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HOUSEHOLD GARDENS:
Theoretical considerations on an old survival strategy

Vera K. Niñez

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HOUSEHOLD GARDENS: THEORETICAL CONSIDERATIONS ON AN OLD SURVIVAL STRATEGY

Abstract

Although scientists, politicians and humanists have long debated the role of backyard gardens in alleviating food shortage and malnutrition, little is known about indigenous home gardening. This research report discusses the historical significance and function of home gardens, offers a definition, and develops a policy-relevant typology based on ecological and socioeconomic determinants. Finally, a cross-cultural comparative review of the literature is undertaken. Despite increasing attention given by agricultural research organizations to small-scale farmers, household gardens continue to be neglected as an important subsistence strategy.

Resumen

Aún cuando mucho se ha discutido sobre el rol de las huertas en la malnutrición, es muy poco lo que se sabe sobre la existencia de las mismas. Este reporte examina el significado histórico y el rol de las huertas, propone una definición de las huertas domésticas y desarrolla una tipología relevante basada en determinantes ecológicos y socioeconómicos. Finalmente, se lleva a cabo una revisión bibliográfica comparativa. A pesar de que el interés de las organizaciones de investigación agrícola ha ido aumentando, las huertas domésticas continúan siendo ignoradas como una estrategia importante de subsistencia.

HOUSEHOLD GARDENS: THEORETICAL CONSIDERATIONS ON AN OLD SURVIVAL STRATEGY

Vera K. Niñez[1]

Introduction

Applied research oriented toward increasing food production and reducing malnutrition in developing countries has traditionally concentrated on large to medium-size commercial and semi-commercial farming enterprises. By the early 1980s, emphasis had shifted toward a farming systems research approach that focussed on small farmers and their socio-economic environment (Norman 1980). Despite this change in clients, however, a strong field production, surplus oriented market bias persists (Shaner, Philipp, and Schmehl 1982). Consequently, little attention has been given to a universal subsistence food production system referred to by Harwood (1979:103) as "farmyard enterprises." Also known as backyard, dooryard, home, kitchen, or food gardens,[2] such small-scale economic units of production encompass both plant and animal production in relatively confined areas usually located close to the family dwelling. Household gardens have evolved in most contemporary human cultures and are the most ancient and persevering form of cultivation. They represent a universal subsistence strategy for families with economic bases ranging from shifting cultivation to highly commercialized agriculture to urban-industrial employment.

In contrast to field agriculture, household gardens tend to be under female management. Since agricultural development projects have mainly dealt with male farmers, however, this vital component of farming systems and urban household economies has gone largely without official attention. Information on household gardens is sparse and more often than not has to be extracted from writings with other foci.[3] Programs developing low input, female-oriented garden technology are non-existent although for many rural and urban households,

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1 Visiting researcher, Social Science Department, International Potato Center.

2 Household Garden is suggested here as the technical term which best designates the full function of these production units serving wider household needs in addition to supplying food and condiments for the kitchen.

3 For instance, a search through 1362 titles of the Kansas State University's Farming Systems Research bibliography yielded 9 entries containing information on domestic gardens. None of the nine, however, deal primarily with gardens. Special thanks to Martha Tomecek for supplying these data.

"backyard" enterprises represent a crucial day-to-day survival strategy involving primary (plant) and secondary (animal) food production in addition to generating small amounts of income in cash or kind through sale or trade of surplus production.[4]

This paper, therefore, discusses the worldwide phenomenon of household gardens and the complementary activity of small domestic animal production, drawing on select examples in the existing global literature, in order to convey a better understanding of this food production strategy. The following specific topics will be addressed:

- Historical significance,
- Definition,
- Ecological and socioeconomic determinants, and
- Cross-cultural perspectives on household gardens.

[4] Home Garden Programs, past and present, have concentrated on transferring technologies which are often poorly researched and adapted to local socio-economic and ecological conditions (cf. Niñez 1984).

I. Historical Significance and Function of Household Gardens

1. From Prehistory to Antiquity

Students of prehistoric agriculture have long pointed to the role of "garden plots" adjacent to the dwellings of semi-sedentary and sedentary peoples in the process of plant domestication.

Grivetti (1980:5-7) points out the likely role played by penned herbivorous animals in the domestication of vegetables through concentrating the seed of leafy plant species in corral manure, a process which greatly facilitated selection and gathering of edible plants. Over time, selected species were purposely transplanted to compounds, while undergoing plant-physiological changes due to more favorable growing conditions.

Following a thesis first proposed by Andersen (1952), Harris (1971:180) holds that cultivation most likely resulted from the incidental activity of scattering plant reproductive material near dwellings "...where human waste and garbage provided ideal growing conditions...," while Childe (1971:15) views progressively purposeful experimentation with seeds collected by women for family consumption as the beginning of plant domestication.

Due to sexual division of labor in early hunting and gathering societies, women rather than men were in the position to experiment with what they collected. They took the crucial step of deliberately planting increasingly larger plots of cleared ground, thus facilitating their traditional task of securing day-to-day provisions for family maintenance (Childe 1971:15). Consequently, some crops (mainly grains) matured into field agriculture which became a dominant sector of male economic activity while others remained in women's gardens yielding food and nutrients with close-at-hand convenience and security.

In contrast to the problem of origins, our knowledge of household gardens in early Western and Near Eastern civilizations is less hypothetical. Records of ancient gardens have come down to us through over two millenia of history (cf. the Code of Hammurabi, Greek and Roman writers). Gardens were considered important enough by the highest civilizations to be eternalized in tapestry, painting, and literature.[5]

Not the oldest on record but certainly the most illustrious for the West is the mythical "Garden of Eden" which contained "every tree that is pleasant to sight and good for food" (Genesis II, 8-17).

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5 The following description of ancient Near Eastern and Mediterranean gardens is drawn from an excellent and pleasant account by Ellen Churchill-Semple (1931).

Ancient gardens were carefully managed to fulfill a dual purpose: productivity and aesthetic appeal, varying --as is the case in modern times-- in proportion to the owner's economic status. Trees and grape arbors in Mediterranean gardens provided shade from a parching desert sun while yielding fruit for food and relaxation. Vegetables were intercropped for utmost land utilization and mutual benefit in terms of soil nutrients and insect control. Flowers served economic as much as aesthetic motives. They were sold for ceremonial use, as spices and food (e.g. saffron, poppies), dye and cosmetic manufacture.

The economic importance of ancient vegetable gardens is illustrated by historians describing "truck gardens" supplying daily, "... and with excellent profits, ..." the urban markets of ancient cities from Carthage to Rome with fresh produce. In addition, the overwhelming presence of small urban household gardens comes to light in archeological data, complete with size and location (Churchill-Semple 1931:436)

In the New World, "forest gardens" as basic production units gave rise to and sustained for over 500 years a complex Mesoamerican society, the Maya, a civilization spread over nearly 100,000 square miles. Mayan food production strategies are shown to have been extremely well-adapted to their tropical, seasonally dry-wet environment. They practiced a system of "forest interculture" which maintained a careful balance between soil-protective tropical forest cover and mixed-crop forest gardening (Stavrakis 1978). Small-scale family production units existed in both urban and rural spheres. Archeological findings show that family plots within residential Tikal comprised "approximately 0.6 hectares of upland and about one hectare of upland and swamp lots" (Puleston 1973:197).

Mesopotamia and the Mediterranean Basin and Mesoamerica are only two evolutionary settings for gardens. In diverse cultures the world over, they have co-evolved with humankind, acquiring in the process a multitude of adaptive and complementary functions.

Although not exhaustive, the following list and subsequent historical and ethnographic examples illustrate this diversity of functions:

- Producing relatively large amounts of food on relatively small extensions of land unsuited for field agriculture.

- Supplying nutrition not obtained solely from field agriculture.

- Providing directly food (including staples) in non-farm settings, especially urban centers.

- Backstopping during periods of crop failure or disruption of food flows.

- Providing fodder for household animals and other household-related needs (handicrafts, firewood, petty cash from sale of incidental or planned surplus production).

- Convenience and security through location relatively close to dwellings in time and space.

- Experimentation with new plant genetic material and cultivation techniques before implementation in field agriculture.

- Diffusion of plant genetic materials and maintaining genetic diversity.

- Guaranteeing women, who stand as "gate keepers" between food production and consumption, a regular and secure supply of food, petty cash, or goods to trade.

2. Diffusion of Plant Genetic Materials: Household Gardens as Experiment Stations

The crucial role of the garden plot as informal experiment station and mechanism by which plant genetic material moves is well illustrated by the migration of American food crop species. Some fifty per cent of the world's food crops originated in the Americas, two of which (potato and maize) are today among the top four in world production. Historical data confirm that diffusion took place through the medium of the garden.

