietary and nutrition education projects in La Maquina (southwest Guatemala), and elsewhere (personal communication, Fernando Barneord).

Direct International Development/ Direct Relief Foundation

This experimental project attempted to demonstrate French intensive biodynamic gardening in tropical areas (with all too temperate zone vegetables). Two sites were in Guatemala, and apparently failed to overcome pest problems or disseminate any techniques. A USAID OPG funded the effort.

In a Peace Corps School Gardens and Nutrition Project, organic methods were used for school and family gardens. Students were encouraged to take plants home, and after a year of gardening at schools, work shifted to technical assistance to home gardens. Hoyt and Stout 1976 reported their experiences. Peace Corps volunteers continued to assist as of 1983, with USAID and CRS contributing vegetable seeds (USAID/Guatemala PC/G-83-11-1AA).

World Neighbors and Plenty

World Neighbors in Chimaltenago, and Plenty in earthquake-affected areas both formerly promoted intensive vegetable gardening and fruit tree cultivation, and introduced soy production. Both PVOs withdrew from work in the country after the safety of their volunteer extension workers and families participating in their projects were compromised.

Haiti

Adventists Development and Relief Agency Seventh-Day Adventist World Service (SAWS)

PO Box 1339
Diquini, Port-au-Prince, Haiti
Contact : J. Fulfer

SAWS Haiti / AID Matching Grant (1982-1985) will establish demonstration home gardens at mother-child clinics and at some homes. See Syme and Marchant 1983 and Harrison and King 1983.

Global Outreach

Operates a vocational technical high school on 60 acres of land near Port-au-Prince where gardening, small livestock raising, dairy operations and other subjects are demonstrated and taught. At Cape Haiti, this NGO supports a poultry project--hens, cages and technical assistance are provided as a package. Each hen produces US\$ 10.50 worth of eggs, and flocks of 20 hens are encouraged.

Holy Cross Fathers

College Notre Dame

Cap Haitien, Haiti

Provides non-formal education and credit to community groups for a regional program of reforestation and amelioration of food crop production. Supported by Interamerican Foundation grant HA-060.

USAID Emergency Food Production Project 5210150 apparently has some promotion of home food production. See PD-AAI-305.

Honduras**ACORDE**

Apartado Postal 163-C

Tegucigalpa

Honduras

Contact: Jose Elias Sanchez (1981)

Agriculture Sector II Program, USAID project 522-0150 includes sub-project for promotion of home gardens. See USAID PD-AAL-664.

CARE

USAID OPG 522-0170 Rural Pilot School Development Program supports CARE efforts. As of April 1982, 18 pilot schools were raising rabbits, keeping bees or cultivating vegetable gardens. One Peace Corps volunteer is assigned to each participating school. In one area, a number of family gardens have been initiated.

Federacion Hondurena de Mujeres Campesinas Region de Occidente

c/o ASEPADE, Apartado Postal 444

Tegucigalpa, Honduras

Contact: Isabel Ochoa and Rosa Dilia Rivera, Directors

Among other activities, women's community development program includes home gardening--300 family vegetable gardens and 6 chicken units--among sixty groups in the Western part of the country. One goal is to improve dietary and nutritional practices. Receives grant funding from Interamerican Foundation HO-058.

Global Outreach

Operates a community development program at three locations in Honduras where home gardening is promoted: La Ceba, Tomate and Puerto Lampira. At Puerto Lampira, a seminary for Misquito Indian boys, each student is taught gardening, tends his own plot in the school garden and, after graduation, is responsible for beginning a demonstration garden and teaching gardening in his community.

**Honduras Applied Nutrition Program
Meals for Millions/ Freedom from Hunger Foundation**

Apartado 1693
Tegucigalpa, Honduras
Contact: Zoila Alvarez

ANP pilot project is located in nine villages of the Department of Olancho. An experimental garden is demonstrated at the Zopilotepe training center and, in 1983, 58 vegetable gardens and six school gardens "flourished". Rabbit raising workshops are also held at the center. Food supplements were distributed to a control population of closely monitored children. Various USAID grants to MFM assisted in financing, though 90% of the project is conducted on private funds.

Ministerio de Recursos Naturales (Ministry of Natural Resources)
Family Consumption Project

According to Brineman 1983, this program to improve food consumption had problems with transportation, administration, personnel and supplies.

Valle de Angeles Hospital Project / Seventh Day Adventist World Service

Francisco Morazan, Honduras
1982-1984 project of the Seventh-Day Adventist World Service under a matching grant from USAID involves promotion of home gardens as a means of improving the health status of mothers and young children in eight rural communities. See Syme 1983.

Jamaica

Catholic Relief Services (CRS)

CRS implemented a joint nutrition project with the Ministry of Health (1971-1976) in the parishes of Hanover, Portland and St. Thomas, and cooperated with the "Small Farmers' Support Project" (actually a household food production effort) in 1977-1981, in rural St. Andrews and rural St. Catherines. Both projects promoted home gardens and small livestock production. See Peat 1976, 1984.

Second Integrated Rural Development Project at Christiana, financed by AID, added a "women's component" to promote small, intensive home gardens designed by Martha Lewis and extended by women trained in the gardening techniques. See Chaney 1981.

Mexico

Comite de Servicio de los Amigos (American Friends Service Committee)

Ignacio Mariscal #132
Colonia Revolucion, 06030 Mexico, D.F.
Phone: 5-35-37-88, 5-35-27-52, 5-66-62-05

This long-standing program of community development in Mexico involving generations of volunteers featured several promotions related

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to home gardens and household food production (as of 1982). In Vicente Guerrero, Tlaxala, the Friends demonstrated the biodynamic French intensive system of organic horticulture, provided assistance to fruiticulture, and assisted a general program of household auto-sufficiency based on household production of meat, eggs, vegetables and milk. In Tacambaro, Michoacan, where the intensive horticulture method was in a stage of experimental demonstration, the self sufficient food production focused on brooding hens, rabbits, greens, and "frijol volador" (*Psophocarpus tetragonolobus*), as well as solar dryers and milk goats, integrated with nutrition education and the introduction of more energy efficient stoves.

Casa de la Cultura Municipal

Biblioteca Publica Federal
Vicente Guerrero, Durango
Phone: (91 181) 5-00-88

Offers training in apiculture, horticulture, and the establishment of ecological centers (casas ecologicas) in communities.

Casa Ecologica C.E.E.S.T.E.M.

Avenida Porfirio Diaz #50
San Jeronimo Lidice
Mexico 20, D.F.

(Km 10- Carretera San Martin-Tlaxcala, Ixtacuixtla)
Performs research on minor crops, and demonstrates biodynamic intensive vegetable production.

Comunidad para el Desarrollo Rural A.C.

Calle 215, No. 107
Colonia Mexico
Merida, Yucatan

This university based nonprofit organization has extended vegetable gardening and communal pig production in the Maya communities of Cozumel and Homun.

Instituto de Tecnologia Apropiada, A.C. (ITA)

Avenida Gustavo Baz #1015
Cerrada Abraham Lincoln #7
Tlalnepantla, Estado de Mexico
(Apartado Postal No. 63-254, Mexico, D.F.)
Phone: 3-97-89-86

ITA's principal endeavor is to establish the production of nonconventional foods through "integrated farms" (granjas integrales), recycling organic wastes into tilapia and polyculture fish ponds and biogas production. A special program develops approaches to arid zones. This government agency works through the National Indigenous Institute and other Mexican government agencies in rural areas with the lowest incomes, and has close links to university research programs in agriculture and renewable energy engineering.

Instituto Nacional de Investigacion de Recursos Biologicos (INIREB)

Km. 2 1/2 Antigua Carretera Coatepec
Xalapa (Jalapa), Vera Cruz, Mexico
Phone: 7-50-84, 7-50-85, 7-50-90

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Carries out research, development, training and extension for the "integrated farm" (finca integrada), combining pond tilapia pisciculture with chicken production, for intensive horticultural production of fruits and vegetables, and for several forms of aquaculture: lagoon osticulture and floating cage tilapia, streambed semi-cultivation of crayfish, and pond pisciculture. One of INIREB's most significant contributions has been to research and demonstrate the intensive wetlands raised bed/drainage technique now popularly known as "chinampas," and to train modern farmers to use a large demonstration track of chinampas in Tabasco for the intensive production of market vegetables and fruits, as well as for self sufficient production. Maintains demonstration plots and a vocational post-primary school for the sons of farmers, and carries out training workshops in villages throughout southeast Mexico. INIREB is also carrying out basic ecological studies and an inventory of the biological resources (both wild and cultivated) of Vera Cruz and near-by Mexican states, and maintains a botanical garden; activities which attract researchers to its graduate school. Publishes popular booklets in Spanish on particular crops and techniques of production, as well as a scholarly journal and conference proceedings on intensive agricultural production systems. INIREB is affiliated with the University of Vera Cruz State, and supported by public funds and private sources, including the Ford, Rockefeller, and Interamerican foundations.

Promocion Ecologica Campesina, A.C.

Avenida Constituyentes # 399, 8o piso
 Colonia Americas, 11820 Mexico, D.F.
 Phone: 2-71-40-55
 Calle San Ignacio #2438
 Colonia San Manuel Sucursal J
 72570 Puebla, Puebla

Promotes an integrated community development approach called "Conjuntos Ecologicos Autosuficientes" (COEA--Self Sufficient Ecological Complexes), which includes fruit and vegetable production, and poultry and rabbit household production systems.

(References for Mexico include 1982 notes of the Grupo Coordinador-Motivador de la Red Informativa de Apoyo, supplied by Tomas Fricke of ATI, and unpublished AMARU reports on Mexican Appropriate Technology organizations based on field visits.)

International Center for Wheat and Maize (CIMYT)

Though not currently active in gardening, conducted horticultural research and outreach during its initial years with support from the Rockefeller Foundation, and established some home gardens locally. After specialization in grain crops, this line of activities ended (Bittenbender 1983).

IIISEO, Oaxaca (Interamerican Indigenous Institute Southern Oaxaca Project)

Gardening extension was part of a community development effort which included "community clean-ups" and installation of latrines and windows, according to Socas' 1978 review of community level development projects (FAO Report 40400-78).

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Peru**United Nations University**

Apartado 5969 (a/c Centro Internacional de la Papa/International Potato Center)

Lima, Peru

Contact: Vera Ninez Rhoades

Currently sponsoring research on kitchen gardens.

FAO provided technical assistance financed by UNDP to an ANP which concentrated on demonstration centers, extension and school gardens. See Perlaza 1967.

St. Lucia

Ministry of Agriculture

Union Agricultural Station

Castries, St. Lucia, West Indies

Contact: Henry H. Lubin

Promotes home gardening (which is fairly common in rural farming areas for the production of lettuce, cabbages, tomatoes, beans and root crops such as dasheen, yams and tannia, but less common in urban areas where gardening focuses exclusively on vegetables), through lectures, seminars, radio talks and assistance from extension officer.

OCEANIAFiji**Navua Health Center**

A mother-child clinic demonstrates home gardening techniques, assisted by the US Peace Corps. Excess production is sold to help support the clinic. The Peace Corps also assisted school gardening projects.- See Anonymous nd.

Papua New Guinea**Appropriate Technology Development Institute**

Lei, Papua New Guinea

Develops demonstration gardens.

Wau Ecology Institute

Box 77

Wau, Morobe Province

Papua New Guinea

Since 1976, has researched and extended an experimental sustained yield compost ridged and tree crop garden. International Voluntary Service, United Nations University at Toyko and New Zealand Aid assist with financial contributions or volunteers. See Gagne 1978-79

Fitzpatrick nd, and Swift 1980, 1981.

NEAR EAST AND NORTH AFRICA

(Pederson 1967 reports on a FAO/UNICEF Home Economics program in several countries of the Near East (FAO Report 00371-67). School gardens were a part of this program.)

Iran

Several reports on the apparently successful mid-1960's Freedom from Hunger Campaign, implemented through a Home Extension Program, include: Eaton Evans 1969, Aghevli 1967, and Southerland 1967. A prominent goal was establishing home gardens as well as teaching nutrition and new forms of food preservation.

Morocco

Parisot 1968 describes how volunteers were organized to promote family gardens and poultry production in rural areas as a part of the development of Home Economics (FAO Report 04086-68).

Tunisia

Permaculture Tunisia

Les Hauts de Gammarth
2070 la Mar, Tunisia
Contact: Abdellaziz Matahari

Save The Children

In areas where water is more readily available, many vegetables are grown in a jumble of intensive gardens where rabbit pens (traditionally six foot deep holes in the ground with mazes of tunnels burrowed in all directions) are actually within the garden enclosure. In an efficient recycling system requiring a minimum of physical effort, rabbit manure is scooped out of the holes and applied to the garden, and vegetable wastes are fed to the rabbits. Mint, parsley and onions grow among artichokes, cucumbers, squashes and tomatoes, providing aromatic pest deterrents.

APPENDIX C: GARDEN BIBLIOGRAPHY

(** indicates documents on file at L.I.F.E.)

A-Authors

Abdelsamie, R.E. **

1979 Performance of Ducks under Semi-Intensive Management in Papua New Guinea, Papua New Guinea Agricultural Journal 30:4:51.

Reports on experimental introduction of duck raising in Situ and Gobari in Morobe Province, PNG. Muscovie ducks had higher survival rates and achieved heavier bodyweights by six weeks than Pekin. Over 30% of the ducks supplied to villagers did not survive the three month trial. Losses were attributed to disease, predation by pigs, hawks and dogs, and theft. Pilot undertakings were profitable. Costs of day old ducklings and feed for night confinement complementing the open range system were covered, and some profits were realized.

Abdoellah, O.S.

1977 Distribution of Fruit Trees in Home Gardens on the Cotarim River Basin, West Java. B.Sc. Thesis, Department of Biology, Padjadjaran University, Bandung, Indonesia. (Mimeograph, in Indonesian)

1978 Research on Home Gardens in Pananjung Village, Pangandaran, West Java. Internal Report, Institute of Ecology, Bandung. Summary results of these studies of traditional gardens in Indonesia are reported in Soenarwoto and Soenarwoto 1979 and 1981.

Abdul Hamid, Ahmad Sarji bin

1977 Consumers' Views of Seeds, IN: Seed Technology in the Tropics, H.F. Chin, I.C. Enoch and R.M. Raja Hsarun, editors: 191-196. Sercang, Selangor, Malaysia: University Pertanian, Malaysia.

Farmers and gardeners in Malaysia complain there are too few seed suppliers too far away, causing transport problems. Seeds, mainly imported, are high priced, have low germination rates, are sold in lots with many broken or dead seeds, are infested by fungi and insects, and are of doubtful genetic purity.

Accati, Elena Garibaldi **

1983 Women's Role in Horticultural Production in Developing Countries : Expert Consultation on Women in Food Production. Food and Agricultural Organization Paper ESH :WIFP/83/5. Rome, Italy : FAO.

19 pages, tables, references : 17-19; T=51

Reviews regional patterns of women's activities in horticulture and recommends national programs, research, policies and project designs

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to enhance their role. States "women should be a target group in all horticultural development programmes," based on their importance in vegetable and fruit production or food processing. Review overgeneralizes from scattered examples in different world areas, and references do not perfectly match the text. Recommendations stress commercial horticulture, which Accati previously surveyed in the Ivory Coast ("maraicheres") and in Kenya, where women cultivate family plots, ("shamba") for home production of sweet potatoes, tomatoes, beans, onions, etc., and have begun to produce flowers for export on their small 50-200 square meter plots.

Achmed, H., A Martadihardja and Suharto

1980 Social and Cultural Aspects of Home Gardens, IN: Tropical Ecology and Development, J.I. Furtado (ed.): 453-457.

Analyzes economic factors of traditional home gardens in Indonesia.

Adegboye, R.O. and A. Abidogiu **

1978 Part-time Farming in the Ibadan Area in Western Nigeria, IN: The Agricultural Entrepreneurship of Upper Income Africans, R. Lawson, editor.

Year long study of 50 part-time farmers of peri-urban Ibadan, Nigeria, which found that: 1) the majority (48) received regular salaries at the upper end of the income scale for work as executives, intermediate technicians, professional administrators, or managers; 2) 15 began part-time peri-urban farming to produce food for home consumption as a means of cutting the rising cost of household food bills, 13 began to earn extra income from market gardening and 6 began for both reasons; and 3) all part-time farmers used more sophisticated methods and had farms larger than the average sized food farms in Nigeria. Maize and perishable vegetables were leading crops. Procurement and supervision of labor was a major problem, as most only commuted on weekends to their farms in off-road peri-urban locations. After farming for five years, most realized profits from sales to local markets. Generally, "recent evidence on the extent of part-time farming in Nigeria indicates that increasing amounts of foodstuffs which are produced by part-time farmers are reaching the market, and production for sale, as distinct from production for subsistence, is becoming increasingly important." The entry of upper income technical-professionals into foodstuff farming, rather than poor urbanites, can be explained by the rising cost of peri-urban land, requiring savings for investment, and the lack of any lending programs for part-time farmers.

Ad-Hoc Group for Family Food Production **

1983 Agenda Items 2&3 World Food Council Ninth Ministerial Meeting, June 27-30, 1983.

3 pages.

Administrative Committee on Coordination (ACC) of the UN System

1979 Possible Actions by Governments to Improve Human Nutrition,

Food and Nutrition Bulletin 6 : 2 (February): 24-26.

In recommendations submitted to the World Food Council by the ACC in Mexico, six priorities are given: 1) appraisal of world nutritional status; 2) actions in the area of food production, storage and marketing; 3) support for the "ideals of nutrition" by all relevant sectors; 4) targeting nutrition interventions to groups at risk; 5) involving families and communities in nutrition improvement; and 6) mobilization of external cooperation and assistance to finance target nutrition interventions on sufficient scale.

Adventist Development and Relief Agency (ARDA) **

nd Solusi Scientific Gardening Project.

4 mimeographed documents.

Collection of internal documents provided by the Adventists evaluates the progress of training in an organic method which was given at an Adventist agricultural school to participants from surrounding communities. One index is the number of consumer durables (bicycles, radios, etc.) purchased by graduates from the proceeds of the gardens they established.

Aghevli, Ezzat **

1967 The Home Extension Program in Iran. Paper presented at the CENFO Treaty Organization Conference on Agricultural Extension, Ankara-Denizli-Izmir, Turkey.

S 530. 3. C4 1967

A Home Extension Program within the Agricultural Extension Program promoted various improvements in rural Iran, where women contribute to field crop work and primarily perform work related to poultry, animal husbandry, dairy, fruits, and vegetable production as well as to preparing food, preserving seeds, and storage. To improve the family diet, home extensionists encouraged the establishment of home vegetable gardens, preservation of fruits and vegetables and improvement of poultry flocks, and taught principles and cooking practices of enhanced nutrition. Gives a case history about one rural woman.

Agricultural Productivity Commission **

1968 Nutrition Activities of the Home Economics Program Division, Agricultural Productivity Commission. **Philippine Journal of Nutrition** 21: 4: 253-257.

This Philippine organization considered food and nutrition as one of the five "phases" of homemaking they promoted. "Home Management Technicians" demonstrated and taught food production, including gardening in limited spaces and growing vegetables in cans, pots or plastic bags. Field personnel established seed banks in local communities, and organized seedling exchanges among neighbors and "pig chains" (piglets awarded to the homemaker who cares for a sow). Three kinds of fruit trees for home lots and "Share for Progress garden kits" were distributed free. About two homemakers adopted per demonstration. For example, between 1966-1968, 43,842 vegetable gardens were demonstrated and 81,479 homemakers "followed the practices;" 19,340 improved poultry flocks were demonstrated and 41,417

adopted the model.

Aguillon, Delfina B. and Rita D. Acosta

1967 Nutrition Programs in Quezon City and Isabela, **Philippine Journal of Nutrition** 20: 4: 162-179

Nutrition councils in the Philippines promote the inclusion of nutrition considerations in programs of various agencies, including hospitals, schools, government agricultural bureaux, and private organizations. Surveyed organizations reported 13 types of nutrition projects undertaken in 1967, and a total of 22 projects. These included livestock and crop production (6 projects), home gardening (2), and seedbanks (1).

Ahmed, I. **

1983 Technology and Rural Women in the Third World, **World Agriculture : IFAP News** 32: 11-12 (November-December): 7-8.
Summary version of article of same title published in the **International Labour Reviews** 122: 6-ff.

Calls attention to the displacement of women's roles in agriculture as mechanization is applied and the land they use to produce food for home consumption is converted into cash cropping. This leads, in some cases, to an inverse relationship between areas under cash crop production and the level of household food consumption. Examples are given from Asia and Africa and for High Yielding Variety (HYV) rice technology, improved maize, and oil palm.

Ahmed, Md. Muzaffar **

nd Home Gardens in Bangladesh : A Case Study of Four Selected Tea Gardens.

Typed ms, 7 pages.

Results of a survey of workers on four "tea gardens" (tree crop plantations) in the Balisherra Valley, Sylhet District, Bangladesh, revealed that 100% of the households produced fruits and vegetables on the homestead land allocated for their use and residence by the estate management. Average kitchen garden size is 2,473.51 square feet, and the range is from 332 to 7,747. Average family size is 5.03 persons, lower than national average and reflecting female participation in the estate work force. Gives detailed statistics on garden sizes, and percentage growing each of several vegetables and fruits. Invites voluntary agencies to develop vegetable gardening for the self-help of tea estate workers, by distributing seeds and promoting cultivation techniques for varieties of vegetables more nutritious than those currently grown. Calls for "action kitchen garden program" to benefit unemployed (laid off) workers who are predominantly women.

Alderman, M. and A.D'Souza

1975 Improvement of Young Child Nutrition in Hanover Parish, **Cajanus** 8: 3: 203-204.

Local health aides identified malnourished children in Jamaica and

1972

helped families improve utilization of available foods, a method known as the Elderslie nutrition program. Malnutrition is reported to have dropped 60%.

Allen, William

1965 The African Husbandman. New York : Barnes and Noble, Inc.
HD 2062.A4

Classic work on traditional African agriculture describes production systems of groups by name and location. Some systems have been supplanted since publication, but this remains an essential source.

AMARU IV Cooperative, Inc.

1980 The Once and Future Resource Managers: A Report on the Native Peoples of Latin America and Their Roles in Modern Resource Management: Background and Strategy for Training. Washington, D.C.: World Wildlife Fund.
97 pages plus 23 pages references, iv, line drawings, tables, plant lists.

State of the art paper reviews research on the knowledge and management of the environment by native cultures in Latin America. Summarizes studies of ethnobiology and indigenous technologies, including major variants of swidden agriculture. Notes Maya "caanche" and Andean small livestock patterns. Compiles lists of major types of domesticated plants--maize, beans, root crops, and tree crops.

Anderson, Edgar

1954 Reflections on Certain Honduran Gardens, Landscape
4 (1) :21-23.

In this pioneering study of Honduras, the definition and typology of "dooryard" gardens introduced a term referring to all plants near a house and the spaces they define. The concept of the "dooryard" was adopted by researchers from the disciplines of landscape architecture, geography, and ethnobotany.

1967 Plants, Man and Life. Berkeley and Los Angeles, California: University of California Press.
251 pages, illustrations, bibliography.
NAL SB.A5 1967

"Home gardens" are defined, on the basis of Mexican examples, as a general system of plant production.

Anderson, J.N.

1976 Dietary Changes in West Coast Malaysia: Context and Consequences. Paper presented at the American Anthropological Association Meetings at Washington, D.C.
(ms).

1980 Traditional Home Gardens in Southeast Asia : A Prolegomenon for Second Generation Research, IN: Tropical Ecology and Development (Proceedings of the 5th International Symposium

(19)

of Tropical Ecology, April 16-21, 1979 at Kuala Lumpur, Malaysia), J.I. Furtado (editor): 441-446. Kuala Lumpur: The International Society of Tropical Ecology.

Concludes with a strategy and detailed design for researching mixed gardens' constituent cultigens and ecological "effectiveness," as well as the end uses of garden products, socioeconomic aspects, and other characteristics and claims reported in the literature. Regards mixed gardens as a key to self reliance and sound eco-development in the Asian tropics.

Asare, J.F.

1969 Sierra Leone : The Role of the FAO/UNICEF Assisted Family Nutrition and Home Development Programme in Community and Social Development. Report to the Government. CEP Report No. 58. 08171-69 MR. Rome, Italy : Food and Agriculture Organization.

34 pages, 9 tables, 4 appendices with 21 references.

Describes a pilot ANP in Sierra Leone which had a limited gardening component.

Atkinson, Daisy E. **

1967 Report to the Government of India on Nutrition Education and Training in the Applied Nutrition Program with Special Reference to South India. CEP Report No. 42 NU: TA/67/21. Microfiche 02353. Rome, Italy : Food and Agriculture Organization.

Describes nutrition education within the women's programs of the Indian ANP 1966-1967, signalling that the training at the palwadis kindergarden preschools' meal program was effective. Notes assistance of American Peace Corps and Canadian University Service (CUSO) volunteers, and contributions of nongovernmental organizations, such as the Christian councils of India, to the work of the ANP.

Austin, James E., M. Mahin, D. Pyle, and M. Zeitlan

1978 Annotated Directory of Nutrition Programmes in Developing Countries. Cambridge, Massachusetts : Harvard Institute for International Development.

General resource for locating nutrition projects. No special attention is drawn to gardening components.

Austin, James E. and Marian Zeitman, editors

1981 Nutrition Intervention in Developing Countries: An Overview. Prepared by the Harvard Institute for International Development for the Office of Nutrition, Development Support Bureau, United States Agency for International Development. Cambridge, Massachusetts : Oelgeschlager, Gunn and Hain. 227 pages, tables, bibliography pp. 147-208.

No word is given on production for consumption in this overview report for a series of seven special studies, each of which is represented in this volume by a chapter. Topics include supplementary

feeding, nutrition education, fortification, formulated foods, consumer price subsidies, agricultural production and technical change, and the integration of nutrition in primary health care. A model in Chapter Nine, "Agricultural Development, Technical Change, and Nutritional Goals," by Richard H. Goldman and Catherine Overholt, (pp. 111-121) posits that increased production lowers food prices for some and increases farm income--the model T theory. They note that different changes affect different people, thus lower prices benefit the urban poor; more inputs benefit non-farm labor; farm employment benefits agricultural labor (but can have opposite effects); increased output benefits farm families, and increased marketing benefits farm income and non-farm labor.

Axelson, Marta L., Claire Monod Cassidy, Maria M. de Colon, and Karen Eide Rawlings *

1982 Consumption and Use of the Winged Bean by Sri Lankan Villagers, **Ecology of Food and Nutrition** 12: 127-137.

Among other observations, gives information on Sri Lankan home gardens among the Sinhalese Buddhist rural middle class in Colombo, Kandy, Kegalle, and Anuradhapura. Article documents the cultivation and dietary use of the winged bean in Sri Lanka. Most respondents grew two plants of a green-pod variety in their home gardens.

B-Authors

Bairagi, Radheshyam

1983 Dynamics of Child Nutrition in Rural Bangladesh, 173-178.

Baird, Joel **

1983 The Lake Gardens of Kashmir, **Garden** (July-August) 6-12.
Illustrated.

Raft gardens ("raads") and gardens built up at the shore of Lake Kashmir from lake mud and weeds ("dheem") built by the Mirbahahri ethnic group are described. These gardens are similar in concept to the floating gardens or "chinampas" of Mexico. The Mirbahahri live from foraging and home and market gardening. Formal lakeside gardens built by the Moguls in the 15th century are noted in passing.

Barbados Advocate (News)

1983 Vegetable Project Promising, **Barbados Advocate**

Newspaper account of current home gardening promotion in Barbados, cited as typical of helpful local publicity and media technical assistance.

Bassett, Thomas J. **

1979 Community Gardening in America, **Plants and Gardens** Brooklyn Botanic Garden Record 35: 1 (Spring, May) : 14-15.

In a special issue of **Plants and Gardens** set up as a handbook, Bassett sketches the history of community and school gardening movements in the United States.

Basson, Priscilla **

1982 Domestic Productivity in Male and Female Headed Households of Rural Jordan, **Ecology of Food and Nutrition** 12: 75-78.

Domestic productivity was defined in the study as "household procedures leading to the preservation of food for storage and later consumption." Food production in household gardens is lumped together with processed food from fields or purchased crops. Findings for Jordan: 1) Families consume most of the production of household gardens; 2) Grapes are the most important agricultural resource, rather than animals, vegetables or other fruits; 3) Families with wives working outside the home have the lowest levels of household productivity; productivity is intermediate for households where women engage in a cottage industry; the highest levels of household productivity are correlated positively with childbearing; the households with the greatest number of children generally produce more; 4) Wives living apart from husbands (generally because husbands are wage migrants living elsewhere) are more productive than women who share family responsibilities with a resident or weekend visiting spouse, (because they had access to cash from remittances to purchase raw foodstuffs for additional home processing); and 5) Women's roles do

not change dramatically upon male outmigration.

Beaudry-Darisme and M.C. Latham

1973 Nutrition Rehabilitation Centres: An Evaluation of Their Performance. Monograph No. 31. *Journal of Tropical Pediatrics* 19 : 3: 299-332.

Beckford, George L.

1972 Persistent Poverty : Underdevelopment in Plantation Economies of the Third World. New York: Oxford University Press. 303 pages, + xxvii, bibliography.

One of several overviews of the plantation economy as a social system, noted because allocation of home garden areas to resident plantation workers appears to be a common management characteristic of plantation systems (eg. see next entry).

Benjamin, C. **

1977 A Survey of Food Gardens in the Hoskins Oil Palm Scheme, Papua New Guinea, *Papua New Guinea Agricultural Journal* 28: 2-4: 57-71. Port Moresby, PNG : Department of Primary Industries. (tables, map)

Reports a survey of gardening areas in the settler blocks of a commercial smallholder oil palm colonization scheme in West New Britain, Papua New Guinea. Each settler family has only 2 - 2.8 hectares available for subsistence gardening in "back blocks" of primary and secondary forests and along roadsides where residences are aligned. The annual size of each family garden ranged from a third to half a hectare, and average garden life "was consistently recorded as one to one and a half years," perpetuating the traditional New Guinea bush fallow rotational or shifting system. Intercrops and relays traditional to the gardening of the different ethnic groups settled on the scheme were also perpetuated (for example, yam-mandi interplanting with taro among the Sepik). Exchanges of native cultivars, especially "green vegetables" ("kumus"--a generic term in pidgin), among ethnic groups has begun. Relatively shortened fallows (5-7 years), given the small areas available for food crops, are reducing yields. Benjamin predicts increased reliance on crops that can withstand shorter fallows, such as chinese taro, sweet potatoes and triploid bananas. Recommends introduction of soil enriching fallow cover crops, such as winged beans, cow peas, or other legumes. Per person per year average garden areas were at .058 ha--at the lower end of the range of garden areas analyzed as required for this environment (from .06-.12). Despite these constraints, some households also produced vegetables and roots for local marketing.

Benneh, G.

1972 Systems of Agriculture in Tropical Africa, *Economic Geography* 43 : 2-3: 244-257.

Typology of African agrarian systems supports generalization of vegetable production as a field crop cycle or relay.

Berleant-Schiller, Riva

1977 Production and Division of Labor in a West Indian Peasant Community, *American Ethnologist* 4: 2 (May):253-272.

Sexual division of labor between men and women on Barbuda, a Caribbean island, shown to correlate with subsistence and cash production.

Bindon, James R. **

1982 Breadfruit, Banana, Beef, and Beer: Modernization of the Samoan Diet, *Ecology of Food and Nutrition* 12: 49-60.

Comparison of the diet of Samoans on Samoa and in two areas where they have migrated shows greater variety on Samoa, where orchard gardens are common. In Samoa, diets include store-bought processed foods, which are the backbone of the outmigrants' diet.

Binkert, Gregor H. **

1981 The Economic and Nutritional Potential of Home Gardens in Southeast Asia. Unpublished (ms).

24 pages, bibliography p.27-32.

Contains a working definition of traditional home gardens, distinguishing these from commercial or market gardens. Stresses the "mixed" garden concept as most reflective of the ecological and social reality of tropical gardens in general, though no examples are given from tropical Africa or the tropics of South or Central America. Thoroughly reviews the literature from Indonesia and the Philippines, summarizing or quoting extensively from G.J.A. Terra's extensive writings, as well as more recent sources, such as Stoler 1975, Sommers 1978, and Soemarwoto and his colleagues.

Bittenbender, H.C. **

1983a The Role of Home Gardens in Rural and Suburban Family Nutrition in the Third World. Paper presented at the Association of Women in Development Conference, Women in Development--A Decade of Experience, October 14-15, 1983 at Washington, D.C.

Unpublished manuscript 14 pages, bibliography.

Up-to-date summary of recent literature covers gardening in the United States and in the "Third World," with critical comments on intervention strategies. Advocates Farming System Research (FSR) approach.

1983b Handbook of Tropical Vegetables. East Lansing, Michigan: Department of Horticulture, Michigan State University. Paperbound, 118 pages, illustrations (line drawings), bibliography, plant lists.

