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FINAL REPORT

SOCIOECONOMIC FEASIBILITY STUDY OF THE TRANSFER OF AVRDC GARDENING SYSTEM TECHNOLOGY TO COUNTRIES IN SOUTHEAST ASIA

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I. INTRODUCTION

Raising the nutritional status of the Asian rural poor is of great importance if these people are to increase their quality of life and contribute to long-term national development. Getting the rural poor to grow consumption and/or income generation gardens can increase overall farm production and lead to more available cash, higher quality food, fewer nutritional problems, and a subsequent increase in the quality of life. The growing of gardens for cash or for consumption are also a way for women to get more involved in rural and national development, for it is often the women and the children who plant, manage, harvest and sell or cook a garden's plentiful output.

The Asian Vegetable Research & Development Center (AVRDC), Taiwan, has developed both consumption and income-generation gardens and has shown these gardens to be technically feasible. However, more data are necessary in order to show if these gardens are economically feasible. The purpose of this study is to develop a methodology for evaluating the economic feasibility of the AVRDC gardens, and to test the methodology by applying it to some existing data from a Taiwan farm family. If the methodology proves to be feasible, then these garden and evaluative technologies will be transferred to Thailand.

In Asia, most rural areas are still traditional while a few others have, more or less, been modernized. With respect to agricultural development, "traditional" means that family labor predominates, and that farm production (e.g., gardens) is mainly produced and utilized by the family. It is a farming/family living system that can be studied as a whole unit.

The farm-home complex is thus a self-contained unit in which very few inputs are purchased from the non-farm sector. As most Asian farm land is in the hands of small farmers it is they who must learn to increase on-farm production in order to increase food supply, farm income and nutritional status.

To increase production (and thus increase income, nutritional status and quality of life), three economic factors are of importance in Asia: (1) the combination of the small farm size and its traditional farming practices, (2) the existence of food deficit areas, and (3) the existence of a sizable subsistence farm sector. From these three factors four priority areas may be derived in order for agricultural development research to assist in increasing small-farm production: (1) the economics of subsistence-type farms and the economics of the household, (2) the economics of farm labor, (3) farm practices and management, and (4) the limits of farm diversification (e.g., should they add gardens?) and economic planning in family farms. These factors must be researched in order to see whether gardens -- and which of the AVRDC gardens -- can be added to a farming/family living system in order to increase farm production and employ female family labor.

Unfortunately, little analysis has been done in Asia that relates to the above development research. One of the goals of AVRDC, therefore, is to assist cooperating agencies in developing countries to raise the quality of life of their rural poor (in particular, the small farmer) by means of research and development. Pursuant to these goals, AVRDC has conducted three kinds of farm-garden research (home garden,

school garden and market garden) based on small-scale surveys in selected developing countries (Thailand, Philippines and Indonesia) to determine what nutritional problems exist, who these effect, which foods (especially vegetables) will alleviate these problems, and the response of national governments and international aid organizations to these problems. AVRDC has, therefore, initiated this project with the cooperation and support of USAID in order to apply its research to these questions. The specific purposes of the project are:

(1) To add an appropriate economic base to the AVRDC garden program.

(2) To develop micro-economic methodologies for analyzing the garden and associated farming/family living systems (F/FLS) which will result in providing quantified information of use to planners and policymakers in developing countries.

(3) To transfer AVRDC garden system technology and economic evaluation to Thailand (the initial country to receive the project).

(4) To test, evaluate and disseminate the total package throughout Thailand and to other developing countries.

The purpose of this 6-month phase (of an overall 2-year project) is to develop the methodologies for economic evaluation and to lay the groundwork for transferring the mthodologies and the AVRDC gardens to Thailand.

II. BACKGROUND

A. General

In 1981 AVRDC planned its Garden Program as a nutritionally-focused scheme designed to develop gardens for home-consumption and for income-generation. The consumption-type gardens (home gardens and school gardens) were designed to grow crops which are not only culturally acceptable to SE Asians but will also alleviate some of the nutritional deficiencies prevalent in this part of the world.

The market garden is designed to indirectly raise the nutritional status of the rural poor by increasing their annual income, and thus providing them with the means to buy more nutritious foods.

From the previously mentioned small-scale surveys AVRDC has learned that there are Vitamin-A, Iron and Calcium deficiencies in Thailand, the Philippines and Indonesia, which affect the usual vulnerable groups -- preschool children, pregnant and lactating women. Green leafy vegetables and yellow fruits and vegetables contain significant amounts of Vitamin A, Iron and Calcium which can be used to alleviate some of these problems.

Garden programs are in the national development plans of all three countries, and some have obtained assistance from international aid organizations. Some of these programs have been partially implemented, and others are fully implemented but inhibited by such factors as inadequate seed supplies.

During the collection of existing nutritional information in Thailand, Indonesia and the Philippines it was noticed that all three countries include "nutrition" in their five-year national development plans

and that under "nutrition" are listed various garden activities. Thus, all three countries can use assistance in developing these garden activities so that they respond to the nutritional goals of the national development plans. One goal for example, might to be increase consumption of vegetables containing Vitamin A while another might be to increase farm income so the families can buy the nutritious foods that they cannot grow. These activities range from small home gardens to larger school gardens and market gardens.

B. Institutional Structure

The Asian Vegetable Research Development Center (AVRDC) is an international agricultural research center located in Taiwan. AVRDC specializes in tropical vegetables and has as one of its goals improving the nutritional status of the rural poor, especially small farmers. AVRDC has developed a program of home, school and market gardens which are specifically designed to help meet the nutritional deficiencies found in each of the Southeast Asian countries with which AVRDC deals. These gardens have been shown to be technically and nutritionally feasible. AVRDC plans to transfer these gardens to each country, beginning with Thailand. Only a small amount of economic analysis has been undertaken on these gardens to date. More economic information is considered necessary both to determine whether farmers in each of these countries are likely to adopt the gardens and to facilitate the decision of policy makers to support the development of garden programs in their country.

Under the contract between USAID and AVRDC through USDA, the AVRDC will develop a method which can be used by countries in Southeast Asia to evaluate the economic viability of the AVRDC home, school, market and possibly other income generating gardens among F/FLS families at various locations in each country. The AVRDC will also develop a plan for transferring its garden program to Thailand and for testing both the gardens themselves and the method for evaluating their economic viability under field conditions in Thailand.

The economic methodologies for analyzing both the gardens and the F/FLS will be developed at AVRDC under the guidance of consultants H. H. Chen, Ag. Economist, National Taiwan University, and A. Hagan, Ag. Economist, U. of Missouri.

III. THE PROJECT

A. Definition

The project consists of three phases.

1. Phase I.

   (1) Development of a methodology to measure the economics of AVRDC's gardens; plus development of a means to analyze F/FLS; and application of both to some existing data.

   (2) Report on AVRDC experience and recommendations for its application in FY 83.

   (3) Preparation of agenda for further applied research in Thailand to permit extension of gardens and associated F/FLS methodology to village level.

2. Phase II.

   (1) Transfer of garden program to AVRDC research site at Kasetsart University, Thailand.

   (2) Test under Thai conditions the micro-economic methodology developed for the gardens at AVRDC.

   (3) Identify F/FLS families in pilot study area.

   (4) Test overall methodology on F/FLS families and on gardens.

   (5) Initiate training of scientific and extension personnel (gardening, nutrition, seed technology and micro-economics).

3. Phase III.

   (1) Transfer gardens and methods to village-level demonstration plots and evaluate the whole project.

   (2) Transfer knowledge to other developing countries. The project aims at increasing both a farm family's income and its

nutrition status by diversifying garden food production. It will directly or indirectly raise the nutritional status of vulnerable groups through AVRDC research and development, through the consumption of high quality vegetables, through education and through the generation of income.

The project will be executed by AVRDC in cooperation with Kasetsart University of Thailand and supported by AID/Washington. Other cooperating agencies are the USAID Mission in Thailand and the Thai Dept. of Agricultural Extension.

B. Type of Garden

AVRDC has designed the following gardens for the project:

Home garden. This type of garden is strictly for consumption, and consists of a small (approximately 4 x 4.5 meters) plot containing an intercrop of culturally acceptable vegetables that will provide a family of five with something to "add to the pot" on a daily basis for all or most of the year.

School garden. A school garden can be two things. Firstly, it can be a large (approximately 10 x 19.5 meters) garden that will grow some culturally acceptable vegetables to be cooked in the school to supplement the rice-and-sauce lunches that children generally bring to school in some SE Asian countries. Secondly, it can be one of a number of very small 1 x 4 meters plot that can be used as an educational tool to teach children how to grow and cook vegetables so that gardening becomes a part of their future way of life. As an educational tool this small plot will be used to teach a team of 2 or 3 children how to prepare the land, how to plant and manage the crop, when to harvest and how to cook the final product.

Market garden. This type of garden is also developed on a 10 x 19.5 meters plot. It will grow vegetables that are in high demand at local markets. High quality seeds are essential. This may require the co-operation of bilateral or governmental agencies to produce, package and market such vegetable seeds and then provide them to small farmers at low cost. Such a program is being jointly planned by USAID and the Kingdom of Thailand and will result in high quality, well-packaged, seeds of 14 highly marketable vegetable varieties. The nutritional goal of such a garden is to provide families with additional income so that they can buy more expensive protein foods from sales of fresh market vegetables (and, of course, consume the surplus).

Processing garden. This is a new-type garden that AVRDC has added to its work. It is similar to the market garden except that the crop is not sold as a fresh market item. Instead, the crop is processed by cottage industry methods into a more profitable product. This type of garden is designed to take advantage of situations where there is unemployed labor and where a source of additional income is needed to buy some food items. Examples of this concept are: (1) the growing of sweet potatoes for making potato chips, sweet potato candy or sweet potato bread; (2) the growing of various hot peppers, to be dried, packaged, and sold or turned into pepper oil for sale in small containers; or (3) the growing of sweet potatoes and cooking them to feed to pigs for eventual sale, with the pig feces used to produce biogas to cook the trypsin inhibitor out of the sweet potatoes, and produce additional biogas for general farm use.

C. Measurable Objectives

Home garden. Develop a culturally acceptable intercrop of vegetables

(and even a few fruits) that will provide vegetables for the housewife throughout the year and yield the following percentages of the recommended daily allowance of select nutrients for a family of five (2 adults; 3 children):

Vitamin C: 100%
Vitamin A: 80%
Calcium : 40%
Iron : 40%
Plus measurable amounts of protein

School garden. Provide ½ cup (113 grams edible portion) of vegetables for 40 children, 5 days per week for at least 60 days during the school term. The educational objective is to make children aware of the production-consumption process involving some of the more nutritious vegetables.

Market garden. To increase income of the rural poor (i.e. households existing on less than US$1,000) by at least 30%. This is to be done by developing gardens that will grow on a small commercial basis, crops in demand at local markets. The market garden concept will take advantage of any new vegetables on which AVRDC will conduct evaluation trials from commercial seed sources. AVRDC's New Vegetable Committee has recommended the following vegetables for evaluation trials, some of which will be evaluated for the AVRDC Garden Program: Radish (Chinese), cauliflower, pepper (sweet and chili), Chinese mustard, snap-bean.

Processing garden. Grow and process a crop into an item which will increase a poor farm family's income by 50%. This is presently planned for Indonesia under the income-generation part of the nationwide "BKKBN" family planning program. We plan to grow yellow-flesh AVRDC sweet potatoes, which will be shredded, mixed with local sugar and formed

into a small pressed cake, which, when fried in oil, will be packaged and sold as an inexpensive snack that is high in Vitamin A, offers additional calories to calorie-deficient children, and provides an income for village women.

IV. METHODOLOGIES FOR THE EVALUATION OF GARDENS

Both economic and non-economic evaluations of the AVRDC Home, School and Market Gardens are proposed. The processing garden at AVRDC is not yet producing acceptable data. Some of the non-economic measures are more important in assessing the impact of the improved nutrition gardens when adapted on a broad scale. These include chemical analyses to determine the nutritive content of the vegetables produced; the rate of acceptance and degree of consumption by low-income families and school children; the value of training received by school children in the "Learning by Doing" process; the long-run impact on promotion of effective extension programs with low-income families; etc. These all have economic consequences.

Micro-economic methodologies are used to evaluate the economic performance of the garden enterprises themselves and their impact on the farming/family living system to which applied. Both types of economic analysis start with pricing the products and costing the inputs involved in the garden enterprise.

A. Materials and Methods

Home gardens: In four plots measuring approximately 4 x 4.5 meters and consisting of three raised beds per plot (4 x 1.5 meters x 25 cm high), a culturally acceptable intercrop of vegetables was planted for each of the three different types of home gardens, plus a Vitamin A garden.

During the growing periods the yield of each crop was determined. Samples of each crop from each garden were analyzed for their Calcium, Iron, Vitamin A, Vitamin C, and Protein content. From these data the percentage of recommended daily requirements (RDA) available for a

family of five -- based on FAO standards -- was determined from each crop in each garden.