Perhaps the best documented case of plant migration is the diffusion of the potato (Solanum tuberosum) to Europe, Asia, and Africa. Within roughly one century following its arrival in Europe around 1580, the potato became a widely established European garden vegetable and staple along with its botanical cousins tomato and eggplant (Salaman 1970). Ships engaged in large-scale exploration and colonization efforts during this period carried among their provisions potatoes, already recognized for their nutritive value and high vitamin C content. Potato and other seeds were planted in outpost vegetable gardens on islands where ships regularly stopped to trade or pick up fresh water (e.g. Tristan da Cunha, the Oceanian and Melanesian islands).[6]

Subsequent colonization and settlement by Europeans brought the potato and non-staple garden vegetables established at this time in Europe to the Near and Far East, Africa, Australia, and North America. Today, the potato represents the most important garden staple in temperate and high elevation tropical and subtropical world regions (International Potato Center n.d.).

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6 Laufer (1938) provides the basis for information on the migration of the potato around the world.

Dependency on the potato grew rapidly in regions where it found a niche not occupied by other crops in field rotation or garden production systems (Laufer 1938:86, Offenburg Potato Files n.d.). In China's Szechwan mountains, for example, Buddhist monks are described as cultivating potatoes along with turnips, spinach, and a few cabbages in their temple gardens. In the Soviet province of Tashkent, due to unfavorable climatic conditions, the potato remained confined to the special care of Russian settler gardens while in some high-altitude parts of Africa and New Zealand, as well as in Ireland, potatoes soon grew "almost wild" and became "very popular with the natives." The Japanese who did not care for the taste of the tubers initially nonetheless cultivated them in their gardens for the gentle beauty of their blossoms ultimately depicted in Japanese poetry. Today, Japan produces over 3.3 million tons annually (International Potato Center 1982).

Not solely from the New World to the Old but also vice versa did plant migration occur via household gardens. The Americas have at least as many Old World as New World plants on their cropping and gardening lists including fruit and forest trees. In many American regions, native, semi-domesticated and domesticated plant species were largely supplanted by Old World introductions following conquest and settlement (Antúnez de Mayolo 1981).

Experimentation by Europeans on American soil frequently began in gardens. In Peru, for example, the first Spanish woman to arrive was responsible for the introduction of wheat, experimenting in her garden with a few grains which had emerged from a bag of Panamanian rice. "Within a few years, she was able to bake the first loaf of Castilian bread, and the wheat soon spread from the garden of Doña Inés de Rivera to the fertile valley of the Rímac and from there throughout the entire continent" (Martin 1974:90). Encouraged by this success, other field, garden, and tree crops were introduced via courtyard gardens to rapidly change much of the American agricultural landscape.

Diffusion of plant genetic material was already practiced by indigenous colonists of 15th century Inca Peru, the mitimaes, who were resettled in newly conquered areas and

> carried with them their seed for rapid propagation in their new homes. ...even today, when campesinas (peasant women) migrate, they carry in their busums grains of corn which they will plant in their new homes.
>
> (Antúnez de Mayolo 1981:77)

To date, gardens function as farmers' individual experiment stations in many Andean communities of the high sierra or high jungle where new varieties of potatoes, maize, and vegetables, or other known varieties taken to different locations, are tested before planting in the fields.

The role of household gardens in disseminating and adapting plant food species and cultivation techniques to new environments has been illustrated for many of the world's arable biomes. Johnson (1971) in reviewing studies on farmer experimentation, reports on Conklin's description of the Hanunoo in the Philippines who have a special plot for plant experimentation:

> Cultigens of all sorts --especially new or unfamiliar varieties-- are grown experimentally in small houseyard gardens as single objects of great horticultural interest.
> (Conklin 1957, quoted in Johnson 1971:155)

A related function of household gardens is maintaining genetic diversity. Gardens must be viewed not only as food backstop in cases of field crop failure or lack of sufficient field area but also as genetic backstop in case of large-scale field crop failure brought about by disease or pests (cf. Johnson 1971 for cross-cultural examples).

3. Much Nutrition on Little Ground: Household Gardens, Potatoes and European Population Politics

Although the popular image of household gardens attributes little nutritional significance to them, historical data from Europe and Asia reveal that small cultivated parcels located near family dwellings have been of preeminent nutritional, economic, and socio-political importance. The combination "household garden-potato" for example, represents a highly successful small-scale food production arrangement. Thanks to the painstaking work of Redcliffe Salaman (1970) on the potato in Europe prior to and during the Industrial Revolution and Berthold Laufer (1938) in Asia, Africa, and the South Pacific we have a better understanding of the historic role of household gardens and potatoes.

The potato's great promise as a human food had been proclaimed shortly after its discovery in the Americas by politically conscious individuals in lands as distant as Ireland, China, Prussian Germany, Japan, and Britain. The constant threat of crop failure and pending biblical lean years, for example, brought the possibility of potato cultivation for subsistence purposes to the foreground of socio-political thinking in 18th century China. By empirical decree, potato cultivation was forced on peasants in places of "high hills and sandy soil" (Laufer 1938:72). Likewise, in Japan, following years of famine and food shortages, the potato cultivated in ornamental gardens was promoted as a nutritive crop.

Similar events, often spurred by government decree, occurred in Europe (Salaman 1970). Until the end of the 18th century, Old World grains consumed in the form of bread and gruel formed the European subsistence base. With the late 18th century grain price inflation, however, this product became priced out of reach for impoverished and malnutritioned rural and urban working classes. Bread riots were staged in England and on the Continent and governments urgently sought

solutions to the problem of feeding a growing proletariate in the wake of the Industrial Revolution. This situation fostered the overwhelmingly important role played by household gardens and land allotments on the one hand, and the potato, newly discovered "European" garden staple and bread substitute, on the other.

The potato first became solidly and irreplaceably established as a garden vegetable in Ireland. Irish "potato gardens," and their success in allowing the poor to feed themselves, were called to the attention of European policy makers, bringing about in Britain "the inception and development of laborers' (land) allotments as national economic policy" (Salaman 1970:525). However, allotments were not always sufficient and laborers were found "digging up plots on the side of the road" to plant potatoes, demonstrating a determined self-help philosophy. Small-scale food production policies in Britain progressed to a point where 77,000 acres of small allotment plots produced potatoes and vegetables for the landless poor (Salaman 1970:525).

In the British rural setting, agricultural laborer families already produced a large amount of their subsistence needs, albeit no staples, on land allotments which were in fact cottage gardens. Large estates set aside additional parcels from 1/4 to one acre in size to be used by workers for production of potatoes and garden vegetables. This practice of making marginal land available to workers in the rural sphere, once proven successful, diffused to colonies where plantation slave labor began supplying themselves on "provision grounds," marginal lands not suited to large-scale commercial plantation production (Brierley 1976).

In Prussia, at the time of Frederick II, a similar situation resulting from wars, harvest failures, and inflationary grain prices, demanded action on part of the government in supplying bread for the poor, and following its large-scale acceptance as a garden staple and subsequent field crop, the potato became the "bread of the poor man" (Offenburg Potato Files n.d.).

German land allotment policies appeared during the first half of the 19th Century. Their strongest advocate, Schreber, was concerned with improving nutrition among the economically displaced and impoverished weaver artisan class by providing land and knowledge to produce a large percentage of their own food. Schrebergaerten (Schreber type gardens) quickly became part of municipal programs to accomodate working class needs for family food production.

The success of small-scale, household-level food production in 19th Century Europe was based on the coincidence of two major factors: (a) a situation of absolute necessity resulting from increasing pauperization of rural and urban populations, and (b) the "discovery" of the potato as a staple species which lent itself to small-scale production on marginal land with simple garden technology. Thus, without the potato's adaptability to low-technology production and its ability to replace grains as a dietary base for Europe's poor, temperate

gardens could not have met the unprecedent demand of feeding large population segments. On the other hand, closed field rotation systems, e.g. in England and Ireland, left only marginal lands (allotments, gardens) for cultivating the new "proletarian" crop still unaccepted by upper social strata controlling agricultural production. Thus, jointly household gardens and potatoes furnished a large portion of the calories needed to support Europe's Industrial Revolution.

Continuing into the 20th Century, even highly industrialized societies of Europe and North America are quick to revert back to household-level food production during times of crisis as one way to insure immediate and secure basic food supplies covering at least part of their consumption requirements.

During the Great Depression, US "relief gardens" flourished while World War II "victory gardens" helped maintain food production levels high enough to sustain populations behind the fighting lines. The recent resurgence of home gardening in Europe and the US during the 1970s and 1980s corresponds directly to the present worldwide economic depression and a concern over diminishing world natural resources.