Prepared as a college textbook, this study synthesizes basic agronomic data on vegetables in four groups: fruit vegetables, leaf vegetables, legumes, and roots and tubers. Each profile of a particular vegetable includes scientific and English common names, names in other languages spoken in the major producing countries, chromosome

number, agronomic data on cultivation requirements, standard nutritional analysis, and references to further readings. Serves as a basic reference to popular tropical vegetables, as a model for crop fact sheets and as a guide to the literature on important vegetable crops. Core library selection.

Blaylock, James R. and Anthony E. Gallo **

1983 Modeling the Decision to Produce Vegetables at Home,
American Journal of Agricultural Economics (November):
722-729. References p. 729.

Applies statistical tests to examine the variable economic factors in US households' decision to produce vegetables. The data bases used include the Gardens for All 1981-1982 survey and USDA Nationwide Food Consumption Survey. Generally, 18% of the total money value of vegetables consumed by an average US household were produced at home, and average savings were on the order of \$0.78 per week. This is more than 20% of the amount non-gardening households spent to purchase vegetables. The following variables were found to influence the probability that a US household would garden: region (greater in the North Central region and least in the West), rural location, homeownership, ethnic group (with other variables controlled, Blacks garden less), and availability of adult labor. Households with members over age 55 were most likely to garden. Households consisting of only a lone adult or with preschool children were less likely to garden. Households with low incomes derived from labor were most likely to garden, and saved more on their food budgets. However, households with nonlabor incomes also chose to garden, reflecting the "opportunity cost" of time. Because study is based on a large sample, it levels the diverse population, ecological zones and market prices in the United States. Its methods, and the specific results of this study may be applicable elsewhere. It would be interesting to test the predictions about the characteristics of households likely to garden in another country where gardening was popular.

Blumenfeld, G. **

1968 School Gardens : Why and How, **Indian Horticulture** 12 :4
(July-September) : 31-34.

Article about school gardening in India gives tips on organizing the children, on garden layout and on tools. Asserts that the school garden should not be viewed as a production unit for school feeding, but as a learning experience. Warns against hiring a gardener ("mali"): "his existence automatically diverts responsibility from the children." Costs for installing a one-acre garden with vegetable, fruit tree, and well-nurseries-compost sections is given as Rs 10,000.

Blumenfeld, G.

1970 see FAO--based on the work of G. Blumenfeld

Bolton, Ralph and Linda Calvin **

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1975 Guinea Pigs, Protein and Ritual. Department of Anthropology, Pomona College, Claremont, California.

Draft manuscript, 42 pages, bibliography, appendices.

Guinea pigs ("cuyes) are raised in the kitchens of Andean rural and urban households, as it is believed they cannot survive without the smoke they "drink". As guinea pigs can sicken if bitten by spiders or infested with lice or fleas, smoke fumigation may be functional. Reviews reports in ethnographies of Andean communities of Cavia porcellus L production, gives ethnosemantic terms used in husbandry and life cycle details. Guinea pigs scavenge for kitchen scraps and are fed green grasses ("q'achu"). Analyzes flock management strategies as linked to meat production for calendrical rituals, thus distributing animal protein intake through the year, and at moments when people need to fortify themselves for the "hungry season" and cold weather. Optimal flock size is 15; minimum is two females and one male, and varies during the year. Flocks are larger when grass is abundant and are slaughtered with the onset of the dry season or when meat is needed for ritual feasts. Suggests guinea pig production is less important where swine displace their home meat production function, and because swine and guinea pigs compete for potato peelings and other kitchen scraps.

Borremanns, Valentina

1983 Appropriate Technology Which Lightens Women's Heavy Daily Task, **GATE—Questions, Answers, Information** 3 (September): 3-7.

Issn 0723-2225

Women's control over the hoe and the garden is one of the main areas reviewed as an example of how appropriate technology has helped women. "Thanks to the new alchemy of organic agriculture—cum—A.T., the recovery of the hoe by women is in no sense a romantic regression. Formerly undreamed of results can now be achieved with comparative ease." However, since about the same amount of land can be managed as a market (truck) garden or as a home garden in Chile, ways of using the garden are in conflict. A plot that can grow 35 species of vegetables, fowl and fish to sustain two women and five children could also produce enough for market to assure them a cash income. The choice of a subsistence strategy would mean better nutrition for all, according to the author, who is closely associated with the crusading priest, Ivan Illich.

Boylston, Hope

1980 School Garden Program Final Report. New York, New York: CARE.

8 pages

AID ISN=27 368, PD-AAH-985

Title suggests school gardens were the main emphasis, though the project formally intended that these demonstrations would inspire family gardens. For later results see Efides 1983.

Bressani, Ricardo

- 1983 World Needs for Improved Nutrition and the Role of Vegetables and Legumes. Asian Vegetable Research and Development Center, 10th Anniversary Monograph Series. Shanhua, Taiwan, Republic of China.
22 pages, 15 tables, references: 19-22.

General overview of the relative contribution of different types of vegetables to solving nutritional deficiencies reported in referenced national surveys.

Breure, A.L., M. Kabiran dan Awan

- 1976 Home Garden in the Kali Samin Watershed. Upper Solo Water Shed Management and Upland Development Project. FAO Upper Solo Management and Upland Development Project, Solo, Indonesia.

Describes an effort to improve home gardens in Indonesia.

Brierley, J.

- 1977 Kitchen Gardens in the West Indies, with a contemporary study from Grenada. *Journal of Tropical Geography* 43 (December) : 30 - 40.

Brodber, Erna

- 1975 A Study of Yards in the City of Kingston. Mona, Jamaican University of the West Indies, Institute of Social and Economic Research, Working Paper No. 9.
85 pages, bibliography

The "yard" is an urban Jamaican residential unit, here examined for structural and psychosocial properties.

Brownrigg, Leslie A., Inge Maria Harman, and Roger Neil Rasnake

- 1979) Appropriate Technology for the Bolivian Campesino : A Background Social Feasibility Study. AID Contract No. 511-193 T. Washington, D.C. : AMARU IV Cooperative Inc.

Comparative ethnographies of two Bolivian communities give information on home production, gardening, and tree crops. In Huaytu, a government colonization in the low, humid tropics of Santa Cruz, family gardening has been installed through the influence of successive development assistance efforts, particularly by Mennonite volunteers. Most vegetable gardens are grown during the fallow ("barbecho") cycle of swidden, somewhere on colonists' 10 hectare "lotes"; others are grown next to houses. Both types produce throughout the year; annuals are planted twice, in May and September. "In order of frequency, the garden crops are tomatoes, lettuce, onions, beans ("frejoles"), potatoes, carrots, radish, squashes ("hoco" and "zapallo"), bell peppers, peas, turnips, sweet potato ("camote"), oregano and other spices, and celery" (p.117). A variety of fruit trees is grown in orchards between one half to two hectares around the houses of some lots. Raising poultry (3-10 brooding hens, geese, ducks, and an occasional turkey) is nearly universal, and beekeeping is common. Some colonists raise pigs, whose free rooting causes

problems among neighbors. Snakes are a hazard for poultry, so the noisy and "brave" geese are favored. Surplus tomatoes, some fruits, and eggs are sold. In Yura, a traditional Quechua-speaking community in the dry highlands of Potosi, by contrast, only a few Yura have walled orchards, raise rabbits, or sow an early vegetable cycle on the walled, terraced and irrigated plots close to houses. The custom of corralling range animals (oxen, cows, llamas) in house courtyards, and their grazing of crop stubble makes the protection of orchards and the vegetable cycle difficult. Attempts to introduce poultry production fell victim to peste, a poultry virus. No guinea pigs are kept.

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C-Authors

Calavan, Michael A.

1977 Decisions Against Nature: An Anthropological Study of Agriculture in Northern Thailand. Center for Southeast Asian Studies Special Report No.15. Northern Illinois University.

216 pages, HD 2080.56.C3

This study gives garden crop strategies, time budgets, and Thai land use terms for the pioneering settlement of Chaing Mai, Thailand, where market vegetable production dominates the economy. An analysis of the agricultural labor of ten families for one year shows that, of 65,600 total hours, 12,170 are spent gardening vegetables. Vegetable gardens are placed in "swan" (mixed use fields), and in "longar" orchards, and "paa" (cleared forest land). Contains no data on gardens close to houses.

Canada, Department of Agriculture. **

1976 Small-Scale Food Production. Publication 1574. Ottawa, Canada.

Gives input-output items for various small-scale enterprises for Canada: livestock and poultry (chickens, turkey, geese, ducks), horticultural crops, field crops, woodlots, beans, and other enterprises, giving for each: potential production, property and equipment investments, operating expense items and labor and management requirements. Categories of investment and expense are not assigned dollar amounts.

CARE

1979 School/Family Garden Program Quarterly Report. Chile OPG 5130314.

AID: ISN=27366, PD-AAH-984

Administrative document reports on progress of the Chile project profiled in the text. See also PD-AAF-916-A1 ISN=30486, PD-AAH-983; ISN=30521, PD-AAH-982 ISN=17440, PD-AAF-916-A1; Boylston 1980 and EFIDES 1983.

Carp, Carol **

1983 Seasonality, Women's Work, and Health, **Mothers and Children**. Bulletin on Infant Feeding and Maternal Nutrition. 3 : 3 (October): 1-3.

Photographs, references p. 3.

Presents, in a popular summary, the relationships between seasonality and health status that have been reported from the Sahel and Bangladesh, where the onset of the rainy season brings hunger, infections and disease, just as labor demands for field preparation are high. Recommends mixed gardens, among other strategies, because garden produce could tide over family food supplies between harvests and provide supplemental income and materials.

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Caribbean Agricultural Research and Development Institute (CARDI)
--Dominica

1983 Intensive Production System for the Farm Kitchen, IN: CARDI
Annual Report :41-43, plus appendix.

In Dominica, an experimental project of CARDI is promoting gardening and rearing small livestock. Major components of the system to keep farm kitchens continuously supplied with fresh food include a "food fenced" vegetable garden with 12 beds (each 1 x 1.30m), a compost heap, livestock in improved pens, and a "cut and carry" livestock feed plot. Foods in the fence include: christophene, passion fruit, peas, beans and vine gourds. Beds are planted with leafy, fruiting, or rooting vegetables grown by the season. Eggs and meat from small livestock require pens and the feedlot for efficient production. Reports the results of on-farm interventions. Highest cost was for the "absolutely necessary" purchase of wire for pens and fence on which the food grew.

Chale, Freda and Alice Stewart Carloni **

1972 Nutrition and Rural Poultry and Rabbit Production Projects,
Food and Nutrition 8: 2: 26-31.

Backyard chicken production by women has expanded in Africa. Eggs, containing significant amounts of vitamin A, calcium, phosphorus, iron, thiamin, riboflavin, and vitamin D, are made into popular, quickly cooked dishes. Meat is served to fulfill hospitality obligations. Rabbit meat remains unfamiliar to rural households in most parts of the world. Stresses the need to study the social feasibility of poultry and rabbit production in terms of rural women's available time, to train female agricultural extension and veterinary officers, and to design training workshops that are culturally appropriate for rural women.

Chaney, Elsa and Martha Lewis **

1981 Creating a "Woman's Component": A Case Study in Rural Jamaica. Washington, D.C.: Office of Women in Development, Agency for International Development.

32 pages, multilith, 3 appendices, bibliography.

A "Famiy Food Production Program" in Jamaica introduced a garden design based on intensive raised bed techniques to produce nine vegetables yielding through the year which were used in the local diet. Selected vegetables were: okra, kale, calaloo (amaranth "spinach"), carrots, pak choi, peanuts, pumpkins, red kidney beans, and tomatoes. Conceived as a "woman's component" to add on to USAID's second Integrated Rural Development Project, this production-oriented effort was carried out by home extensionists. Report discusses how trainees were recruited from high school graduates, trained, and integrated into the IRDP team of extensionists in each microwatershed. Demonstration gardens were placed in the plots of local farm women. In less than one year after home extensionists began work, 540 small home gardens were established. The beneficiary goal is 5,000 families.

Chen, Hsi-huang, Jack Gershon, and Chiung L. Huang

1983 Socioeconomic Feasibility Study of the Transfer of AVRDC Gardening System Technology to Countries in Southeast Asia. Final Report USDA Contract 53-319R-2-240. 103 pages.

The Asian Vegetable Research and Development Center (AVRDC) has developed four garden models: 1) for home use, "strictly for consumption," to "add to the pot," featuring three raised beds on a 4x4.5m plot; 2) for schools, to supplement school lunches with acceptable vegetables and teach home gardening (10x19.5m); 3) for market, to grow high demand fresh vegetables (10x19.5m); and 4) for crops processed by cottage industry prior to sale, such as sweet potato candies or breads, and pepper oil. Four types of home gardens have been modeled: the Thailand, Indonesian and Philippine (based on vegetables popular in those countries), and a garden rich in the production of Vitamin A. Figures 6,7,8, and 9 respectively give annual cropping patterns. The economics, nutrition outputs, monthly use of labor, and relative cost of select nutrients have been analyzed on the basis of experiments in Taiwan. The Thailand home garden model has the highest total value, total cash variable cost, net cash income, net income, and capital/labor ratio. The Philippine garden scores lowest, except in economic return. Gardens were modeled to provide a family of two adults and three children with certain percentages of their recommended daily allowances of calcium, iron, vitamins A and C, and measurable amounts of protein. Family farm data collected in Taiwan is given. Appendices detail the procedures used in evaluating the gardens and "farming/ family living systems-F/FLS". Plans are proposed for the transfer of the garden technology to Thailand via USAID.

Chen, Lincoln C., A.K.M. Alauddin Chowdhury and Sandra L. Huffman**
1979 Seasonal Dimensions of Energy Protein Malnutrition in Rural Bangladesh : The Role of Agriculture, Dietary Practice and Infection, *Ecology of Food and Nutrition* 8:175-187.

This longitudinal study of Comilla District in Bangladesh describes how seasonal variations in maternal activities (particularly as related to mothers' harvesting of grain field crops--rice, millet, and wheat) changes their attentiveness to feeding children. Other effects of the cropping patterns and seasonal food shortages on young children are documented. Vegetables are grown as a field crop cycle in Comilla and are not always available. Sharpest differences in the weight and nutritional status of women and their children were registered between the landless and the landed, who typically have no more than 2 acres.

Chin, H.F., I.C. Enoch and R.M. Raja Harun

1977 Seed Technology in the Tropics. Sercang, Selangor, Malaysia: Universiti Pertanian Malaysia.

Contains articles on production of horticultural seeds used both by commercial farmers and home gardeners in Malaysia. T.S. Lee (pp. 169-174) suggests production of "bayam" and "ocra" be localized. W.H. Pau notes that most seeds are imported to Malaysia (pp.187-190).

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Christian, R.

1981 Planning a Vitamin Packed Garden, *Organic Gardening* 28
(February) :119-224.

Concept of planning gardens to maximize production of nutrients, a common concern of home garden research designers for developing country situations, is here applied to the US organic garden.

Claessens, J.J. **

1970 Rapport au Gouvernement du Senegal sur les Jardins Scholaires et les Centres de Formation Rurale du Ministere de l'Education National. UNDP/TA Report AGP:TA/185. Microfiche 12576. Rome, Italy: Food and Agriculture Organization.

Assisted by an FAO horticulturalist from 1963-1970 and by two women nutritionists on a short term basis, a project of the Ministry of Education in Senegal equipped 224 school canteens, 250 school gardens, and 15 school chicken coops. As school was held during the dry season, European vegetables were cultivated in school gardens, each 1000m² to one hectare in size. Some fruits (bananas, papayas) were planted. Fencing was a problem. Costs of the project were 247,080,000 CFA, or 31,000,000 CFA/year (converted into 1983 US dollars, about \$ 315,636 per year).

Cleveland, David A. **

1982 Economic and Dietary Contributions of Urban Gardening in Tucson. Paper presented at the American Anthropological Association meetings at Washington, D.C. December 6, 1982. 23 pages, ms., charts, graphs, references p. 21-23.

Reports same data as Cleveland, Ferguson, and Orum 1981, adds an analysis of the nutritional content of foods produced in the experimental gardens, and explores the general sociocultural context of gardening and commercial vegetable production in the US Southwest. Data charts show production by month, labor, KG produced, and various inputs.

Cleveland, David A., Nancy Ferguson, Thomas V. Orum **

1981 Energy Efficient Urban Gardening in the Desert: Technical, Social and Cultural Parameters. Paper presented at the American Anthropological Association meeting at Los Angeles, December 4, 1981.

14 pages, ms., references p.14, plant lists.

Provides a cost/benefit analysis in economic and energy terms based on longitudinal study of three experimental intensive gardens, designed for year-round production of annual fruits and vegetables in Tucson, Arizona. Discusses the problem of subsidies for commercial agriculture, notably the cost of pumping irrigation in the US southwest. Labor input was about two hours per week and the value of produce by unit of labor varied from \$0.25 to almost \$1.50 per hour. Other costs averaged \$0.39 per pound of vegetables worth \$0.70 at

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supermarket prices, which are higher than US averages in Tuscon, and increasing. Yield ratios increased with experience. Authors conclude their gardening method can give a positive economic return in all seasons and positive energy return during the winter, due to reliance on pumped water in hotter months. Compare with report on Mirasol experiment in California, Community Environmental Council 1976.

Cloud, Kathleen

1978 Sex Roles in Food Production and Food Distribution in the Sahel, Proceedings and Papers : The International Conference on Women and Food, University of Arizona. Tuscon, Arizona. January 8-11, 1978.

Contrasts division of labor among sedentary farming and pastoral economies of the Sahel. Among the swidden farmers, Cloud distinguishes vegetable gardening, small animal production, and wild plants gathering as three of five "areas" of food production primarily in the care of women. Women also thresh and store millet or sorghum, but other "men's crops" (peanuts, gum arabic, and cotton) are sold for cash to buy consumer durables and agricultural inputs, but not food. Hunting is of some importance to the family diet as well. Among the pastoralists, women milk animals, gather wild plants, and garden.

Coe, Mary Lee, illustrated by John Winthrop Fowler

1978 Growing with Community Gardening. Taftsville, Vermont : The Countryman Press.

149 pages, line drawings, index, bibliography.

Intended as a comprehensive handbook for organizing community gardens, this guide gives a history of community gardens in Europe and the United States as related to the Greenbelt movement, allotment gardens, and victory community gardens in urban areas. Contains profiles and brief case histories of particular community and institutional gardens. Contains practical advice on organizing community gardens as a social institution, and gives resources available, such as regional community gardening non-profit associations, newsletters, books, and sources of horticultural advice.

Community Environmental Council

1976 Agriculture in the City : El Mirasol Educational Farm. Santa Barbara, California : Community Environmental Council, Inc.

74 pages, line drawings, bibliography.

Popular report, in an easy style, of experiments at a California community garden and ecology experimental station, now evolved into the Mesa Project at a 5.5 acres permanent site near Santa Barbara. The "two-week method" for composting, urban beekeeping, and poultry sections are recommended. Gives labor, cost, and yield statistics for 1974 --at low estimate of \$0. 20/lb for vegetables produced, labor invested earned \$4/hour. Preparation of 24" double dug beds took 15-20 hours/week for the first month.

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Connolly, H.E. and J.D. Utzinger **

1977 Study: Economic Value of Home Garden Vegetables, **Ohio Report on Research and Development** 62 :5 : 70-72.

Debates claims of economic returns from U.S. home gardens as exaggerated, using controlled study of four 10x15 foot gardens where typical US annual vegetables (tomatoes, cabbage, lettuce, spinach, green beans, squash, peas, beets, Chinese cabbage, onions, carrots, radishes, broccoli, green peppers, and potatoes) were grown in April-November season. A significant cost item was transportation by automobile to the garden site, some three miles from the investigators' residence. It took seventy nine round trips to perform the 38.8 hours of labor required for the season. Other costs reflected the "new start" and gardening technique characteristics of the experiment: purchase of handtools, plants and fertilizers, tiller rental, and soil testing. (For established gardeners owning tools and having built up their soil and beds, these cost items would not be typical.) Prices used to value production were from local retail supermarkets. Cautions against locating gardens far away from the residence, and growing crops with low market value (eg. potatoes). Suggests that community gardeners organize car pools. Companion piece, Utzinger and Connolly 1978, softens criticism.

Cook, Adrienne **

1983 When Times Get Tough, The Tough Go Gardening, **Washington Post** ("Backyard Gardener" column).

Summarizes preliminary results of the 1983 Gallup Poll survey carried out for the Gardens for All organization, profiling U.S. home gardening.

Cornelius, Pierre M.F. **

1968 Report to the Government of the Philippines on the Horticultural Program in Applied Nutrition. United Nations Development Program No. TA 2460 PL: TA/81. Microfiche 02406. Rome, Italy : Food and Agriculture Organization. 16 pages.

Reports on a pilot project in Bayambang and Bautista, Philippines in 1964-1967 and extension in 1966 to Cebu on Visayan Island and in 1968 to Bukidon on Mindanao Island, co-sponsored by WHO, FAO, and UNICEF and implemented through the Bureau of Public Schools. ANP pilot established a 20 hectare model farm and poultry breeding section by 1967, and 45 school gardens producing 42,279 kg of vegetables (40 varieties) from 125,466 m². Home gardens were demonstrated to barrio leaders and PTA's and educational (demonstration) gardens were established either at a barrio leader's home or as a community garden producing food used in a supplemental feeding program for children under age 12. "Community-oriented" legume fields and some market gardens were also established. Gives ideal characteristics of the family gardens promoted as follows: allocating 10m² per family member, producing 5-10 vegetables (especially eggplant, green pods of beans, sponge gourd, sesbania flowers, and okra), and being fenced, enriched with composted manures, and pest controlled by hand-picking insects and grubs. Notes constraints of family gardens

expressed--lack of space, planting materials, labor, and water supply and overabundance of stray animals--but concludes these problems "can be solved by the people themselves: it is the school teachers' job to see necessary individual and community action is taken" (:11). No statistics on number of home gardens are given.

Covich, Alan P. and Norten H. Nickerson

1966 Studies of Cultivated Plants around Choco Dwelling Clearings, Darien, Panama, *Economic Botany* 20: 285-301.

Choco traditional house site gardening in Panama is so casual that it requires a trained botanist to sort out the cultivated from the protected and wild species. Style of gardening approximates the basic Caribbean jibaro.

Critchfield, Richard

1980 Shahhat: An Egyptian. New York: Avon Books, Discus Printing.

265 pages, illustrations, photographs.

ISBN 0-380-48405-6

LCCN 78-11945

Journalist's account of the life story of his friend Shahhat, an Egyptian peasant, makes constant reference to role in the lives of Shahhat's family of a home garden established by Shahhat's father.

D-Authors

D'Almeida, Francis **

1967 Developpement des jardins familiaux au Dahomey. NU TE af 67/11. Microfiche 01999. Rome, Italy : Food and Agriculture Organization. 3 pages.

Gives results of 1961 nutrition survey in Benin and vegetables introduced by this FAO ANP for adaptive research.

Davidson, John, and Joan Davidson (editors) **

1981 Conservation for Development at the Edge of Settlements. Gland, Switzerland : International Union for the Conservation of Nature and Natural Resources (IUCN-CEP).

Reports a 1980 workshop which recommends demonstration projects such as encouraging fruit and vegetable gardening by city residents in the developing world. (The Lusaka, Zambia urban gardening project was inspired by this workshop.)

Davis, Charles L.

1981 Report of the Team Agronomist. Mauritania 6820204.
AID: ISN 858, XD-AAJ-317-A

Interim progress report gives insights into the Mauritanian Vegetable Production project profiled in the Mauritania case history in the main text.

Deaver, Sherri

1980 The Contemporary Saudi Woman, IN: A World of Women, Ericka Bourignon, editor: 19-42. New York: Praeger and J.F. Bergin.

Behind seven foot high opaque garden walls with a single door or gateway, Saudi women can move about without their "abaya" and veil. In the new apartment buildings and prefabricated Western houses, roof gardens or walled-in balconies provide a garden area: the special precinct for women's social life (:36).

de la Cruz, Elisea

1969 The Nutrition Education Program of the Philippine National Red Cross, Philippine Journal of Nutrition 22 : 4 ; 233-234.

In the Philippines, the Junior Red Cross Department (PNRC) operates seed banks in public and private schools to increase food production.

Delmendo, Medina N. **

1980 A Review of Integrated Livestock-Fowl-Fish Farming Systems, IN: Integrated Agriculture-Aquaculture Farming Systems, R.S.V. Pullin and Z.H. Shehadeh, editors :59-71. Manila, Philippines : International Center for Living Aquatic Resources Management.

Describes systems for integrating production of different kinds of small livestock (poultry, pigs, fish and others). Systems detailed

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are suitable for household, farm, community, or commercial poly-production. In China, kitchen wastes are a major source of feed for pigs. Pig wastes are composted and applied to farmland and fishponds. In Vietnam, pig wastes are used to fertilize vegetable plots as well as to raise fish. In Thailand, Malaysia, Singapore, Hong Kong and Indonesia, pigs are penned over, or at the edge of, fish ponds. In Thailand, a third tier of a poultry coop over the pig pen pyramids above the fish pond. This Thai arrangement produces in 1,600m², 4,000 kg of catfish, 8,000 kg of pork and 15,330 chicken eggs annually. Combined farming of pigs and fish is limited in Indonesia to the Hindu and Christian areas, though other combinations (fish with duck or other poultry, or with horse or sheep) are found in Muslim West Java. Experimental pig/fish farms have begun in the Philippines and the US. In Hong Kong, Vietnam, India, the Philippines, and Central Europe, duck/fish farming has expanded rapidly. Gives manure composting techniques, comparative nutritional analyses of pig feed, and economic analyses of the various combinations of small livestock. The scale of these operations generally requires areas larger than most home gardens; however, in several systems described, vegetable beds and/or orchards are located beside the fish ponds or on raised beds among the canals leading from the fish ponds (Thailand), providing a spatial alternative to home gardens. Pond/pen/coop combinations are usually located in lower-lying places, at some distance from residences.

Dema, I.

1965 Survey of the Diet in Western Nigeria.

1969 Nutrition and Agriculture, IN: Proceedings of the Eastern African Conference on Nutrition and Child Feeding. Washington, D.C.: U.S. Government Printing Office.

Demaray, Hannah Disinger

1969 Gardens and Culture: Eight Studies in History and Aesthetics Beirut, Lebanon: Eastern Press.
148 pages. LC Call No. SB 465 D45

Contains article by W. Ward, reviewed separately, on Near Eastern gardens, by Akrawa on Arabic gardens in Spain, by Sutton on Japanese, de Vingh on French, and Walmsley on English gardens.

Denevan, William A.

1980 Latin America, IN: World Systems of Traditional Resource Management, G.A. Klee, editor: 217-244. New York : Halsted Press.

Defines the Latin American and Caribbean house garden on page 236 as a system distinct from all others in the region. Inventories agricultural systems and land forms.

De Schlippe, Pierre

1956 Shifting Cultivation in Africa: The Zande System of Agri-

culture. London, United Kingdom: Routledge and Kegan Paul. Describes "field types which are grouped around homestead to which the common name of garden has been applied," giving division of labor by sex and marital status.

Dewey, K.C. **

1979 Agricultural Development, Diet and Nutrition, **Ecology of Food and Nutrition** 8: 265-273.

Suggests that shifts to commercial production in the tropics generally have led to a greater dependence on food products imported from outside the tropics, which cost more and have lower nutritional values than the local production which is displaced. "Even when third world countries experience substantial economic growth, the proportion of malnourished people does not necessarily decline." Supports her thesis with a review of the literature.

Diggs, J.F.

1982 Recession Makes the Garden Grow, **U.S. News and World Report** 92 (March 22):74-75.

Popular article relates increasing participation in US home gardening to economic conditions.

Direct International Development / Direct Relief Foundation
(DID/DRF) **

1978 A Preliminary Assessment of the Applicability of French Intensive / Biodynamic Gardening Techniques in Tropical Settings.

A-1404.30 in the Peace Corps Library

Under the terms of a grant from USAID, DID/DRF established demonstration gardens in Guatemala, Honduras, and the Dominican Republic in order to adapt the French Intensive "biodynamic" method to tropical conditions. Local people were also given instruction by volunteers in hygiene, health care, and aspects of gardening technique. Local uptake was minimal. Only two home gardens were inspired in Belen, one in Malalan, Guatemala, and none at the San Marcos de Ocoatepeque, Honduras, or the Jarabocoa, D.R., demonstration sites. One constraint was Central Americans' preference for the hoe as a gardening tool, and their unfamiliarity with the spade needed for double-digging. An evaluation of how well the volunteers adapted the method in the demonstration gardens is given by Stephen R. Kaffka, who provides an appendix explaining the principles. Pest control was a major problem, identified but not surmounted. A problem not identified is apparent in the list of vegetables and herbs demonstrated at Ixcán, Guatemala--few have any place in the local diet, and most are temperate zone introductions. Appendix by Pamela Crombie gives health and nutritional status of local populations living near demonstration gardens.

Djajadiredja, Roestami, Zulkilfi Jangkaru, and Mochamad Junus **

1980 Freshwater Aquaculture in Indonesia with Special Reference

to Small Scale Agriculture-Aquaculture Integrated Farming Systems in West Java, IN: Integrated Agriculture-Aquaculture Farming Systems, R.S.V. Pullin and Z.H. Shedadeh, editors: 143-165. Manila, Philippines: International Center for Living Aquatic Resources Management.
Plates, figures, tables, references.

Offers a typology of aquaculture from West Java where fish are raised in small (.06-1.19 ha) ponds fed with water derived from wet rice fields. Various combinations of fish ponds with other livestock (ducks, chickens, goats, pigs and cattle) and with vegetables are detailed as to yields, stocking, fertilization data, and inputs and returns (cost/benefit). These West Javanese integrated agro-aquaculture systems can be viewed as an intensive form of "field" production spatially separate from the regional home garden.

Duke, Jim **

1983 Economic Plants for Holdrige Life Zones.
Mimeographed manuscript.

Assigns 1000 economic plant species to "Holdrige Life Zones," a system for classification of land by the vegetation it can support. A useful resource for selecting plants for gardening in unfamiliar ecozones.

Dodds, K.S.

1963 The Origins of Fruits and Vegetables, Span. 6:64-67.

Duckham, A.N. and G.B. Masefield

1970 Farming Systems of the World. New York: Praeger, and London: Chatto.
NAL 542 S439.D8

Due, Jean M. and Donald Gehring

1973 Jamaica's Strategy for Import Substitution of Vegetables in the 1960's, Illinois Agricultural Economics 17:1 (January): 20-26.

Shows that the major types of vegetables imported (given as a percentage of all vegetables consumed) were also produced in Jamaica, demonstrating that Jamaica's plan to increase vegetable production as an import substitution measure was practical. Overview article is relevant, as some of this production in Jamaica is in home gardens.

Duensing, Edward, and Christopher Brune

1979 Urban Community Gardens. Public Administration Series Bibliography P-354. Monticello, Illinois: Vance Bibliographies.
11 pages.

Bibliographical resource for understanding the urban community garden movement in the United States includes a directory of Agricultural Extension Service agents responsible for urban gardening pro-

grams.

Duncan, Neville

1972 The Development of Small Scale Farming: Two Cases from the
Commonwealth Caribbean, **Caribbean Quarterly** 18:7: 59-71.
Describes market garden projects in Jamaica and Trinidad.

E-Authors

Eaton-Evans, M.J. **

1969 Home Economics in the Kharaghan Area, 1967-1969. FAO/FFHC Pilot Project on Rural Development in Iran. Microfiche 07699. Rome, Italy: Food and Agriculture Organization. 16 pages.

Because dietary surveys revealed deficient vitamin A and riboflavin in Iran, an FAO ANP strategy encouraged vegetable production. "Home gardens were made in any odd space not being used for something else, sometimes in courtyards surrounded by a low wall of mud and/or sticks or on ledges where the sheep and goats cannot reach or they are made in gardens as such" (:4). Seeds were distributed in 1966 but because of drought, first gardens were a total failure. The next year and subsequent years, gardening was very successful and popular. Young women in the home economics program planted "Iranian fashion" in small seed beds which are flood irrigated by water from streams or carried from a tap. Their fathers or brothers often assisted garden preparation. Ridged beds proved unsuccessful except for cucumbers. Most popular vegetables were: radish, cucumber, spring onions, spinach, and Iranian salad leaves such as parsley. Some tomatoes and carrots were successfully grown. Curly kale and brussel sprouts were grown in center gardens. Potatoes were also grown in home gardens, although also a field crop. Notes that a problem of sanitation and constraint for home gardens was the use of manure to enrich field crops (of which grapes were the most important) and to make fuel cakes.

Ecology of Food and Nutrition.

Department of Nutrition, University of California at Davis, California 95616. Serial publication.

Ecuador, Mission Andina

1961 Mission Andina en el Ecuador: Resumen de actividades mayo 1956/abril 1961. Quito, Ecuador: Editorial La Union Catolica C.A. State Department HC 202 A37
46 pages

Community development program supported by ILO was directed to 86,000 in 95 communities and affected an additional 230,000 persons. Small livestock production (rabbits et.al.) was promoted, among other activities.