School garden: In a 10 x 18 meter plot, consisting of twelve raised beds (10 x 1.5 meters, 25 cm high), the following tropical vegetables were planted: amaranth, Chinese mustard, Chinese radish, kangkong (water convolvulus), leaf lettuce, pai-tsai, winged-bean intercropped with sweet potato and yardlong bean intercropped with sweet potato. Choice of vegetables was based on nutritional content and cultural acceptability.

Agricultural procedures requiring little input were followed with minimum use of pesticides. Where possible, manual weeding and pest control were practiced. During the growing and harvesting periods the yield of each vegetable was recorded.

Market garden: Surveys were first conducted at major local markets to determine which vegetables were to be in short supply during the following months and therefore could command a good price. The most promising of these vegetables were then grown in the market garden. This garden consisted of a 10 x 19.5 meter plot containing thirteen raised beds (10 x 1.5 x 25 cm high). Standard AVRDC agricultural procedures were followed.

The following vegetables were planted: Chinese cabbage, tomato, Chinese mustard, common cabbage, Chinese radish, eggplant, cucumber and Chinese leek. At harvest time these were sold to merchants at local markets. Little economic input/output data were collected on the gardens because they were being tested for their feasibility to raise nutritional status and generate income.

Now in Phase I, very detailed performance data on the three types of experimental gardens at AVRDC -- The Home Garden, The School Garden and The Market Garden -- are collected on a regular daily basis. The physical production data from these gardens allow for economic evaluation which is not feasible for the same gardens in pilot-study areas. This analytical data from the AVRDC gardens may well provide guidelines useful in outreach of the gardens.

The types of data collected for each AVRDC garden are as follows: (1) the actual weight, in kilograms, of each vegetable crop harvested; (2) the actual market sale value of harvested crops from market gardens; (3) a computed value of crops from home gardens; (4) the cash costs of inputs used in production; and (5) the actual time (minutes and hours) used for producing and harvesting each crop in home gardens and the additional time required for transport to market.

Processing garden: This garden is still in the early stages of development at AVRDC. We will attempt to initiate it in Thailand if the Thais are interested.

B. Methodologies

Using production and economic data, several economic evaluation are made as part of the F/FLS and gardens analysis. First, the gross income (value of production) of each crop included in each type of garden is computed. Then, the cash costs of inputs and the hours of labor used for each crop are calculated.

Using the above data, plus chemical analyses of each vegetable crop, further analyses reveal the gross value of each nutrient -- calcium, iron, Vitamin A, Vitamin C, and protein -- provided by each vegetable

crop. The net value of the various nutrients is then calculated by deducting the cost of producing the crop. From this, the net value per unit of output is calculated - both with and without the cost of labor included.

By comparing the generation of income, the comparative value of each crop or cropping pattern is then determined by calculating the yield, price, cost and labor use. The yields and prices of each crop displayed seasonal fluctuations while costs remained more stable. A potential yield was established for each crop according to past experience in the AVRDC home, market and school gardens during the study years. This potential yield or "break-even marketable yield" may be used to divide the total production cost and thereby determine the average unit cost. This unit cost may then be taken as a "break-even market price". The two break-even indicators above can be used in the design of future plans for increasing farm earnings from such gardens.

In order to evaluate whether it is costly for farmers in Taiwan to acquire their recommended daily allowance (RDA) of select nutrients from their garden, we calculate "relative nutrient cost" to estimate the overall nutritional value of food products based on Taiwan Food Balance Sheet and food prices. Relative nutrient cost is defined by the formula:

$$\text{Relative nutrient cost } (R_j) = \frac{\sum_{i=1}^{n} C_{ji} \times P_{ji}}{\sum_{i=1}^{n} C_{ji}}$$

R_j is the Relative nutrient cost of the nutrient component "j"

P_{ji} is the price of the unit nutrient component "j" of food commodity "i" in the diet

C_{ji} is the amount of nutrient component "j" provided by consumption of food commodity "i" in the diet

$\sum_{i=1}^{n} C_{ji}$ is the total intake of nutrient component "j" in a diet composed of the commodity 1, 2, 3, ..., n.

If the input cost of each nutrient provided by cash vegetable crop or cropping pattern is less than the relative nutrient cost in Taiwan, it may be worthwhile extending the garden project to Taiwan, and in particular to the rural poor.

V. METHODOLOGIES FOR THE EVALUATION OF F/FLS

For the whole-farm/whole-family type of analysis, a micro-economic methodology is needed. For this project, a simplified hand budgeting procedure is used. The purpose is to evaluate the economic consequences of adopting one of the recommended garden units in an existing farming/family living system - either a part-time or full-time farming operation. The specific methodology used is comparative (block) budgeting.

The first preparatory step in this procedure is to develop realistic gross-margin (income-over-variable-cost) budgets for each enterprise to be considered. (Each type of garden may be treated as one enterprise for this analysis.) The next step is to follow a logical, systematic procedure for making the evaluations. A sequential process is used in the block budgeting procedure recommended by Dr. Albert R. Hagan, Consulting Agricultural Economist. This methodology is explained and illustrated in several publications[1/].

1/ 1) Missouri Farm Planning Handbook, Manual 75, University of Missouri, Columbia, College of Agriculture-Estension Division, June, '81 - Pages II-3 to II-12; III-12 to III-35; & IV-2 to IV-30.

2) Hagan, Albert R. - The Agricultural Development of Nepal - Analysis of the Agricultural Sector, Special Report 189, Agri. Experiment Station, University of Missouri, Columbia, Agu, 1976 - p.44.

3) An Assessment of the Agricultural Potential of Central Tunisia - Evaluations and Recommendations by Albert R. Hagan, etal, University of Missouri, Columbia, April, 1978 (USAID Sponsored) Appendix A - P. 128; pages 80-91; and pp.153-193 .

4) Hagan, Albert R. (et al) Agricultural Development in Central Tunisia - Recommendations for Irrigation, Erosion Control, and Dryland Farming Interventions - University of Mo., Columbia, July, 1978, pp. 93-104; 153-163.

5) Hagan, Albert R., Farm Systems Management - Planning and Budgeting, Report of A Shortcourse Conducted at the FSDC Area II Training Center, Bulacon Province, Philippines, Jan./Feb., 1981. University of Missouri, Columbia, 1981.

After enterprise budgets are prepared for all enterprises in the existing farming system - and any additional ones to be included and evaluated in alternative systems, such as one of the recommended gardens - the farming systems analyses can be started. To make the task simpler and more accurate, a series of worksheets has been developed for each major step in the evaluation process (samples of these worksheets, modified for Taiwan are attached).

The first step in the analysis is to evaluate the existing (present) farming system, using the procedure and "standard" budgets as explained above. This provides a basis (benchmark) for comparison with any other alternatives systems to be considered, each of which may include one of the recommended gardens and various other changes in enterprise combinations.

The comparative budgeting procedure provides for three major types of evaluation measures for each system analyzed - the resource (input) requirements, the profitability of the system, and the cash-flow feasibility of the system for the farm family resources. The land, capital, and labor resources needed for each complete system first are quantified. Then, profitability measures - such as farm business profit and total family profit - are calculated. From this profit, the returns to capital, to family labor and management, and returns per hour (or man day) of family labor can be computed. (In calculating total profit in this procedure, the value of farm produced food is treated as income.)

Cash-flow feasibility of the system are calculated by adding to the net cash farm income all outside sources of family income - from investments, non-farm business and crafts, off-farm labor income, etc.

From this total net cash family income, the cash obligations - for family living, taxes, interest and principal payments on debts, etc. - are deducted to derive the net cash available to the family. This net figure is one useful figure for comparing one system with another.

In using this micro-economic analytical procedure, one should keep in mind that it is not, necessarily, a profit maximizing procedure, as is the case for linear programming. Rather it is a procedure for comparing the economic consequences of alternative systems which are predetermined to be feasible and workable by the farm family.

VI. ECONOMIC ANALYSIS OF AVRDC'S GARDENS

A. Home garden: Among the four types of home gardens (Indonesia, Thailand, Philippines and Vitamin A garden) demonstrated in AVRDC from June, 1981 to May 1982, the "Thailand garden" had the highest total value, total cash variable cost, net cash income, net income, VII (see Table 1), and capital/labor ratio while the "Philippines garden" was lowest in all categories except VII (see Table 1). It appears that management of the "Thailand garden" is more capital intensive and this, in turn, results in high production, values and high incomes.

The "Indonesia garden" shows the best results in terms of the total outputs of protein and calcium. Iron, Vitamins A and C from "Indonesia", "Thailand" and Vitamin A gardens all exceeded their expected percentages as discussed under the measurable objectives on Page 9 (see Table 2). The input costs of protein and calcium were cheapest for the "Indonesia garden" while the cheapest iron and Vitamin C were obtained from the "Thailand garden" (see Table 3). As predicted, Vitamin A production was cheapest in the Vitamin A garden.

The monthly labor-use variability of each type of home garden is shown in Table 4 and Figures 1 to 4. Although the Vitamin A garden has the highest monthly average labor use, its co-efficient of variability is the lowest. This means that the Vitamin A garden needs more labor inputs and that its labor use is more evenly distributed than in the other cases.

The cost of nutrient production under different cropping patterns may be calculated and the gardens ranked in ascending order of cost to determine the comparative advantages of each. Following this methods,

Table 1 Economic evaluation of four different type of home gardens demonstrated in AVRDC, Shanhua, Tainan, Taiwan, R.O.C. during June, 1981 to May 1982.

	Unit	Country type of home garden			
		Indonesia	Thailand	Philippine	Vitamin A
Total product	kg	278.7	279.5	187.4	228.3
Weighted average price	NT$/kg	10.8	11.7	10.0	12.2
Total value	NT$	3,019.1	3,258.6	1,876.2	2,766.7
Total cash variable cost	NT$	833.3	925.4	546.2	816.0
- Seed		60.5	89.1	69.6	65.7
- Fertilizers		687.5	698.7	413.8	671.1
- Chemicals		71.6	86.1	53.4	73.1
- Fuel fee		3.1	1.0	0.8	0.2
- Rice straw		6.9	4.2	5.2	4.7
- Bamboo		0.0	45.0	0.0	0.0
- Hired labor		3.7	1.3	3.4	1.2
Total family labor	hrs.	75.3	71.8	68.2	80.0
Value of family labor	NT$	2,183.7	2,067.8	1,964.2	2,288.0
Total variable cost	NT$	3,017.0	2,993.2	2,510.4	3,104.0
Net cash income	NT$	2,185.8	2,333.2	1,330.0	1,950.7
Net income	NT$	2.1	265.4	-634.2	-337.3
VII a/	%	127.2	136.4	116.5	114.3
Total cash variable cost / Value of family labor	%	38.2	44.8	27.8	35.7
N	kg	22.9	20.4	12.1	21.2
P_2O_5	kg	5.8	9.5	8.6	8.5
K_2O	kg	49.9	49.8	24.8	45.4
Compost	kg	119.0	126.0	95.5	133.3

a/ Defined as "% of ha-months cropped to vegetables within the study year", it's a time-weighted land use index.

Table 2 Nutrition outputs and their percentage contribution to yearly nutrient requirements for a family of five by type of home garden demonstrated at AVRDC, June 1981 - May 1982.

	Unit	Yearly nutrients requirement for a family of five		Type of home garden							
				Indonesia		Thailand		Philippine		Vitamin A	
		Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
Protein	g	54,385	100	6,299	12	5,709	10	4,063	7	4,743	9
Calcium	mg	1,131,500	100	397,814	35	361,456	32	170,374	15	350,031	31
Iron	mg	17,885	100	10,468	59	11,578	65	4,612	26	7,797	44
Vit. A	µg.R.E.	958,125	100	897,077	94	576,943	60	535,301	56	1,093,924	114
Vit. C	mg	51,100	100	116,972	229	132,189	259	87,241	171	15,493	187

Table 3 Relative nutrient cost of five select nutrients in Taiwan and input cost of nutrient types of four AVRDC home gardens, June 1981 - May 1982.

	Unit	Relative nutrient cost of Taiwan a/	Type of home garden			
			Indonesia	Thailand	Philippine	Vitamin A
Protein	NT$/100g	76.21	47.86	52.46	61.76	65.47
Calcium	NT$/100mg	12.46	0.76	0.83	1.47	0.89
Iron	NT$/100mg	437.22	28.80	25.87	54.40	39.83
Vitamin A	NT$/100 μg.R.E.	9.39	0.34	0.52	0.47	0.28
Vitamin C	NT$/100mg	N.A.	2.58	2.27	2.88	3.25

a/ Based on Taiwan Food Balance Sheet 1980 and the price of each comodity is from Monthly Statistics of Commercial Commodities, December, 1980.