II. Problems of Definition

The available literature offers little help in clearly defining a given plot of cultivated land as garden rather than field. Some basic criteria must be established which are specific enough to functionally differentiate household garden production strategies for home consumption from market garden or field production. On the other hand, these criteria must allow for the distinct appearance of household gardens in different world biomes, their "real function" (within the household economy) and "major intended use" (consumption or sale) of a given plot of cultivated land. Leaving aside social, clinical, recreational, and aesthetic objectives, the following definition for household gardens (HGs) is suggested:

> The household garden is a subsystem within larger food procurement systems which aims at production of household consumption items either not obtainable, readily available, or affordable through field agriculture, shifting cultivation, hunting, gathering, fishing, livestock husbandry, or wage earning. Household gardens supply and supplement subsistence requirements and generate secondary direct or indirect income. They tend to be located close to permanent or semi-permanent dwellings for convenience and security.

A variety of home food production strategies exists worldwide and even within ecological regions. In the Peruvian Mantaro Valley, for example, four common small-scale food production types for daily use can be readily observed over a distance of merely 15 kilometers:

1. fenced gardens adjacent to the family dwelling (cabbages, potatoes, squash, corn, condiments, flowers);

2. plots planted as gardens but physically part of fields close to the house (cabbages, beans, potatoes);

3. cropping of field margins with vegetables for immediate consumption (potatoes, beans, cabbages, squash);

4. intercropping of the outer three to six rows of staple fields, especially maize, which lends support to climbing vegetable species (beans, peas, squash, melon).

In addition, to secure small animal cut-and-carry fodder in this highly intensive agricultural and horticultural production zone, fodder crops are sown in grain fields' outer limits to be cut together with the immature grains as needed, and weeds are allowed to grow in maize fields for controlled grazing or pulling.

Variation in the appearance of HGs is determined by cultural, ecological, and socio-economic factors. It is therefore helpful to isolate common traits or tendency characteristics to further distinguish HG food production from two related systems: market gardening

and field agriculture. Table 1 enumerates the most type-specific characteristics of these production systems.

Table 1. Tendency Characteristics of Selected Production Systems

Concept	Household Garden	Market Garden	Field Agriculture
species density	high	medium to low	low
species type	staple, vegetable fruit (cultural)	vegetable, fruit (market oriented)	staple (subsistence agro-industrial)
main production objective	home consumption	market sale	subsistence, market sale
labor source	family (female, elderly, children)	family or hired (male, female)	family, hired (male, female)
labor requirements	part-time	full-time	full-time
water requirements type	high-irrigation	high-irrigation	med. to low/irrig. rain food
harvest frequency	daily, seasonal	(short) seasonal	(long) seasonal
size of unit	small (relative)	medium to large	medium to large
space utilization	horizontal, vertical	horizontal, vertical	horizontal
fencing	frequent	less frequent	limited
location	close to dwelling	close to urban market	rural setting, close or distant from homestead
cropping patterns	irregular, row	row	row
economic role	supplementary	major economic activity	major economic activity
technology	simple hand tool	hand tool or mechanized	mechanized if possible, hand tool
inputs - cost	low	medium to high	medium to high
geographical distribution	rural and urban	sub-urban	rural
skills	gardening-horticultural	market-horticultural fruticultural	agricultural, commercial
government assistance	none or minor	credit	credit, extension

Ruthenberg (1971:104) distinguishes "garden cropping from... arable cropping by the following features which are usually but by no means in all cases, found simultaneously: (1) cropping those plants for personal consumption that cannot be collected nor supplied by arable farming, (2) small plots, (3) proximity to the house, (4) fencing, (5) mixed or dense planting of a great number of annual, semi-permanent, and perennial crops, (6) a high intensity of land use, (7) land cultivation several times a year, (8) permanence of cultivation, and (9) cultivation with hand implements.

III. Toward a Typology of Household Gardens: Ecological and Socio-economic Determinants

Biological characteristics of indigenous HGs are dictated by the ecology of a particular world region, while intensity of use and management are determined by wider household economic activities. HGs range from the crude beginnings of a tiny spot by the house with five corn stalks, a squash plant, herbs, and flowers in a Lima, Peru slum to the highly productive raised-bed gardens of the Chinese. Conversely, what functions as a household garden for a Shipibo Indian in the Peruvian jungle would appear to an Englishman a mere toleration of growth around the hut.

These two major factors responsible for physical variation in household gardens, ecological and socio-economic, are treated below.

1. Ecological Determinants of Household Gardens

The structural appearance of household gardens is determined in large part by the natural ecology and a family's attempt to utilize as many locally adapted species as possible on a relatively small extension of land for a multitude of household-related purposes. The types of cultivars found in gardens are dictated by the region's ecological potential and cultural food preferences. These generally coincide as they evolve together in traditional systems. Furthermore, ecology and culture determine non-food utilitarian materials produced in the garden and traditional animal species that complement garden and field vegetable and staple production.

Although household gardens are found in virtually all of the world's cultivable regions, two major ecological types occur: tropical and temperate (cf. Figure 1 and 2). An understanding of these is important since, frequently, home garden campaigns have attempted to impose temperate garden principles onto tropical or sub-tropical garden circumstances (Niñez 1984).

Geertz (1963) describes the "tiered" nature of Indonesian tropical gardens which imitate the tropical forest structure as opposed to single-tiered field agricultural systems. In the top tier, tropical gardens feature a canopy of tall shade trees benefitting garden, homestead, and livestock. The next "layer" consists of a lower tier of bushy growth made up of starchy root crops (cassava, fruit-yielding bushes) followed by ground-covering species (taro, sweet potato, squash).

Tropical layered gardens represent well-adapted micro-environments. They are governed by a laissez-faire, extremely conservationist management philosophy which entails functional interdependence of species, spontaneous propagation, spontaneous soil regeneration, erosion and leaching controls, and optimal utilization of horizontal and vertical space. Traditional tropical species are non-seasonal and propagation is typically vegetative.