Edmundson, Wade **

1981 Nutrition and the Household Economy, IN: Agricultural and Rural Development in Indonesia, Gary E. Hansen (editor): 255-269. Boulder, Colorado: Westview Press.

Though not specific to home gardens, this analysis of nutrition in Indonesia supplements articles by Ann Stoler noted below.

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Efides (Eficencia y Desarrollo)

- 1983 Final Report: CARE-Chile School Family Gardens Program. 57 pages plus appended tables, bibliography and documents, typescript.

This independent evaluation commissioned by CARE is extensively quoted in the case history of the Chilean School/Family Gardens project in the main text. Documents the comparative success of the school gardens, and the inattention to the family gardens aspect of the program.

Egharevba, R.K.

- 1977 The Pattern of Vegetable Production in the Western State of Nigeria, *Acta Horticulturae Tropical Agriculture* 53: 157-158.

"The pattern of production (in Nigeria) is changing because of increased production and establishment of home garden projects in various parts of the state...Families are encouraged to cultivate their own gardens so as to have vegetables in the diet more frequently" than at the five day intervals when markets are held. Market vegetable gardens in wet valleys ("Akuro") are encouraged to produce for the dry season, and demonstration plots have been established near fish ponds for easier irrigation. Most popular vegetables are: "tete," "sokoyokoto," "amunututu" or "Sejesoro," "ebolo," "igbagba," "osun," "ogununmo," a hot pepper, and locally improved tomatoes.

Engel, R.W.

- nd Nutritional Improvement Through the Green Revolution: Background Information. USAID internal document. 5 pages, plus 10 tables.

Analyzes the contribution home gardens can make in a model similar to Yang's (see below).

Epstein, T. Scarlett

- 1983 The Training and Visit System in Its Socio-cultural Setting, *Culture and Agriculture* 20 (Summer): 8-10.

Summarizes the T&V or "Benor" system of agricultural extension based on Village Extension Workers and their contact farmers as implemented in India: the national demonstration project for this popular method. As the system by-passes women (except for the 1-2% of all contact farmers who are de jure female household heads), Epstein proposes reforms of the system to introduce women as Subject Matter Specialists who will participate in the routine technical retraining of VEW's to teach them ways they can contact village women directly. Epstein also suggests that "female information brokers" could arrange meetings and introductions to farming women. Sex segregation has reinforced and justified the male bias of the Indian T&V system. The significance of this article for designing gardening interventions is two-fold. One, it describes a problem of male bias commonly reported for agricultural extension systems and built structurally into the T&V model, which makes these less than suitable vehicles for the

extension of gardening advice insofar as women are involved in this activity over and above their involvement in field crop production. Second, it proposes ways to "graft" new subjects and new approaches onto the training and visit systems which might be applied to gardening extension. Note that the T&V model is now fairly routinely diffused through World Bank agricultural extension projects at the national level.

Evers, H.D.

1981 The Contribution of Urban Subsistence Production to Incomes in Jakarta, *Bulletin of Indonesia Economic Studies* 16 (2): 89-96.

F-Authors

Fagley, R.M.

- 1983 Better Nutrition and Subsistence Agriculture. NGO Working Group on Food and Nutrition.
5 pages. Draft.

Favor, Bradford E.

- 1981 Peace Corps/Mauritania 1981 Vegetable Production Training. Final Report.
11 pages.

A five week course in vegetable production and small animal husbandry has been performed by a Peace Corps training contractor for Mauritania, Ghana, Thailand, and PNG volunteers. In-country training involves observing and practicing local vegetable techniques and reviewing case histories of earlier volunteers' efforts.

Fernandez, N.A., J.C. Burgos, L.T. Roberts, and C.F. Asenjo

- 1968 Nutritional Status of the People in Isolated Areas of Puerto Rico, *Journal of American Dietetic Association* 53:2:119-126.
In the Caribbean, cash crops of tobacco, coffee, and starchy vegetables dominate production, and "almost none of the families had home gardens," though 70% raised pigs. Clinical, biochemical, and dietary studies of a rural community population revealed deficient intake of Vitamin A, riboflavin, calcium, and calories. Among infants, iron status was low and intake limited to milk, starchy vegetables, cereals, and sugar products.

Ferro-Luzzi, A. and J.V.G.A. Durnin

- 1981 The Assessment of Human Energy Intake and Expenditure: A Critical Review of the Literature. ESN: FAO/WHO/UNU/EPR/81/9. Rome, Italy: Food and Agricultural Organization.

Concludes that there have been too few studies of energy intake in relation to actual energy expenditure, and since very few of these have been performed in developing countries, that Western models and assumptions are being projected.

Ferroni, M.A.

- 1982 The Nature and Extent of Nutritional Deficiencies in the Peruvian Andes. *International Agricultural Economics Research* No. 82-4: 1-24. Ithaca, New York: Cornell University, Department of Agricultural Economics.

Analysis of the 1971-1972 Peruvian National Food Consumption Survey demonstrates that a decline of calorie and protein adequacy, B vitamins, iron, and calcium intake occur with decreased subsistence production of the traditional starchy staples of the diet, until a high threshold household income is achieved and the currently preferred foods—milk, meat, processed wheat products, vegetable oils and

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sugar products—can be purchased in sufficient quantities. The nutritional risks in a change over from traditional subsistence to cash oriented production analyzed for Peru may provide a general hypothesis for other areas.

Field, Augusta N.

1980 Nutrition Programs for Children in Developing Countries: A Report to the Presidential Commission on World Hunger. Washington, D.C.: Presidential Commission on World Hunger. 40 pages, LRS80-8670

"The purpose of this report is to provide a cohesive overview of private voluntary agency efforts in food distribution, nutrition and health education and environmental improvements in developing countries. (Activities of) nine private organizations and the Peace Corps are described by location, targeted population, type of program and location of delivery. An overview of UNICEF and some of its programs is also included"

Fiksel, Mary **

1983 Plan Senegal's Market Gardening Project: An Evaluation. St. Louis, Senegal: Foster Parents Plan International. 79 pages, tables, manuscript.

Fitzpatrick, Ellen T. **

nd Acceptance of Subsistence Agro-Silvacultural Techniques in the Wau Valley.

Extension to Papua New Guinea villagers of the Wau Ecology Institute compost ridged and tree crop garden began in two demonstration gardens on land donated by villagers. In six months, 24 gardens ranging in size from 15m² to 22m² were established. For more information on the Wau research, see Swift.

Fleckenstein, F. von

1978 Dooryard Food Gardens in Port Moresby: An Original Study of Morata Together With a Comparison of Other Studies Past and Present. Port Moresby, Papua New Guinea: Economics Department, University of Papua New Guinea. 58 pages, tables, bibliography, figures

1976 study of two households in Morata settlements gives social characteristics of gardening families, physical characteristics, functions of gardens, and comparisons of land use, land tenure (finding house-renting households distinctive), and livestock practices. Includes recommendations to solve problems such as small size and low yields of gardens (CAB).

Flood, Riefford B.

1978 Home Fruit and Vegetable Production. Metuchen, New Jersey: Scarecrow Press. xii, 163 pages, illustrations, index, bibliography.

NAL SB 355.F 63

Manual on fruit and vegetable production in the United States is intended to guide home gardeners.

Food and Agriculture Organization (FAO)

1966 Horticultural Development in the Applied Nutrition Programme. Report to the Government of India. FAO No. TA 2249. Rome, Italy: Food and Agriculture Organization.

One of a series of reports pertaining to the India ANPs, this document covers the period of horticultural research before such research was largely decentralized to the states.

1970 School Gardening and Nutrition Project. Report to the Government of Sudan. FAO TA 2886. Rome, Italy: Food and Agriculture Organization.

Administrative report on school gardens in the Sudan describes their multiple problems. Home garden efforts were originally planned for the project, but, somehow, this plan never materialized.

(FAO—based on the work of G. Blumenfeld)

1970 Horticulture in the Applied Nutrition Programme and its Relation to Horticultural Development. Report to the Government of India. FAO CEP Report 62. Rome, Italy: Food and Agriculture Organization.
56 pages + vii, figures, references.

For the Indian ANP school, community, and home gardens, recommends that future horticultural activities be more cost oriented, that no more community gardens be established, and that enterprises such as market gardens might contribute more to horticultural production than do school or home gardens. This critique is abstracted in Tropical Abstracts 28:1:28.

1979 Review of Food Consumption Surveys 1977 (Household Food Consumption by Economic Groups), Volume 2: Africa, Latin America, Near East, Far East. Report No. 0326-F844. FNP#1/2. Rome, Italy: Food and Agriculture Organization.
288 pages.

Indexes food consumption surveys.

1980 Analysis of Food Consumption Survey Data, Developing Countries. Rome, Italy: Food and Agriculture Organization. (0326-F 2118) FNP#16.
139 pages.

Gives a comparative analysis of the food consumption surveys indexed in FAO 1979.

1981 Bibliography of Food Consumption Surveys. Report No. 0326-F2177 FNP#18. Rome, Italy: Food and Agriculture Organization.
85 pages.

Provides a bibliographical resource guide to the literature on food consumption surveys.

1983 Pilot Project for the Development of Women's Vegetable Gardens and Fruit Crop Production through Village Groups in the Gambia. Report No. TCP/GAM/2202(T). April. Rome, Italy: Food and Agriculture Organization.

A pilot FAO project for community gardens is encouraging women to grow fruits and vegetables in the North Bank Division of the Gambia.

FAO, Plant Production and Protection Division **

1972 Projet pilote de jardins potager. Rapport final. FH/GHA.3 Microfiche 24388. Rome, Italy: Food and Agriculture Organization.

3 pages.

FAO provided technical assistance to a 1966-1972 home garden project in Ghana funded by Misereor (German NGO), the Entraide et Fraternite (Belgian), and the German Freedom from Hunger/AD Committee. FAO contributed school and clinic gardens. Objective of the project was to improve family gardens at lodgings in the civil service quarters at Labone Estates, a housing development near Accra, by increasing vegetable and fruit production. Few low income people participated. They had little space or land to garden, as they depended on relatives for lodgings, leading to some "wayside" gardening. Moreover, water, drawn from metered municipal connections, was too expensive for low income people to use in gardening, and even garden tools were prohibitively expensive. As a result, most of the 300 participants were middle income. FAO also assisted in developing materials on nutrition education for the 1972 "Produce Your Food" national campaign.

Note: The works cited above are by FAO as a corporate author. Additional works published by FAO, some of which report FAO ANP projects, are cited by their individual authors.

Franda, Marcus

1982 The Seychelles: Unquiet Islands. Boulder, Colorado: Westview Press and Hampshire, England: Gower.

140 pages, photographs, index, notes and selective bibliography: 129.

ISBN (U.S.) 0-86531-266-4 ISBN (U.K.) 0-566-00552-2

In a general country study, describes the relation of diet to economics. Quotes a 1960's study demonstrating that Seychellois subsisted on a diet of rice--all imported--and cassava, plantains, yams, and breadfruit, much of which was also imported (:79). In past 20 years, imports of processed foods, beef, and milk have vastly increased. Only 2.8% of the population is engaged in agriculture. However, in 1977, 40% of all households kept at least 1 or 2 pigs in the backyard and 55%+ kept chickens. "The dominant tradition in the Seychelles has been for families--even in urban areas-- to maintain small kitchen gardens and a few animals and chickens but shy away from farming on a major scale" (:8).

Fredrich, Barbara

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1969 Mexicali Gardens: Species, Functions and Arrangements in the Palacio and Carbajal. MA Thesis. University of California at Los Angeles.

Analyzes the function and arrangements of Mexicali gardens in the geographical mode of the "dooryard garden" typology established by Anderson.

Freeman, Peter

1963 Some Factors Affecting Land Use in Chinchero, Peru. MA Thesis. Interamerican Institute of Agricultural Sciences. Turriabla, Costa Rica.

G-Authors

Gade, Daniel

- 1967 The Guinea Pig in Andean Folk Culture, *The Geographic Review*
57 (2): 213-224.

Gagne, Wayne and Betsy Gagne **

- 1978- Seeking a Settlement in Shifting 1979 Agriculture, *Dialogue*
1979 Winter-Spring: 2-5.
International Voluntary Service volunteers explain the Wau Ecology
Institute model garden.

Gallager, Janice

- 1976 Direct Relief Foundation Study Sites in Milagro and Guayaquil, Ecuador, IN: Small Scale Intensive Food Production: 81-84. Washington, D.C.: League for International Food Education.

DRF volunteer reports on her establishment of a demonstration intensive garden in the rural community of Milagro and a low income urban area of Guayaquil, both in Ecuador. Techniques introduced, such as composting with chicken manure, double digging, transplanting, bed layout, and seed flats, were unknown to the local people (and the local agricultural engineer) and they did not realize that many of the vegetables could be grown in their climate. The garden integrated local tree crops such as guava, mango, papaya and avocados for shade and production. Project will also establish a garden and training program at an orphanage, and arrangements were made with the Bishop of Riobamba in the Andean highlands to introduce training there. Though local people expressed interest in gardening techniques and training, no home gardens are reported. Report is enthusiastic, and a bit romanticized, portraying Ecuadorians as "Inca Indians" yearning to restore their aboriginal culture.

Gardens for All. Periodical bi-monthly publication of Gardens for All, Burlington, Vermont.

Gardens for All

- 1978 Gardening in America 1977. Shelburne, Vermont.
This survey, describing US gardening activities for the year 1977, found 32 million households gardening. Forty-three per cent of all families in the United States raised fruits and vegetables on an area equivalent to 7 million acres (up 7 million since 1971--and an estimated 7 million people not gardening that year would have gardened if they had had a plot. Average gardener saved \$375 on food bill.

- 1979 Gardening in America--Results of the Sixth Annual Survey. Burlington, Vermont: Gardens for All.

1980 Summary of the 1979 National Gardening Survey Conducted by the Gallup Organization for Gardens for All. Burlington, Vermont: National Association for Gardening. Reports 33 million gardeners--42% of all households.

1983 Gallup Poll Survey for Gardens for All. Summary.

Garvey, J.E.

1976 Urban Agriculture. Los Angeles, California: Program in Urban Agriculture. 344 pages.

Georgia Cooperative Extension Service

nd Value of the Home Garden. SG-001. 1 page.

Gershon, Jaci:

1983 The AVRDC Garden Program, June 1981-June 1982. Paper prepared for the AVRDC Progress and Planning Workshop, February 7-10, 1983. 60 pages.

Fighting Malnutrition with Home Grown Vegetables. 2 pages.

Two reports promote the Asian Vegetable Research and Development Center's home garden models.

Gispert, Montserrat **

1981 Les Jardins Familiaux au Mexique: Leur Etude dans une commune rurale nouvelle situee dans une region tropicale humide (Family Gardens in Mexico), Journal d'Agriculture Traditionnelle et de Botanique 28: 2: 159-182.

Ethnobotanical studies carried out in a planned colonization settlement in Vera Cruz, in the Mexican low humid tropics, reveal the blending of home garden traditions which were carried, along with specific cultivars, from colonists' various communities of origin in Mexico. In Balzapote, Vera Cruz, the term "huerto" refers to the total space around a human habitation, and is used interchangeably with the terms "solar" (a measure of land) and "jardin" ('garden'). House sites were selected for their gardening potential. The family garden, like the house, was a place for the whole family to join in common activities. Home garden production met immediate household needs, though a few herbs, eggs and poultry were sold. The surface area of "huertos" varied from 800 to 5,000m², cleared from the tropical forest, and leaving in place select trees of economic value. Eventually, 27.5% of the home garden plants would be wild. Two thirds of the cultivated plants were brought by settlers and exchanged. Common names of plants used among colonists reflected common names in their place of origin. Gives illustrative species.

Gleissman, S.R., R. Garcia E., and M. Amador A. **

1981 The Ecological Basis for the Application of Traditional Agricultural Technology in the Management of Tropical Agro-systems, Agro-Ecosystems 7: 173-185. (Maps, figures, plant lists, bibliography)

In Mexico, ponded tanks produce fish, ducks, and aquatic plants used to fertilize raised platforms ("chinampas") which are used for intensive, continuous cultivation of vegetables and fruits.

Goode, Pamela M. **

1983 The Role of Vegetable Growing in Household Food Production References, sample pilot project profiles. (ms).

Overview essay stresses definitions, and quotes extensively from Sommers 1978 and Yang 1979. Appends a bibliography of "literature concerning vegetable promoting projects" by A. Warren. Literature reviewed was selected primarily from the collection of the Institute of Child Health in London and features studies of nutritional status in anglophone African countries and Papua New Guinea, rather than reports on gardening projects per se, thus establishing the need, or nutritional premise, for gardening as an intervention, as opposed to reporting on actual attempts.

Gopalan, Coluthur

1969a. Nutritional Atlas of India. Hyderabad, India: National Institute of Nutrition.
150 pages

1969b Diet Atlas of India.
102 pages

Gopalan, C., B.V. Sastri, and S.C. Belasubramanian

1978 Nutritive Value of Indian Foods. Hyderabad, India: National Institute of Nutrition, Indian Council of Medical Research.

(1971) ii, 204 pages, index
NAL TX 360.I4N37 1976

Studies emerged in the context of the massive ANP of India, clarifying the differences among the culturally heterogeneous Indian populations.

Greene, Wade

1976 The New Alchemists, New York Times Magazine (August 8, 1976): 12-13, 22, 30, 32, 38-48.

Describes the work of the New Alchemy Institute in "designing and testing of intensive food-growing methods that can be employed on a small scale and without recourse to the extensive mechanization and chemical consumption of modern agriculture." Covers fish culture, solar energy, and gardening.

Grigg, David B.

1969 The Agricultural Regions of the World: Review and Reflection, *Economic Geography* 45: 95-132.

1974 The Agricultural Systems of the World: An Evolutionary Approach. London and New York: Cambridge University Press. ix, 358 pages, maps, bibliography: 308-343.
NAL S439.G788

Grivetti, L.E.

1980 Goat Kraal Gardens and Plant Domestication: Thoughts on Ancient and Modern Food Production, *Ecology of Food and Nutrition* 10: 5-7.

Abandoned goat kraals in the eastern Kalahari of Botswana are used as "gardens." Edible wild plants spouting there are transplanted to gardens inside household compounds and tended. Raises as a general hypothesis that livestock historically played a role in the rise of horticulture and the process of plant domestication, by concentrating seeds from their droppings near house sites.

Guerts, F.M.A. **

1973 Report to the Government of Nigeria: Home Gardens for Improved Nutrition. Report 1970-1971 (Third Phase). FAO 90 AGP:FFHC/8. Microfiche 25100. Rome, Italy: Food and Agriculture Organization.

Summary report of changes in the third phase of the Ilesha Gardens project recommends that the diffusion of ideas and the work of the Central Garden's seed production be continued, that the focus of nutrition extension shift from infant and child feeding to general family nutrition, and that extension on home gardens be incorporated into the general horticultural extension actions of the Ministry of Agriculture and Natural Resources. Notes that more participatory, self-help methods of extension could not be explored in the third phase but should also be a priority.

Guillaume, G.M.D, S.H. Bederinan, N. Freville

1967 Subsistence Activity in Five Villages on and Around Mt. Cameroon in Victoria Division, West Cameroon, *Research Paper Series* No. 14: 1-35. George State College, School of Arts and Sciences.

Subsistence activities and division of labor by sex differ sharply among five villages within a relatively small geographical area, though all villagers are swidden cultivators for whom the cocoyam, prepared as a fofou, is a staple food. In Bona Ngombe, women farm mixed crop swidden gardens, which feature root crops (cocoyam and sweet cassava) and tree crops (plantains, oranges, grapefruits) grown for home consumption, and pepper, coffee, bananas, and cocoa (cacao), grown largely for sale. Men clear these plots, and provide fish, the mainstay of the diet. In Masuma, swiddens produce cocoyams (tended by women), sugar cane, pineapples, and tree crops: bread-

fruit, oil palm, bananas, plantains, and coconut. Surplus food crops produced are used to purchase salt, meat, and fish, as well as consumer durables, and villagers keep chickens, pigs, goats, and sheep (though meat is eaten only about three times each month). Iron, calcium, riboflavin, and Vitamins C and D are generally deficient in villagers' diets; iron deficiency anemias among children are common, as are high rates of infant mortality and low rates of fat and protein consumption among children and lactating women.

Gratch, Haim **

1967 Report to the Government of Ceylon on Horticultural Development Through School Gardens in Applied Nutrition and Agricultural Education Programs. Report PL: TA/61. Microfiche 01017. Rome, Italy: Food and Agriculture Organization.
12 pages.

In Sri Lanka, home gardens were to be an idea carried by school children and members of the Young Farmers club from the demonstration school gardens to the homestead (:2). Four centers were each to assist 10 schools, though only 20 school gardens functioned at the time of the report. Eventually, 9,000 schools were targeted for ANP, a goal never realized as this ANP effort was disbanded by the international donors because the government failed to meet its obligations in the implementation of the ANP. Each class in grades 1-6 was to have had a small vegetable garden where the children "can have a feeling of work and the joy of producing and eating" and learn the "dignity of labor." In few of the home gardens visited was there "any attempt to grow a garden for home consumption only, and including a good variety of nutritious vegetables and fruits. In most cases, it was a garden for sale." (:8) Notes that a seed multiplication unit will be needed.

Gwatkin, D.R., J.R. Wilcox, and J.D. Wray

1980 Can Health and Nutrition Interventions Make a Difference? Monograph No. 13. Washington, D.C.: Overseas Development Council.

Gwatkin, D.R., J.R. Wilcox, J.D. Wray, J.P. Habicht, and W.P. Buts
1978 Measurement of Health and Nutrition Effects of Large Scale Nutrition Intervention Projects, IN: Evaluating the Impact of Nutrition and Health Programmes R.E. Klein et. al, editors: 133-182. New York : Plenum Press

Though gardening was not noted for any of the projects evaluated, this comparative analysis and critique of measurements on nutrition projects is relevant to the case of gardening for nutrition.

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H-Authors

Hagan, Albert R.

1983 AVRDC Model Garden Outreach Program. Consultant Report on USAID Contract No. ASB-0249-5-00-3029-00.
65 pages, multilith.

Trip report of a consulting microeconomist describes the Asian Vegetable Research and Development Center's limited extension of model garden. Report's stress is on the horticultural systems observed.

Hamad, M. M. **

1970 Report to the Government of Sudan on School Gardening and Nutrition Project. Report No. TA 2886 AGP: TA/180.
Microfiche 12274. Rome, Italy: Food and Agriculture Organization.

Report of the FAO horticulturalist assigned to a UNDP financed project promoting school and community gardens in the Sudan 1966-1970 gives project results. Twenty nine school gardens were established in Khartoum Province, mainly in rural areas, and 10 in Blue Nile or the Northern Province. Each was fenced and surrounded with Acacia trees. Typically, half an acre in each school garden was designated for fruit trees. Walls and pumps were installed in 20. Model garden plans, hand tools, vegetable seeds, fruit trees, insecticides, fertilizers, and chicks for poultry production were distributed. All gardening was carried out by the pupils, who took produce home. In areas where land or irrigation water was simply not available, only poultry units (37) were established. Although the project planned to work with the Ministry of Health to develop 12-acre community gardens, this aspect of the project never materialized. One of the school gardens was converted into the Meridi Centre fruit tree nursery and another (Sraurab) school and its garden were confiscated by the military.

Hansen, Gary E. (editor)

1981 Agriculture and Rural Development in Indonesia. Boulder, Colorado: Westview Press.
312 pages (for home gardens see "pekarangan" in index)
ISBN 0-86531-124-2
NAL HD 2082.A64

Contains articles by White, Stoler and Edmondson, included in this bibliography.

Harlan, Jack P.

1975 Crops and Man. Madison, Wisconsin: American Society of Agronomy/ Crop Science Society of America.
295 pages, illustrated, bibliography: 271- 286
NAL SB 185. H 31

In a general typology of crop production systems, frames definition of gardens in distinction to field crops.

26

1976 Plants and Animals That Nourish Man, **Scientific American** 235 (September): 89-97.

"Presents a history of the domestication of plants and animals." Suggests that man has chosen a relatively small number of species for domestication, and that "agriculture is not an invention or a discovery and is not as revolutionary as we had thought; furthermore, it was adopted slowly and with reluctance."

Harris, D.R.

1969 Agricultural Systems, Ecosystems, and the Origin of Agriculture, IN: The Domestication and Exploitation of Plants and Animals, P. Unko and G. Dimbleby (editors), pp. 3-16. London: Duckworth.

Harris, Marvin

1971 Town and Country in Brazil: A Socio-Anthropological Study of a Small Brazilian Town. New York: W.W. Norton and Company, Inc.
302 pages
SBN 393005739

Gives a description in passing of the Brazilian "quintal"--backyard walled garden.

Harrison, Polly F. and Joyce M. King **

1983 Evaluation Report, Seventh-Day Adventist World Service Haiti: AID Matching Grant Program Maternal and Child Health Nutrition. Arlington, Virginia: Management Science for Health.

127 pages, tables, references: 92-93, maps.

This is one of four evaluations of centrally funded AID grants to FVOs for health projects by an AID contractor. SAWS-Haiti site is one of 17 countries covered by the SAWS-AID matching grant for "Extending Agricultural, Family Health, and Nutritional Development Programs to Target Communities from Existing SAWS Institutions." The basic strategy in Haiti is to attract children through a feeding program to under-five clinics where surveillance of and assistance to their health and growth rates is initiated. Establishment of kitchen gardens, demonstrated at participating clinics, were an aspect of the program. Activities programmed for 1982-1983 included assignment of agriculture auxiliaries to assist planting kitchen gardens in four villages around each of five health centers. Kitchen garden programs began at Belladere (3/82), La Fossette (12/82), Moustiques (1/82), Ranquitte (3/82), Roulin (1/82) and St Roc (1/82). A demonstration garden planted at Gros Mangles was eaten by goats. At each center, aides assisted seven families in planting gardens (:66, Table 6). Nine hundred mothers at each center were to be trained in the production of table vegetables. Evaluators found project was exceeding its anticipated rate of family garden establishment. Notes "since no data are gathered on amounts planted or harvested in the demonstration and home gardens, we have concluded that the amounts produced, while they add quality and variety

to the meals given at the centers and to home diets, do not merit the labor involved in compiling production and distribution data for use as an impact indicator. This should be compiled as an output indicator for management purposes only" (:27). Though the SAWS-Haiti project documented improvements in the nutritional status of participating children, the contribution of food produced in kitchen gardens could not be separated from other sources of improved diet.

Hart, Robert D.

1982 One Farm System in Honduras: A Case Study in Farming Systems Research, IN: Readings in Farming Systems Research and Development, W.W. Shaner, P.F. Philipp, and W.R. Schmehl, editors: 59-73. Boulder, Colorado: Westview Press.

Presents summary analysis of a farm system in Yojoa, Honduras, where maize is the principal field crop. Among the general conclusions, states, "few vegetables are produced or consumed in the area and crop systems with vegetable components or the design of household gardens should be considered" (:71).

Hering, L.J.

1967 Is Vegetable Gardening Profitable? **Horticulture** 45 (March): 38-39.

Herklots, Geoffrey A.

1972 Vegetables of South East Asia. Hong Kong: Hafner Press and London: George Allen and Unwin.
525 pages, illustrated, bibliography: 520
NAL SB320.8.T7H4

Recommended as a guide to regional vegetable resources.

Hernandez, M., C. Perez, J. Ramirez, H. Madrigal, and A. Chavez
1974 Effect of Economic Growth on Nutrition in a Tropical Community, **Ecology of Food and Nutrition** 3: 283-291.

Argues that in the Mexican lowlands, the loss of diversity and of traditional agricultural practices (which include home gardens) have had a detrimental effect on the diet and nutrition of local people.

Higgs, E.S. and M.R. Jarman

1969 The Origins of Agriculture: A Reconsideration, **American Antiquity** 43: 30-40.

General hypothesis of the origins of agriculture is based on recent archeological discoveries. Takes the view that there were several primary "hearths" of domestication.

Hills, Theo L. and Stanley Iton **

A Reassessment of the "Traditional" in Caribbean Small-scale Agriculture.

Traces Caribbean traditions of small scale agriculture to the "provision grounds" allocated on plantations. Introduces the term and concept of a "food forest," or tropical mixed agriculture.

- 1982 The "Food Forest," A Type of Intensive Mixed Garden Agriculture: Its Contemporary Ecological Significance.
7 pages, mimeographed manuscript, 5 figures, tabular plant list.

Preliminary document illustrates the concept of the "food forest" with a list of plants by functions (subsistence, local marketing, etc.), and by structure and physiognomy (plants taller than 20m, vegetables, herbs and spices, etc.) and with diagrams, from diverse forests, of the layout of plots on St. Kitts and Jamaica. "The only possible way of fully appreciating the ecological wisdom of the Food Forest is to identify, map and count every plant and to observe behavior and changes during the course of the year."

Histand, Lowell

- 1978 OPG to International Voluntary Services (IVS) for Botswana Horticultural Development Project. (USAID Grant 78-633-30)
This is the proposal generated by IVS, which became the basis of an operational program grant.

Ho, Leonard

- 1977 Some Aspects of Seed Production and Distribution in Asia, IN: Seed Technology in the Tropics, H.F. Chin, I.C. Enoch, and R.M. Raja Harun, editors: 197-205. Malaysia: Universiti Pertanian Malaysia.

Charts flow of seeds to home gardeners and commercial growers for Japan, Taiwan, and the Philippines. In Japan, seed companies supply consumers directly. In Taiwan, seed sources include agricultural stations, seed companies, small seed multipliers, and import-export concerns. However, home gardeners and vegetable farmers receive seeds indirectly, through farmers' associations, local seed stands, and retail stores. In the Philippines, consumers obtain seeds from dealers, importers, and agricultural stations. Comments on the relative efficiency of the distribution systems would have been valuable.

Home Garden Magazine. Periodical publication.

Home Garden Vegetable Series- Hawaii University Cooperative Extension Service NAL SB 320 A 1H3. Occasional publication series.

Home Gardener. Periodical publication since 1965.

Horowitz, Michael M. **

- 1967 Morne-Paysan: Peasant Village in Martinique. Case Studies

in Cultural Anthropology. New York: Holt, Rinehart and Winston.

114 pages, bibliography: 111-114, photographs, maps, figures, tables.

LC 67-17089

Based on fieldwork over 1956-1964, describes gardening (among other activities) in a rural, hilly (380m) village near the coastal town of Covin. Houses are surrounded by a small semi-enclosed yard where ducks, pigeons, and chicken coops and rabbit hutches are kept and breadfruit, mango, orange, and other fruit trees are planted with the wild guava (:21). Poultry scratch freely, leading to some disputes among neighbors. Rabbits are secured in warrens, where they are fed vines and weeds gathered by children every morning. Many families devote a portion of the yard to a small "herb garden" (:21) to raise spices such as garlic, shallot, ginger, gombo (hibiscus), turmeric, and medicinal plants, over 100 of which are used for remedies. Grown as crops on outfields which are generally less than one hectare in size are the "gros legumes" (yams, taro, bitter and sweet manioc, sweet potatoes) and the "legumes et salades" (eggplant, carrot, cabbage, maize, onion, turnip, tomato, cucumber, radish, and lettuce, which is transplanted from seed bed containers). Fields are cultivated intensively, in what amounts to a gardening approach with contour hoeing, intercropping, multicropping, and relay cropping in any combination (:24-26) for 4-5 years, then are left to rest in a pasture fallow grazed by cows or the donkeys and horses used for transport, or in natural vegetation fallow lasting no more than four years. Bushes and fruit trees, such as bananas, mangos, citrus, coconuts, papaya, and breadfruit, are grown for sale (including export sales in orchards) (:28), which achieves some control over erosion. Erosion is a problem after over 100 years of intensive cultivation. Gives data on marketing ("higging,") which is largely in the control of women, purchases of food (bread, margarine, milk, dried salt fish) (:92-93), and malnutrition (:68), which affects 70% of the children age 2-4. Makes the point that malnutrition can be attributed to poor utilization of nutritional foods, rather than to absence or scarcities; a finding of some other studies in the Caribbean. Compares Morne-Paysan with other villages in the West Indies studied in the 1950's and 1960's. For August Town, Guayana, household gardens were also described in a 1956 monograph by R.T. Smith. Villages in Puerto Rico and Jamaica were more dependent on sugar plantation regimes and did not display the variety of agriculture crops and practices reported. Morne Paysan was founded by free persons of color in the late 18th century and populated by emancipated slaves who left the sugarcane areas on the coast.

Hoskins, Colin M.

1954 The Samaka Guide to Housesite Farming. Manila: Samaka Service Center.

Manual prepared for and distributed in the Philippines was one of the first to present the "mixed garden" approach.