Table 4 Monthly labor-use variability by type of home garden, AVRDC, June 1981 - May 1982

	Mean	Standard Deviation	Coefficient of variability a/
	(hrs.)	(hrs.)	(%)
Indonesia	6.28	2.91	46.35
Thailand	5.98	2.12	35.41
Philippine	5.68	1.80	31.63
Vitamin A	6.66	1.79	26.83

a/ Coefficient of variability (C.V.)= $\frac{\text{standard deviation (S.D.)}}{\text{mean}} \times 100$

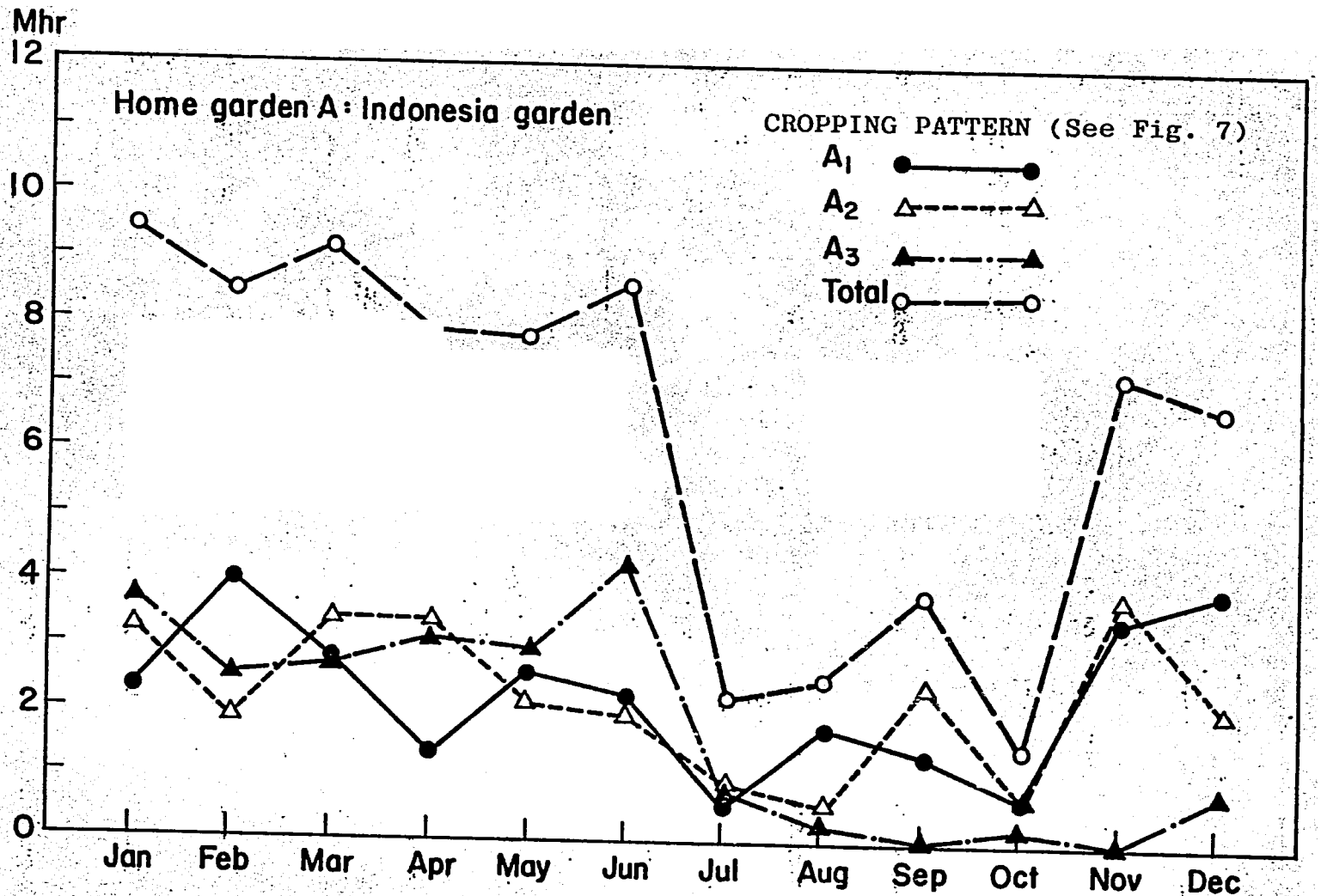


Fig. 1. Labor use: month-to-month total and individual cropping pattern, June 1981-May 1982.

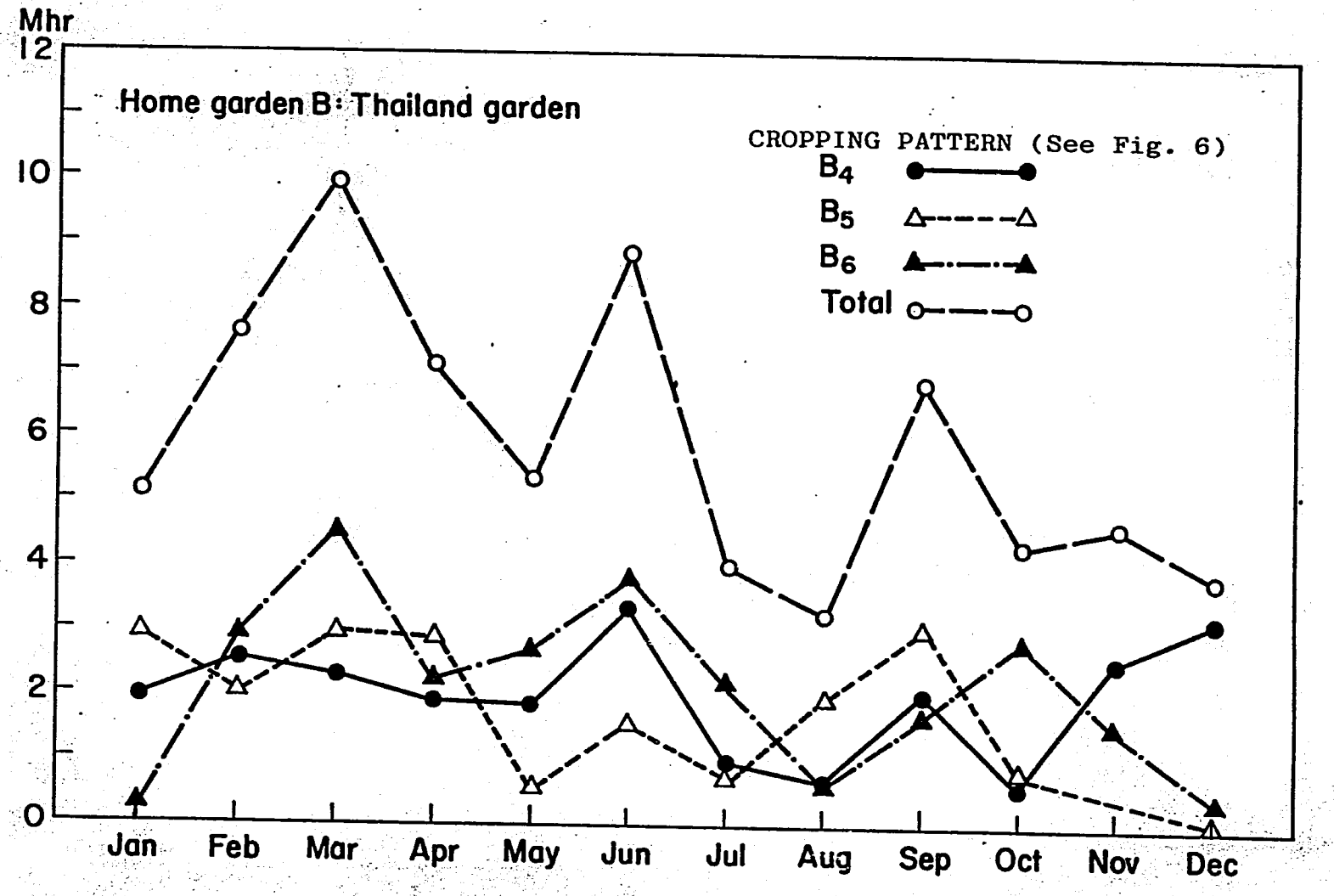


Fig. 2. Labor use: month-to-month total and individual cropping pattern, June 1981-May 1982.