FIGURE 1

Ecological Profile and Production Levels of HGs: Tropical

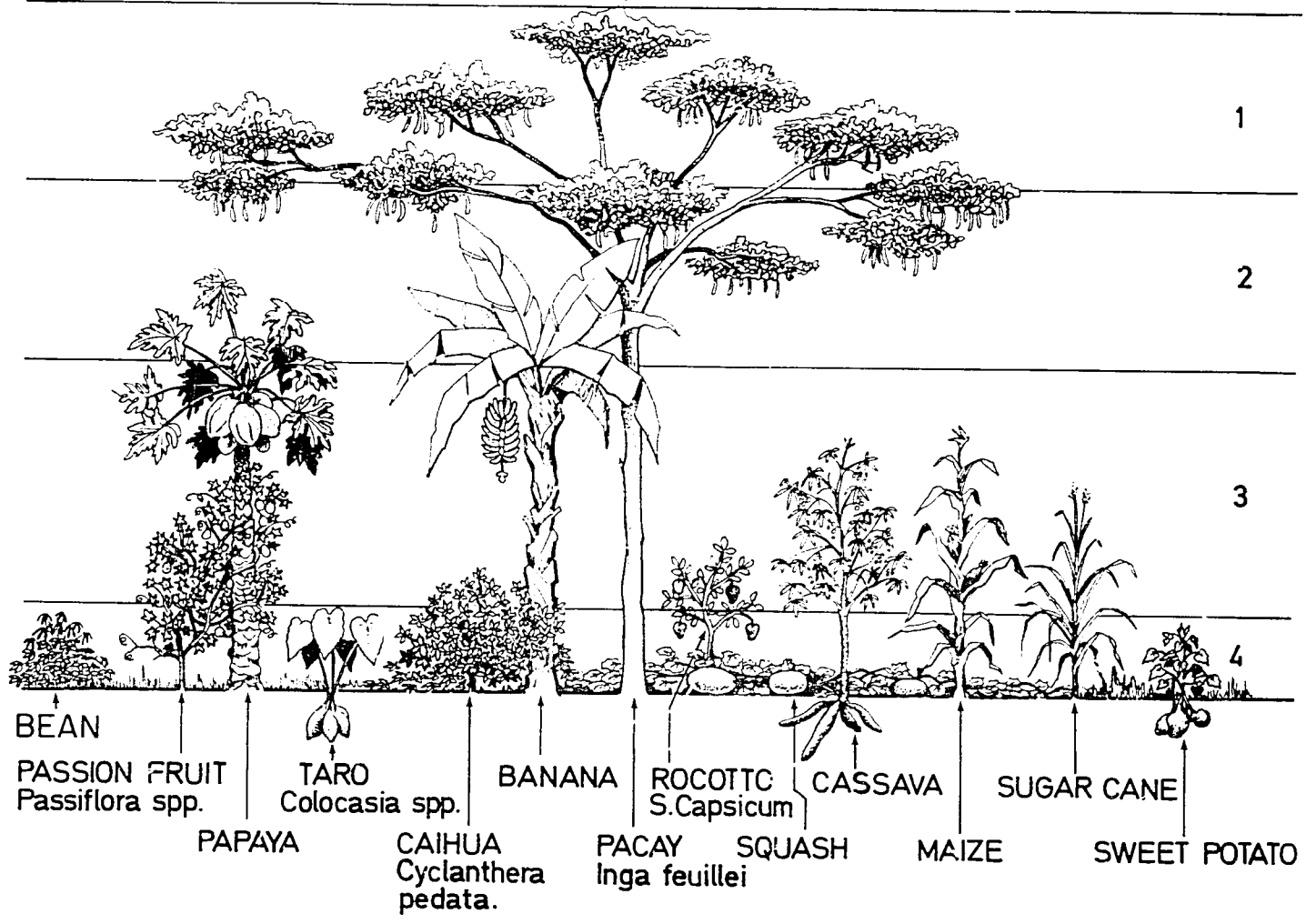
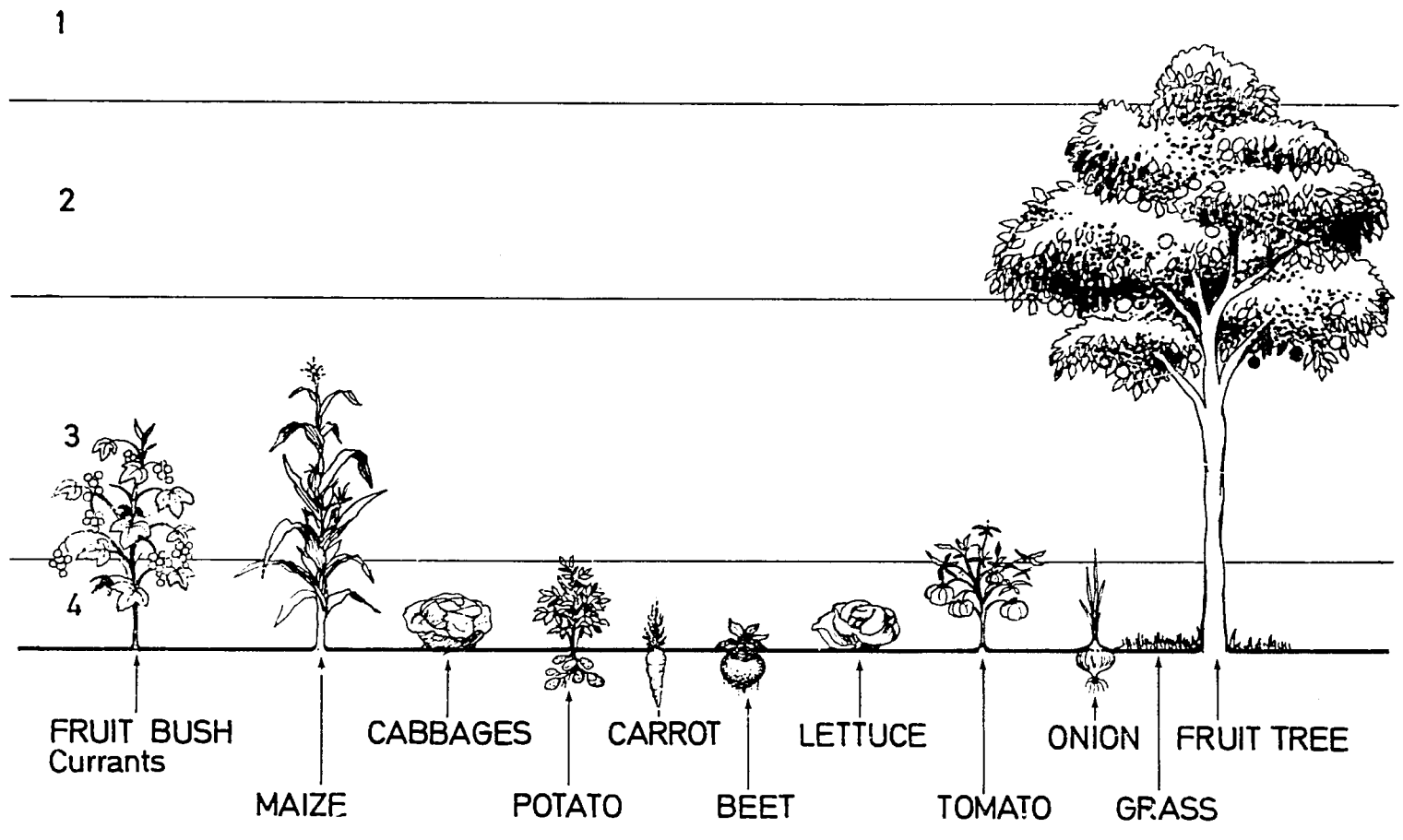


FIGURE 2

Ecological Profile and Production Levels of HGs: Temperate



Temperate gardens (cf. Figures 2 and 5), in contrast, tend to be dominated by seed culture, although tubers play a greater role than generally recognized. Layering is not a functional adaptation in cool climate gardens and trees represent fruit rather than staple species. The temperate garden features seasonal vegetables, root and tuber crops and well-spaced fruit trees and bushes with ground-covering species unshaded. Shading, often a necessity in hot climates, is little desired and could be inhibitive to plant growth and development in sun-poor and high-altitude regions.

Contrasting vegecultural and seed culture production systems, Harris (1976:125-126) finds that in "vegecultural plots, plant diversity tends to be greater, plant stratification more intricate, and the canopy of vegetation more nearly closed," representing "... structurally and functionally more complex ecosystems than do seed cultural plots."

This difference may become crucial in terms of soil fertility and erosion when traditional vegecultural systems are partially or totally replaced by non-adapted seed culture systems. Equally vital for development considerations, Harris points out the differences in soil fertility demands between the two systems and their traditional cultivars, a point which must be carefully considered when introducing new technology and crops into existing low-capital systems: seed culture, with mainly high-protein yielding crops (e.g. grains), make higher demands on soil fertility than do traditional tropical starch-yielding root and tuber crops of vegecultural systems. "Conversely, seed cultural systems are less conservative of soil resources and more readily get out of ecological equilibrium" (Harris 1976:126). In the past, agricultural development in tropical regions has promoted single-tiered seed over multi-storied vegeculture, the former aiming to replace, at least in part, the latter, often without achieving an a priori understanding of systems' interrelationships and waste areas in tropical forest regions have resulted.

The tropical HG type is found with permanent, semi-shifting, and shifting cultivation. Although both fields and gardens of shifting cultivators are usually multi-cropped, the "garden" surrounding the homestead shows higher species density while lacking the relative order and design of "forest fields." With increased population pressure reducing shifting land area, and market crop incentives, traditional shifting cultivation systems have changed over time to semi-shifting and permanent cultivation developing an intricately timed "agro-forestry" cropping system with short and long-term cropping patterns (Soemarwoto, n.d.).

2. Socio-Economic Determinants of Household Gardens

In addition to the ecology of HGs, their function within household economies must be understood. For example, size and management of a garden that supplies the major part of a family's subsistence requirement differs considerably, within the same geographical region,

from a backyard furnishing only herbs and fruit, while providing space for the family's poultry flock. Furthermore, rural gardens are distinct from urban gardens, and animal populations accompanying plant food production vary from countryside to city in species and number. Also, a housekeeper-gardener with a plot too small or poorly suited for production of a good portion of family subsistence needs may decide to grow one or two "cash crops" to obtain small amounts of capital for purchasing daily consumption items without therefore becoming a "market gardener."[7]

In relationship to household economies, two basic types of gardens can be identified: subsistence and budget.[8]

a. Rural subsistence gardens. These gardens exist in conjunction with permanent or shifting field production and supplement field-grown staples with vegetables, herbs, spices, and fruit in the absence of easily accessible and dependable or affordable retail marketing systems.

They complement high-carbohydrate field staples with plant and animal protein, vitamins, and minerals. Rural subsistence gardens also have the important function of bridging the gap between the end of stored field staple supply and new harvest, as well as providing a convenient daily supply of "garden staples" (fresh maize, roots, tubers) which can also be sold in small quantities at local markets.

Animals are always part of this production system. They are fed on garden and kitchen waste, fodder crops grown in marginal garden areas, cut-and-carry fodder from marginal areas among fields, and pasturing. The subsistence garden also yields construction materials, firewood, and handicraft materials.

When a farming system becomes highly commercialized and produce and fruit are accessible through retail markets, rural subsistence gardens tend to decrease in size and eventually turn into lawns on flower gardens.

b. Budget Gardens. Two types of budget gardens can be identified: rural and urban.