Hoyt, Anthony and Carlyle Stout **

1976 Organic Methods Bring Hope to Guatemala, Organic Gardening and Farming (January): 168-172.

Two volunteers describe their school and family gardening promotion in a Peace Corps program in Guatemala, "School Gardens and Nutrition." Thirty-six volunteers participated, trained by Guatemalans, assisted by CARE, and provided with seeds for distribution donated by a US company. Organic methods were selected because chemical fertilizers were too expensive for local people, who were too reliant on pesticides banned in the US. The family plots which sprang up were in fenced areas near homes. Within a year, some fresh garden produce was appearing in local markets, displacing expensive imports.

Hubler, David E.

1984 Computers: Putting the Byte on Vegetables, Washington Post (February 2): D5. Washington, D.C.

Describes home garden planning assisted by computer services. Systems software was developed to transmit information to county extension agents from FACTS (Fast Agricultural Communications Terminal), a state wide computer link in Indiana. Through 1976 research at Purdue, the programs were adapted to home garden needs. Several seed companies, state extension services and private companies now offer computerized home garden planning. A Maryland company offers planning for organic biodynamic French intensive gardening.

Hughes, James M.

1981 Project Evaluation Summary (PES) for Mauritania 6820204.

26 pages plus appendices

AID: ISN-856, PD-AAJ-317

Reports on 18 demonstration gardens involving 600 families, and collection of baseline data for a USAID project to promote vegetable gardening in Mauritania.

Hutterer, Karl

1982a Interaction Between Tropical Ecosystems and Human Foragers: Some General Considerations. Honolulu, Hawaii: The East-West Center, Environment and Policy Institute.

Views "home gardens" as a fourth fundamental agricultural system of the humid tropics, distinct from "swidden" (garden sized, but used for limited time periods), swamp land cultivation including raised fields and irrigated pond fields, and monoculture on large permanent dry fields. Offers a definition (:144): "small plots immediately adjacent to human habitation which are cultivated on

a permanent basis throughout the life span of the habitation. Home gardens are generally ecologically very diverse and complex, containing a mixture of tree crops, smaller woody plants (bushes and shrubs), and herbaceous annuals and perennials (vegetables, condiments, medicinal, industrial and ornamental plants). Although home gardens combine elements of the three previously mentioned systems, they differ significantly from all three in their systemic configuration and particularly in their interactions with the human cultivator. They may well represent a very old form of cultivation, deriving from man/plant interactions that developed in the refuse areas fringing settlements of early foragers (cf. Sauer 1952:71)."

1982b Ecology and Evolution of Agriculture in Southeast Asia. Working Paper. Honolulu, Hawaii: East-West Center, Environmental and Policy Institute.

Huxley, Anthony **

1978 An Illustrated History of Gardening. New York and London: Paddington Press Ltd. Published in Association with the Royal Horticultural Society. ISBN 0-7092-0322-5. In the United States and Canada, ISBN 0-448-22424-0.

352 pages, illustrated (line drawings, photographs and color plates), index, bibliography.

Premier volume of the history of gardening is distinguished by well-researched illustrations.

Hyams, Edward

1971 A History of Gardens and Gardening. London: J.M. Dent. 345 pages, illustrated, bibliography: 334-336. NAL SB451.H9

A standard history of gardening which stresses European forms.

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I-Authors

Inmink, Maarten D.C., Diva Sanjur and Marta Colon

1981 Home Gardens and the Energy and Nutrient Intakes of Women and Preschoolers in rural Puerto Rico, **Ecology of Food and Nutrition** 11: 191-199.

Study of 109 women and 50 children in Puerto Rico demonstrated that more adequate caloric and nutrient intake, except iron (Fe), was associated with children who had access to home garden produce. Food expenditures per capita did not decrease with increasing availability of home-grown food. Among women with home gardens, Vitamin A intake was higher.

Indian Horticulture: The Editor **

1967 Editor's Page, **Indian Horticulture** 7:2:2.

1968 Editor's Page, **Indian Horticulture** 12:4:2.

1972 Editor's Page, **Indian Horticulture** 17:5:2.

Sample series of editorials encourages Indian public to grow home gardens. "No sophisticated machine tools, no World Bank loans, are required to grow vegetables and fruits. One need not be an agronomist to grow bhindies.... If each family decides to grow a few plants of bhindi or brinjal or some cucurbits or just the humble palak, at least one third of the rising market price could be neutralized...." Over the sampled years, reports of government promotion of vegetable production declined in the editor's comments.

Inglett, G. and G. Charalambous, editors

1979 Tropical Foods: Chemistry and Nutrition. New York: Academic Press.

ISBN 0-12-37092-4, 2 volumes.

Volume 2 contains Yang 1979, cited below.

Institute of Cultural Affairs **

nd Shamba la Nyumban/ Home Gardening Manual. Nairobi, Kenya.
12 pages, line drawings

Bilingual gardening pamphlet is used as part of the community nutrition intervention of ICA's self-help development plan.

Interamerican Foundation (IAF) **

Note: Various internal IAF Grant Profiles are cited by a 2 letter (=country) code and three digit project code number in the text and Appendix 2.

Intermediate Technology Development Group **

1983 Proposal for a Programme on Household and Community Level Food Production Systems.

4 pages, mimeographed.

Based on an impressionistic analysis (no data, no sources) of vege-

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table projects, concludes that commercial market gardens have been more successful than gardens "established for nutrition reasons rather than income reasons," and that participatory projects were more successful than "imposed" projects. Proposes a program "to introduce improved methods of food production (vegetables, survival crops, fruit trees, minor livestock) through backward linkages into seed production, drying and packaging, production of tools, net fences, and animal hutches at the village level, and likely forward linkages into village level production of solar dryers or other food processing equipment and the production of low cost vehicles." These are the "intermediate technology" hardware areas where this British organization has established expertise. Pilot countries may be Bangladesh and Kenya. (Peru is also being considered to represent Latin America).

International Board for Plant Genetics Resources

1982 Directory of Germplasm Collections IV--Vegetables. Rome, Italy: IBPGR.

Irvine, F.R.

1949 Indigenous Food Plants of West Africa, Economic Botany 3: 436-444.

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J-Authors

Jain, Ravindra K.

- 1970 South Indians on the Plantation Frontier in Malaya. Yale Southeast Asia Studies no. 2. New Haven and London: Yale University Press.
459 pages, maps, figures, plates, references p.446-452, index.

Gardening and raising goats and poultry are mentioned in passing in this ethnography of ethnic south Indian Tamils who form the resident worker community on a Malaysian rubber plantation. "In addition to allotting a garden plot to each family at the back of the labor lines (block housing for workers' families), the management allows estate workers to plant fruits and vegetables in a narrow strip of land in front of, and by the side of, the line. The line patch is often cultivated by women" (:104-105). A father or his son work the larger allotment plots, which produce vegetables, manioc, betel, papaya and plantains for domestic consumption, but also some for sale within the estate (:19). Figure 17 diagrams a continuous strip of land, 100 x 2,838, within which garden plots are allocated according to the size of the family. Households also raise goats, buying kids two months before an important feast (Tipavali) when "scores" of tethered goats graze in front of the labor lines. More cash income from wages is spent on meat and fish than vegetables as "a considerable portion of vegetables needed for household consumption are grown in the garden patch...chicken and eggs may also be provided for domestically." The garden plot and free housing are primary fringe benefits for estate workers. Only one member of a resident family need be employed. Men and women perform similar tasks on the rubber plantation, but work in sex segregated groups.

Janzen, Daniel H.

- 1973 Tropical Agro-Ecosystems, **Science** 182: 1212-1219.

Jardin, C.

- 1967 Rapport sur une visite en Polynesie Francaise 26 mai-6 juin 1967. 01185-67-WS. F. OCE 65037 F/F NU. Rome, Italy: Food and Agriculture Organization.

Gardens were a part of the school feeding project in French Polynesia described in this report.

Jardin, C. and J. Crosnier

- 1975 Comment Ameliorer l'alimentation familiale. South Pacific Commission. Noumea (New Caledonia).
43 pages, drawing, photographs
FAO Access No. 32938

Handbook of household production written for Oceania covers family gardens, hen house management, and food hygiene, conservation, and preservation. Avant garde chapter shows how to put in a hydroponic garden, pointing out that sand is the main atoll resource. **Advoca-**

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tes using schools as centers where communities are taught the techniques.

Journal of the New Alchemists. Brattleboro, Vermont: The Stephen Greene Press. Serial publication.

NAL Call Number GF1.J6

ISSN 0-162-833x

ISBN 0-8289-0366-2, or -0 (paperback)

Juadiong, Lydia **

1968 The School Feeding Program--An Experience in Bayambang ANP,

Philippine Journal of Nutrition 21: 3: 188-190.

Reports from the Philippines that seeds and seedlings from school nurseries were "tenderly cared for in the backyard gardens."

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K-Authors

Kaitz, Evelyn F **

1979 What Government Surveys Show, **Plants and Gardens**, Brooklyn Botanic Garden Record 35: 1 (Spring, May) 16-17.

Summarizes results of the USDA-ESCS survey from 1977 on home food production in the United States. Lists most popular vegetables and fruits grown at that time.

Kalinkin, A.F.

1981 Lichnoe podsobnoe khozyaistvo, kollektivnoe sadovodstvo i ogorodnichestvo. (Personal Part Time Farming, Collective Horticulture, Allotments and Kitchen Gardens.) Moscow, USSR: Kolos.

255 pages, references, tables (in Russian)
(CAB 1574933 Roo25-00180 3).

Origin, regulations, and economic importance to the national food supply in the Soviet Union are given for several forms of private, part-time farming, including kitchen gardens per se. Appended are official directives and regulations.

Kaplan, Rachel

1973 Some Psychological Benefits of Gardening, **Environment and Behavior** 5: 2: 145-161.

Vegetables offer practical rewards, but the longer people garden, the more other, subjective kinds of satisfaction become important.

1978 People/Plant Survey: Some Highlights. Manuscript.
Much quoted unpublished study (see Lewis, Coe, Relf) reports results of a survey of American Horticultural society members to determine what motivates long-term gardeners. Subjective rewards (a feeling of peace and tranquility) and sensory rewards (the beauty of the garden) were ranked higher than the satisfaction of producing food or experimenting with plants.

Kemp, P.

1977 The Production of Fruits and Vegetables in Kitchen Gardens and Allotments, **Proceedings of the Nutrition Society** 36: 3: 301-305.

Forecasts increasing demand in the United Kingdom for plots of land to grow fruits and vegetables due to rising food prices and consciousness about nutrition. Describes practical steps to encourage home production, including increased production of seedlings, potassium sulphate, and ammonium sulphate. Estimates that from allotments alone, 120,000 pounds sterling worth of produce can be expected annually.

Kimber, A.J. **

1972 The Sweet Potato in Subsistence Agriculture, **Papua New**

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Guinea Journal 23: 3-4-80-102.

Results of a mail survey, literature search, and field studies quantify the importance of sweet potatoes in New Guinea and their extreme "radiation". Thirteen types are planted among the people of Lake Ipea, 31 among the Enga, and 30 varieties among the Chimbu.

Kimber, Clarissa

****1966** Dooryard Gardens of Martinique, **Yearbook of the Association of Pacific Coast Geographers 28: 97-118.**

Documents three gardens in different regions of Martinique and their differences and similarities in management practices, layout, and use. Notes most gardens are on freehold plots and are common in both urban and rural areas. Provides useful species list and diagrams of garden layouts and plant use areas. Concludes that the dooryard garden "represents an evolutionary adjustment to the ecology of the Caribbean, but how much was innovation and how much inheritance needs to be considered."

1970 Recent Historical Plant Geography of Martinique. Ph.D. thesis, University of Wisconsin at Madison. Ann Arbor, Michigan: University Microfilms.
788 pages, illustrated
NAL QK 231.M3K5

Expands studies of the dooryard garden in Martinique reported in Kimber 1966, with an analysis of recent changes and introductions in the plants grown.

****1973** Spatial Patterning in the Dooryard Gardens of Puerto Rico, **Geographical Review 6** (January): 6-26.

Classifies 80 gardens studied in Puerto Rico into six types, giving diagrams for each. The most contrastive are the "jibaro" and the "manor" styles. In the jibaro, the dwelling is surrounded by bare earth and a few plants set in tin cans. Beyond the beaten earth, a refuse midden serves as the place for cuttings to germinate; animals are tethered, and a few wild or cultivated trees and many weeds grow. The manor style sets the house facing a lawn framed by ornamentals with outbuildings to the side and a backyard garden arranged in distinct beds. Food plants are screened from view in the back. Garden paths are paved, but the area is unfenced. Any animals are kept in barn areas. The four other types of gardens represent a continuum between these two styles. The "traditional" garden is an elaborated jibaro with more useful plants. The "vernacular" features plants in beds, numerous potted plants, living fences, and many animal pens. Species diversity is high. The "contemporary ideal" has a "consciously patterned arrangement of front lawn, foundation plantings, hedges and trees," with flower beds in front and at the side of the house. Middens are transformed into compost heaps. Animals are penned. The "house and garden ideal" shifts the emphasis to ornamentals. Characteristic activities and activity areas are given for each of the six types of gardens. Kimber suggests that patios and other structures of the more formal styles substitute for the beaten earth clearings in the jibaro and traditional styles. Suggests the jibaro and other vernacular styles

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derive from Arawak traditions, and other influences on dooryard gardens can be traced to Spain or to modern U.S. suburbs.

King, K.W.

1971 The Place of Vegetables in Meeting Food Needs in Emerging Nations, *Economic Botany* 25: 6-11.

King, Melvin H., Judy Wagner, and Regina Mitchel **

1978 Report on Feasibility of Developing Peace Corps Programs for Urban Food Production and the Outline of Training Design. Contract Report on Urban Gardening No. 77-043-1043. A 1404.32 in the Peace Corps Library

Reports site visits to Korea and the Philippines where, at the time, Peace Corps volunteers largely stationed to teach English felt underutilized and isolated in their assigned communities. Recommends that all volunteers in the NANEAP (North Africa, Near East, Asia & Pacific) Peace Corps region "receive pre-service training which will enable them to identify and follow up opportunities to encourage families to produce more of their own food and to improve the nutrition of family diets." This would require a training program in Urban Food Production featuring hands-on demonstrations closely linked to language and cultural studies, especially concerning the vocabulary of foods and vegetables. Contains strategies for urban food production in the countries visited. In Korean cities, space is available on the flat roofs and balconies of housing and in schoolyards; the low cost bamboo and plastic greenhouse technology used in peri-urban Seoul to produce market vegetables throughout the snowy winters could be applied to urban rooftop home or community gardens for the multifamily dwellings. Receptivity to the concept of vacant lot community gardening for the Philippines was guarded: Co-author Wagner was one of the directors of the Boston Urban Gardeners, a community organization which encourages this use of urban space. Eviction of squatters, whether residential or gardening, had been a point of tension in Manila.

Kirch, Patrick Vinton **

1978 Indigenous Agriculture in Uvea, *Economic Botany* 32 (April-June): 157-181.

Summarizes the literature and gives the major patterns of traditional agriculture for Uvea or Wallis Island, which lies between the Fijian and Samoan archipelagos. Uvean agriculture is zoned spatially. Near the coast are the elaborate "to'oga" gardens where perennial tree crops (coconut, breadfruit, fruit trees, and Pandanus) are grown and annuals are intercropped on rectangular "garden islands" ("fuhi")--planting beds raised .75-1.0 meters above interlaced drainage systems. The central permanent drainage canals ("ano matu'a"), ditches ("kavano"), and raised platforms to tap spring water modify the swampy environment and reduce crop maturation time. The to'oga gardens are village property, maintained by the community. Individual areas are allocated to families which use dibbles ("huo") to plant taro, then cover fuhi with a mulch ("u'ufi") of dried leaves that

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retards weed growth, enriches the soil nutrients, and retains soil moisture. After successive croppings, fuchi are fallowed and rebuilt with mud from the drainage ditches. Most village dwellings are set amidst the to'oqa garden. Above the garden village lies a zone for swidden cultivation of yams and aroids called the "gave." Bananas are planted as a relay extending the swidden use life up to five years. The 11 clones of the hopa group of triploid AAB bananas provide survival food in the August-October famine period before yams mature and when breadfruit is out of season. Truly communal traditional gardens are rare in the world; it is notable that even in this system of village ownership, maintenance and space allocation, usufruct plots on particular "garden islands" are for families and that the unique irrigation-drainage technology demands some centralized coordination.

Klougart, Asger **

1981 Horticulture for the People, *Acta Horticulturae* 105:
47-51.

Quotes a Danish survey documenting that more than a billion kroner (\$200 million US) worth of food is harvested from some million gardens in Denmark, one-fifth of which contain small prefabricated aluminum "glasshouses." Reports most (67%) Danish home gardeners rely on information in the "magazines" and circulars distributed free by gardening suppliers and manufacturers of inputs, though 48% read articles on gardening in newspapers, and 29% listen to radio talk shows. The materials of horticultural societies reach only about 17% of the million gardeners; only 6-7% ever join such societies. In order to reach "the people", whose favorite "sport" (more common than all other sports combined) is gardening, Klougart suggests that horticultural societies report gardening with the same gusto as sportscasters, and develop media programming for television. Though gardening programs are rare in Denmark, 51% of all home gardeners receive horticultural advice and ideas through this media channel. Dismisses the idea that gardening is popular as an expression of individuality and creativity in a country where building codes restrict more architectural expressions.

L-Authors

Latham, Michael C.

1979 Human Nutrition in Tropical Africa. FAO Food and Nutrition Publication No. 1, Rev. 1. Rome, Italy: Food and Agriculture Organization.

Planning and Evaluation of Applied Nutrition Programs.

Laumark, Sandra **

1982 Women's Contribution to Intensive Household Production in Bangladesh: Vegetable Cultivation. Paper presented at the Third Annual Seminar (on) Maximum Production from Minimum Land at the Bangladesh Agricultural Research Institute, February 1982.
16 pages, mimeographed.

This article is abstracted in the profile of CARE's Bangladesh project, in the main text.

Lawson, Rowena M. **

1977 The Agricultural Entrepreneurship of Upper Income Africans. A Report of ESCOR, Ministry of Overseas Development. 232 pages, bibliography: 227-232.
NAL S B453.3 W 413

Collection of articles on peri-urban gardens in Africa documents a recent trend.

Lea, D.A.M. **

1970 Activities Studies in New Guinea Villages, **Papua and New Guinea Agriculture Journal** 21: 3-4: 118-126.
Map, figures, bibliography.

The reports of Papua New Guinean university students on 320 individuals in seven of the students' home villages during the Christmas season showed that adult men and women (over age 15) spent between a fifth and a third of each 12-hour day surveyed working in "subsistence gardens" (swiddens), and over an hour a day travelling between home and these gardens. "While in the subsistence gardens, the men spent 60% of their time clearing and digging, and the women spent 70% of their time weeding and harvesting," with some variation among villages (:124). Men and women also participated about equally in activities related to the cash crops of cocoa and coconuts, with men doing most of the clearing and weeding and women most of the harvesting. What differentiated the adult roles was in how men and women spent the remainder of their time. "In all villages, cooking and household tasks took up most of the remaining day for women, except in one village where 40% of their day was spent making pottery. Men also carried out tasks classified as related to the household and housebuilding.

League for International Food Education (L.I.F.E.)

- **1976** Small Scale Intensive Food Production. Report of a Workshop on Improving the Nutrition of the Most Economically Disadvantaged Families. Prepared under Contract AID/TA-C-1071 on behalf of the Office of Nutrition, Bureau for Technical Assistance, USAID. Washington, D.C.: L.I.F.E.
97 pages, plus iii and appendices (A-27), tables, figures, references cited: 20-23.

Proceedings of a conference held at Santa Barbara, California in October 1976 contains two articles reviewed separately; Yang 1976, and Gallagher 1976. A particular gardening technique, "French Intensive/Biodynamic Gardening" is stressed, and results and methods of various practitioners of this technique (or its variants) dominate the publication. The first appendix by Hugh J. Roberts relates technical advances in this organic technique to "family food production." A five stage project is proposed to adapt the technique to conditions in developing countries.

- **1981** Small Scale Food Production: The Human Element. The Proceedings of the Third International Conference on Small Scale and Intensive Food Production.
Washington, D.C. : L.I.F.E.
114 pages, multilith, paperbound, tables, figures, literature cited: 20, 83.

Collects presentations given at a conference held in October 1981 at Santa Barbara, sponsored by the Volunteers in International Service and Awareness, Ecology Action of the Midpeninsula, L.I.F.E., Community Environmental Council, Inc., and New Transcentury Foundation. One contribution specific to kitchen gardens is reviewed separately (Yang 1981). Several unique experimental gardens are noted: the Kahumana Mandala 0.5 hectare garden in Hawaii (:80-83), demonstration vegetable gardens in highland Ecuador (:71-76), Save the Children's demonstration garden in Westport, Connecticut (:40) and their pilot garden in Honduras (:22-25), and the Wau Ecology Institute Research Garden (:100-103). The main subject of the conference is organic farming.

Leathan, David J. ******

- 1983 Economic Analysis of Home Vegetable Gardens, **Benson Institute 6**: 16-19.

Tables chart dollar value of vegetable produce, variable cost of production, dollar savings, labor requirements, and dollar savings per hour of labor for vegetables typically grown in US food gardens. Dollar savings per labor hour are greatest for zucchini squash (\$36.30), spaghetti squash (\$24), cucumbers (\$15.67), and carrots (\$14.14). At the lower end of ranking appear potatoes, peas, cauliflower, corn, radishes and snap beans: all yielding less than minimum wage. Space allocations needed to supply the normal consumption requirements of a family of four are charted. Ten models of gardens ranging in size from 25 to 1,700 square feet are presented. Each provides space to produce all the vegetables of a certain type that a family of four can be expected to eat fresh, and recommends profitable allocations of space by selecting vegetables which yield the highest dollar

savings. (This economic analysis proves that tomatoes and zucchini, so popular with US gardeners that they have become the butt of jokes, are among the most profitable of all possible choices and suitable for the smallest gardens.)

LeSar, John and Nicolas Danforth **

1983 Evaluation Report Seventh-Day Adventist World Service Tanzania AID Matching Grant Program in Community Health and Nutrition. Arlington, Virginia : Management Science for Health.

51 pages, tables, charts

Evaluates Tanzania site of a multicountry SAWS effort funded in part by an AID grant. Strategy in Tanzania rests on training and supporting paid Community Health Promoters (CHP's) to teach fellow villagers principles of health and modern agriculture. Each CHP "should have a kitchen garden for growing vegetables" (:13). Kitchen gardens were also demonstrated at Seventh-Day Adventist clinics, though at one clinic "animals had destroyed most vegetables because no adequate 'animal-proof' fencing was available" (:15).

LeVine, Robert A. and Barbara B. LeVine

1966 Nyansongo: A Gusii Community in Kenya. Six Culture Series: Volume II. New York, London, Sydney : John Wiley and Sons, Inc.

204 pages, maps, diagrams, tables, bibliography, index.
LC 66-18786.

Describes Gusii homestead agriculture in Kenya as related to child rearing practices. Homestead agriculture, though primarily for subsistence and based on hoe cultivation by women, is not primarily a garden system (see maps 2 and 3 and text 5-18). Gusii homesteads are placed amidst cultivation fields where finger millet, maize, and sweet potatoes are produced in relay. "Some women plant small fields of sweet potatoes, beans and peas to provide a supplementary food supply" (:13) before the main harvest. Livestock are grazed beyond cultivation areas, though often corralled near the house, as milk is consumed daily. Tree crops include bananas (regarded as snack food), oranges (sold in the market), and coffee, the main cash crop at the time of the study. Wild vegetables are gathered and consumed, and some women raise cabbages for home consumption and to take to market. Surplus corn and eleusine are bartered or traded for cash.

Lewis, Charles A.

1979a Plants and People in the Inner City, **Planning** 45 (March): 10-14.

1979b The Harvest is More than Vegetables or Flowers, **Plants and Gardens: Brooklyn Botanic Garden Record 35 : 1 (Spring-May) : 14-15.

1980 Gardening Programs Promote Improved Maintenance and Community Relations in Public Housing Developments, **Journal of Housing** 37 (December) :614-617.

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All three articles stress the psychological and social benefits of gardening in urban neighborhoods in the United States.

Lewis, Martha Wells

1978 Women and Food : An Annotated Bibliography On Family Food Production, Preservation and Improved Nutrition. Washington, D.C.: Office of Women in Development, United States Agency for International Development.

Sections of this annotated bibliography—"Vegetable Gardening for Developing Countries and Tropical Climates" (pp. 8-20), "Raising Small Animals" (pp. 21-24), and "Better Nutrition through Vegetable Gardening" (pp.25-29)--give a good selection of the "how to do it" literature, including gardening or animal husbandry manuals, textbooks and key references.

Liebrecht, S. **

1967 Rapport au gouvernement de la Côte d'Ivoire sur le Programme d'alimentation scolaire et de nutrition appliquée. Report No. TA 2406, NU:A/67/19. Microfiche 02021. Rome, Italy: Food and Agriculture Organization.
9 pages. (In French)

Report of an FAO nutritionist, assigned for the year 1966-1967 to develop menus for a feeding program in the Ivory Coast operating in 58 school canteens and utilizing rations donated by UNICEF and the World Food Program. Notes that school gardens have multiplied rapidly, that there are more school gardens than school canteens, and that FAO and the US Peace Corps are actively involved in assisting school gardens. Independently of the school feeding program, 40 chicken units have also been established at 40 schools by the Ministry of Animal Production. Performance of a UNICEF sponsored home economics program with a nutrition education component is described as disappointing, disorganized, and affected by the outmigration of young rural women to the major cities.

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M-Authors

May, J.M. and D.L. McLellan

- 1973 The Ecology of Malnutrition in the Caribbean: The Bahamas, Cuba, Jamaica, Hispaniola (Haiti and the Dominican Republic), Puerto Rico, The Lesser Antilles and Trinidad and Tobago. New York: Hafner Press.
490 pages.

Land devoted to sugar production at the expense of food crops has led to a dependency on imported foods such as salt cod. Theoretically, local production of beans, rice, and a rich variety of fruits could have provided balanced intakes. This research shows why it has not.

Mac Dougall, Elisabeth B. and Richard Ettinghausen (editors)

1976. The Islamic Garden. Dunbarton Oaks Colloquium on the History of Landscape Architecture IV. Washington, D.C.: Dunbarton Oaks, Trustees for Harvard University.
135 pages plus plates, illustrations, references cited
NAL SB 470.5.D85, LCCN 76-468

Literary references to Islamic gardens in Persia, Spain, and Mughal, India are probed to outline the history of Islamic landscape gardening. Articles all stress the form, symbolism, and philosophy of Islamic leisure gardens. Illustrations include photographs of archeological ruins, etchings, "garden carpets," and illustrations of gardens from Indian texts.

Marchione, Thomas J.

- 1979 Food and Nutrition in Self-Reliant National Development: The Impact on Child Nutrition of Jamaican Government Policy, Medical Anthropology 1: 1 (Winter): 58-79.

Demonstrates that increased price of imported food in Jamaica led to an increase in subsistence farming and an increase in nutritional status of children in rural Jamaican areas.

- 1982 Evaluating Primary Health Care and Nutrition Programs in the Context of National Development. Paper presented at the American Anthropological Association meetings, December 1982.
10 pages.

Evaluates the outcome of the community health aid program launched in Jamaica in 1972. Finds the CHA role was diluted and politicized as CHA jobs and CHA assignments were distributed on the basis of political patronage. Finds the nutritional success of the Cornell University Medical program relied upon a steady supply of US PL 480 food to the pilot parishes.

Marton, J. and J. Nagi

- 1972 Historyczny rozwój gospodarstw przyzagrodowych w WRL (The Historical Development of Garden Plots in Hungary), Zagadnienia Ekonomiki Rolnej 4:1122:97-105. (In Polish-CAB)

Describes the "private plot" movement in Poland.

McIntosh, Curtis **

1983 Some Ideas on Selecting Crops and Livestock for Home Food Production, *Cajanus* 16: 4: 199-204.

Recommends soil improvement, production of small livestock on poor land, and growing tomatoes, cabbages, lettuce, cauliflower, sweet peppers, dasheen leaves, bhagi, and ochros in containers (such as oil drums or pails) where homes have no land. Notes that important constraints to gardening in the Caribbean include high rainfall intensity, high wind velocity, marked seasonality among limiting natural factors, and the unavailability of viable seeds, planting materials, feeder stock, fertilizers, insecticides, and veterinary supplies. "Unpopularity" of home food production in the region at this time has the effect of limiting demand for such services. "To the extent that there is an improvement in the demand for such services, a corresponding improvement in the services may be forthcoming." (Article implies a vacuum of home food production in the Caribbean when, in fact, all the techniques recommended are in practice.)

McIntosh, A. and P.A. Shifflett

nd Vegetable Gardening as Leisure or as a Dietary Supplement: A Preliminary Investigation. Department of Sociology, Texas A&M University, College Station, Texas. (Unpublished ms.) Study finds that 70 % of the elderly rural residents of Appalachian Virginia garden and 40% produce more than half the vegetables they consume.

McLarney, Bill

1977 *New Alchemy—Costa Rica, Journal of New Alchemy* (1977): 17-23.

Describes the process of establishing New Alchemy's ecological research and demonstration farm near Gandoca, Costa Rica. Perennial vegetable gardening was begun, with gungo beans, chayotes, yuca, yampi, malabar spinach, and a native perennial sweet pepper emphasized from the start, though production also began for native and imported tropical varieties of seasonal vegetables, including cucumbers, squash, peanuts, tomatoes, eggplants, melons, onions, okra, green beans, mung beans, ayote (a native pumpkin), and local spices such as turmeric, ginger, thyme, oregano, and coriander. By the time of this report (1976), the farm was already regarded by interested local farmers as a source of seeds, traditional cropping patterns were being integrated with new techniques such as composting, and the herbal tea cash crop scheme had begun.

McLoughlin, P.F. M., editor

1970 African Food Production Systems: Cases and Theory. Baltimore, Maryland : The Johns Hopkins Press.

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McNaughton, Jean

1983 Nutrition Intervention Programmes: Pitfalls and Potential,
Ceres 92 (16:2 March-April): 28-33.

Presents an overview of the "Applied Nutrition" programs launched in the late 1950's, which featured nutrition education and food production and became a major focus of United Nations assistance by the 1970's, with ANP's in more than 60 countries. Korea's program was "visibly successful," but others less so. Generally, countries proved reluctant to assume feeding supplement programs begun with international assistance and supplies of food, though the costs averaged only \$30-40 per person served/ year (mainly in food). ANP's proved more enduring, and nationals trained are typically employed in government ministries. Cites recent evaluations, but calls for better data for measuring benefits from operational projects.

Meals for Millions/ Freedom from Hunger Foundation

1983 Second Annual Report to the Agency for International Development. Matching Grant No. PDC-0206-G-SS-2045-00. Davis, California.
65 pages, with appendices.

Menon, A.G.G. and L. Prema **

1975 A Scale to Measure the Attitude of Rural Women toward Kitchen Gardens, **Agricultural Research Journal of Kerala** 13: 1: 27-32.

Statements were collected in Kerala State, India, from 25 women who had kitchen gardens and 25 who had not, as well as from fieldworkers and from the literature, in order to detect attitudes which influenced peoples' choice to garden. Negative statements expressed the following notions: 1) that kitchen gardens will require more work from housewives than they have time available; 2) that they require space not available in home compounds, and costly fertilizers; 3) that vegetables required for the family cannot be produced profitably and that favored vegetables can be more simply purchased in the market; or 4) that garden work will spoil family health or "eat away" leisure time. The strongest negative attitude involved perception of time constraints on housewives (1), yet many of the statements made by those who maintained kitchen gardens noted the exercise and constructive use of leisure time by the whole family. The strongest positive attitude was reflected in statements of the cultural belief that "every home should have a kitchen garden." Other positive statements expressed the views that the kitchen garden provides: 1) a balanced diet; 2) a solution to the problem of vegetable scarcity; 3) good exercise for the family; and 4) a way to use leisure to increase income. Respondents with positive attitudes also mentioned technical solutions as the "reason" they gardened: kitchen gardens can be maintained by "utilizing wastes," vegetables can be grown in pots, and well planned gardens can produce fruits as well as vegetables. An attitude scale based on this study was developed to help promote kitchen vegetable and fruit tree production through the Kerala Applied Nutrition Programme.

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Merrill, Richard, Stuart Hill, and Spenser Cheshire
1976 Ecological Agriculture: An Outline for Research.

Messiaen, Charles-Marie **

1974 Le Potager Tropical (The Tropical Vegetable Garden.) Paris, France: Presse Universitaire de France.
2 volumes, 572 pages.

This handbook reports on Messiaen's horticultural research on Guadeloupe. The first volume covers "general issues," such as the relationship between climate and plant development, tropical soils, pests, weeds, seeds, and breeding and "biological" (organic) methods. The second volume is devoted to particular crops: tomatoes, peppers, melons, and many more. Volumes also include a summary of the literature in French, and ample bibliography on adaptive vegetable research in tropical areas through the mid-70's. A fairly rare and expensive handbook, The Tropical Vegetable Garden is recommended as an essential reference for the design of market and home vegetable gardens in tropical areas.