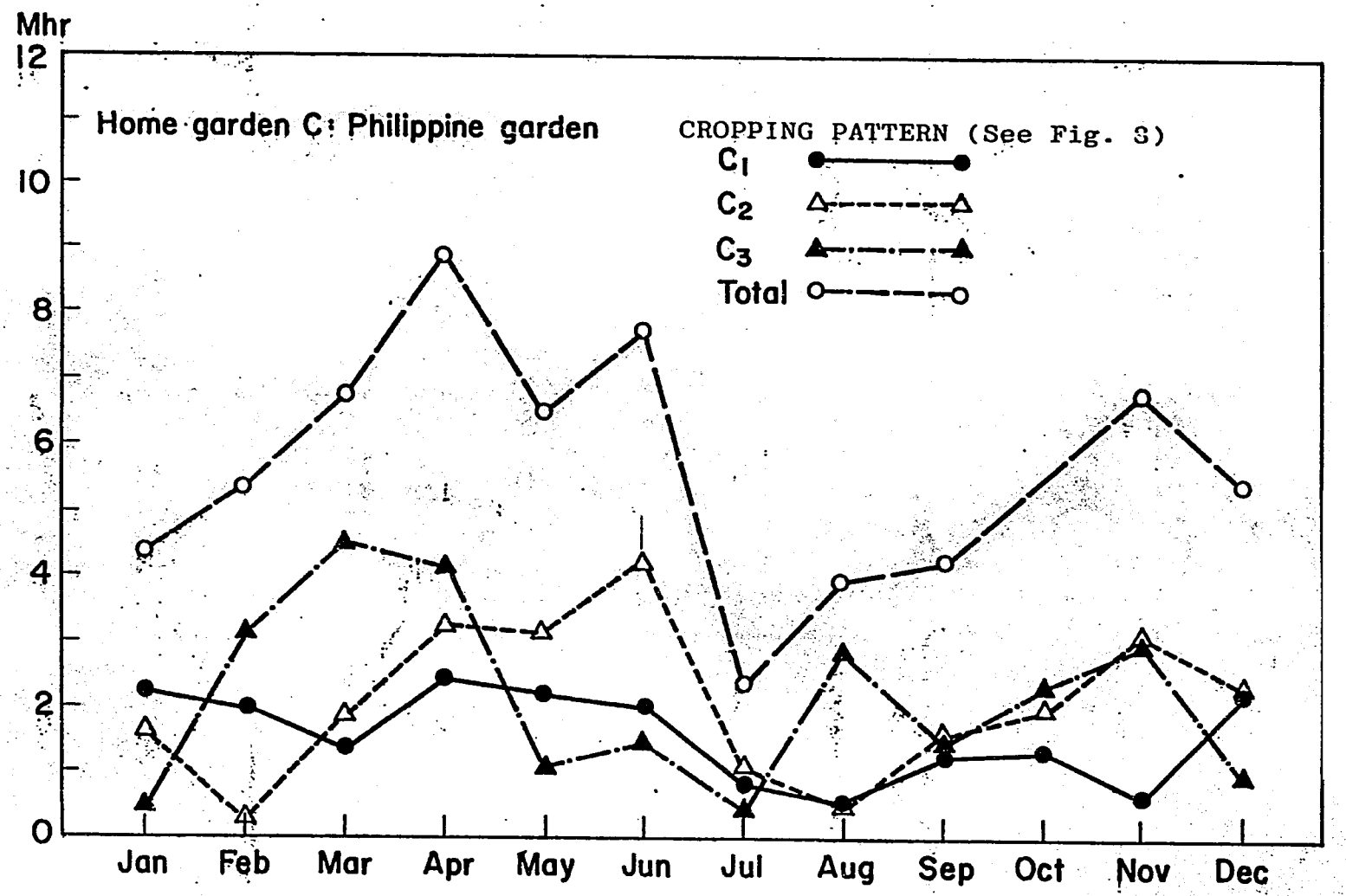


Fig. 3. Labor use: month-to-month total and individual cropping patte

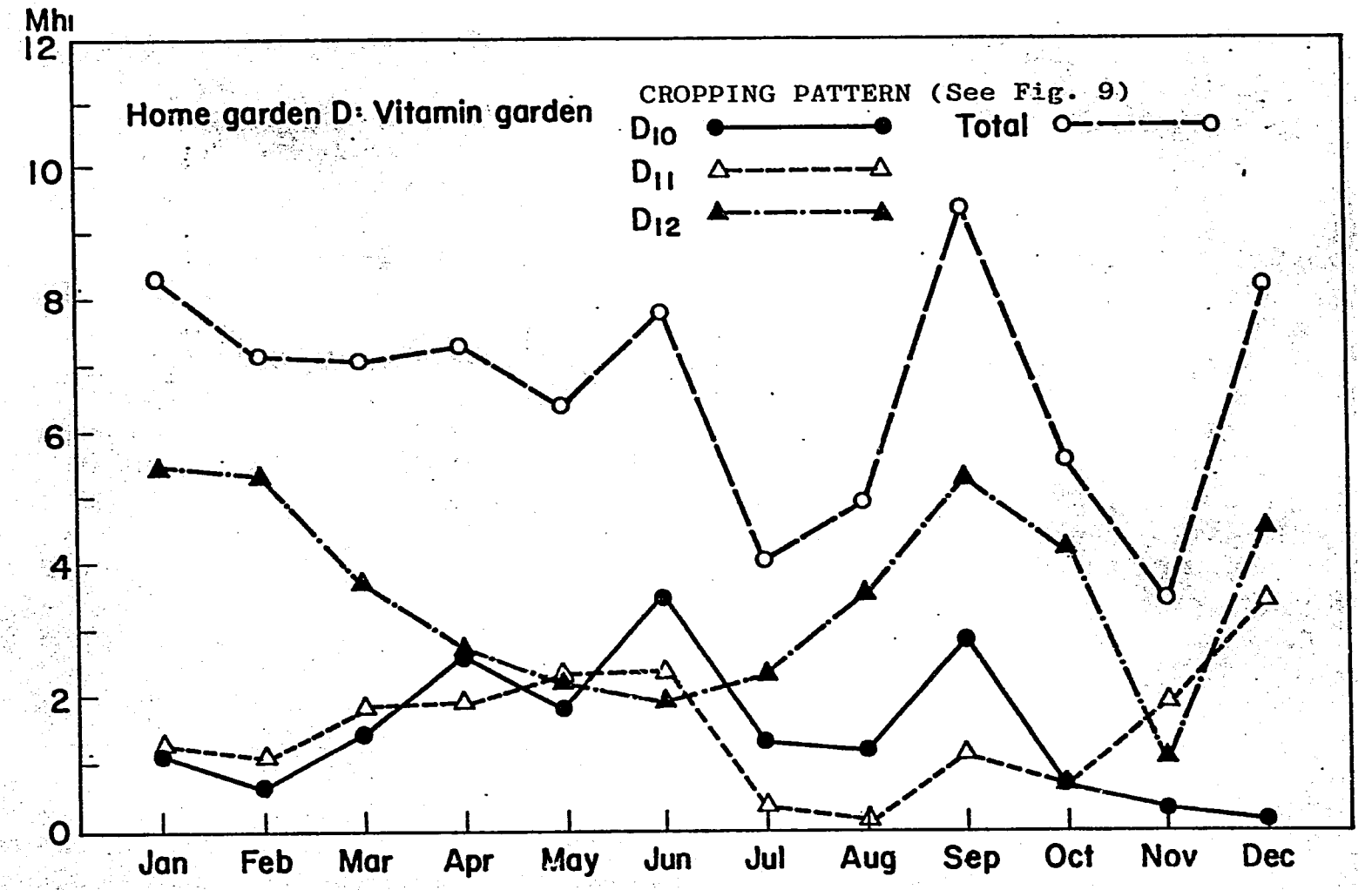


Fig. 4. Labor use: month-to-month total and individual cropping pattern, June 1981-May 1982.

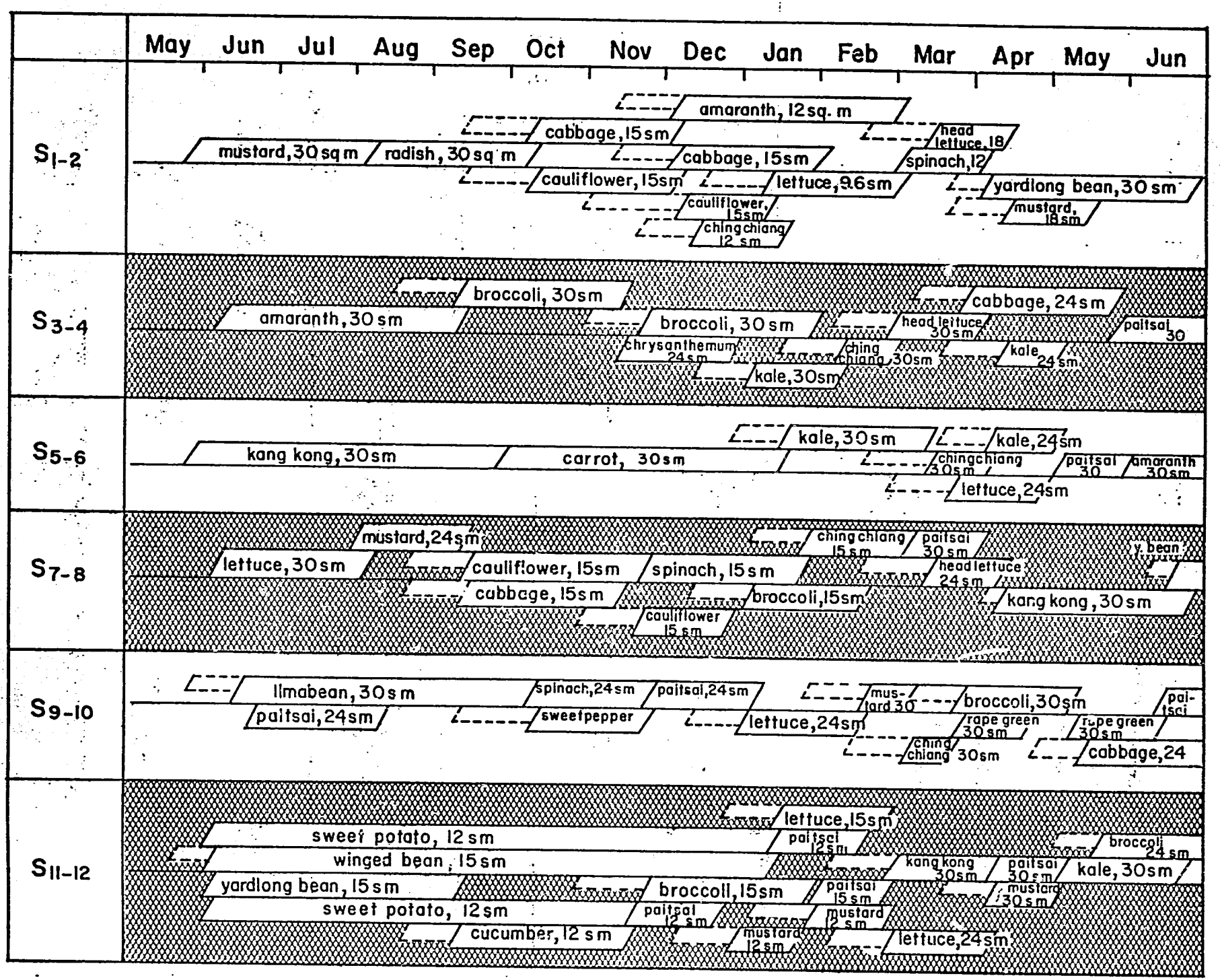


Fig. 5. Cropping patterns of AVRDC school garden, June 1981-May 1982, (Seedling stage, Field stage).

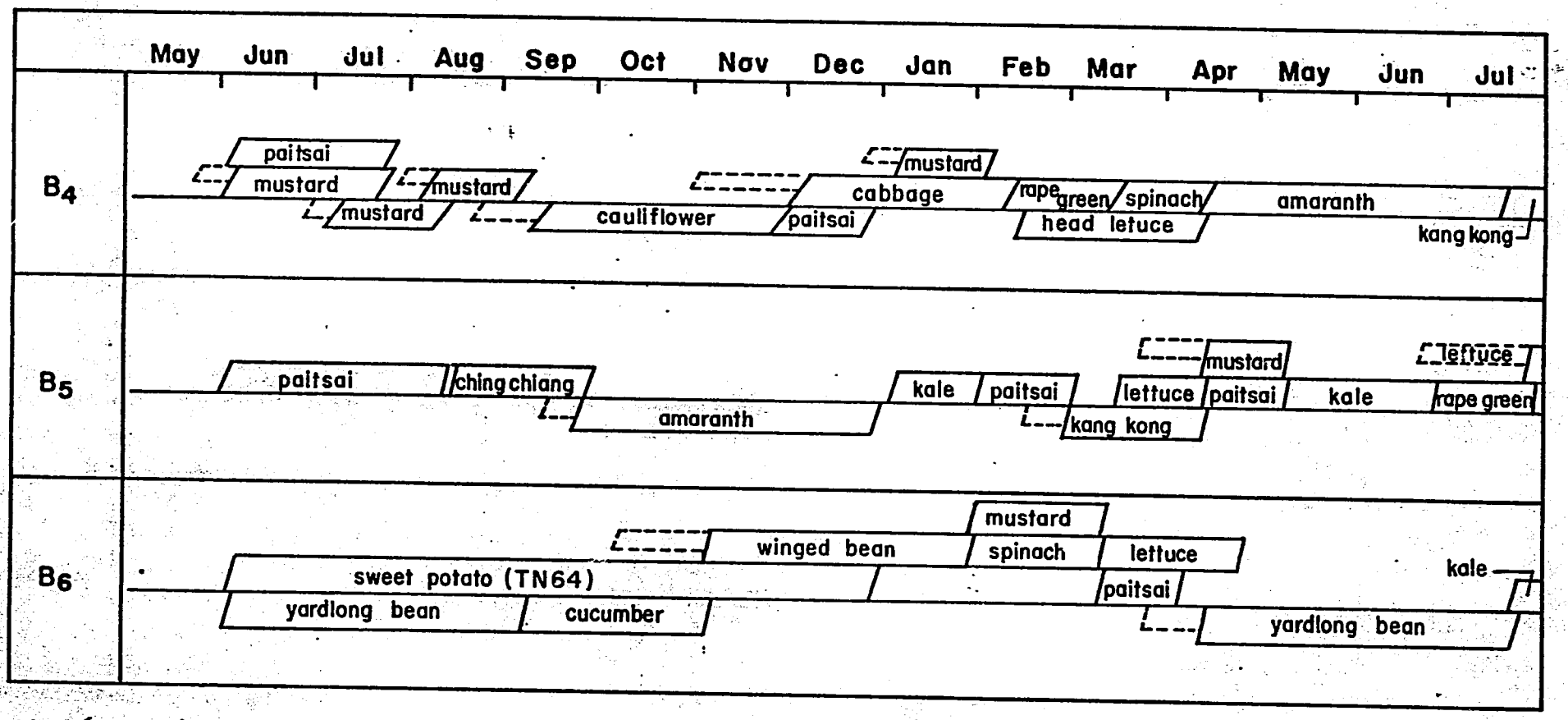


Fig. 6. Cropping patterns of AVRDC Thailand home garden, June 1981-May 1982, (Seedling stage, Field stage).