Rural budget gardens belong to households with economic bases in rural or urban employment (including agriculture, industry, fishing, mining, etc.) but is physically located in the countryside. Due to rural location, farm animals are usually found in this production unit.

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7 Gardens which yield minor income (less than 10% total of household income) are not considered market gardens according to present classification (cf. Table 1).

8 This typology was first presented at the Third Annual Farming Systems conference in Manhattan, Kansas, October 1983 (Niñez 1983).

Urban budget gardens exist in the urban context where, theoretically, all family consumption needs can be met by retail markets. Basic staples are purchased and wage earning is the major economic activity (or aspired activity) of the household.

Animals are not necessarily part of this survival scheme but more often than not, animal production is attempted on a small scale for full utilization of garden and marginal areas in an attempt to self-provide the most valued and costly food, animal protein, at relatively low cost.

Budget gardens are quite versatile and reflect economic trends of a nation at large. As jobs are plentiful and well-paying in the urban context, budget gardens tend to change their appearance from vegetable and staple production units to flower or hobby gardens and lawn area increases in size as productive area decreases. This process is often reversed during times of crisis wher job-generated income is hard-pressed to meet all household needs.

IV. Cross-Cultural Perspectives on Household Gardens

The following ethnographic overview of HGs from selected world regions is based on the conceptual framework provided in Section II (Definition of Household Gardens) and intends to highlight the universal nature HGs maintain despite ecological variation in diverse world regions. The adaptive nature of indigenous systems is emphasized.

1. Asian Gardens

In Tropical Asia, ecology and population pressure have historically favored the development of highly intensive food production systems and technologies which, over centuries, have produced a wide variety of locally adapted, leaf, root, and tuber vegetable species.

The literature on Asian gardens agrees on their great production and nutritional potential and multiplicity of functions (cf. Stoler 1978: Soemarwoto 1975; Sommers 1982). Asian gardens are seen as intricately tied to rural subsistence strategies, supplementing wet rice agriculture as "an important part of the holding ... which can become dominant where there is a town in the vicinity or where there is marked shortage of land" (Ruthenberg 1971:104).

The step from garden production supplementing subsistence agriculture to market gardening for nearby urban centers, or gardens becoming the dominant household subsistence survival strategy, thus, can be a small one. The former generally indicates economic improvement, the latter, a worsening of family economic situations (cf. Stoler 1978).

Land is a limited resource in densely populated Southeast Asia. For example, one-fifth of Javan land area under agricultural exploitation is made up of plots that are "more like gardens than fields" (Ruthenberg 1971:104). Ochse and Terra (1934, quoted in Stoler 1978) found that on Java, "the proportion of land allotted to gardens together with the intensity of their cultivation increases as total amount of crop land per head decreases." Primarily serving daily food needs, pekarangan (village gardens)also function as safeguard against crop failure, provide small amounts of cash through sale of surplus produce and supply animal fodder and materials for household related activities. Gardens not only represent the most intensely used land resource but also an ecologically better adapted, more conservationist food production strategy suited especially to hilly terrain. In Western Java, for example, one observer notes that villages surrounded by a belt of gardens stand out like lush green islands in a sea of eroding paddi land (Soemarwoto 1975).

Indonesian forest gardens of the talun-kebun type are described by Soemarwoto and Soemarwoto (n.d.,b). In this system, "useful" wild, semi-domesticated, and cultivated species have been selected by man in imitation of the natural forest structure. The soil protective and

regenerative tree cover also provides fuel and construction materials while yielding food for home consumption and sale. Within the talun, plots (kebun) are cleared and burned successively for mixed cropping of a wide range of cultivars. These are mainly annuals planted for market sale while the talun harvest goes toward home use and consumption (fruit, fire and construction wood). The kebun usually features one major cash crop.

Javan gardens are multipurpose, intensely used production systems. They have lower labor and technology requirements than paddy production and are therefore family-based intra-household activities. Gardens yield up to 40 per cent of household caloric requirements and up to 20 per cent of household income (Stoler 1978). Due to official neglect of garden nutritional and economic output, however, a large amount of subsistence food produced in gardens is never assessed by Indonesian government statistics (Stoler 1978:8).[9]

Traditional HGs of the rural subsistence type in rural South India and Sri Lanka are described by Azahira and Yazawa (1981). They note a direct relationship between garden size and intensity of cultivation on the one hand and availability of irrigation water or sufficient rainfall on the other.

In the dryland farming area of Hyderabad, for example, farmers live in nucleated villages and gardens measure .13 acres at most. Subsequently, crops are limited and varieties adapted to limited water and space conditions are selected (e.g. gourds are frequently found trailing onto roofs of buildings as "roof gardens"). In the Bangalore area, where settlement is more dispersed and water not as limiting, gardens tend to be larger with greater species diversity. Finally, in Kerala state which registers the highest precipitation in South India, and in the lowland wet zone of Sri Lanka, homesteads are scattered throughout forests of coconut palms and surrounded by "layered" plantings of banana and cassava with a wide range of vegetable species.

A total of "200 kinds of useful plants including vegetables, especially various root vegetables, herbs, spices, fruit trees, fiber crops," are cultivated on approximately 0.25 acres and it seems that "farmers support most of their life with plants cultivated in their own homestead" (Azahira and Yazawa 1981:29). Crops listed for South India and Sri Lanka represent an excellent nutritional mix. In addition, diets are supplemented with gathered wild vegetable species and eating the leaves of young hibiscus (Hibiscus cannabinus) and safflower, an oil crop.

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9 Likewise, Rhoades (1983) reports from another densely populated Asian country, Nepal, on a government statistic from only one district that failed to take into account 4000 hectares of potato production in rural subsistence gardens.

In the subtropical highlands of Sri Lanka, European-type home gardens introduced by British tea-growers have expanded into commercial market production supplying the urban area of Colombo with European-type vegetables.[10]

2. South Pacific Gardens

Intensive use of space close to dwellings, the multiple functions of farmyard plantings, predominance of root, tuber and tree crops are characteristic traits of traditional household gardens in many parts of the world. In Papua New Guinea, banana, roots, and tuberous vegetables have played an important role in pre-colonial survival strategies. Present-day urban budget gardens serve a similar function.[11]

Most gardeners in the Port Moresby area are migrants from coastal and hill land rural areas. Due to the presence of climatic microniches with pronounced but irregular dry-wet seasons migrants have adopted cultivating techniques and crops which differ considerably from their previous rural subsistence gardens. Fruit trees, banana (a "tree" staple), roots and tubers, legumes, vegetables, and local green leafy plants are arranged in irregular and row combinations. As a rule, intercropping is practiced. Nutritional campaigns during the past ten years have stimulated an increase in consumption of leafy green vegetables although banana and cassava still occupy the largest single space in both gardens and diet (Vasey 1982a).

As in Sri Lanka, garden space is an important consideration in community development. Planned migrant settlements in the National Capital District (NCD) feature allotments for food gardens averaging 200 square meters in size. In a Lae hill settlement, people were invited to cultivate food gardens among rows of growing fuelwood trees in a reforestation project (Siki 1980).

Vasey (1982a) in a study of 627 gardens found that one-fourth of gardeners sell produce. Selling occurs more frequently in urban areas with smaller gardens, and, in one settlement, gardeners organized into a cooperative marketing system. The total land area estimated in food gardens in the NCD amounts to 500 hectares supplying an estimated four to six per cent of the NCD's present food requirements. To supply all of the NCD's present food energy needs, the garden area would have to be expanded to up to 12,400 hectares (Vasey 1982a:27-28).

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[10] The value of a Sri Lankan home garden program was proven during the 1983 ethnic riots when vegetable supply was interrupted and families with gardens or container plantings suffered much less than those without home food production schemes.

[11] The following information on rural budget gardens in the National Capital District (NCD) at Port Moresby, New Guinea, is based on Vasey (1982a, 1982b, 1984, and Von Fleckenstein 1978).

Gardens also provide space and fodder for chickens and pigs. Also, people consider them to be good places for children to play and adults to relax.

3. African Gardens

In describing the highly diversified semi-permanent farming systems of the African savannah south of the Sahara, Ruthenberg (1971:61) notes that

> intensity of cropping decreases in concentric circles from the domestic gardens (which can be irrigated year-round) in the vicinity of the huts to the often widely scattered peripheral fields"
>
> (Ruthenberg 1971:61).

While the various plots of individual family holdings are given to a wide range of cash and subsistence activities, one main feature is the "permanent garden with fruit trees and perennial crops like banana and papaya ... which is either no longer shifted or moved only a short distance at short intervals" (ibid. 1971:61). Over the past twenty years, African farming systems have changed from extensive land-use patterns under shifting cultivation to permanent or semi-permanent intensive cultivation. As populations increase, fallow periods decrease and more emphasis is placed on cash crops with costly commercial inputs. Subsistence plots, including the compound garden, thus become more important in family nutrition as more field space is given to non-subsistence commercial crops (ibid. 1971:197).