Minturn, Leigh and John T. Hitchcock

1966 The Rajputs of Khalapur, India. Six Cultures Series Volume III. New York, London, Sydney: John Wiley and Sons, Inc.
158 pages, figures, bibliography, index.
LC 66-17632

The only "home production" found among the Indian Rajputs consists of chickens kept for eggs and meat by men in their compounds, and milk cows (also usually milked by men) from the cattle brought into the men's household area at night. All cultivation is in fields or in orchards, and by men. The "kharif" crop is harvested in the fall (maize, rice, pulses, cotton, hemp, and minor produce) and "rabi" (wheat, barley, oats, peas, and mustard) in the spring (:41). Women occasionally gather field crop leaves as greens, but do not work in fields. The women, who observe purdah, are total vegetarians, and will not touch or abide the presence of meat in their compounds. The principal activity of women in their compounds consists of processing and preparing grains for storage, and food preparation. Sacred plants (tulsa) and shade trees are the only vegetation in the women's compounds. The community is located in Saharanpur District, Uttar Pradesh, in the Himalayan foothills.

Miracle, M.P.

1961 Seasonal Hunger: A Vague Concept and an Unexplored Problem, Bulletin de L'IFAN XXIII Series B 1-2 : 273-283.

Original statement of a problem which has since been explored and detailed in a number of societies, this article notes that "a shortage of calories (occurs) every year in certain months, whether or not total yearly intake is short" in Sahelian societies. See also Ogbu 1973.

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Mollison, Bill

1981 Permaculture Two. Tagari, Tasmania, Australia.
These two handbooks set forth the basic philosophy of permaculture and give illustrative designs.

Mollison, Bill and David Holmgren

1979 Permaculture One. Winters, California: International Tree Crop Institute, U.S.A.

Morgan, W.B. and J.C. Pugh

1969 West Africa. London, United Kingdom: Methuen and Company Ltd.

Mulenga, Timothy **

1977 It is Also Bee-keeping in School Production Units, Farming in Zambia 12:4 (December): 43.

A secondary school boy appointed as "school beekeeper" in Zambia reports on his experience. Hives made in the boys' school woodwork shop and the 40 kg produced from bee colonies are sold to the public to help defray expenses of the school. Boys from several Zambian schools were trained in beekeeping by the Forest Department's Bee-keeping Division. Dadant traditional frame hives are used to produce *Adonsonii* bees.

Muthukrishnan, C.R. and Seemanthini Ramadas **

1974 Perennial Vegetables for Your Kitchen Gardens, Indian Horticulture 19:2: 11-12.

Recommends perennials suitable for larger kitchen gardens (fifth to a tenth acre) in India: agathi (*Sesbania grandiflora*), basella (*B. alba* and *B. rubra*), breadfruit (*Artocarpus hirsuta*), bananas, the leafy vegetable called "multivitamin green" or "chekurmanis" (*Sauropus androgynus*), the creepers chow chow (*Sechium edule*) and coccinia (*Coccinea indica*), Ceylon spinach shrub (*Talinum sp.*), and drumstick (*Moringa oleifera*). Plant space requirements, nutrient content, and cultivation guidelines are given for each. Recommendations are based on research on home gardens at the Tamil Nadu Agricultural University, Coimbatore, India.

N-Authors

Nabban, Gary

1983 The Desert: A Design for Drought, **Organic Gardening** 30
(November):46-47.

Reports experimental designs for agriculture in desert areas.

Nabban, Gary, James Berry, Cynthis Anson and Charles Weber **

1980 Papago Indian Floodwater Fields and Tepary Bean Protein
Yields, **Ecology of Food and Nutrition** 10: 71-78.

Describes the vanishing system of flood water farming, noting that digging wells and groundwater pumping have broken Papago Indian dependence on surface waters, so that now small kitchen gardens are replacing floodwater farming.

Naimark, Susan (editor)

1982 A Handbook of Community Gardening by Boston Urban Gardeners.
New York: Charles Scribner's Sons. ISBN 0-684-17466-9.
180 pages, illustrations, index, bibliography.

This respected handbook is by one of the older local urban community gardening associations.

National Academy of Sciences **

1979 Tropical Legumes: Resources for the Future. Washington,
D.C.: National Academy of Sciences. 79-64185
329 pages, plates.

Latest in a series of NAS publications on new crops, which also includes *The Winged Bean: A high Protein Crop for the Tropics*, and *Underexploited Tropical Plants with Promising Economic Value*. Many of the legumes featured are characteristic of traditional home gardens, but are little known to horticultural research. (The impact of publications such as this validates the little known indigenous crops, and often leads to their promotion in developing countries.)

Nations, James D. and R. Nigh

1978 Cattle, Cash, Food and Forest: The Destruction of the
American Tropics and the Lacandon Maya Alternative.
Manuscript, mimeo.

Restudy of the Lacandon kitchen gardens previously described by Tozzer in 1907 documents the apparent expansion of this system and gives lists of plants currently cultivated. Views the Lacandon approach as a constructive alternative to the clearing of tropical forests for cattle production in Central America, a theme expanded in Nations and Komer. The Lacandon are a forest people in southern Mexico.

Nations, James D. and Daniel I. Komer

Central America's Tropical Rainforests: Positive Steps for

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Survival, *Ambio* (Journal of the Human Environment, Royal Swedish Academy of Science) 12 : 5: 232-238

Describes rapid loss (4000 km²/year) of tropical rainforest in Central America as forests are converted to pasture for beef production and describes "positive steps" to change this pattern. Spotlights such "intensive agroecosystems" as the experimental tropical "chinampas" developed by researchers at INIREB in Vera Cruz, which produce food, cash crops, fuelwood and fodder for a family of five on 2,000m² raised beds; traditional agroforestry techniques of indigenous forest cultures; agroforestry systems experimented with by CATIE at Turrialba, Costa Rica, and such other ecologically sound, intensive systems as "orchard gardens". General and introductory summary article presents problem and possible solutions well.

Ninez de Rhoades, Vera

1983 Small Scale Food Production and Kitchen Gardens: Analysis of Patterns and Programs with an Emphasis on Peru. Lima, Peru: International Potato Center.
Manuscript, 13 pages (proposal)

A study proposed in this document will be available in mid-1984. Ninez is preparing a literature review on home gardens, and performing field work in several different ecological zones of Peru where various kinds of home gardens are kept. Review will also cover programs in Peru such as farmers' markets and community canteens.

Nolan, Mary Lee

1971 Ethnicity in the Dooryard Garden: A Study of Mexican-American Gardens in Bryan, Texas. Seminar Paper, Texas A&M University.

Survival of distinctly Mexican traditions of the "huerto" in the home gardens of Mexican Americans in Texas serves to indicate a lack of acculturation to Anglo-American norms, and/or high level of contact with Mexico.

Nutrition Economics Group ("NEG") **

1984 Food Consumption Considerations in the Design of Agricultural Projects.
6 pages.

Checklist compares design of rural development and agricultural projects with and without consideration of food consumption issues. When nutritional considerations are taken into account, home gardens, school gardens, health/nutrition clinics and home economics training enter the logical framework of design.

Nydegger, William F. and Corinne Nydegger

1966 Tarong: An Ilocos Barrio in the Philippines. Six Cultures Series Volume VI. New York, London and Sydney: John Wiley and Sons, Inc.
180 pages, maps, figures, tables, bibliography: 177-178, glossary, index.

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In contrast to reports from other areas of the Philippines, this rural barrio 300 miles north of Manila (studied before the land reform) did not have mixed gardens close to housesites. Rather, small vegetable patches were cultivated on ridges (:11) above rice paddies, 16 vegetables (especially eggplants, a regional specialty, mung beans and corn), were grown in seed beds then transplanted to harvested paddies, and fruit trees (especially bananas) were grown on the dikes and at the edge of the valleys (:27). Eggplants were the longest-bearing vegetable, and the only vegetable prevalent during the dry season (:26). Excess eggplant could be profitably sold only during a short season, was freely exchanged with neighbors, and figured as a diet staple with rice and fruits. Wild vegetables, such as the vine "saloyot," and "tugi," which resembles a potato, were gathered, consumed domestically, and sold in the local markets. The poorer families rely more on wild foods (:33). "Each house has at least one papaya tree that produces throughout the year, but with greater yield at the end of the rainy season. These trees provide a steady food supply, for few of the many fruits are allowed to ripen, almost all being picked when small and green and used as a vegetable" (:27). Pigs are tied under the house, fed a boiled food made of shaved and pounded banana stalks and corn or rice bran, and are allowed to forage by day (:28). Chickens are raised to provide a weekly cash income but roost in the trees. Goats are entrusted to the care of children, and provide feast food or cash income. Fish caught by men in bamboo traps from canals fed by the rice paddies were a protein source at this time, before chemicals used on the paddies polluted the canal water.

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O-Authors

O'Brien, Patricia

1972 The Sweet Potato: Its Origin and Dispersal, *American Anthropologist* 74 : 3 (June): 342-365.

Details the diffusions and adaptations of *Ipomoea batatas*, a New World plant domesticated by 3,000 B.C., diffused in pre-Magellan times into Polynesia (where it 'radiated' under different cultivation regimes and conditions) and diffused in a post-Columbian spread via Europeans. As sweet potatoes are common in tropical gardens throughout the world and constitute a major subsistence food crop, this exact history of diffusion underscores the importance of exchanges of plant propagation materials in human culture. See also Ho 1955 and Kimber 1972.

Ogbu

1973 Seasonal Hunger in Tropical Africa as a Cultural Phenomenon: The Onich Ibo of Nigeria and Chakakapoka of Malawi as Examples, *Africa XIII* (4): 317-332.

Defines the hungry season culturally in Nigeria and Malawi as "a period when the resources available do not permit (people) to satisfy their hunger in the way prescribed by their culture," and gives detailed examples from two West African societies.

Okigbo, Bede N.

1976 Multiple Cropping in Tropical Africa, IN: Multiple Cropping, R.I.Papendick, et.al., editors. Madison, Wisconsin: American Society of Agronomy.

**1977 Neglected Plants of Horticultural and Nutritional Importance in Traditional Farming Systems of Tropical Africa, IN: Fourth Africa Symposium on Horticultural Crops, *Acta Horticulturae* 53: 131-150.

Reviews literature on African farming systems and horticulture, noting a "prevailing ignorance of indigenous fruits and vegetables," and that much is unknown. Illustrates the nutritional importance of indigenous African fruits and vegetables, giving analytical tables of the nutrients of selected Nigerian crops. Calls for study and conservation of African cultivars. Pays due attention to the "home garden" systems, as well as production of vegetables in swidden and market garden systems.

1981 Alternatives to Shifting Cultivation, *Ceres* 14 (November-December): 41-45.

Describes "new cropping systems within the means of smallholders" in developing countries: no-tillage, mulching, alley cropping, and crop rotation are techniques being investigated by the farming systems engineering team research program.

Oomen, H.A.P.C and G.J.H. Grubben

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- 1978 Tropical Leaf Vegetables in Human Nutrition. Communication 69, Department of Agricultural Research. Amsterdam, the Netherlands: Koninklijk Instituut voor de Tropen (Royal Tropical Institute). Published jointly with Orphan Publishing Company, Willemstad, Curacao.
140 pages, plates, tables, bibliography, line drawings, plant lists.

From its front plate which illustrates a home garden in Benin to its selective notes on "Green Literature," this treatise relates to both traditional and planned home gardens. This charming advocacy document stresses the superior nutritional value of green leaves over other parts of plants commonly eaten, and the large number of tropical plants which fit the "green leafy nutritious bill of health."

Oppenheim, P.P. and S.L. Chan

- 1979 A Study of Home Grown Vegetable Production. Research Report No. 23. Market Research Centre. New Zealand: Massey University. (38 pages)

Studies operation of home gardens in Auckland, where 80% of the respondents had home gardens, and in Invercargill, where 60% had gardens. Insufficient space and lack of time were cited as the main reasons for not operating a home garden. Primary motives for growing one's own food included the higher quality and taste of home grown vegetables. As of 1978, 53% reported stable production, while 37% had recently increased production and future production increases were planned for such vegetables as broccoli, pumpkin, onions, and green peppers. Twenty-five per cent of the respondents purchased seeds at supermarkets; 27% received seedlings from friends or relatives. Many responded that they practice protected cultivation in glass houses (33%) or garden frames (25%). Calculated average value of production was \$85/household, or 6% of total food expenditures for the year. Books and newspaper articles, experience, or advice on seed packages were the main source of information on gardening.

F-Authors

Pacey, Arnold **

1978 Gardening for Better Nutrition. London, United Kingdom: Intermediate Technology Publications Ltd. ISBN 0 903031 507

64 pages, line drawings, tables, bibliography, plant lists, nutritional analyses of particular plants, plates. This booklet is highly recommended by agencies promoting gardening. The second half is a manual, giving basic guidelines for the selection of crops (largely from those familiar to European gardeners and suitable for temperate zones) which will fulfill local nutritional needs, as determined by surveys. Organizational and agronomic techniques are given for establishing gardens. The guide is rooted in the experience of gardening promotion through nutritional rehabilitation units (NRUs) supported by OXFAM-UK. Gardening was taken up at NRUs to produce food for and feed children while teach the mothers accompanying them how to grow and prepare better meals. Later, gardening was demonstrated at rural clinics as a preventative nutritional measure. Case histories are analyzed of 28 gardens related to health centers, such as NRUs, nursing or medical schools, hospitals and clinics. Efforts at rural health clinics were found to be best situated for demonstration purposes.

Padilla, Victoria

1961 Southern California Gardens: An Illustrated History, Berkeley, California

Pagezy, Helene

1982 Seasonal Hunger as Experienced by the Oto and the Twa of a Ntomba Village in the Equatorial Forest, Lake Tumba, Zaire, **Ecology of Food and Nutrition** 12:139-153.

Scarcity of animals for food characterizes the period of greatest nutritional scarcities, which falls in the major rainy season. Measurements of adult males made throughout the year document the phenomenon as weight loss. This study provides an example of the kind of longterm dietary and nutritional studies which are needed before designing a home production intervention.

Palacio, Joseph **

1980 Food and Social Relations in a Garifuna Village (Belize). Ph.D. thesis, University of California at Berkeley. University Microfilms No. RQC 83-00616. Ann Arbor, Michigan: University Microfilms International.

1984 Food Exchange Systems: Food and Social Relations in a Belizan Garifuna Village. **Belizan Studies: A Journal of Social Research and Thought** 12: 3: 1-35. ISSN 0250-6831

Fishing, processing food treats, growing cassava in "bush gardens," and gathering house lot tree fruits and bush teas are the main forms

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of food production, each practiced by slightly different age/gender groups. The exchange of these products defines social relations and hierarchy in cash and non-cash transactions.

Palem, Angel

1967 Agricultural Systems and Food Patterns, IN: Social Anthropology Handbook of Middle American Indians, Volume 6:26-52, Manning Nash (editor). Austin: University of Texas Press.

Gives a typology of Mesoamerican agricultural production systems, including the "calmil," a house site garden.

Paner, J.R.

1978 Nutritious Crops for the Backyard, Phillipine Journal of Nutrition 31 (3): 138-142.

Discusses the size and crop inventory of home gardens in the Philippines and the home garden campaign through the schools as a way to increase food production, decrease malnutrition and minimize dependence on foreign food assistance. Recommended vegetables are selected for low labor intensity on small spaces. Calculates an average family of eight persons needs to produce an additional 2400 calories and 20 grams of protein daily to achieve nutritional sufficiency (CAB).

Parisot, Jeanne **

1968 Rapport au Gouvernement du Maroc sur le Developpement de l'economie familial. CEP No. 51 NU: TA 68/17. Microfiche 04086. Rome, Italy: Food and Agriculture Organization. 59 pages.

Gives details on Moroccan home garden model ("jardin potager") extended and the mode of extension through "promotion feminine" volunteers who worked with other women 30-50 days a year. Gardens promoted were 100m², enriched with manure, and featured seed beds and transplanting for red, yellow, and green vegetables, fruits and legumes (peas, lentils, beans) including some native North African varieties. Potatoes and artichokes were particularly popular. Potatoes, as an unusual new crop, and artichokes, among other cultivars, had potential for marketing. The school gardens were at Fez and at the Centre de Promotion Feminine d'Ahermourou, where volunteers and staff were trained in agriculture, the home garden model, abiculture, and raising rabbits. School poultry units and gardens were established near Rabat. No information on the number of adopters is given.

Paulme, Denise

Les Gens du Riz. Paris, France.

Ethnography of the Kissa of the forested highlands of Guinea describes their use cycles of swidden fields where rice, their staple, is grown and relays include manioc, sweet potatoes, peanuts, cotton, and (on the plains) fonio. Contrasts swidden field cultivation (les champs) with gardening (les jardins). In gardens just outside villages, gombo, maize, and legume beans are grown.

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Peat, Gabrielle

1976 The Ministry of Health/Catholic Relief Services Project,
Cajanus 9:5&6.

During the Catholic Relief Services' joint nutrition project with the Ministry of Health and Environmental Control, from 1971-1976 in Hanover, Portland and St. Thomas, Jamaica, the beneficiaries themselves requested an agricultural project. "The linkage between agriculture and nutrition is logical."

**1984 An Experience in Improving Nutrition and Income through Home Food Production, Cajanus 17:1:28-37.

CPS' "Small Farmer Support Project" in rural St. Catherine and St. Andrews, Jamaica (1977-1981) mobilized and trained the Jamaican National Youth Service and 15 Community Health Aides to promote "home food production activities as a means of improving nutrition and income, and promoting self-reliant development in communities" (:29). Target outputs were 560 kitchen gardens, 42 goat and 30 rabbit livestock units, and a measurable reduction in malnutrition among participants' children under age 3. Where landlords prohibited cultivation, container gardening was promoted: two rubber tires could keep a family supplied with callaloo for several weeks. Local sale of vegetables began. Small livestock production was set back by lack of veterinary services, the shortage of materials to build pens and coops, dog predation, and theft. Hurricane Allen was a general setback to the project. Over the four year project, however, 1,330 persons cultivated gardens at some time and, as of 1981, there were 550 active kitchen gardens and 125 more being prepared for replanting.

Peck, Dee **

1979 The Kleingarten Concept, Plants and Gardens: Brooklyn
Botanic Garden Record 35:1 (Spring-May): 20-22.

Reports the status of allotment gardening in West Germany as of 1976 and describes the financial and spatial arrangements of the gardens. Notes that the movement was initiated by a pediatrician named Schreber at the turn of the last century and has spread throughout western Europe.

Peeters, Alice **

1976 Le Petit Paysannat Martiniquais et Son Environnement Vegetal, Recherches en Cours, Journal d'Agriculture Traditionnelle et de Botanique Appliquee 23: 1-2-3 (January-February-March): 47-55.

Opposes the polycultured fields to the "jardins de case," and notes the characteristics of these home gardens in Martinique. Lists plants grown as food crops, medicinals, and the magically significant ornamentals.

Pelzer, Karl J.

1945 Pioneer Settlement in the Asiatic Tropics: Studies in Land Utilization and Agricultural Colonization. Special Publi-

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cation no. 29, New York: American Geographical Society.
 Reports on early Indonesian transmigration schemes. As still happens,
 colonists from Java installed home gardens.

Pevetz, W.

1977 In the "Gardens of the Saura": Agricultural Impressions
 from the Date Palm Oases of Algeria, *Monatsberichte über die
 Osterreichische Landwirtschaft* 10 : 605-610.

Describes the structure of oases agriculture in Algeria, which is
 based on the date palm, an important trading product, and cleverly
 constructed irrigation systems, which permit cereal, vegetable, and
 fruit production, mainly for consumption by oases' households. Out-
 migration of young men is reducing the labor force needed to keep
 the system intact. Predicts gradual abandonment of the smaller
 oases, and population concentration of the larger, better maintained
 oases, which are assuming urban characteristics as trade centers with
 diverse economic links beyond the local agricultural production
 areas.

Pierce-Colfer, Carol J.

1981 Home gardens...not so easy, *Agenda October*: 8-11. A
 good postmortem on a home gardening promotion that failed, which
 reports on efforts to establish home gardening in a transmigration
 colony. Christian Dayaks, a minority population, had many well-
 tended gardens and healthier children in their place of origin. The
 Vice-President of Indonesia personally presented seeds of cabbage,
 spinach, green beans, eggplants, and cucumbers in August 1979, and
 the government provided herbaceous legumes that December. In 1980,
 15 villages were trained in gardening, a German aid team worked out
 multicropping systems, and a pilot home gardening project which cen-
 tered on income generation for women colonists was begun. Some seeds
 were planted beside houses, and soursop, pumello, papaya and orange
 trees were planted in the house yards. The gardening scheme faltered
 on several points. 1) Male Bias: seeds were distributed to men as
 "household heads" and only men were trained, although women were the
 traditional gardeners. This was because few women knew Indonesian
 and officials were fearful of trying to work with them. 2) Cash
 Crop Preoccupation: rice production was the core economic activity
 and even women decamped for weeks during labor peaks; no arrange-
 ments were made for the elderly or children to continue to care for
 home gardens. 3) Pests: free roaming water buffaloes (a gift from
 the government), wild boars, deer and pest buildups have ravaged
 many gardens since 1975. 4) Markets: nearest markets were timber
 companies and a plantation accessible only by boat. Without regular
 markets, there was no way for the would-be vendors to communicate
 that they were coming to sell produce.

Pillot, Didier **

1980 Outils, Espèces et Techniques de Culture, Dynamique des
 Systemes Haitiens, *Journal d'Agriculture Traditionnelle
 et de Botanique* 27: 3-4: 203-219. (Plates, bibliography,

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map)
 Describes the degeneration of Haitian agriculture, attributed to the worsening terms of trade between the price of coffee, a main cash crop, and beans and maize, the local food crops. Whereas in the past a family could sustain itself with a small garden of food crops and purchase sufficient additional food from the proceeds of cash crop sales, market changes have made food crop farming more attractive. At 500 inhabitants per km² of arable land, intensification is necessary. Three kinds of gardens (jardins) are responding to the crisis. These are: 1) (smaller than 2000m² around a house) a multistoried orchard of spices, bananas, coffee, citrus, avocado and other tree crops; 2) an intercropped garden at some distance from the house where maize, sweet potatoes, beans, root crops, colocasia and cabbages are grown; and 3) (also apart from the house) a continuously cropped garden of beans and sweet potatoes. Despite such adaptations, signs of soil depletion and demographic pressure include: 1) cultivation of higher altitude, marginal, rocky lands called "rak bwa" that were formerly left as protection zones; 2) degeneration of the types of plants appearing in the fallow cycles; 3) declining yields of red kidney beans, leading to more cultivation of the hardier resistant black bean; and 4) disappearance of good quality yams (yam barik and yam francais), substituted by rustic clones and human consumption of fruits and tubers which were previously reserved for animal feed.

Plucknett, Donald L. and Halsey L. Beemer, jr.
 1981 Vegetable Farming Systems in the People's Republic of China.
 Boulder, Colorado: Westview Press.
 386 pages, appendices. LC:80-25363
 ISBN: 0-89158-999-6 \$33.50
 NAL SB 320 8 C5V43

Vegetables are field crops in China, as in many other countries of Asia. Areas dedicated to vegetable production are a common feature of agricultural communes, a traditional community garden of sorts. Peri-urban vegetable gardens are a well-developed feature of cities in the Peoples' Republic. Stress is on technical features, rather than the disposition of produce, though communal production and communal disposition of the produce is implied as the major characteristic.

Podselver, Laurence **
 1980 L'Essartage et ses Implications sur le Mode de Developpement en Milieu de Foret Tropicale (Amazonie), Journal d'Agriculture Traditionnelle et de Botanique Applique 27: 1: 5-18.

General review of the literature on Amazonian subsistence systems notes the strategies in the choice of swidden locations. The Bora, Mirana, and Secoya keep small gardens close to the house. The Mundurucu, Campa, and Cashinahua select forest sites with special characteristics. Canelos make swiddens six or more hours' walk away from their residence in order to pursue hunting and gathering activities en route to their swiddens. The ceremonial importance of

maize does not diminish the overwhelming practical importance of bitter manioc (cassava).

Pontifica Universidad Catolica de Chile, Facultad de Agronomia **
 1983a Fundaciones de Vida Rural: Programa de Desarrollo de Comunidades, Comuna de Perquenco, IX Region. Evaluation. 12 pages, mimeographed, map

After working for two and a half years, the Rural Life program introduced and installed 100 family gardens (huerto familiar) in Perquenco town, Chile. Based on intensive cultivation, each garden averages 84m², where 27 vegetables are grown. Gardens are cropped continuously, producing 16-21 vegetables in the spring-summer season and at least 15 during the autumn-winter. The average value of one home garden production averaged 2,338 Chilean pesos in December 1982, of which about ps/375 worth are sold each month. The gardens installed with project assistance were spontaneously replicated by neighbors. For each garden assisted by the project, an additional 2.5 gardens "radiated." The nutrition education component of the project promoted the use of salads, dietary diversification, and selection of lower cost foods for purchase, so that an average of ps/250 per month were saved per household. Total earnings, savings, and value of food produced at home reached an average of ps/2,964 per month. Women were the main beneficiaries and participants of the program, which cost ps/20,000 per year per participant. Due to the multiplier effect, the ratio of cost to benefits is currently 1 : 1.95, and is expected to reach 1 : 4 within another two and a half years. The Interamerican Foundation provided grant funding.

1983b (Same Title as Above/ full report)
 88 pages, tables, map, plant lists, figures

1983 Fundaciones de Vida Rural: Programa de 1984 Desarrollo de Comunidades.
 9 pages, mimeo.

Prosper, Suzanne M. **

1969 Nutrition Education and School Gardens in the Elementary Schools of Senegal, **Nutrition Newsletter** 7: 4 (October-December): 27-30.

Joint UNICEF and FAO project in Senegal built 62 pilot school canteens, reorganized 117 existing canteens, and supplied protein rich food. After the close of the project, UNICEF continued to supply food for the canteens, which were handed over to the government. Seventy-five school gardens were established under the project, and an additional 60-65 gardens and 5 poultry units were established per year after the final phase of the project. Much of the nutrition education aspects of the project were devoted to educating pupils and canteen managers/ cooks to accept new foodstuffs and food habits, eg. eating the dish "couscous" at noon instead of just as an evening meal. A didactic book on nutrition and a book called The School Garden were prepared for use in training pupils and the horticulturalists respectively.

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Protein-Calorie Advisory Group (PAG) of the United Nations System
 1972 PAG Statement on Popular Participation and Community
 Involvement in Nutrition Improvement.
 NAL TX 553 P 7P72 nc. 15.

1979 Women in Food Production, Food Handling and Nutrition, with
 Special Emphasis on Africa: A Report of PAG. FAO Food and
 Nutrition Paper no. 8. Rome, Italy: Food and Agricultural
 Organization (FAO).
 223 pages, bibliography : 203-223.
 ISBN 9 251006911
 NAL TX 341. F605 no. 8
 FAO order # FNP 8

Puleston, Dennis E. and Olga Stravrakis Puleston
 1971 An Ecological Approach to the Origins of Maya Civilization,
Archeology 24: 330-346.

Pullin, Roger S.V. and Ziad H. Shehadeh, editors **
 1980 Integrated Agriculture-Aquaculture Farming Systems. Proceed-
 ings of the ICLARM-SEARCA Conference on Integrated Agricul-
 ture-Aquaculture Farming Systems, Manila, Philippines,
 August 6-9, 1979. Manila, Philippines: International Center
 for Living Aquatic Resources Management. ISSN 0115-4389.
 258 pages, charts, tables, maps, illustrations, biblio-
 graphy.

Presentations published in this volume are reviewed separately. Gen-
 erally, the systems described are larger than those suitable for
 "home gardens," although several function as a form of household
 small livestock food production on small farms.

Purvis, Barbara **
 1969 The Applied Nutrition Programme in India, Nutrition News-
letter 7:4: 43-44.

This synopsis of one of the longest running FAO/UNICEF ANPs (India,
 1959-1969) describes some accomplishments. By 1969, ANP operated
 in 16 states and 6 Union Territories through 580 Community Develop-
 ment Blocks, reaching 5% of India's population (then at 530 million
 people). Though centrally coordinated by the Department of Community
 Development, each state and each block had a coordinating committee,
 and training was usually carried out at the State level. The ANP
 scheme included promotion of family gardens through women's clubs
 (Mahila Mandal), school gardens worked by children and a limited
 school feeding program, and community gardens (anchayat Samithi)
 producing for kindergarden feeding programs. It also included, as
 demonstrations for the women's clubs, village fish ponds in some
 areas, and occasional poultry units managed by women's or youth
 clubs (Yuvak Mandal). Part of the produce of the fish ponds or
 poultry units was directed to the various meal programs. Although
 a nutrition education campaign was pursued by all personnel, Purvis
 observes "the food production aspects have, in general, made more

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progress than the educational work at the village level, particularly when it has been possible for some economic improvement to occur." UNICEF committed some \$14 million and Indian central and state governments committed "on the order of" \$37 million over the decade, a cost in 1983 dollars of approximately \$153 million.

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R-Authors

- Rao, Maddineni M. and Joseph E. Edmunds **
 1983 Intercropping of Bananas with Food Crops: Cowpeas, Maize and Sweet Potatoes, **Tropical Agriculture** 61: 1 (January). Intercropping affected the productivity of bananas (hands per bunch, fingers per bunch, finger weight, and days to harvest), but the authors conclude, "banana intercropping is specially beneficial to the smallholder in the Windward Islands as it provides greater total yields and a possibly greater financial return resulting in a more uniform distribution of income. In addition, intercropping could also reduce risk from pests and adverse weather as they tend to affect different crops differently."
- Rasanjiferahasina, M. and S. Ranaioson **
 1977 School Compounds Pilot Project. Evaluation of Project. Malagasy Democratic Republic, National Education Ministry, Ministry of Rural Development and Agrarian Reform, Malagasy National Committee of the Freedom from Hunger Campaign. Report No. FAO FFHC MAD 56. Microfiche No. 40635-77. Rome, Italy: Food and Agriculture Organization.
 Family gardens were introduced in four provinces, but the main objective of this FAO project was to introduce ample demonstrations of farming at school compounds. School gardens had a negative connotation in Madagascar and were struck from the curriculum and vocabulary after the period of colonial abuses. Products farmed at schools were either consumed by students, or taken home.
- Raynaut, C.
 1969 Quelques donnees de l'horticulture dans la vallee de Maradi. IFAN-CNRSH.
 "Groupements de femmes" in Niger grow vegetables in communal gardens with individual plots.
- Redstrom, Ruth A. **
 1972 Household Production and Preservation of Food for Home Use in the United States, by Region. CFE Photocopy Series 1. Agricultural Research Service, USDA.
 NAL: a TX 603 R4
 Gives summary statistical data on all aspects of home food production in the United States, including gardens by crop.
- Relf, Paula D. **
 1979 Therapy through Horticulture, Plants and Gardens: **Brooklyn Botanic Garden Record** 35 : 1 (Spring-May): 18-19.
 1982 Consumer Horticulture: A Psychological Perspective,

HortScience 17 : 3 (June): 317-318.

Both articles summarize results of surveys and studies in the United States of the psychological aspects of gardening. Relf 1982 gives a status report on the field of horticultural therapy.

Reutlinger, Shlomo, and Marcelo Selowsky

1976 Malnutrition and Poverty: Magnitude and Policy Options.
World Bank Staff Occasional Paper No. 23. Baltimore,
Maryland: Johns Hopkins University Press.
(BIBL LRS76-17447)
23 pages.

"After presenting statistics indicating the 'global dimension of malnutrition in low-income countries,' the authors examine policies and programs they regard as most cost effective to alleviate the problem (they characterize as) 'hunger amid plenty.'"

Reutlinger, Shlomo, and Harold Alderman

1980 The Prevalence of Calorie-Deficient Diets in Developing Countries, World Development 8 (May-June): 399-411.
(BIBL LRS80-13152).

"...Derives estimates of the extent of malnutrition as measured by the prevalence of calorie deficient diets on the basis of readily available data for a large number of countries"

Robinson, Dudley A. **

1967 Report to the Government of Tanzania on the FAO/UNICEF Assisted Applied Nutrition and Training Project AFP 223 in Hombolo, Tanzania 1963-1966. Report No. RU: TA/67/5 TA 2328. Microfiche 00506. Rome, Italy, Food and Agriculture Organization.

Community gardening around Hombolo Lake in Tanzania and school vegetable and fruit gardens were established to address area food and nutrition problems. Problems included protein and calorie malnutrition among children, seasonal (post-harvest) food shortages, periodic famines, common hookworm infestation, and endemic bilharzia. A fruit nursery was established from which seedlings of 7,225 pawpaw (papaya), 660 citrus, and 700 guavas were distributed. The survival rate of home plantings ranged from 20% to 55%. Vegetables encouraged were garden legumes (pigeon peas), tomatoes, amaranthus spinach, and squash. Cassava production was introduced as a famine reserve and the preparation of its leaves was taught. Five-day courses in nutrition, school meals, vegetable gardening, poultry raising, and beekeeping were the core of the educational and extension work. ANP piloted among the 4,000 families of Hombolo division was expanded to the 53,000 families of Dodoma District. Most families in the area kept a 6-acre "shamba". Project research on malnutrition led to a strategy to increase production and consumption of food.