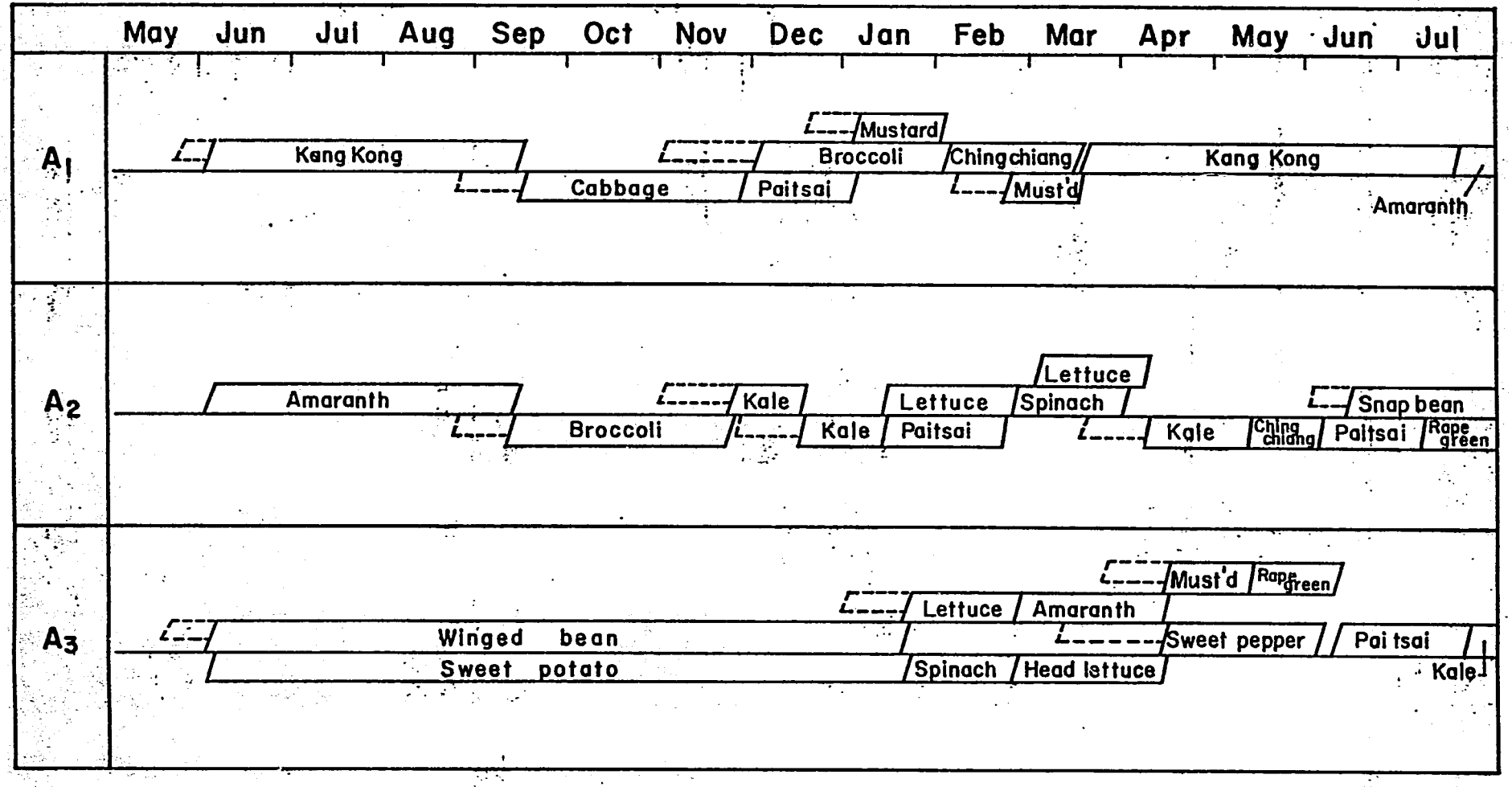


Fig. 7. Cropping patterns of AVRDC Indonesia home garden, June 1981-May 1982, (▭ Seedling stage, ▭ Field stage).

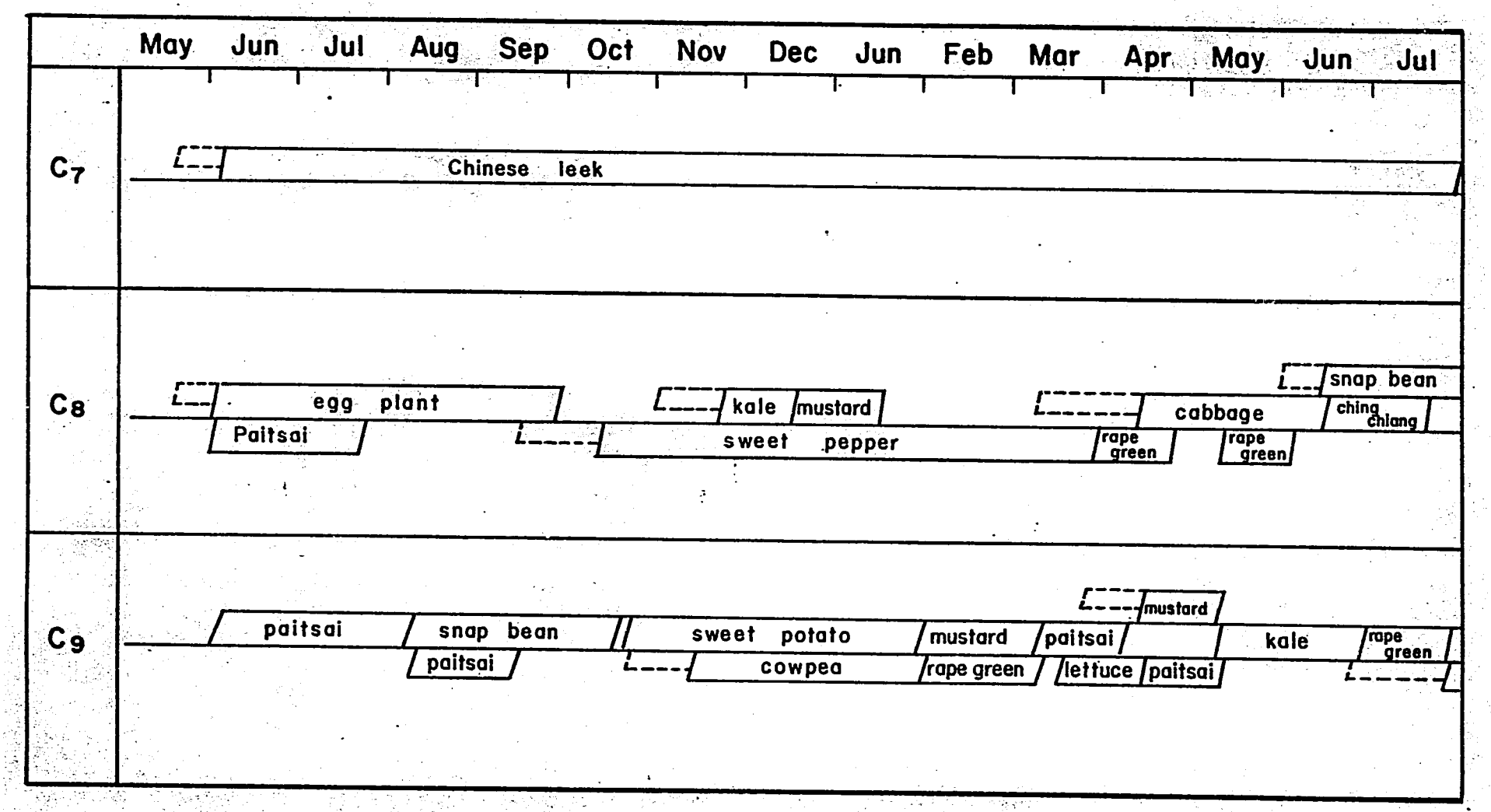


Fig. 8. Cropping patterns of AVRDC Philippine home garden, June 1981-May 1982, (Seedling stage, Field stage).

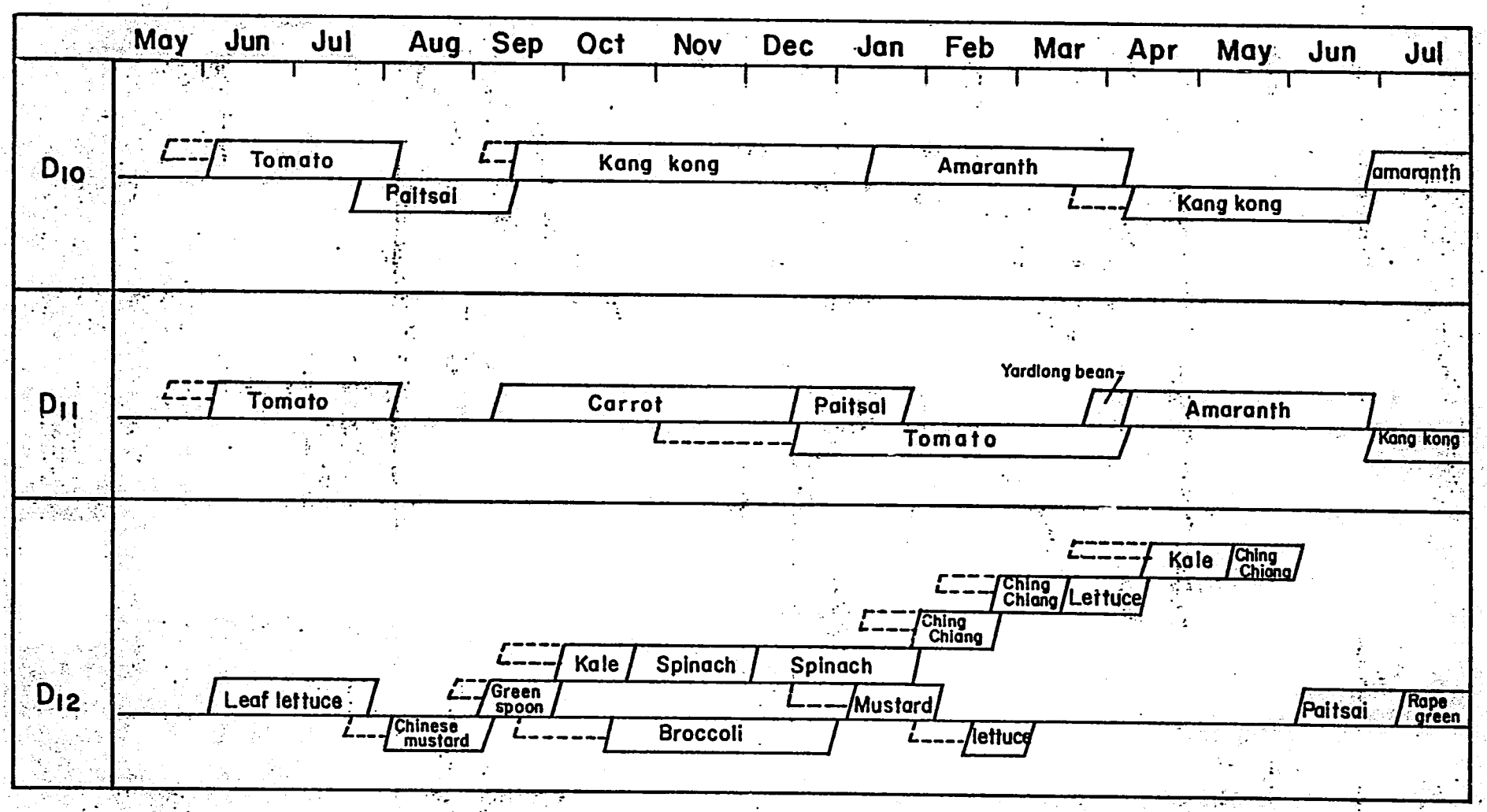


Fig. 9. Cropping patterns of AVRDC Vitamin A home garden, June 1981-May 1982, (Seedling stage, Field stage).

Table 5 Input cost and its rank a/ of nutrient types by cropping pattern of AVRDC home and school gardens, June 1981 - May 1982.

Croppint pattern	Protein		Calcium		Iron		Vitamin A		Vitamin C		To
	Cost	Rank	Cost	Rank	Cost	Rank	Cost	Rank	Cost	Rank	Ra
	0.01 NT$/g		0.01 NT$/g		0.01 NT$/g		0.01 NT$/g		0.01 NT$/g		
Home gardens											
Indonesia: A_1	40.54	13	0.92	11	42.65	9	0.36	9	2.16	12	54
A_2	52.65	8	0.58	15	23.71	15	0.26	12	2.52	8	58
A_3	55.51	7	0.89	12	24.27	14	0.45	6	3.66	4	43
Thailand: B_4	64.90	5	1.05	10	35.81	13	0.62	5	2.36	10	43
B_5	33.07	15	0.39	17	12.32	17	0.26	12	1.28	16	77
B_6	66.48	3	1.95	2	49.22	8	1.05	1	4.34	1	15
Philippine: C_7	41.65	12	2.08	1	49.98	7	0.74	2	3.57	5	27
C_8	65.00	4	1.34	6	56.73	3	0.32	10	2.22	11	34
C_9	85.05	1	1.36	5	55.06	4	0.70	3	3.69	2	15
Vitamin A: D_{10}	47.19	10	0.75	13	38.40	12	0.40	8	2.64	7	50
D_{11}	63.77	6	0.68	14	40.42	10	0.16	17	3.25	6	53
D_{12}	83.35	2	1.18	7	40.29	11	0.38	7	3.69	2	29
School garden											
S_{1-2}	50.27	9	1.43	4	69.89	1	0.31	11	1.84	13	38
S_{3-4}	21.68	17	0.39	17	14.77	16	0.17	16	1.03	17	83
S_{5-6}	20.48	18	0.43	16	8.46	18	0.09	18	0.98	18	88
S_{7-8}	33.02	16	1.08	9	52.17	5	0.19	14	1.31	15	59
S_{9-10}	40.30	14	1.18	7	59.28	2	0.18	15	1.77	14	52
S_{11-12}	46.84	11	1.56	2	50.80	6	0.64	4	2.43	9	33
TOTAL:		171		169		171		170		170	851

a/ Ranking according to the higher the cost, the lower the rank.

the five highest ranks are S_{5-6} (refer to Fig. 5), S_{3-4} (refer to Fig. 5), B_5 (refer to Fig. 6), S_{7-8} (refer to Fig. 5) and A_2 (refer to Fig. 7) (also see Table 5). The vegetable intensity indices of these five ranks are located between 1.01 to 1.20 (see Table 6). Table 7 shows that these five cropping patterns use less fertilizer and have a higher family labor income by comparison with the local labor wage rate (around NT$28-NT$30/hour in Tainan county).