In Kenya's densely populated Kakamega district, deep fertile soil and sufficient rainfall allow intensive year-round cultivation of cash and subsistence crops. Like in the tropical savannah of Central Northern Africa, women plant household gardens with permanent tree crops (e.g. early and late maturing banana varieties). Two vegetable planting seasons are distinguished: peas and beans in Spring, leafy vegetables in Fall (ibid. 1971:197). A few head of cattle, sheep, and chickens also contribute to family diet and budget.

As an example of model land use, the Chagga home gardens of Tanzania's densely populated Mt. Kilimanjaro area have been noted (Fernandez, et al. n.d.). In a forest transformation process similar to the Indonesian talun-kebun, useful trees (fruit, food, fire and construction wood, fodder) are retained replacing others with utilitarian species, also featuring intensive small-holder production of subsistence and cash crops. The average size Chagga home garden (0.68 hectares) produces 125 kg beans, 275 bunches of banana, and 280 kg of parchment coffee annually. Bananas and coffee are major cash crops. Home gardens insure against crop failures in coffee, maize, or beans which occur periodically. Additionally, home gardens house and/or feed pigs, chickens, bees, few cattle. Pigs especially are important sources of income.

Chagga homesteads and gardens are up to 16 kilometers distance from fields. This separation in time and space between fields and family dwellings illustrates the crucial role of HGs in supplying a large percentage of daily consumption needs.

In describing the Zande shifting cultivation system, de Schlippe (1956), stresses the importance of vegetables. Women are the main agri- and horticulturists among the Zande and have traditionally had their own fields. They tend semi-permanent gardens, courtyard plantings and fields with a small array of simple tools typical of shifting cultivators. Vegetables are both cultivated and gathered. Specially grown in the courtyard for their leaves are two varieties of jute (Corchorus olitorius L.), mock tomato (Solanum sp.), and two types of amaranth. Okra and roselle, oil-seed water melon, sweet sorghum, groundnuts as vegetables, yams, bananas, and cassava are also grown close to the dwellings where ash and refuse provide favorable growing conditions. Cassava and barkcloth-ficus provide dividing hedges, and in some cases, mango, oil palm, and citrus trees can be found. In addition, species grown for other purposes are consumed as vegetables. In gardens belonging to better-off homesteads and closer to urban centers, tomatoes (Lycopersicum esculentum Mill), eggplant (Solanum melongena), pineapple, and papaya (Carica papaya L.) are found.

4. Caribbean Gardens

Indigenous gardening technology from Africa was transferred to the Caribbean through the introduction of slave labor for 18th century sugar plantations (Innis 1961:19). To reduce the burden of maintaining large numbers of workers, plantation owners allocated "provision grounds" and "kitchen gardens" where slaves in their spare time could grow their own (plant and animal) food and become self-sufficient as well as sell surplus production at Sunday markets (Hall 1969:157, cited in Brierley 1976).

Averaging 2000 square meters in size, contemporary rural budget gardens on the humid tropical island of Grenada provide for an often numerous family through a wide array of species from four continents, "... including banana, plantain, and yam from Africa, ... the New World crops cassava, corn, and sweet potato, ... salad vegetables and crops of temperate origin ... from Europe, and Southeast Asian cultigens, including breadfruit, so that a distinctive crop repertory was created " (Mintz 1974:236). This repertory has not changed basically in over one hundred years (Brierley 1976:32).

Despite high yield potential, monthly labor input is estimated at only 16 hours (Brierley 1976:31). Labor-saving management practices which lend these gardens their tropical "unkempt" appearance include spontaneous propagation, interculture, and mixed cropping for optimal use of space, nutrients, and plant symbiotic relationships (e.g. nitrogen fixing qualities in legumes benefit maize, in turn serving as

support for legumes) as well as natural fences protection from outside view.[12]

The livestock component of these household food production systems consists mainly of poultry and swine, with a single cow, a few goats, or sheep occurring less frequently. They serve occasional family consumption and, as importantly, represent a source of ready and secure cash.

5. South American Gardens

Peru provides an ideal laboratory for the study of South American gardens in three distinct ecological zones (arid coast, Andean highlands, and jungle). Gardens are also found in urban settings like Lima (Niñez 1984).

a. Coastal Gardens. Rural coastal budget gardens supplement household economies based on agricultural wage labor. A well-managed garden of average size (15 by 30m) can generate one-fifth of monthly family income through savings and small market sales with little capital and labor input. Workers' gardens, often the only piece of land, are found on the very margins, physically and economically, of large-scale, irrigated commercial agri- and horticultural enterprises. Severe production constraints are posed by seaside conditions where soils are saline, rocky, and tend to water-log. Trees especially suffer from the constant, sharp marine breeze.

The most versatile crop on the Peruvian coast is sweet potato which serves human (roots) and animal (leaves and roots) consumption. Fig and banana are trees which produce relatively well under coastal conditions.

b. Urban Gardens. Gardens also represent a major adaptive strategy in urban poor household economies. The larger metropolitan area of Lima features urban budget gardens especially in its lower-income and slum settlements. As in the rural setting, urban coastal gardens are highly varied in appearance due to their location on extremely marginal space. HGs are found in front or back yards, along highways and irrigation ditches, and often represent the only green spots in abandoned and neglected city parks (Figure 3).

Lima city gardens often evolve from the nucleus of a banana cluster, a few stalks of maize, and squash or melon to highly productive units of up to 800 square meters with a wide range of cultivars. In the urban setting, gardens and related small-animal production can represent a crucial aspect of family economy in a situation of high unemployment.

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12 Compare Ruthenberg 1971:28 for terminology of types of cropping patterns

c. Highland Gardens. Highland gardens in the Peruvian Andes are of temperate appearance and are found in rural subsistence economies and mixed subsistence/commercial production systems. In the Tarma valley, Department of Junin, for example, mild climate and irrigation allow for year-round production of horticultural crops in the valley and seasonal subsistence crops at higher altitudes (Figure 4).

Household gardens and farm houses are located above the valley floor (at 2400 m.a.s.l.) on 800 to 1000 square meter lots. Gardens have multiple functions closely tied to the larger production system: seed production for commercial field horticulture, experimentation with new varieties, and producing for human and animal consumption. Small weekly sales of garden produce at local markets provide cash for minor household expenses. Sometimes, bee-keeping is a "side-line" of these gardens supported by commercial production of flowers.

Tarma's HGs replicate both subsistence field products (potatoes) and commercial horticultural crops, the largest relative area given to garden staples (maize and potatoes). The management philosophy behind this apparently unnecessary repetition is very functional within the local economic system: commercial field produce (vegetables and the staples maize and improved potatoes) is purchased by retailer-truckers directly in the field without nutritional benefits to the family. High-altitude field staples (grains, native potatoes) are limited to one yearly season while forming the basis of family caloric intake. Garden staples, thus, bridge the gap between new harvest of subsistence field staples and the end of the storable period. As "improved" varieties of potatoes are planted in the garden, these can also readily be sold on local markets. Garden-produced vegetables also have this dual purpose as gardens are large enough to plant sufficient quantities for small-scale but regular market sales. While field production and commercialization is the traditional domain of the male household head, garden and small animal production and sales are affected by women who welcome the cash income to purchase basic household needs not self supplied.

d. Jungle Gardens. The high and low Peruvian selvatic regions feature highly irregular patterns of tropical gardens which are in many cases hardly recognizable as such. However, plantings around the dwelling can be crucial to survival in the absence of easily accessible retail markets. What Raffles (1871, quoted in Stoler 1979) observed for Indonesia applies equally well to the Peruvian Chanchamayo and Yurimaguas region:

> In the first establishment or formation of a village or new ground, the intended settlers take care to provide themselves with sufficient garden ground around their huts for stock and to supply the ordinary wants of their families ... the settler labors to plant and rear in it vegetables that may be most useful to his family and those shrubs and trees which may at once yield him their fruit and their shade.