Romanoff, Steven A.

1983 Food, Debt, and Rubber Tappers in the Bolivian Amazon.

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Unpublished manuscript.

Respondents in a random sample of farmers, townsmen, and rubber tappers living in isolated camps in Beni, Bolivia, expressed their desire to live in one place in order to plant fruit trees, raise animals, and improve their houses. Dietary deficiencies and household food crises were related to a lack of subsistence production. At the same time, family economic problems stemmed from the burden of food purchase costs. Concludes that commercial development of the region would be more likely if enhanced by subsistence production, including home gardens.

Roumeas, Loik **

1969 Rapport au Gouvernement de Mauritanie--Programme d'alimentation scolaire et d'éducation en nutrition. UNDP AT 2618. Microfiche 06075. Rome, Italy: Food and Agriculture Organization.

13 pages.

In Mauritania, UNICEF sponsored a school garden project between 1963-1968. One hundred twenty-two school gardens were established. Gardens were rare in southern Mauritania at the time. Technical support to school garden efforts was "rudimentary," so the main project focus shifted to teaching nutrition education in schools.

Rubert, Brian **

1978 The Role of the Home Garden in Improving the Nutritional Status of Developing Nations, IN: Small Vegetable Gardens Resource Packet Part C: 4-3 - 4-8. Washington, D.C.: Peace Corps Information Collection and Exchange. (Reprinted in 1982.)

Excerpt from a masters thesis views home gardens as "an agronomically feasible, nutritionally desirable, (and) economically justifiable" way to increase vegetable consumption. Regrets that vegetables have been neglected in favor of cereal crops in the search for solutions to the world's food problems. "Vegetables are thought of simply as a protective factor contributing merely to quality of diet with vitamins and minerals." However, the "role vegetables play in supplying energy and protein in a population's diet do not reflect small farm and home garden production and consumption. It is important that vegetable crops receive equal attention in a country's agricultural planning...."

Ruck, H.C. **

1963 Report on a Visit to Nigeria, Dahomey and Ghana, 1-23 March, 1968. Microfiche 02789. Rome, Italy: Food and Agriculture Organization.

Problems and progress uncovered in site visits constitute mid-way evaluations for three FAO technical assistance projects. The projects were officially known as FH/DAH 4 "Improvement of Nutrition in South East Dahomey by the Development of Home Gardens," NIG/5 Ilesha gardens, and FFHC Pilot Home Gardens FH/GHA 3. Finds fault with Benin and Ghana projects, as few local people adopted in Benin

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and the Ghana project did not reach low income residents. Praises the Nigeria project. "The idea of the mixed garden in which all the plants are grown together, often in a semi-wild state, and at different levels with trees, climbers, and lowly growing shrubs and plants intermingled is typical of South East Asia. Its introduction to West Africa by Professor Terra is a remarkable new idea, and if utilized skillfully, may well prove an important "interim" measure in meeting the ever increasing problem of feeding the growing population" (:3).

Ruthenberg, H.

1976 Farming Systems in the Tropics. Oxford: Clarendon Press.
366 pages.

Ruthenberg, H. with J.D. MacArthur, H.O. Zandstra and M.P. Collinson
1980 Farming Systems in the Tropics. New York: Oxford University
Press.

xxii, 424 pages,
ISBN 019859481X (hardcover)
ISBN 0198594828 (paperback)
NAL SB 111 R 87 1980

S-Authors

Sabry, Z.I.

1982 Issues in the Evaluation of Nutrition Interventions: An International Perspective, **Food and Nutrition** 8:2: 3-8.
 "Projects which involve nutrition interventions usually have a multitude of variables, many of which are not identifiable." Evaluation has generally been avoided as too costly, and the budget for this item ranges between one and five per cent of total project costs. Trial interventions are regarded as "bothersome delays," though essential to better planning. Study of a control group not receiving project benefits raises obvious ethical issues.

Sanders, William T.

1967 Settlement Patterns, IN: Handbook of Middle American Indians, Volume 6: Social Anthropology, Manning Nash, volume editor: 53-86. Austin, Texas: University of Texas Press.
 Relates "scattered villages" as a settlement pattern in highland Mexico and Guatemala to the "calmil-barbecho" system. "Each family has a relatively large house lot, which is planted in maize and intensively cultivated (calmil). The land is never rested as it is continuously fertilized by refuse from the house and its occupants. Each family also holds a number of larger fields outside the residential area of the village, which are not fertilized but alternately rested (barbecho). The size of the calmil is limited by the amount of refuse available....Certainly all calmil villages must be scattered villages, but the converse may or may not be true." (:82).

Sanjur, Diva **

1982 Social and Cultural Perspectives in Nutrition. Prentice-Hall.

Sastrapradja, Setyati, Siti Harti Aminah Lubis, Eddy Djajasukma, Hadi Soetarno and Ischak Lubis

1977 Vegetables. LIDI Publication Series No. SDE-39

1981 Vegetables. Rome, Italy: International Board for Plant Genetics Resource Secretariat.

Savane, Marie Angélique **

1981 Implications for Women and Their Work of Introducing Nutritional Considerations into Agricultural and Rural Development Projects, **Food and Nutrition Bulletin** 3:3: 1-5.
 Though not specific to the home gardening strategy, this masterful review of the patterns of women's contribution to food production and their general work load in rural areas is a sensitive and sensible analysis.

Scharmer, Roger P.

1980 Urban and Community Gardens, **Challenge** July: 6-12.
How and why to set up community garden organizations is treated in this article.

Schmitt, Bernard A.

1979 Protein, Calories, and Development: Nutritional Variables in the Economics of Developing Countries. Westview Special Studies in Social, Political, and Economic Development. Boulder, Colorado: Westview Press.
224 pages, tables, figures, appendices, notes, bibliography: 213-220., index.
IC:78-17294; ISBN: 0-89158-185-5 \$28.50
NAL HD 9000.5.S375

Schofield, S. and C.M. Lambert

1975 Village Nutrition Studies: An Annotated Bibliography. Brighton, United Kingdom: Institute of Development Studies, University of Sussex.
285 pages.

This primary reference can be consulted to find existing studies of nutrition before new studies are undertaken. Lists and evaluates methodology and findings of nutrition studies, arranged regionally for Africa, the Middle East, North Africa, India, Asia, Oceania, Latin America, and the Caribbean.

Schubert, Bernd, H. Butscher, C. Kellner, O. Lin, M. Thomsen and B. Wolf

1982 Vegetables in East Kalimantan: Agro-Economic, Nutritional and Ecological Aspects of Promoting Vegetable Production and Marketing in the Three Districts of East Kalimantan, Indonesia. Seminar fur Landwirtschaftliche Entwicklung. Berlin: Technischen Universitat Berlin.

Describes a recent market vegetable project in a transmigration setting in Indonesia. A "home garden" approach was tested to reproduce the function of house site production for family nutrition and for sale in the colonization/transmigration settlements.

Schwartz, J.W.

1981 A Bibliography for Small and Organic Farmers, 1920 - 1978. Washington, D.C.: United States Department of Agriculture, Science and Education Administration.
237 pages, indexed
NAL call number az5076.A 1 U54

This resource bibliography compiles publications on organic farming and gardening.

Schwartz, Sara J. **

1980 Review of Home Gardening Projects. OPD/Asia Bureau. (Inter-

nal draft AID document)
 Briefly reviews FAO's ANPs in India, Sri Lanka, Nigeria, the Sudan, and the Caribbean. Notes gardening components in World Bank and AID projects, and profiles gardening projects or interest in gardening of OXFAM-UK, the Peace Corps, Ezra Taft Benson Agriculture, CARE, and the Ford and Rockefeller Foundations. Identifies as major constraints to implementing home gardening projects: 1) local acceptance of new food produce in areas where vegetables are not normally consumed; and 2) lack of country infrastructure to support and maintain gardens, eg. to deliver inputs, seeds and tools in time, and to provide extensionists. Gives as "criteria for success" the following conditions: 1) women are already responsible for producing their families' food; 2) local vegetables are already a part of the family diet; 3) soil, weather, and water resources are sufficient to maintain gardens in areas accessible to village women; 4) local seed production and distribution facilities are already present in the target area; 5) extension agents, knowledgeable in both home gardening and nutrition, can communicate effectively with rural women; 6) the community and families support the gardening project and are willing to invest the time and labor required to maintain the gardens; and 8) the communities and families are taught and understand the connection between vegetable consumption and nutritional status.

Setyati Harjadi, M.M. Sri

1975 Potential Contribution of Home Gardening to Nutrition Intervention Programme in Indonesia. Seminar on Food and Nutrition, Bogor, Indonesia. (ms)

1977 Improvement of the Home Garden in the Context of the Family Nutrition Improvement Programme of the Government of Indonesia. Final Report. Bogor, Indonesia.

For Indonesia, studies home gardens and recommends changes in home garden crop composition and style. Though written in Indonesian, results and recommendations are reported by writers in English (Soemarwoto, Binkert). A random sample of 20 farmers in each of 12 villages in four provinces of Indonesia revealed that all had gardens. Though fruit trees abounded, recommendations for the improvement of the home garden to achieve better nutrition included: increased production of popular fruit trees, tuber/legume rotations, edible plant fences, medicinal plants, technical extension and educational aids, establishment of village seed gardens, introduction of new technologies such as grafting, compost production, tree pruning, high yield seedlings, and greater involvement of housewives.

Sekyi, P.E. **

1977 The Development of Individual Home Gardens in Ghana, *Acta Horticulturae* (Tropical Horticulture) 53: 123-125.
 Ascribes the development of home gardens in Ghana to colonial period European influences and policies of Ghanaian institutions.

Sevenhuysen, G.P. and A.P. Burgess

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- 1980 Evaluation of Nutrition Interventions and Annotated Bibliography and Review of Methodologies and Results. ESN/MISC/80/4. Rome, Italy: Food and Agriculture Organization.

Provides a general reference and evaluation of nutrition interventions in projects assisted by FAO.

Shri AMM Murugappa Chettiar Research Centre **

- 1981 Biodynamic Gardening. Monograph Series on the Engineering of Photosynthesis Systems. Volume 4. Bombay, India.

Reports on experimental organic home gardens promoted in India. Gives 1979 and 1980 yield results for on-farm tests of the modified French intensive biodynamic gardening which the center has adapted for difficult Indian soils (clay and sand). Kitchen gardening outreach extension established 22 gardens. Constraints faced by adopters included the cost of the fencing needed to prevent goats from entering, unavailability of water near homes, and lack of effective pesticides. Yields of greens and cluster beans grown on top of sand in a fishing village ranged from 18 to 54 tons/ha equivalent. Average labor requirements were a half-person day per week. Calculation of caloric input (energy for work) in relation to caloric output produced positive ratios up to 1:3 for some gardeners, but were negative for others. Appended tables give yields. Some farmers decided spontaneously to enlarge the area they gardened in order to produce for market as well as home consumption.

Sillitoe, P.

- 1983 Roots of the Earth: Crops in the Highlands of Papua New Guinea. Manchester, United Kingdom: Manchester University Press.
285 pages, bibliography, plates, 2 maps, 46 tables
ISBN 0-7190-0874-3

Papua New Guinea traditional swidden gardens are the subject of this study. Six different types of swidden "gardens" with distinct cropping patterns are identified. Yields differ enormously, though sweet potato accounts for 3/4 of the total production. Gives plant names in Wola (a New Guinea language), English and Latin, and the Wolas' classification and cultivation practices for each plant.

Simons, Frederick J.

- 1964-5 Two Ethiopian Gardens, Landscape 14: 3: 15-20.

Brief report in the "door yard garden" style of analysis describes house site planting for a small sample in Ethiopia.

Singh Thandi, Ranjit

- 1977 Grow Fruit Plants in Kitchen Garden and Around the Tubewell, Progressive Farming: A Monthly Journal of the Punjab Agricultural University 13:5: 5-6, 17.

For India, recommends specific varieties of fruit trees selected for their space requirements and potential to bear year round.

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Suggests 6-10 trees suitable per housesite orchard. The concept of developing the areas around tubewells as gardens later became the focus of a major effort in Bangladesh and India, retrofitting the use of the deep tubewells.

Skinner, G. William

1978 Vegetable Supply and Marketing in Chinese Cities, *China Quarterly* 76 (December): 733-793. (BIBL IRS78-20841).
Chinese peri-urban gardens provide most of the vegetables produced and marketed in Chinese urban areas. "Discusses the goal of food supply self-sufficiency for urban areas and describes patterns of urban agricultural development."

Socas, Carlos **

1978 Development at the Community Level. Experiences in Mexico, Colombia, Peru and Argentina, 1975. Rome, Italy: Food and Agriculture Organization.
Retrospective review of community development projects in several Latin American countries notes that gardening was a part of a project in Oaxaca, Mexico.

Soemarwoto, Otto **

1975a The Home Garden System: An Ecological Consideration of an Integrated Approach for the Prevention and Rehabilitation of Degraded Soils. Paper presented at the Symposium on the Prevention and Rehabilitation of Degraded Soils in Area Development at Jakarta, October 27, 1975. Bandung, Indonesia: Universitas Padjadjaran.
Describes Indonesian traditional home gardens and advocates their improvement and expansion as the most efficient way to produce food and energy without environmental degradation. Proposes a checker-board mosaic of "sawah" irrigated rice fields and home gardens of about equal size to be arranged along sloped land for colonization projects, biogas based rural electrification and interspersed protection forests.

1975b Unifying Concepts in Ecology, IN: Rural Ecology and Development in Java, W.H. van Dobben and R.H. Lowe-McConnell, editors: 275-281. The Hague: Dr. W. Junk B.V. Publishers.
General article on ecology uses the example of the ecological and structural complexity of the Indonesian home garden as an illustration of principles.

Soemarwoto, Otto and Idjah Soemarwoto **

1979 Village Home Gardens: Their Functions and Structure, *Kompas* (January 10): 4,9.
Lists characteristics of traditional Indonesian home gardens later detailed (see 1981 article of the two authors below). Argues that many "village renovations" and "garden improvements" promoted by authorities have an urban bias and will destroy some functions of

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home gardens. Destructive innovations include "cleaning up" by cutting down useful trees and replacing them with decorative ornaments; fencing, which is regarded as anti-social in rural areas; and urging an emphasis on marketed crops or certain vegetables that can be harvested only once a year, at the expense of the traditional inventory that can be harvested daily. "The best approach to village development would be to explore the ecological wisdom of the villagers, to systematize this knowledge as a science, and use critically this science as a foundation for village development and thereby really benefit villagers."

**1981 Home Gardens in Indonesia. Paper presented at the Fourth Pacific Science Inter-Congress, September 1-5, 1981 at Singapore.
19 pages.

Focuses on the functions of the traditional Indonesian home garden ("pekarangan") in conserving soil, water and genetic resources, as well as their production, social and aesthetic functions. The multi-storied gardens vary from about 20 to 2000m² in size, contain an average of 30-50 species (and up to 200 species,) with high ratios of perennial to annual species, and with varying root depth and height, so as to exploit soil nutrients and sunlight. Nutrient storage in the perennials prevents leaching.

Soemarwoto, Otto, Idjah Soemarwoto, E. Karyono, E.M. Soekartadiredja, and A. Ramlan

1975a The Javanese Home Garden as an Integrated Agro-Ecosystem, IN: Science for Better Environment (Proceedings of the Inst. Congress on Human Environments=HESC at Kyoto, Japan, November 1975), pp. 193-197. Tokyo: The Asahi Evening News.

Presents in a popular journalistic style the virtues of the Indonesian traditional home garden.

1975b The Javanese Home-Garden as an Integrated Agro-Ecosystem, Agro-Ecosystems (November) Kyoto, Japan.

Solon, Florentino S., Barry M. Popkin, Thomas L. Fernandez and Michael C. Latham

1977 Research to Determine the Cost and Effectiveness of Alternative Means of Controlling Vitamin A Deficiency (Xerophthalmia). Report to the Philippines National Science Development Board.

Full technical report of the Philippine experimental project summarized in Solon et. al. 1979.

**1978 Vitamin A Deficiency in the Philippines: A Study of Xerophthalmia in Cebu, American Journal of Clinical Nutrition 31 (February): 360 - 368.
5 tables, references p. 368.

Reports an experimental Philippines project concerned with testing ways to correct Vitamin A deficiency. Summarizes the results of clinical baseline studies of vitamin A deficiency in a population

of Philippine children and other studies isolating factors associated with Vitamin A intake, such as household composition, location and income, the age and gender of children, and mothers' employment outside the home. About 70% of the families had home gardens, most less than 25 m². Gardens produced annual values of \$14.50 annually, equal to 3% of average family income, but contributing 8% of the income of the poorest 25%. Larger gardens in the outlying rural neighborhoods were associated with higher Vitamin A intake--each 1% increase in the value of home garden production increased each child's intake by an average 192 IU. In other areas, declines were registered with increased garden produce values as larger fruits were marketed. Children of employed mothers had lower Vitamin A intake, but fewer diseases and parasites, which the investigators attributed to the role of mothers in preparing soup dishes which feature green leafy vegetables. The study provides background for the test of interventions described in Solon et. al. 1979, annotated below.

Solon, Florentino S., Thomas L. Fernandez, Michael C. Latham and Barry M. Popkin **

1979 An Evaluation of Strategies to Control Vitamin A Deficiency in the Philippines, **American Journal of Clinical Nutrition** 32: 1445 - 1453.

6 tables, references

Reports a controlled experiment in the Philippines to assess three methods of supplying Vitamin A: by public health and horticulture intervention, by massive dose capsules, and by fortification of MSG, a popular food additive. Each alternative method was applied in non-adjacent neighborhoods (barrios or barangays) in four different settings: urban squatter, urban fringe, rural coastal, and rural hinterlands, after extensive baseline studies of 1715 children's deficiencies and clinical symptoms of xerophthalmia, and dietary, demographic, socioeconomic, and other studies of the children and their families. Sample included a total of 1407 children. The gardening intervention provided seedlings or seeds and cultivation advice for water convolvulus, drumstick (tree horse radish), and Malabar nightshade, judged to be popular crops rich in carotene. Gardens averaging 18.5m² were calculated to produce 15,000 IU of Vitamin A equivalents as beta carotene per person per day, three times the Vitamin A RDA. The incidence of severe malnutrition decreased, and weight-to-height ratio increased in the rural and urban areas where the garden intervention was made. However, on the basis of cost and clinically tested outcome, the simpler method of fortification of MSG was judged most effective. Cost of the public health and horticulture intervention per 300 household barrio was estimated at \$2,840 annually, versus \$63 for capsule and \$173 for MSG fortification. Benefits of the public health and horticulture intervention other than on Vitamin A deficiency alone were to be documented separately.

Sommers, Paul

1978 Traditional Home Gardens of Selected Philippine Households and Their Potential for Improving Nutrition. M.A. Thesis,

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University of the Philippines, Los Banos.

Thesis reports the results of a survey of 40 households with traditional mixed gardens in the Philippines. Gardens averaged 400-600m² and their plant diversity ranged from 14-41 different species. Fruit trees, legumes, root crops, spices and leafy vegetables were produced, primarily (for 75% of the sample) for home consumption.

**1983 Low Cost Farming in the Humid Tropics: An Illustrated Handbook. Manilla, The Philippines : Island Publishing House Inc.

Handbook for installing or improving mixed gardens in the "humid tropics" is based on the author's studies of Philippine home gardens and visits to Indonesia.

Note: Sommers was the principal author of the UNICEF Home Garden Handbook (1981) referenced by corporate author, UNICEF, below.

Soon Young Yoon **

1983 Women's Garden Groups in Casamance, Senegal, **Assignment: Children** 63/64: 133-153.

Traditionally, women of the dominant Diola ethnolinguistic group in the region of the Casamance river, Senegal, gardened an average of 0.2 hectares of vegetables in their backyards during the dry season. Government attempts to promote private plot farming in the 1960's led to a glut of tomatoes and potatoes. Prices fell. The scheme failed. About 1974, pressed by the drought, food shortages, and a new market in the tourist trade, interest in market gardening revived. With funds collected through women's banking groups and assistance from UNICEF and a government project (PIDAC), women organized market gardens. In 1982, 53 such groups received UNICEF assistance in the form of tools, cement to line and build wells, and pumps. Though called "women's groups," 16 of the total of 190 new groups UNICEF will sponsor have some men as members. Case histories are sketched for two market gardens. At Boucotte Ouoloff, individual women have rows ranging in extension between 20 and 200m² within the collective plot. At Dianky, production is more collective: the president of this group aspires to the presidency of the republic, and uses informal pressure to assure each member produces her share. Both groups are satisfied with their increased income and report improvements in their families' diet. This UNICEF Casamance project should not be confused with a USAID Women and Development project with similar objectives in the same area. That WID project failed as the women selected to be participants were too involved in migration and labor in rice fields to establish continuous market gardening.

Southerland, Eleanor

1967 Practical Approaches to Home Economics, IN: Aghevli 1967: 225-243.

Based on her experiences in Iran, Southerland presents a strong case for home economics extension in any development efforts directed at achieving food security. For rural efforts, Southerland suggests that local home economics agents be selected from among women with a

rural background who understand farm living yet have formal education as high or higher than those living in the area where they will work, as well as an ability to teach and work well with people. Under-scores as universal the role of women in food production, storage, preservation, preparation, and in nutrition choices, health, and sanitation. Reports on the work of the Iranian Home Extension, which she advised in the mid-1960's. Home gardens were promoted. The number of families with home gardens increased from 370 to 929 in 1963, the total linear feet increased 313%, and pounds of vegetables harvested increased 324%. More modest gains (48%-226%) were registered in the pounds of vegetables sold, income from these sales, and pounds of vegetables dried, stored, or salted. The number of vegetables pickled shot up 1,282% that year. Similar gains were noted in home chicken and egg production, as well as other improvements.

Spinks, G.R. **

1963 Pilot Survey of Food Consumption and Expenditure Patterns--
Two Settlements in Port Moresby, Papua and New Guinea
Agriculture Journal 16: 1 (June) 21-36.

Eight of the ten households surveyed in a Papua New Guinea port city maintained gardens important to their household economies. Seven were in their home villages, from which they received weekly shipments by canoe of yam, banana, tapioca, taro, and sugar cane. Only one family had a garden in the Port Moresby area. Even with these supplements, the households (varying in size from 5.36 to 17.10) spent 79% of their weekly average expenditures on foodstuffs in one community, and 67% in the other. The bulk of family income came from wages, with male householders working as government clerks, carpenters, drivers, or as other kinds of skilled laborers. Animal protein was the most costly of the foodstuffs, purchased as tinned meat or fish, cheese, bacon, fresh red meat, or fresh fish. Carbohydrate staples were almost entirely from the households' gardens.

Spinks, G.R., T.W. Langton, and E.C.G. Gray

1964 Appraisal of Two Land Settlement Schemes in the Gazelle Peninsula, New Britain. **Papua and New Guinea Agriculture Journal** 16: 4: 189-200.

Gardens were important to colonists in two settlement schemes in Papua New Guinea based on plantation cocoa production. Warangoi, one of the colonies, is considered to be an expansion of lands owned by a local clan, while Ilugi, the other colony, has been settled by people of diverse origins. Each family is allotted about 17 acres, with clearings, shade, and cocoa. Warangoi, the more culturally cohesive community, had larger gardens--an expression of traditional attitudes towards the importance of large food gardens (:198). Foodstuffs produced were consumed on the holding by the leasee, his family, and by laborers employed, who often received food as a supplement to wages. Some food was sold to local laborers or employees of the settlement scheme. Only small quantities were sold to a local market in Rabaul.

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Srinivasan, T.N.

1983 **Measuring Malnutrition, Ceres** No. 92 (16:2) : 23-27.
Evaluates nutrition research methodology used in recent international studies and concludes that the "in-take based" definition and standardized measurements of growth represent methodological flaws in studies of nutritional status. Advocates more research on precise in-take in relation to energy expenditure under normal conditions in developing countries.

Stamp, Elizabeth

1977 Growing Out of Poverty. Oxford University Press.
In a general review of small scale, self-help development projects, commends home gardening projects in Zaire and Guatemala.

Stavrakis, Olga

1972 The Role of Diet within the Subsistence Systems. Paper presented at the 71st Meeting of the American Anthropological Association at New York.
Maya home gardens in Dolores, Belize, are one-fifth of a hectare, around houses, and manipulated by plant associations.

1978 Ancient Maya Agriculture and Future Development, **Culture & Agriculture** (Bulletin of the Anthropological Study Group on Agrarian Systems) 5: 1-8.

Describes present day intercrop gardens in the Guatemalan Peten, planted around virtually all village houses and in large towns, with 20-40 different edible species centered on fruit trees and typically four-storied. Children pick fruits. Despite swidden field production of staples, dooryard foods are of great importance in the diet.

1979 The Effects of Agricultural Change upon Social Relations in a Village in Northern Belize, Central America. Ph.D. thesis, University of Minnesota. University Microfilms No. BTK 80-11888. Ann Arbor, Michigan: University Microfilms International.

Reviews information on Dolores, Belize (1972, above) and gives home garden pattern, much diminished, for northern Belize sugar growing community.

Stavrakis, Olga, and M.L. Marshall

1978 Women, Agriculture and Development in the Maya Lowlands: Profit or Progress? IN: Proceedings and Papers of the International Conference on Women and Food: 157-174. University of Arizona.

Traditionally, there was a strict division of labor between farming systems of the Maya of northern Belize. Men were concerned with milpa production of maize on swidden outfields, hunting, fishing, and gathering, while women tended kitchen gardens and small live-stock--pigs and poultry fed with kitchen scraps and milpa products. Women's production was directed both to household consumption and sale, but milpa maize was for subsistence: the men's cash source

was from work as occasional laborers. With the introduction of the cash crop of sugar cane in northern Belize, consumption patterns changed. Consumption of local fruits, fish, and meat declined, and consumption of canned meats, soft drinks, and koolaid (flavored sugar water) increased dramatically. Childhood nutrition was marginal. Represents a case of the nutritional risks incurred during a transition from subsistence to commercial production.

Stokes, Bruce

1978 *Small is Bountiful*, IN: *Local Responses to Global Problems: A Key to Meeting Basic Human Needs*. World Watch Paper No. 17: 18-28. Washington, D.C.: World Watch Institute.
ISBN 0-916468-16-X

This is an earlier, shorter version of Stokes 1981 (see below).

1981 *Small is Bountiful* (Chapter 5), IN: *Helping Ourselves: Local Solutions to Global Problems*: 77-90. New York and London: W.W. Norton and Company.
160 pages, bibliographical notes 143-154, index (paperback).
ISBN 0-393-01362-6, 0-393-00054-0

Advocates producing some portion of food as a "buffer against inflation and malnutrition" and reviews home and community urban gardening trends in the United States, Europe, China, the Soviet Union, and Indonesia. Discusses positive policy steps to encourage self-help gardening, primarily in urban areas. Largely anecdotal examples are given.

1978 *The Urban Garden: A Growing Trend*, *Sierra* 63 (July-August): 17-28.

For the United States, describes federal government involvement in urban gardening programs and discusses the problem of high concentration of heavy metals in vegetables grown in urban areas.

Stoler, Anne L.

1975 *Garden Use and Household Consumption Patterns in a Javanese Village*. New York: Department of Anthropology, Columbia University.

Reports results of a survey of 478 households in "Kali Loro" hamlets of southcentral Java, Indonesia, and structured sample of 21 households ranked by wealth (as access to "sawah" rice). Fifty five per cent of the land was in "pakarangan." Productivity in cash value co-varied with garden size: the smaller gardens produced more intensively, with returns to labor for intensification. Proportion of garden produce sold was the same for all household gardens, and amount consumed was 69-74% of total production. Households with smaller gardens resorted to wage labor, trade, and sale of crafts, but richer farmers with "sawah" produced rice commercially. Garden crops included low risk and highly productive cassava and arrowroot, though these have low market values. Home gardens are called "living food stalls" ("warung hidup") and most plants are perennials.

1977 *Class Structure and Female Autonomy in Rural Java*, *Signs*: 3

(autumn): 74-89.

From a detailed study of women's contribution to the household economy in Indonesia, derives the following generalization: "The favorable position of Southeast Asian women has generally been interpreted as a function of their contribution to the household and rural economy. Indeed, in the case of Java, neither the colonial period nor the postcolonial development appear to have lessened the relative economic and social independence of rural women."

1978 Garden Use and Household Economy in Rural Java, **Bulletin of Indonesian Economic Studies 14: 2 (July): 85-101. Canberra: Australian National University.

Gives results of a study of traditional home gardens in Indonesia. Part I describes general economic and ecological characteristics of home gardens. Part II describes research methods and problems encountered in measuring and comparing production and consumption for rural households. Part III is a preliminary analysis of data on home garden production and use as it relates to household consumption and income patterns. Data is based on 1973 fieldwork in "Kali Loro", Central Java. Argues here, as in other papers, that variability in garden cultivation is explained by access to other strategic resources.

**1981 Garden Use and Household Economy in Java. IN: Agricultural and Rural Development in Indonesia, Gary E. Hansen (editor) pp.242-254. Boulder, Colorado: Westview Press.

Traditional home gardens in Indonesia provide more than 40% of a household's caloric needs and more than 20% of its income. Lower income households (more reliant on gardens than rice cultivation) produced and consumed more leafy vegetables than higher income households, so that Vitamin A deficiencies were less of a problem among the poor than among the rich. Advocates focus on mixed gardening for development projects.

Stout, Ruth and Clemence R. Stout

1971 The Ruth Stout No-Work Garden Book. Emmaus, Pennsylvania: Rodale Press.

Gardening manual popular in the United States presents the deep trench composting technology.

Stuhlmiller, E. M., R.B. How and K.W. Stone

1976 Consumer Use and Experience with Home Gardens and Produce Purchased Directly from Farmers. Agricultural Economics Research Publication 76-20. Ithaca, New York: Cornell University.

79 pages + vi, 29 tables, references, appendices.

Presents analysis of 3200 responses to a questionnaire sent to five counties in New York State. Respondents were more likely to live in a small village or rural area (rather than on a farm or in a city), to have children, to be well educated, to have the female head of household not employed outside the home and to have a household income over \$15,000 (1976 dollars). Data is presented on the kinds

of fruits and vegetables grown in home gardens, reasons for gardening, problems encountered and the extent of home processing of produce grown (CAB).

Suter, Carol Bolton **

1967 Strengthening Cooperation and Coordination in Community Nutrition Work in Isabela, *Philippines Journal of Nutrition* 20: 2: 66-74.

First person account of a nutritionist at work in the Philippines during the Isabela ANP notes the contribution of food produced in home gardens to lunch programs, and publishes a photograph of the school garden at Sinamar Norte, San Mateo. This school garden is a complex affair, with a citrus grove, fish pond, poultry, piggery, and cattle.

Swift, John F. **

1980 Wau Ecology Institute Research Garden Update. Paper presented at the Food Crop Research Meeting.

Reports 1979 yields from experimental garden plot in Papua New Guinea, the discovery of a taro resistant to beetle attack, and the influence of *Parasponia* nitrogen fixing roots on maize, among other research results.

1981 Agro-forestry Garden in Morobe Province: Agronomic Results and Observations after Five Years of Continuous Production. Wau Ecology Institute.

6 pages plus 4 appended tables, plant lists, mimeographed. Yields have been measured annually since 1976 of a compost-contoured ridged experimental garden some 1800m² in size, in Papua New Guinea. Production of root and vegetables each year equals that of traditional Tsembaga (a native PNG system) taro and yam swidden gardens, which require 15 year fallow between crop cycles. Labor requirements for the Wau experimental garden are higher than for traditional PNG systems, as measured in 13 extension gardens farmed by villagers. The traditional shifting of cultivation areas each year leaves behind pests, disease, weeds, and declining soil fertility: all these problems confront the sedentary plot. The problem of pests and disease was approached by alternating varieties of cassava, but to little avail. Organic composts from husks were found to spread taro beetle infestation. Trees at experimental garden include 30 types. Experimental research generally seeks a method to sedentarize the PNG swidden, which is seen as necessary because fire-adapted grasslands are encroaching and preventing growth of bush fallow in Morobe.

Syme, David R. and Brenda Marchant **

1983 Evaluation Report "Extending Agricultural, Family Health and Nutritional Development Programs to Target Communities from Existing SAWS Institutions": SAWS/USAID Matching Grant Program No. FDC/0228/G/1160/00, October 1, 1982 - September 30, 1983. Takoma Park, Maryland; Seventh-day Adventist World Service/ International.

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204 pages plus viii, tables, maps, diagrams.