Table 6. Cropping pattern to vegetable intensity index (VII) and total rank of input cost of AVRDC home and school gardens, June 1981-May 1982[1/]

Total rank of input cost	Vegetable intensity index (VII)								
	0.91-1.00	1.01-1.10	1.11-1.20	1.21-1.30	1.31-1.40	1.41-1.50	1.51-1.60	1.61-1.70	1.71-1.80
15-25			C_9						B_6
26-35	C_7				C_8, D_{12}				S_{11-12}
36-45			S_{1-2}	B_4					A_3
46-55	A_1	D_{10}, D_{11}					S_{9-10}		
56-65		A_2, S_{7-8}							
66-75									
76-85		B_5	S_{3-4}						
86-95		S_{5-6}							

[1/] Refer to Fig. 5 - 9.

There were in total 29 kinds of vegetables planted in the AVRDC home, school and market gardens during the period June 1981 to May 1982. Table 8 shows that kang kong, amaranth, chrysanthemum, spinach, rape green, kale, broccoli, lettuce, mustard, common cabbage, pai-tsai, ching-chiang pai-tsai, carrot, Chinese leek, head lettuce and sweet

AVRDC home and school gardens, June 1981 - May 1982.

Cropping pattern	Total product	Weighted average price	Total value	Cash variable cost: Total	Seed	Fertilizer	Chemicals	Others	Total family labor	Net cash income for family labor	Total rank of input cost a/
	kg/m^2	NT$/kg	NT$/m^2						hrs/m^2	NT$/hrs.	
Indonesia: A_1	18.8	9.3	174.8	62.6	3.1	55.3	4.1	0.1	4.52	24.7	54
A_2	16.7	12.5	208.8	39.4	4.1	30.4	4.4	0.5	4.45	38.1	58
A_3	10.9	11.0	119.9	36.9	2.9	28.9	3.5	1.6	3.58	23.2	43
Thailand: B_4	14.0	6.5	91.0	62.0	3.7	52.4	5.5	0.4	4.14	7.1	43
B_5	19.2	14.4	276.5	28.6	3.4	20.3	4.4	0.5	3.44	71.8	77
B_6	13.4	13.1	175.5	63.6	7.8	43.7	4.4	7.7	4.38	25.6	15
Philippine: C_7	8.0	8.2	65.6	7.3	1.3	4.9	0.8	0.3	3.22	18.1	27
C_8	15.9	9.3	147.9	53.7	5.1	44.5	3.7	0.4	4.17	22.8	34
C_9	7.3	13.5	98.6	30.0	5.3	19.6	4.4	0.7	3.98	17.2	15
Vitamin A: D_{10}	10.2	12.1	123.4	43.9	1.6	39.8	2.4	0.1	3.03	26.1	50
D_{11}	11.4	7.8	88.9	42.0	1.4	37.3	2.9	0.4	3.15	14.8	53
D_{12}	16.2	15.4	249.5	50.0	7.9	34.7	6.9	0.5	7.15	27.9	29
School garden:											
S_{1-2}	14.6	8.8	128.5	38.1	3.0	28.8	2.8	3.5	3.49	25.6	38
S_{3-4}	17.0	11.5	195.5	15.8	3.9	8.8	2.3	0.8	2.37	75.4	83
S_{5-6}	16.6	11.5	190.9	13.7	3.2	8.0	2.0	0.5	1.93	92.0	88
S_{7-8}	14.7	11.9	174.9	17.4	3.6	10.2	3.0	0.6	2.81	55.9	59
S_{9-10}	14.7	9.6	141.1	29.9	7.1	18.4	2.9	1.5	2.80	39.6	52
S_{11-12}	15.5	10.9	169.0	34.3	8.8	20.4	4.2	0.9	4.00	33.7	33

a/ Data from table 5.

Table 8 Input cost and its rank b/ of nutrient types by vegetable of AVRDC home, market and school gardens, June 1981 - May 1982.

	Duration a/	Protein		Calcium		Iron		Vitamin A		Vitamin C		Total Rank
		Cost	Rank	Cost	Rank	Cost	Rank	Cost	Rank	Cost	Rank	
	--days--	0.01 NT$/g		0.01 NT$/g		0.01 NT$/g		0.01 NT$/g		0.01 NT$/g		
1. Amaranth	76	29.02	28	0.20	29	9.21	28	0.30	20	2.20	20	125
2. Broccoli	93	29.14	27	1.01	23	92.21	15	0.41	19	0.92	29	113
3. Cabbage	93*	33.98	24	1.31	20	128.46	12	0.21	21	1.71	24	101
4. Carrot	92	69.69	13	1.81	17	59.59	18	0.05	29	8.34	8	85
5. Cauliflower	83*	77.32	10	7.17	6	217.74	8	30.86	4	1.79	23	51
6. Celery	81*	206.89	4	3.17	11	79.34	17	1.10	14	14.28	3	49
7. Chinese cabbage	70*	70.14	12	3.41	7	190.38	9	+	2	3.81	14	46
8. Chinese leek	378*	45.23	19	2.46	15	51.31	21	2.02	12	6.25	11	78
9. Ching-chiang pai-tsai	47*	47.08	17	1.39	18	53.95	19	0.20	22	1.81	22	98
10. Garland chrysanthemum	58	31.20	26	0.94	24	21.70	27	0.07	28	3.57	16	121
11. Cowpea	103	122.26	6	11.49	4	359.14	5	29.93	5	18.48	2	22
12. Cucumber	65	149.20	5	3.30	10	620.23	2	8.71	10	9.27	5	32
13. Egg plant	126*	76.72	11	5.24	7	186.85	10	19.37	6	8.80	6	40
14. Mustard	55*	61.43	14	0.92	25	82.63	16	0.46	18	0.96	28	101
15. Kang kong	99*	20.70	29	0.52	28	28.70	25	0.12	25	1.20	27	134
16. Lettuce	63	33.05	25	1.35	19	28.03	26	0.17	23	3.66	15	108
17. Limabean	138*	397.16	1	141.39	1	1262.39	1	235.65	3	117.82	1	7
18. Head lettuce	47	56.97	15	2.78	12	97.13	14	0.14	24	6.79	10	75
19. Kale	52*	49.83	16	0.53	37	7.41	29	0.63	16	1.55	25	113
20. Pai-tsai	38	44.80	20	1.04	22	53.86	20	0.98	15	1.81	21	98
21. Radish	61	82.83	9	2.58	14	341.01	6	∞	1	3.34	17	47
22. Rape green	31	36.73	21	0.69	26	38.48	22	0.11	26	2.51	19	114
23. Snap bean	70	97.38	7	9.74	5	292.14	7	9.74	8	9.74	4	31
24. Spinach	43	35.37	22	1.10	21	31.12	23	0.08	27	1.38	26	119
25. Sweet pepper	139*	237.83	3	39.64	2	475.66	4	0.60	17	2.61	18	44
26. Sweet potato tips	187	95.54	8	1.96	16	30.42	24	1.16	13	7.77	9	70
27. Tomato	107*	331.05	2	20.17	3	582.91	3	5.89	11	8.71	7	26
28. Winged bean	200*	34.37	23	3.64	8	134.26	11	9.17	9	4.78	12	63
29. Yardlong bean	69	46.51	18	2.69	13	117.79	13	14.74	7	4.38	13	64

a/ Direct seeding duration and transplanting duration including seedling stage which is marked with *.

b/ Ranking according to the higher the cost, the lower the rank.

potato tips are high in rank and low in cost. Figures 5 to 9 indicate that the best five cropping patterns (S_{5-6}, S_{3-4}, S_{7-8}, B_5, and A_2) are all good combinations of these 16 vegetables.

B. School garden: The AVRDC school garden is designed to daily provide 113 grams (equal to approximately ½ cup of edible portion of green leafy vegetables) of cooked nutritious vegetables for each of 40 children, 5 days per week, for at least 60 days of the school-term. The results (below) suggest we can change our objectives to 70-100 school children.

During the study year the AVRDC school garden produced 2,778.4 kg of vegetables which, in turn, can daily provide 113 grams of nutritious vegetables for 205 children 5 days per week, for at least 120 days during the school-term. (This is perhaps more children than a rural school has enrolled, but it will give planners the flexibility of designing into the program either a reduction of garden size or other alternatives such as encouraging the schoolchildren to take home the surplus vegetables for their families to consume, or have the school sell the vegetables as a school income-generation scheme). Food from the AVRDC school garden can contribute significantly to the daily intake of protein, vitamin A and minerals for 100 and 200 children, ages 10-12 years (see Table 9). The 180 M^2 plot only requires 43.48 hours of labor per month, but there are market fluctuations in labor use, with two peaks in Winter and Spring (Table 10 and Fig. 10). Since the cropping patterns and vegetable analysis are the same as for the home garden, the input cost results reduplicate those presented in the home garden section.

Table 9 Daily nutrition output and its percentage contribution to daily nutrients requirement for a child (10-12 years old) from AVRDC school garden, for 40, 100 and 200 childen, for 120 school days, June 1981 - May 1982.

	Unit	Daily nutrients requirement of a child		AVRDC school garden			
		Amount	%	Total products	40 children %	100 children %	200 childre %
Protein	g	38	100	56,783	31	12	6
Calcium	mg	650	100	2,262,945	73	29	14
Iron	mg	7	100	67,795	202	81	40
Vitamin A	µg.R.E.	575	100	9,258,651	335	134	67
Vitamin C	mg	20	100	1,279,888	1333	535	267

Table 10 Monthly labor-use variability by cropping pattern of AVRDC school garden, June 1981 - May 1982

Cropping pattern	Area (m^2)	Mean (hrs.)	Standard deviation (hrs.)	Coefficient of variability (%)
S_{1-2}	30	8.73	4.56	52.23
S_{3-4}	30	5.93	2.70	45.45
S_{5-6}	30	4.82	3.96	82.18
S_{7-8}	30	7.01	3.44	49.08
S_{9-10}	30	7.00	4.99	71.33
S_{11-12}	30	10.00	3.95	31.53
Total	180	43.48	18.66	42.91

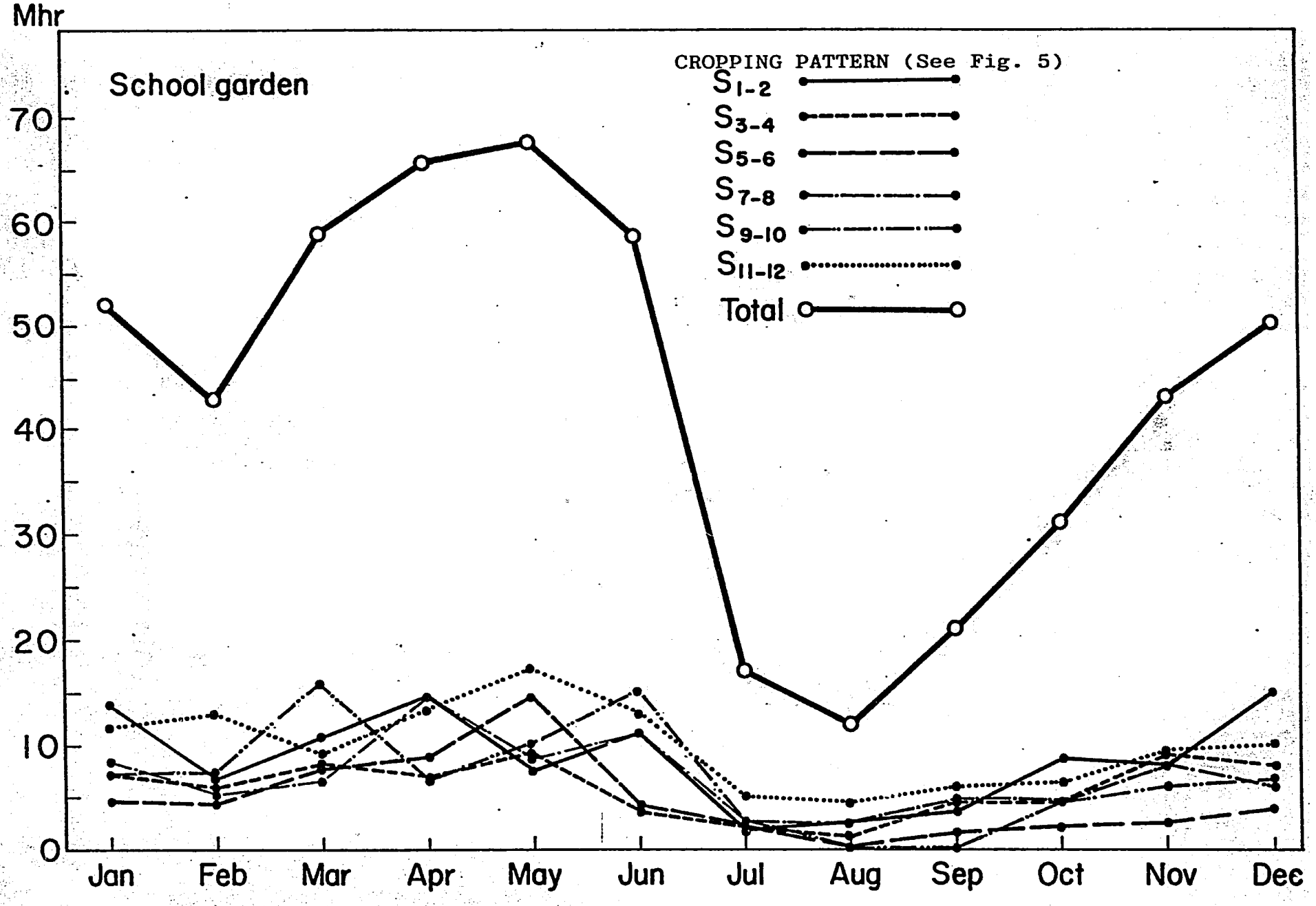


Fig. 10. Labor use: month-to-month total and individual cropping pattern, June 1981-May 1982.