FIGURE 3

Peruvian "Native" Garden (Lima)
Tropical - Urban

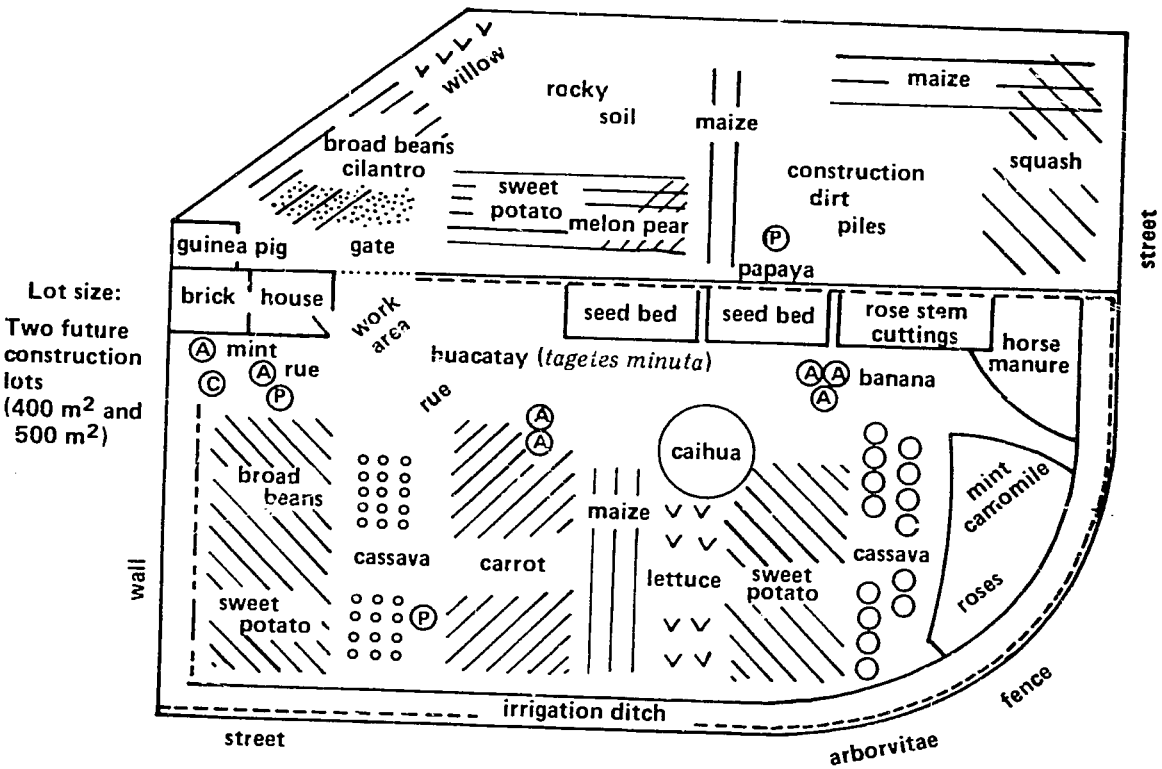
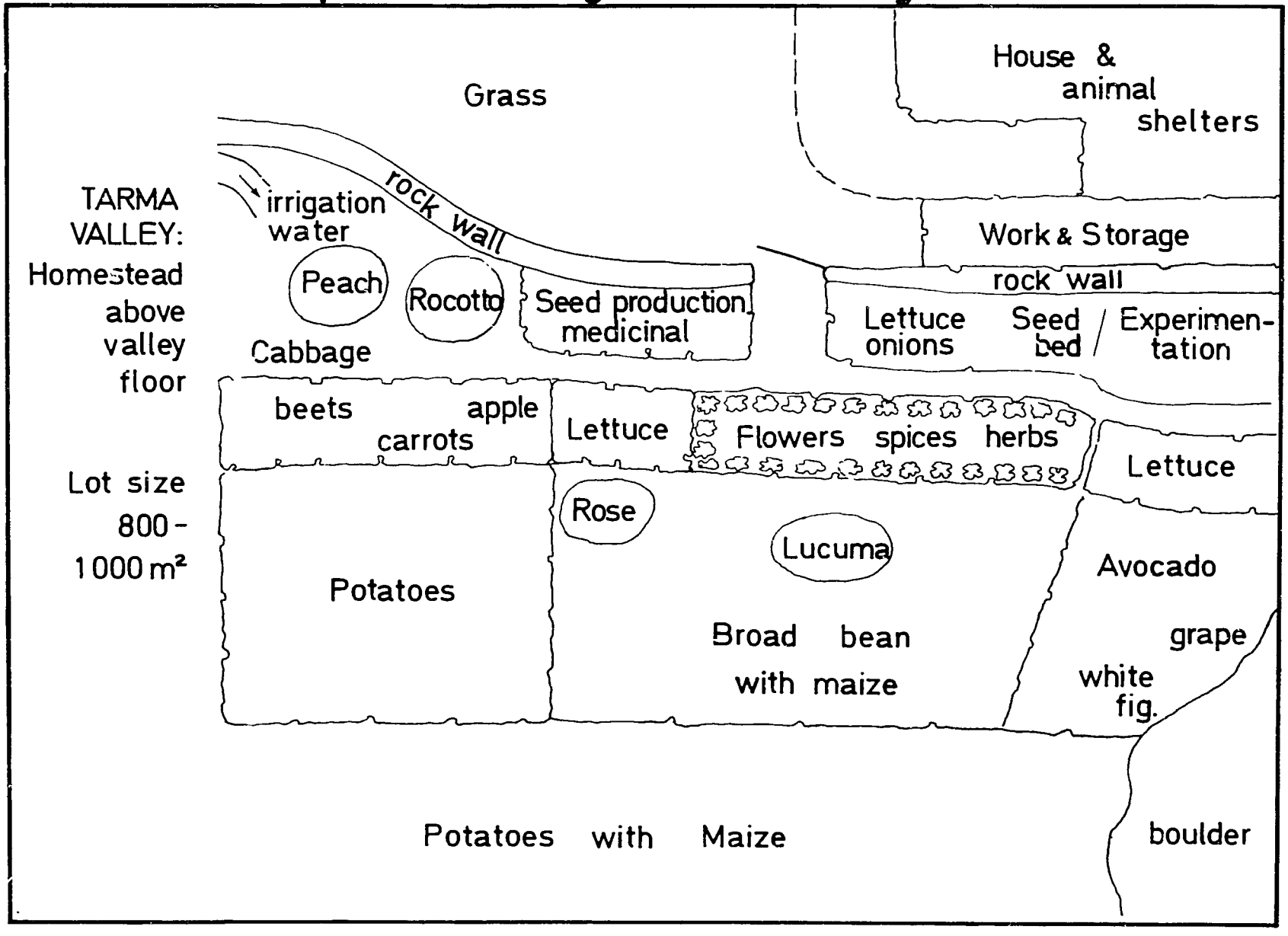


FIGURE 4 Spatial Arrangement of a Highland Garden.



Each homestead has a number of food plant species growing in the immediate vicinity of the hut which are harvested daily. Only species well adapted to the tropical environment are found and tree crops predominate. Tall pacay (Inga Feuillei), avocado, members of the musa family, and citrus are nutritionally important while cassava is the main root crop staple of gardens and subsistence fields alike. Taro is planted close to the house, often in interculture with coffee, papaya, and banana trees while maize is usually monocropped.

Farmyard animals accompanying this tropical production system are mainly chickens, ducks, pigeons, and pigs. To protect garden crops, pigs are tethered or herded, usually the job of children. Chickens roam freely to largely provide for themselves. A family may keep up to 25 chickens and 5 pigs including the young.

6. North American Gardens

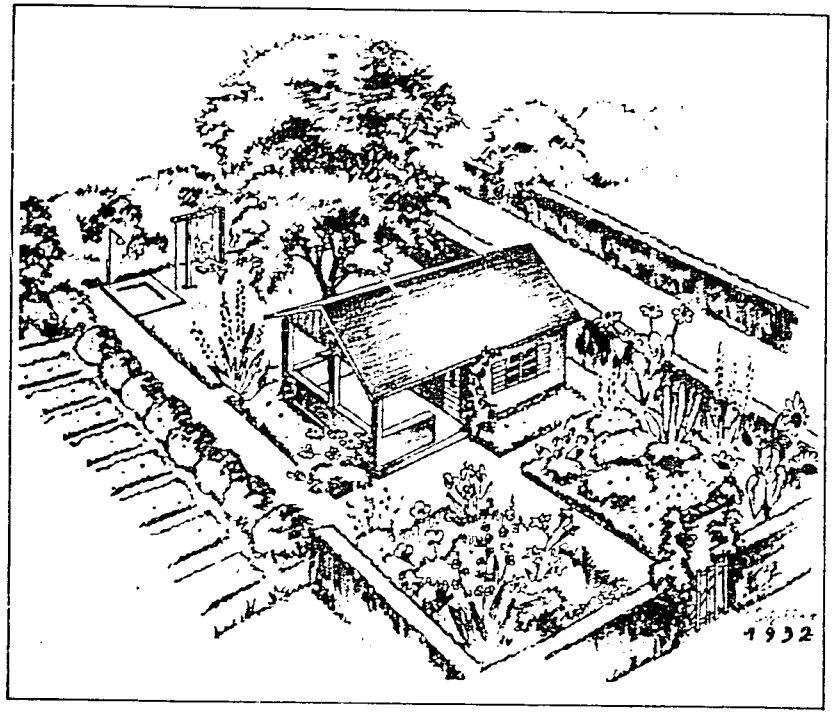
As was the case in traditional European rural subsistence economies, the North American homestead garden and orchard, along with small farm animal production represented a vital aspect of settler adaptation to unknown conditions in 19th century Western and Central United States. American farm families still plant gardens to obtain produce and animal products for daily consumption, processing, and preservation while men pursue often large-scale commercial agrobusiness ventures.