Presents a progress report for projects which have home or market gardening components in Zambia, Kenya, Ghana, the Philippines, Bolivia, Haiti, Honduras, and St. Lucia. This self-evaluation of a complex Adventist program benefits from the exacting monitoring and evaluation system set up for each country project by the authors. The general objectives are to create programs to extend health and/or agriculture from Adventist clinics or schools to surrounding local populations. Extension of home gardening figures in both health and agricultural projects. The Zimbabwe efforts extend the "Solusi Scientific Gardening" through clinics' Community horticultural education outreach and examples set by trainees at an agricultural school (:63-64). An unrelenting drought has reduced the number of home gardens established each year by graduates, who are mainly men who generate income by marketing part of their produce. Community horticultural outreach and demonstration home gardens at clinics were unable to function due to water shortages (:69-71). SAWS' work in central and northern Ghana has been hard hit by drought as well. The agricultural extension aims to increase production of vegetables in the dry season (:40) and has completed some farmer training, but must build storage dams and irrigation canals in 1984. Dry season subsistence agricultural capacity is also the aim of work in Kenya, a strategy which emerged from a health needs assessment of Nandi district by SAWS' counterpart, the University of Eastern Africa (:44-45). In the Philippines, "table gardens" (each 100 square-foot garden plots growing a minimum of five varieties) are part of the rural nutrition program implemented by the Philippine Union college in three rural barrios. In the SAWS Haiti project to decrease the prevalence of malnutrition among children under five, by June 1983, 389 mothers were growing at least two vegetables in kitchen gardens promoted by the project (:107, and see Harrison 1983). Promotion of "home table gardens" for the Honduras Maternal-Child Health assistance, each 10m² in size, was planned but not implemented by the date of this evaluation (:110). "Vegetable gardening for table use" was part of the training given to community health workers in St. Lucia (:140). SAWS/St. Lucia Nutrition Health Survey is also collecting information on how many grow their own food, and how often different kinds of food is eaten (:159). In no SAWS project are more than 50% of the participant/beneficiaries of the Adventist faith, though most projects are run out of Adventist schools or health clinics.

T-Authors

Taylor, J.L. et. al.

1975 Home Vegetable Garden. Bulletin E-529. East Lansing, Michigan: Cooperative Extension, Michigan.

This is an example of the kind of "how-to-do-it" booklet produced to guide home gardeners in the United States by Cooperative Extension affiliates.

Technical Advisory Committee **

1979 Proposal for the Creation of an International Centre for Vegetable Research within the CGIAR System.
AGD/TAC:LAR/79/17.

Documents the need for more research on vegetable crops world-wide. Waivers between the model of regional vegetable centers, possibly attached to existing members of the Consultative Group centers, or expanding the mandate of the vegetable center at Taiwan.

Terra, G.J.A.

1953 The Distribution of Mixed Gardening in Java, *Landbouw* 25.

1954a Mixed-garden Horticulture in Java, *Malayan Journal of Tropical Geography* 3.

Ventures a number of hypotheses about permanent home gardens of the "mixed" type observed by the author. Hypothesizes that individual ownership of the house site is critical, but that communal permanent gardens can occur with communal ownership of the land and house sites, in association with swidden agriculture or with cattle-raising. Presents the theory that intensive mixed gardening did not arise until wet rice cultivation was introduced, as all trees and plants unable to survive inundation were concentrated on family-owned house sites. "This type of agriculture spread with, or through, the Mon Khmer, Chan and Javanese peoples, but also reached the Malabar coast of India and the southwest of Ceylon, together with a 'matriarchal' type of culture" (:40).

1954b Mixed-Garden Horticulture in Java, *Malayan Journal of Tropical Geography* 4: 33-43.

1958 Farm Systems in Southeast Asia, *Netherlands Journal of Agricultural Science* 6 (4) :

**1961 Characteristics of Tropical Horticulture in Relation to Food Patterns, *Chronica Horticulturae* 1: 3 (December): 37-39.

Broad survey of tropical and subtropical garden crops and styles contrasts swidden to permanent "mixed" (multi-layered) gardens of South East Asia and Africa.

1966 Home Gardens for Improved Nutrition, Reunion Internacional sobre Problemas de la Agricultura en Los Tropicos Humedos

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de America Latina, May 22-June 4, 1966, at Lima, Peru.

- 1966 Tropical Vegetables; Growing Vegetables in the Tropics and Subtropics Especially of Indigenous Vegetables. Amsterdam: Instituut voor de Tropen. Afdeling Agrarisch Onderzoek. Communication no. 54.
109 pages, bibliography :105-107
NAL 503 Am 82 no. 54.

- **1967 Rapport au gouvernement du Dahomey sur Amelioration de la nutrition par la creation des jardins familiaux--rapport interimaire. Report No. PL: TA/4/55. Microfiche 01045. Rome, Italy: Food and Agriculture Organization.
15 pages.

Reports the establishment of a 32-hectare central garden near Porto-Novo, Benin, and gives a list (Table 1, pp. 9-14) of the species and varieties selected for adaptive research there. Project aimed to install Indonesian-style mixed home gardens.

Note: For additional citations to Terra, see Binkert 1981: 31.

Therez, Daniel

- 1979 The Heritage and Creativity of Popular Ecological Knowledge as Underused Resources for Development, *Ecodevelopment News* 10: (8) 8-31.

While not specific to home gardening, many of the unusual species and varieties known only to certain sociocultural groups cited as an extraordinary resource in this article are grown in home gardens.

Thomas, Norman D. **

- 1983 The Role of Wild Foods in Potosi Huastec Subsistence. Paper presented at the American Anthropological Association Meetings, November 1983.
28 pages, references.

Describes the form of "kitchen gardens" and their contribution to the diet of Huastec, Mexico, in a study which documents the importance of wild and semi-cultivated foods.

Tindall, H.D.

- 1968 Fruits et Legumes en Afrique Occidentale. Rome, Italy: Food and Agriculture Organization.
261 pages, tables, drawings, photographs, references, annexes.

Lists plant species grown in West Africa and the cultivation techniques and problems of each. Sets forth teaching methods which are designed for school gardens and for training rural extensionists in horticulture. Surveys activities in plant breeding for fruit and vegetable crops, aromatic plants, spices, roots, grains and legumes, and recommends vastly enlarged horticultural research efforts in the region.

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Toury **

1967 La Consommation des legumes en Afrique. Meeting Paper presented at the Applied Nutrition Conference, Dakar, July 1967. Report No. NU: TEaf 67/13. Microfiche 02001. Rome, Italy: Food and Agriculture Organization.
5 pages.

Concerns African peri-urban market gardens. Since 1945, there has been a syndicate of gardeners and market gardeners (maraichiers) in Cap Vert, Senegal. In 1962, they produced 30-50 tons of vegetables, mainly European varieties. There are similar associations in Mali, Burkina Fasso, and Niger. Although generally families in Africa produce vegetables on plots following cereal production (maize, millet or rice) or other carbohydrate staples (manioc or ignames), market gardening is important. Predominant African vegetables are *Amaranthus caudatus*, *A. spinosus* and *A. viridis*, and various hibiscus. Gives a list of important indigenous African vegetables and their estimated nutritional content.

Turner, Paul R.

1977 Intensive Agriculture Among the Highland Tzeltal, *Ethnology* 16 (2): 167-174.

Describes the agriculture of the Tzeltal, a Maya group of Chiapas, Mexico.

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U-Authors

UNICEF **

- 1977 UNICEF-Assisted Family Nutrition Improvement Programme (UPGK).
7 pages.

UPGK is a national intersectoral nutrition program of the Indonesian government, linking participation of the Departments of Health, Agriculture, National Family Planning Coordination, and Religion. UNICEF program supports nutritional improvement at home through mutual self help "gotong royong," by reinforcing and intensifying the tradition of home gardening in Java. Program also introduces monthly monitoring of the nutritional status of children under five at community meals cooked with food contributed by the villagers, and nutrition volunteers to counsel mothers. Village cadres teaching improved home gardening are supported technically by the Department of Agriculture. Nine thousand villages are targeted for intervention.

- 1981 The UNICEF Home Garden Handbook for People Promoting Mixed Gardening in the Humid Tropics. New York: United Nations.
55 pages, illustrations.
NAL SB 323.U5

This is a manual for installing and improving gardens of the mixed type.

United States Agency for International Development (USAID)

Note: In the text, the administrative reports originating from the United States Agency for International Development listed below are referenced by corporate author (USAID), year date, and an internal document number. This citation form was adopted because large sets of documents pertaining to the same or different projects are typically issued in any given year, and the contents, including appendices, of documents can contain items produced at different times. Most of the documents listed are available on microfiche, referenced by the document number given. The document number immediately follows the project number in each citation.

USAID

- **1978 IVS Botswana Horticultural Development. Project No. 633-0215. OPG 78-633-30. PD-AAF-113-A1. Washington, D.C.
31 pages plus appendices (total 46 pages)
Microfiche.

Specifies terms of an \$235,000 FY 78-80 AID operational program grant, appending terms of reference for each volunteer staff position, for a Botswana communal market and school gardening project implemented by the PVO, International Voluntary Services. The Kweneng Rural Development Association and the Serowe Brigade Development Trust are noted as national non-governmental organizations to be involved in the project. Related documents include PD-AAF-113-B1, IVS' proposal by Lowell Hestand, and project evaluation summaries

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PD-AAF-113-F1 (December 1979), B633-0215001503 (1980) and PD-AA-G-635-A1 (January 1981). A commercial vegetable garden was established through the Kweneng Rural Development Association, which divided the plot among 40 families. Evaluation notes that technical assistance was provided to 64 families and primary school groups growing vegetables for home consumption.

****1978** Mauritania Vegetable Production Project Paper. Project 682-0204. PD-AAF-616-A1. Nouakchott, Mauritania. 105 pages plus annexes. Microfiche.

Describes a "feasibility study" project which follows up the success of "Operation Vegetable Production," and an IVS project promoting precoperative vegetable production. A firm contracted by USAID, the United States Peace Corps, and the Ministry of Agriculture in Mauritania were the principal implementing agencies.

****1978** Mauritania Vegetable Production. Project Paper. Project 682-0204. PD-AAC-847-A1. Washington, D.C. 105 pages and annexes. Microfiche.

Main document describing the FY 78-81 USAID-Peace Corps Mauritania Vegetable Production project outlines the \$1,470,000 grant to the government, including: trials of various vegetables in different Mauritanian regions under the supervision of horticulturalists, studies of consumer acceptance of vegetables, and nutritional studies and surveillance of target groups. The Peace Corps is co-financing by providing volunteers at a cost of \$405,000. Project concept was piloted in "Operation Vegetable Production" in 1974, a \$600,000 project which established garden plots among former nomads and supplied water pumps, seeds, fertilizers, and garden tools to 800 families in six regions, who planted 180 hectares producing about 1,500 tons of vegetables (including potatoes) by the end of the project. Project paper discusses why project was narrowed to only three regions.

****1978** Mauritania Vegetable Production. Project 682-0204. PD-AAC-847-B1. Washington, D.C. Microfiche.

This is another version of the project paper cited above, related to the Mauritania effort. Other documents for project 682-0204 include PD-AAJ-317 by James M. Hughes (Progress Report 1981), and PD-AAJ-317-A by Charles L. Davis (Progress Report 1981).

****1978** Mapuche Nutrition Education Project 513-0311. OPG to the Chol Chol Foundation. Project Evaluation Summary. PD-AA1-880 Santiago, Chile. 7 pages, microfiche.

Evaluates small grant to Chol Chol Foundation for nutrition education among the Mapuche Indians of Chile. "In several villages, the Mapuche planted vegetable gardens: a new activity for them" (:5). No evidence was collected on changes in nutritional status of children under five or pregnant and lactating women, who were the target group.

****1979** Honduras Agricultural Sector II Program. Project No. 522-20150. PD-AAF-462-A1. Tegucigalpa, Honduras : Bureau for Latin America and the Caribbean. Microfiche.

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This major FY 79-85 project to improve Honduran agriculture on all fronts (policy, pricing, food distribution, production, research, extension training, infrastructure) included a home garden component (Subproject 07). Subproject aims for "establishment of a continuous, readily available supply of fruits, vegetables and other foodstuffs as both a source of income and improved diet for 24,000 small farm families." Packets of 10-21 seeds and fruit tree seedlings will be sold in \$5 packets (half their actual cost.) "It is expected that "campesino" women will manage the cultivation and harvesting and...be the focus of technical assistance." Two technicians in the Ministry of Natural Resources will distribute the packets. Component is conceived as a "nutrition intervention."

****1979** Honduras Agriculture Sector II Program. Project Paper. Project 522-20150. PD AAP 452 Bl. Tegucigalpa, Honduras: Bureau for Latin America and the Caribbean. 233 pages, plus annexes. ISN-16693. Microfiche.

Component of Subproject 07 described above is explained as "Output 5: Small Farmer Consumption Improvement" on page 37. Costs of supporting the two MNR technicians and of procuring vegetable seeds and fruit tree seedlings locally and from abroad will be \$448,000 US, to which AID will contribute a grant of \$367,000.

****1979** Chile School Family Garden Cooperative OPG 79-80. Project 513-0314. PD-AAH-982. Chile School Family Garden Cooperative OPG 79-80. Project 513-0314. PD-AAH-985

Two documents set forth the terms of a \$150,000 cooperative operational program grant to CARE for CARE's school family garden support to the government of Chile's Ministry of Education.

****1979** Peru Water Management in Small Communities PVO Program Grant 79-81. Project 527-0188. PD-AAF-996-Al. Lima, Peru: Bureau for Latin America and the Caribbean. 11 pages, ISN=17444

Among the PVO projects in Peru supported under this grant and PL-480 food for work is a grant to the Association for Rural Development in Cajamarca (ASPADERUC) and the University of Cajamarca to pilot "ecosystems" in three communities. Paríamarca (290 families), La Paccha-Agocucho (380 families), and Yanamango (390 families) are "comunidades campesinas" in the Cajamarca north Andes. Community development model piloted at Aylambo featured reforestation, terracing, improvement of irrigation ditches and establishment of a 20-hectare vegetable and fruit garden around the village center or school in each community.

****1979** Village Family Planning/ Mother-Child Health. Project Paper 497-0305. Jakarta, Indonesia. 138 pages.

Nutrition activities in this Indonesian project feature education of women. Government refused PL-480 food, preferring improved use of locally available foods. Project will establish "taman gizi," nutrition activity centers, for training and group cooking and feeding with locally purchased foods. Some centers may improve home gardens (i.e. on Madura, East Java :25). A constraint to establishing or

improving home gardening is that many of the target population are landless tenants. In Bali, where land is owned communally, pig cooperatives were considered for the program (:24). Annex D.1 contains an analysis of the food problem. Food purchases account for 80% of family expenditures among the poorest majority, including the landless.

1980 Chile School Family Cooperative OPG 79-80. Project 513-0314. PD-AAF-916.
15 pages plus appendices
Concludes that CARE's school garden project delivered satisfactory training in gardening and nutrition education for students in grades 3-8 in Chile.

**1980 Casamance Vegetable Growers Women in Development Project 698-388.7. Project Evaluation Summary AAG-117-B1.
Summarizes the outcome of a Senegal project which aimed to increase production of onions, potatoes, tomatoes and eggplants to enhance nutrition of children and increase cash income of women. Two-acre community gardens with wells were established in 7 of the 13 target villages. Seeds and spare parts for pumps were difficult for the women to obtain. Unexpected innovations were rainy season relay cropping of vegetable gardens into rice production, and penning of livestock in garden areas to concentrate manure in several villages. Bone, ash, and other organic materials were used on gardens. The 3-strand barbed wire fence the project supplied did not deter goats, but villages which successfully gardened built stronger fences out of local materials, which kept the animals out.

**1980 IVS Botswana Horticultural Development Project. OPG 78-633-30. Evaluation Report. Botswana. Microfiche.
Document relates to the International Voluntary Service project for communal and school gardens in Botswana.

**1980 Mauritania Oases Development Project 682-0207. Project Paper PD-AAG-144. Nouakchott, Mauritania.
This document is the primary source for the profile of the project given as a part of the Mauritania case history in the main text.

**1980 Haiti Emergency Food Production Project Paper. Project No. 5210150. PD-AAF-788. Port-au-Prince, Haiti : LAC/P-80-13.
14 pages plus appendices. Microfiche.
Million-dollar FY 80-81 project for disaster relief in southern Haiti following hurricane Allen included distribution of hand tools and 1,750 pounds of mixed vegetable seeds in order to restore agricultural productivity. Farm model includes a 0.3 hectare vegetable garden. One thousand, three hundred and forty garden vegetables were to be planted.

**1980 Resource Conservation and Utilization. Project Paper. Project 367-0132-04. Kathmandu, Nepal: Bureau for Asia.
56 pages plus annexes. ISBN=17295.
Describes a project in Nepal which will provide technical support, seeds and saplings for planting fruit crops on marginal lands and

establishing commercial vegetable and fruit production.

****1980 Tanzania Village Environmental Improvement (OPG). Project 621-0160 Subproject 02. PD-AAG-066-A1. Dar es Salaam, Tanzania: Bureau for Africa.**
16 pages plus annexes.

Subproject of this operational program grant to Lutheran World Relief for three Turu and three Iramba villages in the Singida region, Tanzania, is to provide water supply to enable villages to establish home gardens. Buried pot and drip irrigation methods will be demonstrated at schools and demonstration plots; villagers will select a system appropriate for their type and size home gardens. The buried pot method is expected to be most popular. Another subproject (04) to establish forestry includes a beekeeping component.

1981 Vegetable Production. Project 682-0204. Project Evaluation Summary. PD -AAJ-317. Nouakchott, Mauritania
Main results reported in this document are quoted in body of text. Proposes to increase funding for remaining years of project and double the number of agronomists assigned as technical assistants.

1981 Thailand Seed Development II. Project Paper. Project 493-0326. PD-AAL-623. Bangkok, Thailand: Bureau for Asia.
38 pages plus 9 annexes.
Thailand FY 82-87 projects follow on project 4930270 to develop support structures which increase Thai farmers' access to improved seeds, including vegetable seeds. As the project goal is to improve the financial status and nutritional health of farm families and other members of the rural poor, the feasibility of experimental extension of the Thailand Home Garden model developed by AVRDC was explored under this project in 1983.

1981 **Proceedings: First Asian Household Nutrition Appropriate Technology Conference.** Washington, D.C.: USAID.
249 pages, 11 tables, 2 figures, 2 appendices, list of participants, 90 references.
Available from International Nutrition Communication Service, Education Development Center, 55 Chapel Street, Newton, Massachusetts 02160 USA (gratis for inquiries from developing countries; \$11 plus postage for others.)
Collection of sixteen papers presented at a conference at Colombo, Sri Lanka, in July 1981, shares themes of improved methods for growing, processing, and preparing foods. Papers on a Sri Lanka government gardening program, contributions of home gardens to alleviating nutritional deficiencies in Asia, and guidelines for innovative cultivation methods (vertical gardens) are reviewed separately. Programs for improved food preservation and processing are described from Nepal ("Save the Grain"), Malaysia, India, and Sri Lanka. Weaning foods, nutritional education and the role of nongovernmental organizations in promotions and programs are additional themes.

1982 A.I.D. Policy Paper: Nutrition. Washington, D.C.: Bureau for Program and Policy Coordination.
12 pages, paperbound, bibliography: 12.

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1984 Nutrition Sector Strategy. Washington, D.C.
11 pages, tables.

United States Congress, House Committee on Agriculture, Subcommittee on Department Operations, Research and Foreign Agriculture
1982 Extension Service Oversight. Hearings of the 97th Congress, Second Session. Washington, D.C.: Government Printing Office. Serial No. 97-EEE, (Hearings February 17, and March 9-10, 1982)
420 pages.
Transcript reports Congressional probe of extension efforts to community gardens in the United States.

United States Congress, House, Committee on Agriculture, Subcommittee on Domestic Marketing, Consumer Relations and Nutrition
1976 Seeds and Plants for Home Gardens. Hearing, 94th Congress, First Session on H.R. 280, December 11, 1975. Washington, D.C.: United States Government Printing Office.
34 pages (LRS76-475)

1977 National Gardening Act of 1977: Seeds and Plants for Home Gardens. Hearings, 95th Congress, First Session, on H.R. 3476 and H.R. 2776. Washington, D.C.: United States Government Printing Office.
143 pages (LRS77-11565)

United States Department of Agriculture (USDA)
and Teachers' Guide to Minigardens. Beltsville, Maryland: ARS, Information Division, Educational Services Branch, Agricultural Research Center.
Handbook developed by USDA is used in school garden programs in the United States.

USDA, Human Nutrition Information Service **

1982 Food Consumption: Households in the United States, Spring 1977. Nationwide Food Consumption Survey 1977-78. Report H-1. Washington, D.C.: Government Printing Office.
296 pages, tables, bibliography: 294-296.

This report contains data on the money value and quantity of home-produced food in the United States from a survey conducted in April, May and June, 1977. The USDA definition of "home-produced food" includes food raised for home use and food obtained by hunting, fishing, and gathering from the wild (:239). Thirty-two per cent of the households reported home-produced food (:1). "Home-produced food accounted for 8% of the money value of food at home in nonmetropolitan households. Suburban and central city households used relatively little home-produced food, three and one per cent respectively" (:2). Tables break down by household income (before 1976 taxes) the different kinds of produce—potatoes and sweet potatoes, fresh vegetables, fresh fruit, okra, peas, etc., giving for each the percentage used, and purchased. A special section in the bibliography lists publica-

tions which have resulted from surveys of household food consumption.

United States Peace Corps, Information Collection and Exchange **

1978 Small Vegetable Gardens Resource Packet.

Some articles in this collection are reviewed separately in this appendix. See entry in Appendix 4.

United States Peace Corps, Office of Training and Program Support
1984 Small Project Assistance Program. Progress Report.

Appends abstracts of Peace Corps volunteers' Individual Activity Agreements (IAAs) which provide small grants (\$100-\$10,000 each) through USAID's Small Project Assistance program (SPA) to community groups assisted by Peace Corps volunteers (PCV's). In the first year of the program (February 1983-1984,) a total of \$460,797 was obligated, 30% for food production and income generation projects, and 20% for food production. In-service training for gardening was given PCVs in Honduras and Western Samoa during 1983. Gardening figured in a number of IAA/SPA projects. School gardens were assisted in Benin, Belize and at Liberia's Boy's School. A fruit tree nursery was installed at an agricultural technical high school in Ecuador. Wells were constructed or repaired for community gardens in the Gambia and Senegal. A young farmers' garden club was assisted in Lesotho. Projects were undertaken to raise small livestock (bees, rabbits, and, in Ecuador, guinea pigs.)

Uriodain, Gerard R. **

1971 Rapport au Gouvernement de Haute Volta sur une Programme de Nutrition Appliquee. UNDP/TA Report No. AT 2924.

Microfiche 13428. Rome, Italy: Food and Agriculture Organization.

19 pages.

In Burkina Fasso, UNICEF introduced school market garden project, installing 1,105 school gardens cultivating cotton, peanuts, millet, sorghum, or market vegetables. Produce of gardens was sold to provide income for the operating costs of each school. Market vegetable gardens averaged 100-300m² in size and produced onions, tomatoes, lettuce, carrots. Male students sold the vegetables they produced; female students used their garden produce in cooking classes. A nutritionist was "Chief of Party."

Utzinger, James D. and Helen E. Connolly **

1978 Economic Value of a Home Vegetable Garden, *Hortscience* 13: 2 (April): 148-149.

Reports results of a garden experiment in Columbus, Ohio. The object of the experiment was to examine claims about the economic value of home vegetable gardens. Each 150 square foot garden yielded an average of 95.5 kgs of produce with a retail value of \$90.45. Mean economic savings from all vegetables, disregarding labor and transportation expenses, was \$42 per garden. "As gardening for many is fun and a hobby, a dollar per hour return to labor makes it a pro-

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ductive use of leisure time. Alternative forms of recreation can be quite expensive as compared with gardening."

V-Authors

Valerio, T.E. et. al.

- 1980 Household Food Production in the Philippines 1978. Food and Nutrition Research Institute Publication No. 15. National Science Development Board.

Mentions home gardening promotions in the Philippines.

Valverde, V., I. Nieves, N. Sloan, B. Pillet, F. Trowbridge, T. Farrell, I. Beghin, and R.E. Klein **

- 1980 Life Styles and Nutritional Status of Children from Different Ecological Areas of El Salvador, Ecology of Food and Nutrition 9: 167-177.

Small fruit and vegetable gardens surrounding the houses provided by corporate plantations to workers were the only significant agriculture other than coffee production in the coffee region, where 13% of El Salvador's population lived in 1976. Three other geographical/production areas and urban slums were surveyed. In the cotton region (15% of the population), cotton and other cash crops dominated; in the "basic grain subsistence region" (45% of the population,) fruits and vegetables were available seasonally. Diet, weaning practices, and the nutritional status of children (age 6-59 months) varied among the regions.

Vance, Mary

- 1980 Gardens of China: Books in English. Monticello, Illinois: Vance Bibliographies. 5 pages. LRS80-3325

Bibliographic resource lists studies of Chinese gardens, primarily the more ornamental styles.

van Eijnatten, C.L.M. **

- 1969a Rapport au Gouvernement du Dahomey sur Amelioration de la nutrition par la creation de jardins familiaux. Rapport 1965-1968, deuxieme phase. Report No. PL: TA/ 122 FFHC No.38. Microfiche 05857. Rome, Italy: Food and Agriculture Organization. 32 pages.

Reports on the second phase of a gardening project in Benin. Gives results of SDANA nutritional study of Benin and financial and administrative details of the Benin project. FAO's financial contribution through 1968 was \$370,770 of a total project cost of \$560,240. Other contributors were NEDERF and NOVIB, Dutch bilateral foreign assistance agencies. Lists by species the numbers of plants and seeds distributed from the central garden. Discusses the problem of reducing the work force in the central garden, in part supplemented by volunteers from the low countries, and the recipes developed by the "animatrices rurales" (rural promoters or nutrition extensionists). Home garden adoptions by June 1968 numbered only 104. Van Eijnatten succeeded Professor Terra as project manager in 1967.

1969b Report to the Government of Nigeria on Home Gardens for Improved Nutrition. Report 1966/1968 First Phase. FAO Report No. 39. Microfiche 06789. Rome, Italy: Food and Agriculture Organization.

43 pages, charts, tables, plant lists

This is a primary document for the Ilesha gardens project in Nigeria treated in a text case history. Gives a physical description of the project area and the project implementation activities of the first phase including establishment of the central garden and the Mothercraft Center. Much of the report (pages 12-22) describes the plants researched and distributed, giving vernacular and scientific binominal names and specific varieties for each. Patterns of the earliest home gardens established in the villages are described, including most typical initial cultivars. The premise of starting out with small gardens with "space to grow" to demonstrate the gardens in villages proved worthy, as both the total number and average size of the gardens increased steadily during the life of the project.

1971 Report to the Government of Nigeria on Home Gardens for Human Nutrition. Report 1968-1970 (Second Phase). Freedom from Hunger Campaign. FAO 75. Rome, Italy: Food and Agriculture Organization. Nigeria, FAO Demonstration Project 1965-1971

Gives further documentation of pilot home garden project in Ilesha, Nigeria. Dutch horticulturalists familiar with home gardens in Java incorporated Nigerian concepts and species. Headquarters staff collected annual and perennial vegetable and fruit seeds, traditional and foreign, designed demonstration gardens and monitored pests, cultivation problems, and nutritional values of foods. Extensionists carried out interventions in 17 villages, educating mothers in nutrition. More than 600 home gardens were established over six years, averaging 26m² with annual survival rates of 85%. Over 80% incorporated perennial fruit of leaf species; over half were fenced by edible hedges. Gardens were maintained in equal numbers by men, women, and children. Thirty per cent of the households consumed all their production, vegetable consumption increased 50% overall, and gardening households obtained 70% of their vegetables from home gardens. Households without gardens obtained 8% of their vegetables from the gardens of others.

1978 Home Gardens: Principles and Experiences, IN: Small Scale Vegetable Gardens Resource Packet, Part C: 4-12-4-25. Washington, D.C.: Peace Corps Information Collection and Exchange.

This seminar paper originally presented at a conference at Ibadan, Nigeria in 1971, summarizes van Eijnatten's concept of the home garden. He explicitly equates home gardens with what others identify as the "mixed garden," for which the Indoensian variant is his prototype. Such labor-extensive gardens, simulating the rain forest and providing additional foodstuffs to basic diets of grains or roots, are viewed as generally absent in Africa. He makes the point that around African dwellings, animals such as goats, sheep, and poultry encourage "a low vegetation of thorny, hairy or leathery herbs

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and shrublets," but that, once areas are fenced off, other types of flora characteristically appear. The steps given to establish a home garden are based on the Ilesha garden project, with brief references to the Benin home garden project. A section on nutrition and home gardens stresses Oomen's argument in favor of green leafy vegetables and Terra's advocacy of greater dietary diversity. Yields from home gardens are not expected to be as great as from market gardens. In West Africa, home gardens produced only 500 to 1,000 kg/hectare, compared with market gardens yielding 20,000 -30,000 kg per hectare. "The important thing is that the produce becomes available piecemeal for the family," to include greens in meals.

van Epenhuijsen, C.W. **

1974 Growing Native Vegetables in Nigeria. Rome, Italy: Food and Agriculture Organization.
112 pages, bibliography: 109-110, maps, photographs, line drawings, plant lists
NAL SB320.8.N5E6

Argues that local vegetables rather than imported varieties should be grown for horticultural reasons and that local vegetables have strong local markets. Preface refers to the Ilesha Gardens project, and this document presents results of horticultural research at the central garden there. Includes descriptions, each 2-3 pages long, of 43 local vegetables.

Van Heck, B.**

1972 Developpement de l'utilisation des eaux souterraines. Sociologie rurale et facteurs humains. Rapport technique no.4
AGL: SF/DAH 3. Microfiche 18791. Rome, Italy: Food and Agriculture Organization.

Analyzes the human factors inhibiting the adoption of the "fermette," a family farm based on vegetable gardening and some production of staples, with livestock kept primarily to provide animal traction for drawing water from wells and land preparation. Only 27 farmers adopted. The local people used to raising livestock were not used to raising crops and vice-versa, so the animal traction for irrigation and other aspects of mixed (animal and crop) farming central to the scheme were difficult to accept.

Vargas, C.

1983 El Ka'anche': una practica horticola maya, *Biotica* 8: 2: 151-174.

Reports on the small raised fields commonly found in Mesoamerican home gardens.

Vayda, Andrew P. and C. Lowman-Vayda

1969 Field Studies of Nutrition and Behavior: AAAS Symposium, December 27, 1969, *Science* 166 (December): 1312-13.

Studies the relationship of food intake to work output with a focus on New Guinea systems of agricultural production.

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Venkataratnam, L.**

Kitchen Gardening, IN: Horticulture in Central India
(Chapter XV: 135-149). New Delhi: Farm Information Unit,
Ministry of Agriculture, Shastri Bhawan.

Vickey, James and Pamela **

1978 Intensive Vegetable Gardening for Profit and Self Sufficiency. Information Collection and Exchange (ICE) Reprint No. 25. Washington, D.C.: ICE/ OPTC.
159 pages.

Manual developed by Peace Corps volunteers working in Jamaica provides step-by-step guidelines for cultivating vegetables under many climatic conditions organically or with fertilizers. Widely used by Peace Corps volunteers, this manual was also used to develop locally appropriate gardening manuals in Liberia and Togo. An edited version is included in the Peace Corps' gardening resource packet.

Villas Rojas, Alfonso

1969 The Tzeltal, IN: Handbook of Middle American Indians, volume 7:195-225, R. Wauchope (editor). Austin, Texas: University of Texas Press.

Describes the small 'raised fields' ("caanche") built in the house yards of the Maya in the Yucatan, Mexico, often in hallowed tree trunks or small boxes, and the fruit trees around house sites. According to Villas Rojas, a surplus of the maize produced in the swidden outfields ("milpas") was marketed, on the order of 30-40% beyond the requirements of the producing household (:252), and households' subsistence derived from this milpa maize, tree crops, and the "caanche" garden.

Villers Ruiz, L.**

1981 L'Habitation Rurale Traditionelle: Une Etude Ethnobotanique en Territoire Maya, Journal d'Agriculture Traditionelle et de Botanique Appliquee 28: 1: 33-53.

Reports Mesoamerican tropical lowland house building practices and the kinds of woods and other vegetation used from two 'ejidos' in Quintana Roo State, Mexico. Diagrams show location of banana trees, fruit trees, and poultry coop on house lots.

W-Authors

Wagley, Charles

- 1971 Introduction to Brazil. New York: Columbia University Press.
341 pages, bibliography: 313-326, index, illustrations, maps
Page 136 begins a description of the role of backyard gardens
("quintal") in Brazilian culture.

Wagneur, Willy **

- 1969 Report on Horticulture in the FAO/UNICEF Assisted Projects
in Eastern and Central Africa with Special Reference to
Kenya and Zambia. Report No. CEP No. 59, FAO/UNICEF/PL 3.
Microfiche 08857. Rome, Italy: Food and Agriculture
Organization.
36 pages, maps.