C. Market garden: During the June 1981-May 1982 study period, the AVRDC market garden produced a total of 2,153 kg of marketable produce and earned about NT$12,419 (US$310) of net income over variable cost. This just met the market garden objectives. There was a net loss of about NT$3,704, however, when the family wage labor for 524.4 hrs. was calculated at the rate of NT$30.74 per hour (Table 11 & 12), but these gardens are meant to be encouraged in areas where there are little or no outside demands on family labor.

In order to determine the type of cropping pattern which can generate the highest income, the cost & return by cropping pattern are evaluated. Table 13 indicates that the net cash income for a family for the seven cropping patterns is over NT$20 while cropping patterns M_{13}, M_{3-4} and M_{11-12} (refer to Fig. II) provide the three highest returns to labor. Monthly labor use variability of the cropping patterns adopted in the AVRDC market garden is quite high, with a peak in the spring (Table 14 and Fig. 12).

Table 15 shows that net cash income per hour from the twelve kinds of vegetable was over NT$10. These vegetables were radish, eggplant, tomato, common cabbage, spinach, cucumber, Chinese leek, broccoli, yarlong bean, chrysamthemum, mustard and cauliflower. Most crops of those used in the M_{13}, M_{3-4} and M_{11-12} patterns are selected from among these twelve (Fig. 11). Crop yields and prices exhibit great seasonality. Under the soil and environment conditions at AVRDC we try to establish a yield level for each crop which will serve as a "break-even marketable yield" and use this to divide the total crops cost and obtain the "break-even market price". From the

Table 11. Annual value of production from AVRDC market garden, June 1981 - May 1982.

AVRDC Garden Project

Worksheet for Summarizing Annual Value of Production

(Gross Income)[1/] From Garden Unit

Type of Garden Market Garden Irrigation: Yes (v); No (

Location: Taiwan, R.O.C. (Country) Tainan (Area) Shanhua (Subdivision)

Cooperator Name: AVRDC Address: _____

No. in Household _____ No. Adult Equivalents: Labor _____ Consumption _____

Line	Kind of Vegetable	Area	Seeding Rate	Total Product (kg)	Weighted Average Price/kg[3/] NT$	Tota Valu NT$
1	Broccoli	192 m^2	7.68 g/192 m^2	278.1 (4.10)	10.17	2828.
2	Cabbage	120 m^2	4.5 g/120 m^2	314.8	6.95	2188.
3	Carrot	30 m^2	18 g/30 m^2	35.5	2.13	75.
4	Cauliflower	60 m^2	2.4 g/60 m^2	41.0	10.69	438.
5	Celery	34 m^2	11.33 g/34 m^2	41.0	6.83	280.
6	Chinese cabbage	30 m^2	5 g/30 m^2	27.0	4.37	118.
7	Chinese leek	15 m^2	25 g/15 m^2	95.8	10.96	1050.
8	Ching-chiang	54 m^2	32.4 g/54 m^2	42.0 (1.00)	1.32	55.
9	Chrysamthemum	54 m^2	20 g/54 m^2	184.2 (11.50)	4.56	839.
10	Cucumber	54 m^2	4.32 g/54 m^2	160.6 (4.05)	10.86	1744.
11	Egg plant	30 m^2	7.5 g/30 m^2	81.4	13.50	1099.
12	Head lettuce	30 m^2	15 g/30 m^2	58.0 (1.50)	3.00	174.
13	Kale	102 m^2	61.2 g/102 m^2	40.5 (0.50)	7.63	308.
14	Kang-kong	30 m^2	137.5 g/30 m^2	14.5 (4.50)	3.99	57.
15	Lettuce	90 m^2	30 g/90 m^2	83.5	3.28	274.
16	Mustard	162 m^2	79 g/162 m^2	141.1 (15.50)	8.18	1154.
17	Pai-tsai	108 m^2	6.48 g/108 m^2	159.1 (13.20)	3.92	607.
18	Radish	30 m^2	15 g/30 m^2	45.6	15.60	711.
19	Rape green	24 m^2	14.4 g/24 m^2	12.5	9.95	124.
20	Spinach	84 m^2	50.4 g/84 m^2	157.8 (0.50)	10.31	1627.
21	Sweet pepper	84 m^2	3.36 g/84 m^2	23.0 (1.00)	24.16	555.
22	Tomato	30 m^2	0.915 g/30 m^2	33.1	20.06	664.
23	Yardlong bean	60 m^2	6.1 g/60 m^2	83.1 (7.90)	12.01	998.
24	Gross value of production (Gross Income)					17976.
				Total: 2153.2 (65.25)	8.35	

1/ For analytical purposes, Gross Value of Production will be considered "Gross Income".

2/ Equivalents to be calculated from household records from pilot-study family unit.

3/ If the product is only for home consumption and is not sold, we use local farm price as basis for calculation.

Table 12. Economic evaluation of AVRDC market garden, June 1981 - May 1982.

AVRDC Garden Project

Economic Evaluation of Garden Enterprise

Type of Garden Unit: Market Garden Irrigation: Yes (✓); No ( )

Location: Taiwan, R.O.C. (Country) Tainan (Area) Shanhua (Subdivision)

Cooperator Name AVRDC Address _____

No. in Household _____; No. Adult Equivalents:[2/] Labor _____ Consumption _____

[1/] A. Gross Income (Value of Production) from Garden Unit NT$ 17976.4
(Transfer total from Table 11, Line 24)

B. Cash Variable Costs/Garden Unit: (Unit size 195 m^2)

1. Seed ..... NT$875.7
2. Electricity fee ..... NT$149.0
3. Fertilizers ..... NT$1865.7
4. Chemicals ..... NT$359.1
5. Bamboo ..... NT$241.0
6. Heavy machine fuel fee ..... NT$13.9
7. Rice straw ..... NT$10.0
8. Transportation fuel fee ..... NT$1142.3
9. Market fee ..... NT$876.5
10. Hired labor ..... NT$23.9

C. Total Cash Variable Costs ..... NT$ 5,557.1

D. Net Cash Income over Variable Costs ..... NT$12,419.3

E. Total Hours Family Labor Required ..... NT$ 524.5

F. Net Cash Income/Hour of Family Labor ..... NT$ 23.7

G. Value of Family Labor (524.5 hrs x NT$/hr 30.74) ..... NT$16,123.1

H. Total Variable Costs (L.C + L.G) ..... NT$21,680.2

I. Net Income Over All Variable Costs/Garden Unit ..... NT$-3,703.8

J. Net Household Garden Income per Labor Equivalent Unit ..... NT$

K. Net Household Garden Income per Consumption Equivalent Unit ..... NT$

[1/] For analytical purposes, Gross Value of Production will be considered "Gross Income".
[2/] Equivalents to be calculated from household records from pilot-study family unit.

Table 13. Indicators of economic evaluation in different cropping patterns, AVRDC market garden, June 1981-May 1982.

Cropping pattern	VII	Marketable yield	Weighted average price	Total value	Cash Variable Cost					Total family labor	Net cash income per family labor	Net Income
					Total	Seed	Fertilizers	Chemicals	Others[a/]			
		(kg/m²)	(NT$/kg)	- - - - - - - - - -			(NT$/kg)	- - - - - - - - - -		(hrs/m²)	(NT$/hrs)	(NT$/m²)
M_{1-2}	1.31	11.94	7.38	88.12	28.67	4.08	8.37	1.79	14.43	2.84	20.96	-27.39
M_{3-4}	1.39	9.50	8.84	83.98	20.96	2.88	6.10	1.67	10.31	2.35	26.85	-15.06
M_{5-6}	1.44	10.99	8.09	88.91	30.28	4.68	11.26	2.22	12.12	2.81	20.89	-26.20
M_{7-8}	1.28	9.15	9.43	36.28	30.50	6.25	12.18	1.50	10.57	2.36	23.60	-16.07
M_{9-10}	1.44	14.09	8.20	115.54	35.65	5.21	12.92	1.71	15.81	3.52	22.67	-26.18
M_{11-12}	1.29	12.42	7.62	94.64	29.21	4.76	9.10	1.98	13.37	2.54	25.73	-13.06
M_{13}	1.04	7.39	11.30	83.51	19.88	2.65	4.53	2.20	10.50	2.13	29.90	0.91
Weighted average[b/]	1.33	11.04	8.35	92.19	28.50	4.49	9.57	1.84	12.60	2.69	23.68	-18.99

a/ Including hired labor wages, rice straw fee, fuel fee, bamboo costs, electricity fee and market fee.

b/ Using bed size as weight.

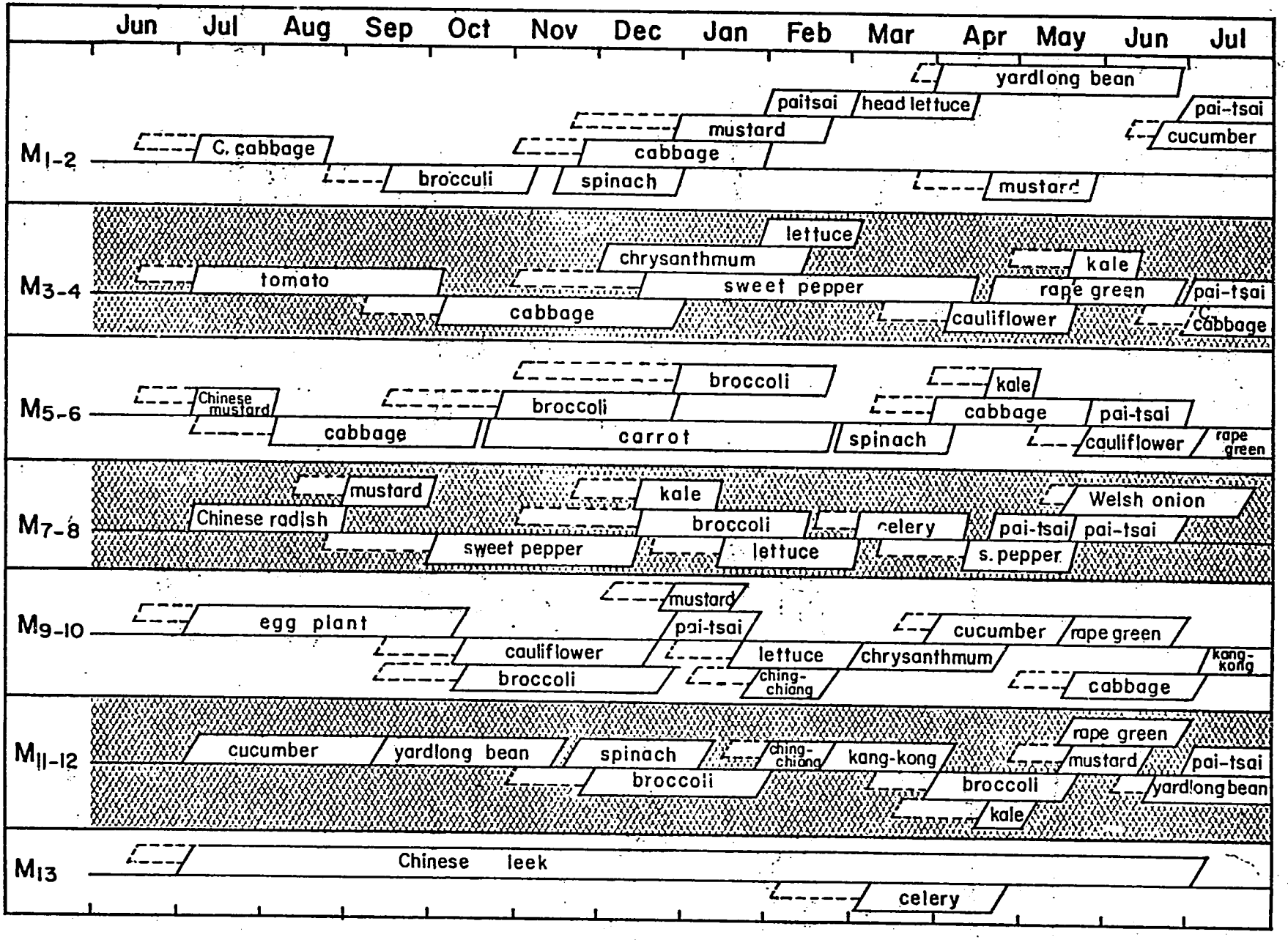


Fig. 11. Cropping patterns of AVRDC market garden, June 1981-May 1982, (Seedling stage, Field stage).