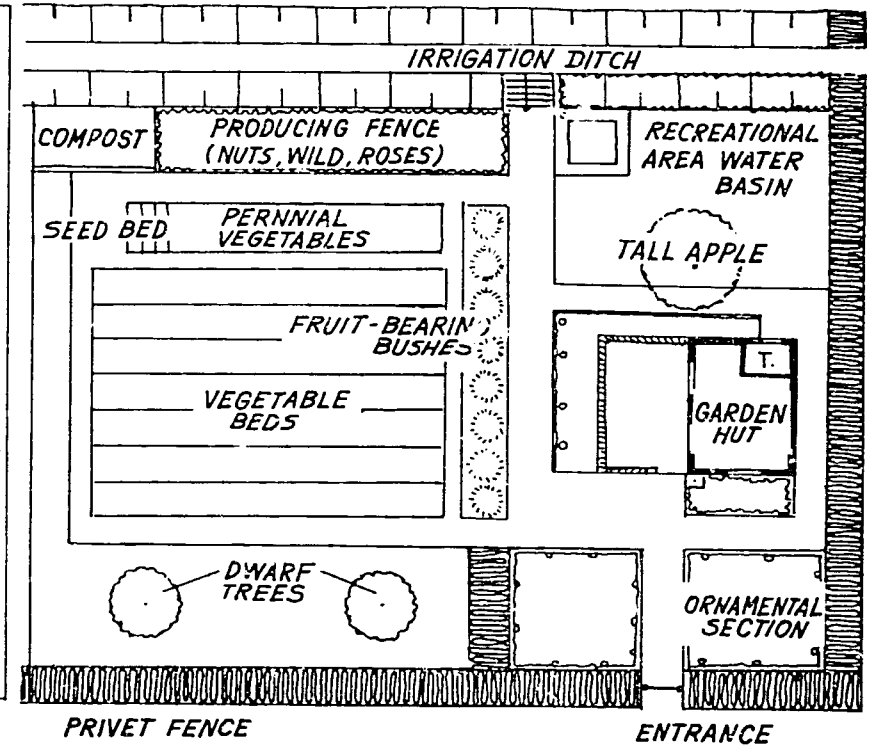
Descendants of settler families in the Midwest of varied ethnic-religious backgrounds vividly recall the household gardens of their grandparents. Since the 1970s, this same generation saw a revival of family food production in backyard gardens. In Oklahoma, for example, many retirees find that gardening for vegetables and staples (potatoes, sweet potatoes, beans, tomatoes, corn, okra, melon, etc.) can make a valuable contribution to often small pensions. Backyard gardens of approximately 120 square meters produce enough in two yearly growing seasons to warrant major canning efforts. Wilhelm (1975) offers a household garden typology based on food gardens of rural black working families pointing out the considerable variation and socioeconomic determinants of gardens. The "folk-type" garden, for example, consists of vegetables planted behind the house while the "nominal type" includes a wider range of produce, staples, and farm animals for productive purposes, and flowers and ornamentals to satisfy aesthetic needs.

Pressing on the limits of agriculture, 18th century English and Irish settlers and their descendants in Newfoundland's northern outports "combined fishing, sealing, hunting, and home gardening to insure the margin for survival" (Omohundro 1984:3). In this inhospitable area where frost can damage plants eleven months of the year, topsoil is shallow prohibiting mechanization, deplete of nutrients, and water-logged, vegetable gardening nonetheless has been the most reliable and widespread survival strategy, and, over time, an ingenious adaptation to the particular environment has evolved in native gardening technology (cf. Omohundro 1984a and b).

FIGURE 5

European Model Garden (German)
Temperate Urban/Suburban





With "progress and modernization" arriving in the 1950s and 60s, outporters largely abandoned gardening due to high rates of outmigration and growing dependence on government social benefit payments over reliance on home food production when other major economic activities (fishing, logging) failed. However, the economic recession of the 1970s, saw Newfoundlanders returning to urban budget gardening as one important survival strategy.

Gladwin and Butler (1982) present the case of small Florida farmers. Florida farm gardens range in size from 0.1 to 5 acres. In two yearly growing seasons, gardens produce 69 per cent of the vegetables consumed by the family. Some families also supplement farm income with wage earning as well as subsistence hunting, fishing, and animal production, the latter supplying up to 55 per cent of household meat and fish requirements (ibid. 1982:265).

The current trend in US urban centers toward community gardening or "rent-a-garden" projects is utilized by young and old, for a variety of personal or economic motives. During the past two years, community garden groups have encouraged some of the latest US immigrants, Hmong from Laos, to plant gardens as one means of achieving an economic foothold in their new homes (Gardens for All News, January 1982:1-2).

V. Conclusion

The purpose of this paper has been to (1) discuss a small-scale food production strategy termed Household Garden, (2) point to its value in supplying basic balanced nutrition and considerable direct and indirect economic benefits to a variety of household types, and (3) provide a conceptual framework of HGs to aid policy formulation in the vital sphere of family food production.

Household gardens and their production potential represent one of the last frontiers for increasing food production in the struggle against world hunger and malnutrition. It is estimated that total yields of food crops must increase 30% while 25% additional land must be put into food production to keep up with population growth (FAO 1981). In other words, world food production must be increased over 50% by the year 2000 while world's natural resources (e.g. petroleum-based products as major agents in increasing agricultural output) are declining and costly. The resulting high cost of food produced in capital-intensive field systems stimulates higher consumer prices which may negate the desired end of more and better balanced food supplies. A rising price tag on food production also results in uneven national and international food distribution and creates a dependence on imported and subsidized food staples while neglecting to meaningfully develop national food production.

At the family level, household purchasing power has been suggested as an indicator of malnutrition and applied nutrition programs criticized on treating "effects" rather than "causes," thus never achieving their stated objectives (Shuftan 1979:29). At national levels, governments can no longer afford large-scale food imports in light of the present world economic crisis and are now looking for ways to increase national food production. Furthermore, to put an additional 25% of land "under the plough" could well lead to large-scale ecological disaster since such land has to be etched from increasingly marginal areas with a delicate ecological balance (e.g. mountains, tropical forests). Scrimshaw (1963:206) notes with appropriate foresight, that

> ... "cultivation of marginal lands is ... unsuccessful unless it is carried out by farmers with a century-old tradition ... or by modern experts with a detailed knowledge of the local conditions and the varieties of crops that are suitable for those conditions."

From all points of view, the time has come to carefully consider alternative ways of increasing food production. The Household Garden strategy is one means of achieving this goal. HGs have evolved through centuries, altering traditional environments to a minimum while utilizing natural resources to the fullest. In addition to being ecologically well-adapted, this small-scale food production system has traditionally been confined to areas not suited for agriculture. As

HGs are established close to family dwellings or "wasted" areas near human settlements, they pose no threat to lands presently under field production.

A call for detailed research on traditional HG systems and subsequent "popularization of the new knowledge for possible improvement on home (food) production" (Grubben 1978:53) dates back several years and still holds value. Intense, well-planned HG campaigns are necessary to promote HGs among local populations and bureaucracies. In addition to producing food, gardens register the added benefit of creating employment and income not otherwise offered by local economies. The notion that food production and its improvement are limited to rural settings needs to be reconsidered especially in light of continuing large-scale rural-urban migration in many LDCs. Urban gardens enable low-income urban populations to produce considerable amounts of their subsistence needs with a more favorable nutritional balance than is provided by sole dependence on "free" or subsidized food staples. HGs also offer the possibility to produce food where the highest concentration of populations are found (e.g. in or surrounding urban centers), thus helping to reduce distribution problems.

Unfortunately, development efforts at the grass-roots level are still frequently thought of as only "introducing new and more efficient methods" (e.g. Peace Corps Manual M-17, 1982:7). More appropriate may be an interdisciplinary approach emphasizing holistic research that seeks to develop and improve existing technology without disruption of indigenous functional production systems (cf. Rhoades and Booth, 1982 on the "farmer-back-to-farmer" philosophy of development). Household garden projects should not become a testing ground for "Western" gardening trends which, although "ecology-conscious," fail to scientifically consider the ecological and socio-economic circumstances of target areas and populations (cf. Niñez 1984). Workable programs, must be structured on a functional synthesis of the "improved" and the "native" approach under the assumption that both systems contain valuable technology.

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