Rare comparative overview of Applied Nutrition Projects summarizes the distinctive characteristics of efforts through 1969 in ten countries: Kenya, Zambia, Burundi, Comoros, Lesotho, Madagascar, Mauritius, Rwanda, Swaziland, and Tanzania. Three kinds of FAO/UNICEF projects can involve horticulture (gardening). In Applied Nutrition projects, nutrition education is paramount but training in methods to increase production of vegetables and legumes is given to local people through school, family, or community gardens. Home Economics projects act through womens' associations, youth clubs, and social services, establishing home and community gardens. In Education and Training projects, school gardens are established. Table 1 shows efforts in the ten countries. In Kenya, the gardening curriculum was part of the Community Development Training Center. The curriculum, in turn, had been developed from a study of how vegetables were grown locally. Wagneur's synopses are quoted in the appendix on gardening project, by countries.

Wang, Virginia Li

- 1976 Food Distribution as a Guarantee for Nutrition and Health: China's Experience, Milbank Memorial Fund Quarterly 54 (Spring): 145-165. (BIBL. LRS76-7180).
"Focuses on the role of agriculture in social and economic development and its relationship to health programs, the strategy of food rationing and the 'private plot' to improve nutrition and health, and the balance of food and population in the Chinese society"

Ward, William

- 1969 Gardens of the Ancient Near East, IN: Gardens and Culture, H.D. Demaray, (editor): 19-34. Beirut, Lebanon: Eastern Press.

Treats ancient Egyptian gardens, each of which had hundreds of trees, were symmetrical, and had ponds of perfect rectangles. Gives cognate names for principal Egyptian cultivars in Arabic, Babylonian, Sumerian, and Mycenaean Greek.

Wardell, Andrew **

nd Achieving Integration, IN: **Survival of the Weakest: Farming and Disabled People in the Third World.**: 6. Somerset, United Kingdom: Society for Horticultural Therapy and Rural Training.

Reports on Anandwan ("Jungle of Happiness,") a leprosarium village in India founded by Murlidhar Devidas Amte ("Baba Amte"). Village has grown into a self sufficient community of over 1000 leprosy victims, blind or physically handicapped people, and ostracized orphans. They work 450 hectares of farm land, a dairy, and poultry farm. "Individuals look after small kitchen garden plots close to their homes, growing fruits and vegetables. The produce is distributed throughout the community." The community has faced prejudices in marketing its surplus milk and eggs, as many believed that these were "tainted"; the gradual success of marketing, however, has helped reduce prejudice. Note, the collective use of individual garden production is rarely reported and may be related to the patronal structure of this therapeutic and refuge community setting.

Wauters, M. M. C. **

1969 Rapport au Gouvernement de la Cote d'Ivoire sur le developpement de la culture maraichere de le jardinage scolaire. Programme des Nations Unies pour le Developpement. Report No. AT 2624 PL: AT/134. Microfiche 06229. Rome, Italy: Food and Agriculture Organization.

Observing the growth of small, peri-urban market gardens around Abidjan, Bouake, Ferkessedougou and other cities in the Ivory Coast, UNICEF, FAO, USAID, the US Peace Corps, and the Government of the Ivory Coast carried out a project from 1962-1968 to teach food production in schools. Instruction was given on indigenous fruits and vegetable, important in local markets (papaya, passion fruit, local beans), on raising Guinea hens, and on cultivating out-of-season vegetables for the export as well as the local market. The idea was that students would later begin their own 'jardin de case.' Details are given on the horticultural centers established, but no figures are supplied for the number of school gardens or how many students adopted the model.

Whiteford, Andrew H.

1964 Two Cities of Latin America: A Comparative Description of Social Class.

In a general ethnography of two cities in Colombia, notes differences in their gardens as an indicator of class.

Wijnhoven, Aldegonda T.E. and Adelheid M. ter Heersche **

1969 Report to the Government of Nigeria on Home Gardens for Improved Nutrition. Freedom from Hunger Campaign NJ:FFHC/69/3. Microfiche 07726. Rome, Italy: Food and Agriculture Organization.
17 pages.

Reports on the Ilesha gardens project in Nigeria from the perspective

of the nutritionists providing technical assistance. Gives good general background on the setting and the nutritional problems of the local Yoruba population, who had diets deficient in protein, riboflavin, iron, and folic acid before the project began. The nutrition syllabus included gardening. Nutrition lessons and demonstrations of how to cook new recipes were initially given at clinics, but two interesting alternatives developed. As more local Yoruba speakers were trained as extensionists, nutrition training and demonstration work shifted to the compounds. The extensionists came to the compounds at the invitation of a woman compound leader who also invited a small group of 10-15 to attend. These women provided all the ingredients and equipment needed. The second alternative came from the emergence of a "Mothercraft Center" built off clinic grounds to resemble a local home, with a demonstration home garden attached. This center assumed some of the nutrition rehabilitation functions of the clinics. In final reports on the Ilesha project, the Mothercraft Center is recommended for replication, and these centers apparently survived as institutions.

Wilbert, Johannes

1961 The Evolution of Horticultural Systems in Native South America: Causes and Consequences. Caracas, Venezuela: Sociedad de Ciencias Naturales La Salle.

Provides an overview of swidden systems in Amazonia.

Wilheim, Gene **

1975 Dooryard Gardens and Gardening in the Black Community of Brushy, Texas, Geographical Review 65 (1) 73-92.

Layouts and use of a sample of gardens belonging to black homeowners in rural Texas fell into identifiable "types:" 1) folk--house on unfenced lots surrounded by bare earth; vegetables grown behind the house; 2) traditional--large vegetable garden in front of the house; yard close to house; 3) nominal--complex; functions resemble a farm, but includes flowers and ornamentals; 4) formal--greatest diversity of vegetable and flower gardens, front and back; 5) semi-contemporary--large yard with small backyard garden; flowers accentuate house; and 6) contemporary--lawn, a few trees, but vegetables absent and flowers scarce. The types were associated with socioeconomic status: the folk type was associated with poverty and the nominal with personal achievement, while the contemporary lawn around a ranch style house symbolized higher socioeconomic status. Women were the decision-makers in the gardening process, though men did most of the plowing, fertilizing and planting.

Wilken, Gene C.

1970 Food Producing Systems Available to the Ancient Maya, American Antiquity 36: 432-448.

**1977 Integrating Forest and Small-Scale Farm Systems in Middle America, Agro-Ecosystems 3: 291-302.

Regards the "multistoried dooryard gardens" of Middle America

(Mexico and Central America = Mesoamerica) as the "ultimate stage in forest emulations." In plots of less than one tenth of a hectare, farmers grow more than two dozen different food plants, in a layered mimicry of the tropical forest. Article generally relates Middle American agricultural systems to their imitation of the tropical forest.

Wilkes, Garrison

1977 Native Crops and Wild Food Plants, *Ecologist* 7 (October): 312-317. (BIBL LRS77-18107).

"Deplores the increasing dependence on a small number of cereal plants to meet basic nutritional requirements. Modern agricultural techniques and economic considerations have caused a reduction in acreage planted with legume crops and the disappearance of many minor, but nutritionally important, food plants."

Wilkes, Richard Ralph

1981 Agriculture, Ecology and Domestic Organization Among the K'etchi Maya. Ph.D. thesis, University of Arizona. University Microfilms No. RQC 82-00327. Ann Arbor, Michigan: University Microfilms International.
562 pages, map, plant lists, bibliography: 526-562.

Swidden maize production in Southern Belize is the main subject, but excellent detail is provided on systems of vegetable and tree crop and small livestock production, hunting and gathering, and diet for Belizan K'etchi, with comparative information from K'etchi in Guatemala and other Maya groups.

Will, A.G.K. **

1972 Performance of a Small Vegetable Market Garden in Uganda, *East African Agricultural and Forestry Journal* 38: 1: 8-15.

Reports on an experimental garden designed at the Kawanda Research Station in Uganda and operated between 1965-1969. The 0.3 hectare garden was irrigated by an overhead sprinkler system and worked by three full-time gardeners (taken to be the equivalent to a farmer, his wife, and one child of working age). Complex rotations, composting with various materials, and grass bundings to create terraces on sloped land were part of the design. Capital costs for installation, including the sprinkler system, amounted to 12,000 Ugandan shillings (sU); recurrent costs were estimated at 1,600 plus depreciation (10% of capital costs). The value of produce sold ranged from sU 1,720 the first year, when only 2,249 kg was produced, to sU 6,363 in the last year, when 8,500 kg was produced. As the net profit would not be adequate for a family income, however, a garden of this size must be considered of supplementary income standard only. Economies of scale could be realized by enlarging the garden to at least two hectares, as additional piping and sprinkler heads would only drive up the capital installation costs for overhead irrigation to sU 15,000, and annual profits would exceed sU 18,000. This would provide an adequate family income.

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Williams, Allen

- 1980 Breaking the Chemical Habit, *Journal of the Interamerican Foundation* 4: 2 (Second Quarter): 16-19.

Describes Anronat Farm, Andrew Royer's terraced, intensively cultivated 1.2 acre 'Natural Farm' in the village of Giraudel, Dominica. This garden/farm integrates the production of 3 cows, 3 goats, 2 sheep, a pig, a donkey, and 86 layers of vegetation. Tree crops include mango, lime, grapefruit, avocado, coffee, and bananas. In two growing seasons, Royer produces chives, parsley, celery, shallots, thyme, garlic, ginger, turnips, beets, onions, cabbage, corn, string beans, eggplants, sweet and "Irish" potatoes, sweet and hot peppers, yams, tannia, marigolds, and anthurium lilies. Meat, poultry, and milk are used for home consumption and recycling; the cash crops are vegetables and eggs. Royer works most of the minifarm personally, hiring occasional day labor to help dig trenches and raise beds. (Royer introduced his techniques on a demonstration plot to a community movement in Pilate, Haiti and, with IAF funding, began a small school for 3 students a month on his farm.)

- 1980_L Anronat: Profile of a Small Scale Organic Farm. Summary Report of the Task Force on Ecological Agricultural Practices. Port of Spain, Trinidad: The Association for Caribbean Transformation.

13 pages.

This paper gives greater detail on the farm described in the article above, and attaches a newsletter published by Anronat farm.

Wing, Elizabeth

- 1975 Animal Domestication in the Andes, IN: Symposium on the Origins of Agriculture. Paris: Mouton Press.

Technical paper summarizes recent research from paleozoology and archeology on the process of animal domestication in the Andes, including domestication of the guinea pig, the primary kitchen small livestock.

Wishnetsky, Theodore and Jerry N. Cash **

- 1976 Home Gardening and Canning versus Buying Canned Goods for Green Beans and Tomatoes. Extension Bulletin E936/MSU Ag Fact No. 74. East Lansing, Michigan: Cooperative Extension Service, Michigan State University.

4 pages.

Economic study compares the cost of home food production with purchase, concluding that green beans are a better bet than tomatoes in Michigan.

World Bank

- 1977 Indonesia--Appraisal of a Nutrition Development Project. World Bank Report No. 1318-IND. Washington, D.C.

Identifies nutritional deficiencies of Indonesian population: PCM, vitamin A, and iodine deficiencies, and nutritional anemia. Direct Nutrition Action Program aimed to "increase the production of nutri-

tious vegetables and fruits in 18,000 home/ village gardens through provision of improved seeds, development of model garden packages, and intensification of agricultural extension efforts."

1983 Technical Data Sheet No. B 83/89: Indonesia / Transmigration IV Project.
2 pages.

In a project in Indonesia to settle 3,500 families at Muara Wahau and 2,500 families at Sangkulirang in East Kalimantan, each family will receive 1.25 ha. of land cleared by the transmigration authority for houselots and food crops (home gardens). A tree crop pilot plantation will support seedling distribution to colonists. Total cost of project is \$121 million, \$63.5 of which is financed by the bank.

Wott, John A. **

1982 A Short History of Consumer Horticulture, *HortScience* 17: 3 (June): 313-316.

Gives concise history of American gardening, based on 21 references.

Y-Authors

Yamaguchi, Masatoshi **

- 1978 World Vegetables: Principles, Production and Nutrition Value
Davis, California: University of California.

221 pages, glossary, plant lists, illustrations

Chapters in a published syllabus of a university course cover major vegetable types—eg., the edible aroids, alliums, solanaceous fruits et al. Provides raw data on the nutritional value of many tropical vegetables.

Yang, Y.H.

- 1976a Home Gardens as a Nutrition Intervention, IN: Small Scale Intensive Food Production: 60-80. Washington, D.C.: League for International Food Education.

- 1976b Home Gardens, a Low-Input and High-Output Food Resource for Rural Families in Asian and Pacific Countries. Hawaii: East West Center. (Reprinted in the Peace Corps' Small Vegetable Gardens Resource Packet.)

Advocates vegetables as "efficient producers of calorie and protein," capable of solving chronic nutritional problems in developing countries. Nutritional problems are illustrated for the Republic of Korea, Indonesia, the Phillipines and the United States. Brief reference is made to FAO/WHO/UNICEF ANPs' promotion of home gardens and to the "Green Revolution Campaign" in the Phillipines, the "Green Book" of Malaysia, and the "New Community Movement" in Korea which feature home food production. Yang then gives his now famous framework for calculating optimal nutritional contributions from a home garden, documented by a series of tables repeated in most of his publications on the subject.

- 1978a Designing Farming System for Better Nutrition Output. Hawaii: East-West Center.

- 1978b Maximizing Nutritional Output of Small Farms. Hawaii: East-West Center.

- 1979 Tropical Home Gardens as a Nutritional Intervention, IN: Tropical Foods: Chemistry and Nutrition. G. Inglett and G. Charalambous (editors). Volume 2: 417-446. New York: Academic Press.

- 1981a Nutritional and Environmental Considerations in Small Scale Intensive Food Production, IN: Small Scale Food Production: The Human Element (Proceedings of the Third International Conference on Small Scale and Intensive Food Production): 44-58. Washington, D.C.: League for International Food Education.

Focused on kitchen gardens in Hawaii (150 square meters and growing dark leafy green vegetables), this report recommends crops tested at the East-West Center Community Garden--cabbages, chard, lettuce, and

others. Cropping systems and their output as nutritional support for a family of six persons are given for a 150m² garden and a one hectare farm model.

1981b A Neglected Food Resource: Home Garden. Paper prepared for the First Asian Household Nutrition Appropriate Technology Conference, July 13-17, 1981 at Colombo, Sri Lanka.

Yen, D.E. **

1974 Arboriculture in the Subsistence of Santa Cruz, Solomon Islands, *Economic Botany* 28 (July-September): 247-284. Describes the tree crop systems of a group in the Solomon Islands. Plant lists and cultivation techniques are detailed. Arboriculture provides staple food.

Z-Authors

Zapata, C. M.

1967 Gardens of Mexico, Intriguing Alchemy of Tradition and Imagination, **Home Garden** 54 (S): 48-49.

Stress is on the more spectacular ornamental gardens of Mexico.

Zweig, Ron

1977 The Saga of the Solar Algae Pond, **Journal of New Alchemy** (1977): 63-68.

1980 Solar Aquaculture, **Journal of New Alchemy** 6: 93-95.

New Alchemy's experimental solar aquaculture ponds are semi-enclosed cylindrical tanks made of translucent fiberglass measuring 1.5m (5') in depth and in diameter, and containing 2.78 cubic meters (734 gallons) of water each. These small containers produce considerable quantities of fish and, at a cost of \$150, could be considered for household aquaculture. Several combinations of fish have been tried. Operational sets of ponds have been included in the "ark"—a solar greenhouse and residence model—and in the "six pack" backyard solar greenhouse. Open air aquaculture is possible in the summer months in New England. This is an interesting line of experimentation and research to adapt aquaculture techniques to the very small spaces which typify most home gardens.

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APPENDIX D: GREEN THUMB GUIDES: LEARNING "HOW TO DO IT"

- Bachman, Corliss A. et. al., Roger B Yepson (editor)
 1981 Home Food Systems: Rodale's Catalog of Methods and Tools for Producing, Processing, and Preserving Naturally Good Foods. Emmaus, Pennsylvania: Rodale Press.
 ISBN 0878573259, 0878573208
 NAL TX 369.H 65
 ORGANIC GARDENING AND FOOD PROCESSING MANUAL
- Bittenbender, H.C.
 1983 Handbook of Tropical Vegetables. East Lansing, Michigan: Department of Horticulture, Michigan State University.
 118 pages, paperbound, line drawings, bibliography, plant lists.
 GUIDE TO TROPICAL VEGETABLES
 See Appendix 3. Recommended as a conveniently arranged, readable guide to local tropical vegetables.
- Coe, Mary Lee, illustrated by John Winthrop Fowler
 1978 Growing with Community Gardening. Taftsville, Vermont: The Countryman Press.
 149 pages, line drawings, index, bibliography.
 COMMUNITY GARDENING MANUAL
 Step-by-step practical advice is given about organizing community gardens--finding land, assigning space and responsibilities, procuring technical assistance, seeds in bulk, and materials for composting. Lists resource organizations available in the United States.
- Cooperative American de Remesas al Exterior and Peace Corps/
 Guatemala
 1976 Manual Didactico: Huertos Escolares y Nutricion. Program and Training Journal Reprint Series No. 18. Washington, D.C. Peace Corps.
 132 pages, line drawings
 SCHOOL GARDENING MANUAL
 This teaching manual on School Gardens and Nutrition in Spanish was originally prepared for a joint CARE, Peace Corps and "Rural Social Education" project in Guatemala, in the El Quiche, Solola and San Marcos departments. Covers basic gardening techniques, such as composting, seed beds, transplanting and pest control. Gives culturally adapted lessons in environmental sanitation and suggests nutrition lesson plans and actual recipes.
- Engstrom, Laura
 1977 The Six Pack: Backyard Solar Greenhouse, Journal of the New Alchemists: 125

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EXPERIMENTAL / GREENHOUSE AQUACULTURE

Gives technology for aqua-agriculture in translucent tanks suitable for installation in a low cost home greenhouse.

Family Vegetable Garden Series. Michigan State University, Bulletin Office, PO Box 231, East Lansing, Michigan 48824.
(Extension Bulletins)

Farallones Institute

The Integral Urban House: Self-Reliant Living in the City.
San Francisco, California: Sierra Club Books.

URBAN HOME GARDENING MANUAL AND GUIDE TO RESOURCES

A respected guide based on over a decade of experience at an experimental garden/house in California, this resource provides techniques for intensive food production in the smallest nooks and crannies of urban residences. Solutions are in part architectural (sun decks, green houses, greenhouse windows), though the complex planting of house site gardens enriched with recycled wastes is the key to systems.

Foster, Lee

1983 Two Ways to A Great Vegetable Garden: The Chinese vs the French Intensive Method (Views of P.Chan and J. Jeavons), *Family Handyman* 33 (March): 50-59.

Gardens for All. Periodical bi-monthly publication of Gardens for All, Burlington, Vermont.

Herlots, Geoffrey A.

1973 Vegetables of South East Asia. Hong Kong: Hafner Press, and London: George Allen and Unwin.
525 pages, illustrated, bibliography: 520
NAL SB320.8.T7H4

GUIDE TO ASIAN VEGETABLES

Resource for horticultural information about regional vegetables, recommended as a guide for understanding local cultivars, along with Bittenbender 1983, Yamaguchi 1978, and Messiaen 1974, among other sources.

Home Garden Magazine. Periodical publication.

Home Garden Vegetable Series--Hawaii University Cooperative Extension Service NAL SB 320 A 1H3. Occasional publication series.

Home Gardener. Periodical publication since 1965.

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Hoskins, Colin M.

1954 The Samaka Guide to Housesite Farming. Manila: Samaka Service Center.

GARDENING MANUAL / PHILIPPINES

International Board for Plant Genetics Resources

1982 Directory of Germplasm Collections IV-Vegetables. Rome, Italy: IBPGR.

GUIDE TO VEGETABLE CROPS

This guide, and its periodic updates, is useful for more sophisticated approaches in gardening projects. Gardening project staff could arrange to obtain planting materials, and may be in a position to collect systematically, and thus add to the international collections which this guide locates.

Foster, Lee, illustrated by Shirley Barker

1982 Backyard Farming: Growing Your Own Fresh Vegetables, Fruits, and Herbs in a Small Space. San Francisco, California; San Francisco Chronicle Books.

87 pages, illustrated

NAL call number 324.3.F67

GARDENING MANUAL / FRUITS, HERBS, VEGETABLES

Though written for conditions in the United States, and presuming the support structures for home gardening (i.e. availability of water, seed and inputs), this gardening manual sketches approaches to maximize the use of space which could be valuable if adapted to situations in developing countries.

Gentry, Curtis, illustrated by Stacey Leslie

1983 Small Scale Beekeeping. Manual M-17, Information Collection and Exchange. Washington, D.C.: Peace Corps.

212 pages, line drawings

BEEKEEPING MANUAL

Developed under contract to the Peace Corps, this manual gives easy to read and easy to follow diagrams to present basic information on bees, beekeeping technology, and project planning.

Hunt, Marjorie B. illustrated by Jean Seibert

1982 Basic Organic Gardening. Emmaus, Pennsylvania: Rodale Press.

161 pages, index, illustrations, bibliography.

NAL call number SB324.3.H86

ORGANIC GARDENING MANUAL

Hyams, Edward

1975 Survival Gardening: How to Grow Vegetables, Herbs, Fruits, Nuts, Wine and Tobacco in Garden or Allotment. London: J.

Murray.

GARDENING MANUAL / UNITED KINGDOM

Jardin, C. and J. Crosnier

1975 Comment ameliorer l'alimentation familiale. Noumea (New Caledonia).

43 pages, drawings, photographs.

HOUSEHOLD PRODUCTION MANUAL / OCEANIA, PACIFIC REGION

Handbook originally written for an ANP gives practical advice for home gardening and poultry management. As noted in Appendix 3, contains a guide to hydroponic gardening suitable for sandy atolls, which features recycling and concentrating organic wastes.

Jeavons, J.

1975 How To Grow More Vegetables Than You Ever Thought Was Possible on Less Land Than You Can Imagine. Palo Alto, California: Ecology Center of the Midpeninsula.

ORGANIC GARDENING MANUAL

Jobb, Jamie

1979 The Complete Book of Community Gardening. New York: William Morrow and Company.

COMMUNITY GARDENING MANUAL

Lewis, Martha Wells

1978 Women and Food: An Annotated Bibliography On Family Food Production, Preservation and Improved Nutrition. Washington, D.C.: Office of Women in Development, United States Agency for International Development.

GUIDE TO ADDITIONAL RESOURCES

Sections of this annotated bibliography—"Vegetable Gardening for Developing Countries and Tropical Climates" (pp. 8-20), "Raising Small Animals" (pp. 21-24) and "Better Nutrition through Vegetable Gardening" (pp.25-29)--give a good selection of the "how to do it" literature: gardening or animal husbandry manuals, textbooks and key references.

Maingay, Hilde

1977 Intensive Vegetable Production, Journal of New Alchemy (1977): 47-55.

EXPERIMENTAL

Guide to techniques as researched by New Alchemy, including raised beds, small scale irrigation and cloches.

Messiaen, Charles-Marie

1974 Le Potage Tropical. (The Tropical Vegetable Garden.) Paris, France: Presse Universitaire de France.
2 volumes, 572 pages.

GUIDE TO CARIBBEAN VEGETABLES / ADAPTIVE RESEARCH MANUAL / GUIDE TO ADDITIONAL RESOURCES

This handbook reports on Messiaen's horticultural research on Guadeloupe. The first volume covers "general issues," such as the

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relation of climate and plant development, tropical soils, pests, weeds, seeds, breeding and "biological" (organic) methods. The second volume is devoted to particular crops: tomatoes, peppers, melons and many more. Volumes also include a summary of the literature in French and an ample bibliography on adaptive vegetable research in tropical areas through the mid-70's. A fairly rare and expensive handbook, The Tropical Vegetable Garden is recommended as an essential reference for the design of market and home vegetable gardens in tropical areas.

Michigan State University Extension Bulletin and MSU Ag Facts Series.

Mollison, Bill and David Holmgren
 1979 Permaculture One. Winters, California: International Tree Crop Institute, U.S.A.
 GARDENING WITH PERENNIALS MANUAL

Mollison, Bill
 1981 Permaculture Two. Tagari, Tasmania, Australia.
 GARDENING WITH PERENNIALS MANUAL
 Manual and advocacy document for gardening and small scale intensive agricultural systems based on perennials, contains specific design solutions for differing conditions. Sections give creative solutions for gardening in urban areas, such as trellising whole apartment buildings. Due consideration is given to creating total systems for arid conditions. The fundamental concept of Permaculture is to plant it once and plant it right, then reap benefits for a long time. Shift away from an emphasis on annuals incorporates equally long term strategies for rehabilitating the soil, changing water runoff and retention patterns, and incorporating livestock production.

Mother Earth News, monthly magazine

Naimark, Susan (editor)
 1982 A Handbook of Community Gardening by Boston Urban Gardeners.
 New York: Charles Scribner's Sons. ISBN 0-684-17466-9.
 180 pages, illustrations, index, bibliography. \$7.95
 COMMUNITY GARDENING MANUAL

National Academy of Sciences
 1979 Tropical Legumes: Resources for the Future. Washington, D.C.
 National Academy of Sciences.
 329 pages, plates, LCC No. 79-64185
 GUIDE TO LEGUMES

Guide highlights a selection of the legumes, some of which may be appropriate to solving protein deficiencies in local diets. See also companion publications on the winged bean and "underexploited trop-

ical plants."

Newcomb, Duane G.

1975 Postage Stamp Garden Book: How to Grow All the Food You Can Eat in Very Little Space. Los Angeles; J.P. Tarcher.

GARDENING MANUAL/ UNITED STATES

Recommended for its approach to the constraint of small space, although techniques would need to be adapted to conditions in developing countries.

Oomen, H.A.P.C and G.J.H. Grubben

1978 Tropical Leaf Vegetables in Human Nutrition. Communication 69, Department of Agricultural Research. Amsterdam, the Netherlands: Koninklijk Instituut voor de Tropen (Royal Tropical Institute). Published jointly with Orphan Publishing Company, Willemstad, Curacao.
140 pages, plates, tables, bibliography, line drawings, plant lists.

GUIDE TO TROPICAL LEAFY VEGETABLES

Advocacy document stresses the superior nutritional value of green leaves over other parts of plants commonly eaten, and the large number of tropical plants which fit the 'green leafy nutritious bill of health.'

Organic Gardening, monthly periodical, Rodale Press.

NAL Call Number 57.8. OR 32

Pacey, Arnold

1978 Gardening for Better Nutrition. London, United Kingdom: Intermediate Technology Publications Ltd.
ISBN 0 903031 507

64 pages, line drawings, tables, bibliography, plant lists, nutritional analyses of particular plants, plates.

CLINIC AND FAMILY GARDENING MANUAL

This booklet is highly recommended by agencies promoting gardening. The second half is a manual, giving basic guidelines for the selection of crops which will fulfill local nutritional needs as determined by surveys (largely from crops familiar to European gardeners and suitable for temperate zones). Organizational and agronomic techniques are given for establishing gardens.

Peace Corps, Information Collection and Exchange

1982 Small Vegetable Gardens Resource Packet. Resource Packet P-4. Washington, D.C.

GARDENING MANUAL AND GUIDE TO ADDITIONAL RESOURCES

Resource packet is in three parts. Part A reprints an article by Richard Reed on "Secondary Volunteer Activities," and section 2 is a local agricultural and nutritional assessment tool. This is an instrument--a questionnaire--to collect the information on local

food practices and cultivation which is necessary to make an informed decision about what constitutes an appropriate vegetable gardening project. Part B is ICE Reprint No. R-25, the Vickery manual Intensive Vegetable Gardening for Profit and Self-Sufficiency. Part C is a collection of articles on home gardening, case histories by Peace Corps volunteers about their experiences with gardening projects, a list of related materials available from ICE, and a directory of resource organizations. Part D collects charts on nutrition and vegetable gardening. This packet is highly recommended for anyone embarking on a gardening project in a developing country.

Rees, John Leslie

- 1967 The Home Gardener for Temperate and Subtropical Regions.
Sydney, Australia: Angus and Robertson.
270 pages, illustrated.
NAL SB 453 .3 .A8R4

GARDENING MANUAL / SOUTHERN PACIFIC AND INDIAN OCEAN
How-to-do it handbook from "down under" gives advice regionally suitable to Asian and Pacific zones, including the cooler tropics of the New Guinea highlands and other subtropical zones at the southern rim of the Pacific.

Ruck, H.C.

- 1976 Horticulture: A Select Bibliography. FAO Plant Production and Protection Papers, No. 1. Rome, Italy: Food and Agriculture Organization. AGPC: MISC/37.
50 pages, bibliography 1-43.

GUIDE TO ADDITIONAL RESOURCES

Schofield, S. and C.M. Lambert

- 1975 Village Nutrition Studies: An Annotated Bibliography.
Brighton, United Kingdom: Institute of Development Studies,
University of Sussex.

GUIDE TO RESOURCES ON NUTRITION STUDIES

Though somewhat dated by now, this compendium analyzes the methodology of village nutrition studies, and references prior studies by region. As a thorough study of the local nutritional situation is recommended practice in the design of home gardening projects, this reference can be consulted to locate earlier studies in the same general area where local nutritional surveys will be carried out. See Peace Corps resource packet for guidelines to actual local study methods.

Sommers, Paul

- 1983 Low Cost Farming in the Humid Tropics: An Illustrated Handbook. Manila, Philippines: Island Publishing House, Inc.

MANUAL

"Farming techniques" feature a home garden and other methods relevant to home gardening in rural areas in the humid tropics. Particularly relevant to the Philippines.

Stout, Ruth and Clemence R. Stout

1971 The Ruth Stout No-Work Garden Book. Emmaus, Pennsylvania: Rodale Press.

GARDENING MANUAL

Recommended for the unique method of deep composting: a technical solution for gardening under arid conditions or where soils are extremely poor.

Titchmarsh, Alan

1981 Gardening Techniques: The Simon and Schuster Step-by-Step Encyclopedia of Practical Gardening. Published in Cooperation with the Royal Horticultural Society. New York: Simon and Schuster.

96 pages, spiral bound, illustrated (line drawings), index, information sources.

ISBN 0-671-42255-3

(Suggested retail price \$8.95. Available in most bookstores and from the publishers.)

GARDENING MANUAL

Pragmatic handbook describes conventional time-tested practices of the British and American gardening tradition. Although much of the handbook concerns ornamentals and landscaping, the readable and well illustrated advice represents a "state of the art" statement.

UNICEF

1981 The UNICEF Home Garden Handbook for People Promoting Mixed Gardening in the Humid Tropics. New York: United Nations.

55 pages, illustrations.

NAL SB 323.U5

MIXED GARDENING MANUAL

United States Department of Agriculture

Teachers' Guide to Minigardens. Beltsville, Maryland: ARS, Information Division, Educational Services Branch, Agricultural Research Center.

SCHOOL GARDENING MANUAL

Written for American teachers, this guide could be adapted for overseas school garden situations.

Quick Bibliography Series.

GUIDE TO ADDITIONAL RESOURCES

This series compiles and prints listings from the computerized data base of the National Agricultural Library at Beltsville on special topics. Series is available free, as long as supplies last. Issues in the series related to home gardening include reviews of particular vegetables (i.e. tomatoes), aquaculture and organic gardening.

Vickey, James and Pamela
1978 Intensive Vegetable Gardening for Profit and Self Sufficiency. Information Collection and Exchange (ICE) Reprint No.25. Washington,D.C.: ICE/ OPTC.
159 pages.

GARDENING MANUAL

Manual developed by Peace Corps volunteers working in Jamaica.
"Provides step-by-step guidelines for cultivating vegetables under many climatic conditions organically or with fertilizers." Widely used by Peace Corps volunteers, and to develop locally appropriate gardening manuals in Liberia and Togo.

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REGION & COUNTRY INDEX REGION & COUNTRY INDEX REGION & COUNTRY

AFRICA

Accati 1983, Allen 1965, Benneh 1972, Chale and Carloni 1972, De Schlippe 1956, Latham 1979, Lawson 1977, McLoughlin (ed.) 1970, Okigbo 1976, Tindall 1968, Toury 1967, Wagneur 1969

ALGERIA

Pevetz 1977

AMAZON

Wilbert 1961, Podselver 1981

ANDES

Bolton and Calvin 1975, Gade 1967, Wing 1975

ASIA

Delmendo 1980, Gershon 1983, Ho 1977, USAID 1981

BANGLADESH

Ahmed n.d., Carp 1983, Chen, Alauddin Chowdhury, Huffman 1979, Laumark 1982

BELIZE

Palacio 1980, Palacio 1984, Stavrakis 1972, Stavrakis and Marshall 1978, Stavrakis 1979, Wilkes, R. 1981

BENIN

D'Almeida 1967, Ruck 1968, Terra 1967, van Eijnatten 1969a, Van Heck 1972

BOLIVIA

Brownrigg, Harmen, and Rasnake 1979, Romanoff 1983, Syme and Marchant 1983

BOTSWANA

Grivetti 1980, Histan 1978, USAID 1978 PD-AAF-113-A1, USAID 1980 OPG-78-633-30

BRAZIL

Harris, M. 1971, Wagley 1971

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BURKINA FASSO

Uriodain 1971

CAMEROON

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