AVRDC experience for each garden crop, those crops with potential to reach the break-even marketable yield and market price were selected for use. The twelve crops indicated above have a high probability of positive net return while the other nine crops (celery, ching-chiang pai-tsai, head lettuce, kale, kang kong, lettuce, pai-tsai, rape green and sweet pepper) are worthwhile trying for certain crop seasons to determine whether a break-even marketable yield and market price can be obtained.

Table 14. Monthly labor-use variability by cropping pattern of AVRDC market garden, June 1981-May 1982.

Cropping pattern	Area (M^2)	Mean (hrs)	Standard Deviation (hrs)	Coefficient of variability (%)
M_{1-2}	30	7.09	4.03	56.80
M_{3-4}	30	5.87	3.80	64.85
M_{5-6}	30	7.01	2.59	36.85
M_{7-8}	30	5.91	3.22	54.47
M_{9-10}	30	8.81	7.89	89.54
M_{11-12}	30	6.35	3.23	50.83
M_{13}	15	2.66	2.32	87.19
Total	195	43.71	20.43	46.73

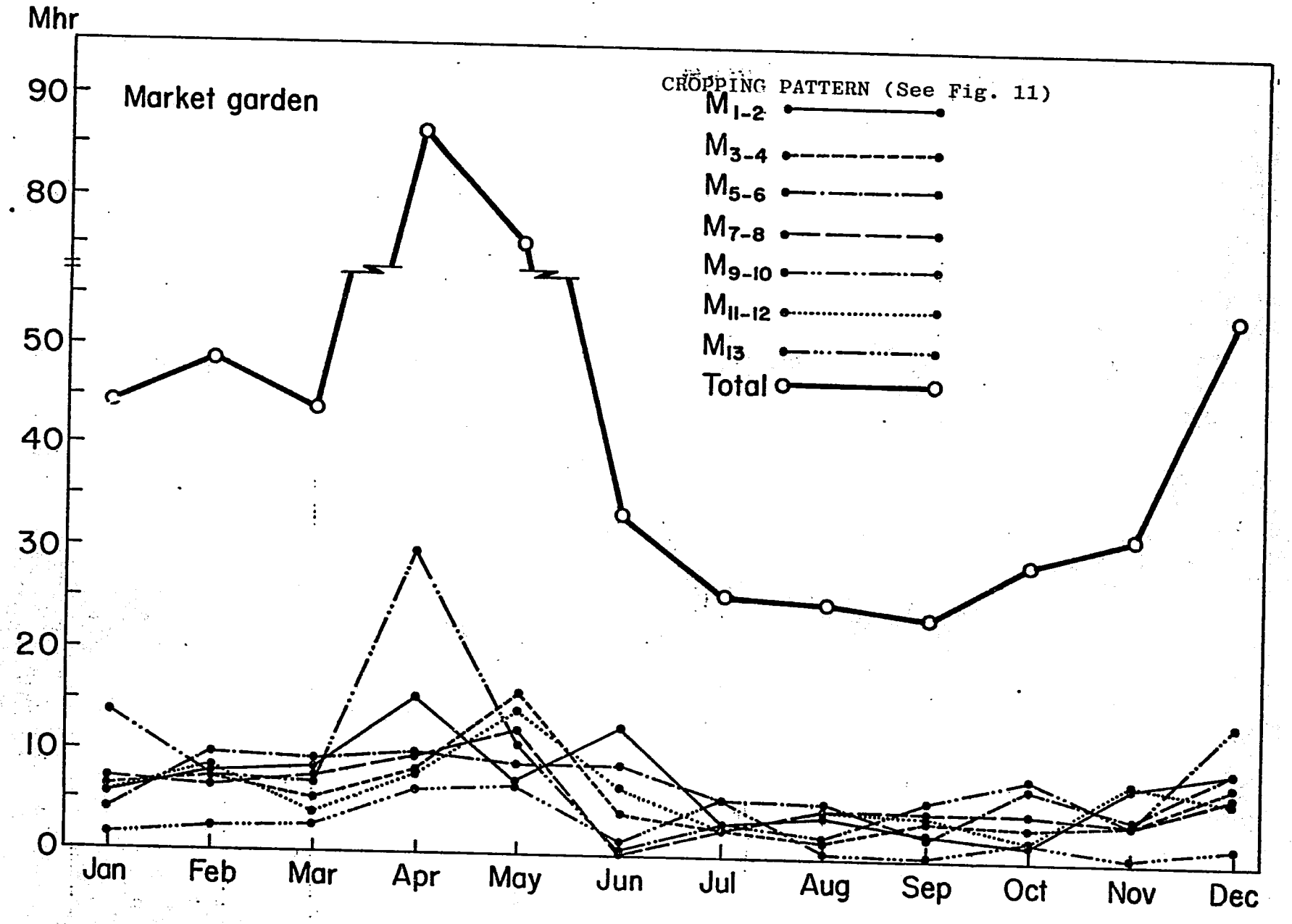
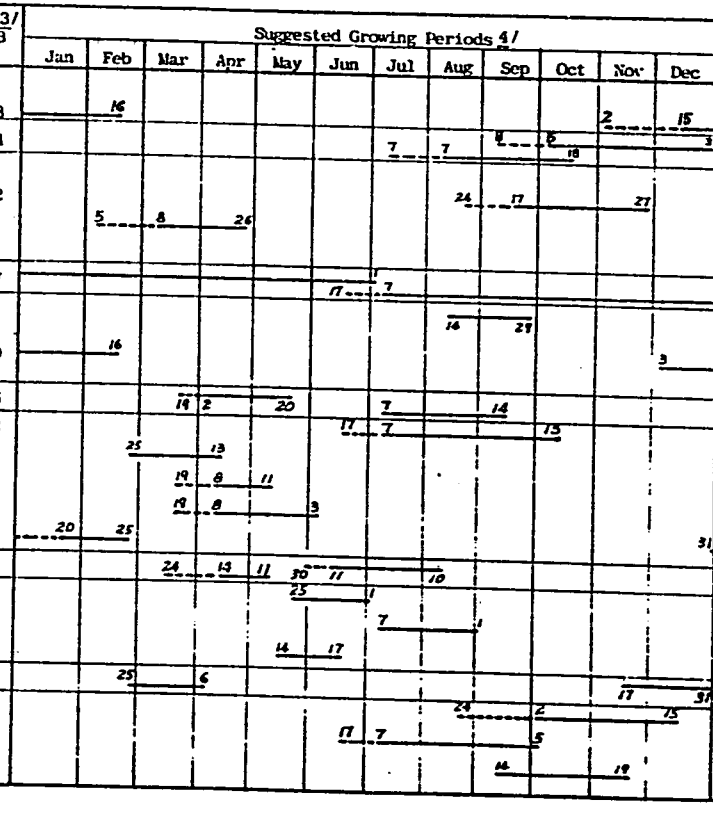


Fig. 12. Labor use: month-to-month total and individual cropping pattern, June 1981 - May 1982

Table 15 Indicators of economic evaluation of crops in AVRDC market garden and their suggested growing periods for maching break-even marketable yield (BEM yield) and market price (BEM price).

	2/ A	Labor used	Cash cost	Total cost	Market-able yield	Market price	BEM yield	BEM price	Total value	Net cash income	3/ B
		—hrs/m²	--NT$/m²	-NT$/m²	--kg/m²	---NT$/kg	--kg/m²	--NT$/kg	--NT$/m²	—NT$/hr-	
1. Broccoli	7	0.34	4.09	15.09	1.45	10.17	2.00	7.55	14.73	29.59	8
2. Cabbage	4	0.29	3.25	12.65	2.62	6.95	1.60	8.53	18.23	50.87	4
3. Carrot 1/	1	0.35	1.96	15.13	1.18	2.13	3.00	5.04	2.52	- 5.55	
4. Cauliflower	2	0.29	3.38	12.36	0.68	10.69	2.00	6.18	7.31	13.47	12
5. Celery	2	0.45	4.29	17.22	1.21	6.83	3.75	4.59	8.24	8.87	
6. Chinese cabbage 1/	1	0.25	4.24	11.99	0.90	4.37	1.00	11.99	3.93	- 1.23	
7. Chinese leek	1	1.81	16.82	69.88	6.39	10.96	5.39	10.96	70.00	29.66	7
8. Ching-chiang pai-tsai	2	0.23	2.29	9.46	0.78	1.32	1.00	9.46	1.03	- 5.54	
9. Garland chrysanthemum	2	0.65	3.27	22.73	3.41	4.56	4.00	5.68	15.55	18.76	10
10. Cucumber	2	0.55	7.52	24.07	2.97	10.86	2.80	8.60	32.31	44.83	6
11. Egg plant	1	0.47	7.86	21.23	2.71	13.50	2.71	7.83	36.64	61.89	2
12. Head lettuce	1	0.35	2.25	12.96	1.93	3.00	4.43	2.93	5.80	10.08	
13. Kale	4	0.23	1.44	8.62	0.40	7.63	0.85	10.14	3.03	7.03	
14. Kang-kong	1	0.23	1.43	8.51	0.48	3.99	2.37	3.59	1.93	2.23	
15. Lettuce	3	0.23	1.39	8.59	0.93	3.28	2.45	3.50	3.05	7.19	
16. Mustard	6	0.28	2.97	11.68	0.87	8.18	1.00	11.68	7.13	14.83	11
17. Pai-tsai	4	0.34	2.31	12.63	1.47	3.82	1.60	7.89	5.63	9175	
18. Radish	1	0.26	4.89	12.82	1.52	15.60	1.26	10.17	23.71	73.59	1
19. Rape green	1	0.38	1.76	13.51	0.52	9.95	1.00	13.51	5.18	8.94	
20. Spinach	3	0.34	3.55	13.71	1.88	10.31	1.50	9.14	19.38	46.70	5
21. Sweet pepper	3	0.29	4.29	13.19	0.27	24.16	0.67	19.69	6.62	7.88	
22. Tomato	1	0.29	6.69	15.66	1.10	20.06	1.00	15.66	22.14	52.97	3
23. Yardlong bean	2	0.56	4.85	21.52	1.31	12.02	1.37	15.71	16.65	21.06	9



4/ Data index	Intercrop 4/ of data index
M7-8 (4)	Kale
M3-4 (2)	
M5-6 (2)	
N.A. 1/	
S7-8 (3)	
M13 (1)	Chinese leek
N.A. 1/	
M13 (2)	Celery
B5 (2)	
M3-4 (4)	Sweet pepper
M9-10(9)	Garland chrysanthemum
M9-10(1)	
A3 (6)	Amaranth
A2 (9)	
D10 (5)	
A3 (4)	Spinach
S1-2 (1)	
B5 (8)	Pai-tsai
M5-6 (9)	Cauliflower
M7-8 (1)	
S9-10(11)	Cabbage
M1-2 (4)	Cabbage
M5-6 (6)	Cabbage
M7-8 (3)	
M3-4 (1)	
M11-12 (2)	

Note: 1/ N.A. = not applicable, and the crop is lack of successful AVRDC experiences to be used.

2/ No. of observation.

3/ Ranked by net cash income per family labor hour.

4/ .....seedling stage, ——field stage; data compiled from all AVRDC home, market and school gardens, June 1981 to May 1982.

VII. ANALYSIS OF FARMER CHIU'S F/FLS

We have made an analysis of AVRDC's gardens. However, AVRDC's garden system is a group of alternate farming enterprises, not a F/FLS for economic evaluation. Nevertheless we wanted to check the process of the F/FLS analysis, i.e., whether it works or not under our conditions. Therefore, we took some existing data AVRDC had previously collected on a Taiwan farmer, Farmer Chiu. We took these data and then applied the analytical procedures described and then conducted a retrospective analysis. A one-year farm survey was made for the Chiu's family farm in 1976. The following are the results of applying the analytical procedures to these existing data:

A. Inventory of Resources

Chiu's farm has six pieces of land with a total land area 2.4 hectares. The total land value was NT$1,360,000. All land is level land with good drainage and can be farmed continuously to grow vegetable crops (see Form 1 and Form 3).

Farm buildings, including warehouse, compost house, hog pen, poultry house, and drying ground, are valued at NT$45,000. Other inventory such as machinery and farm equipment are valued at NT$64,660. The working capital including feed, seed, and other assets are valued at NT$13,480.

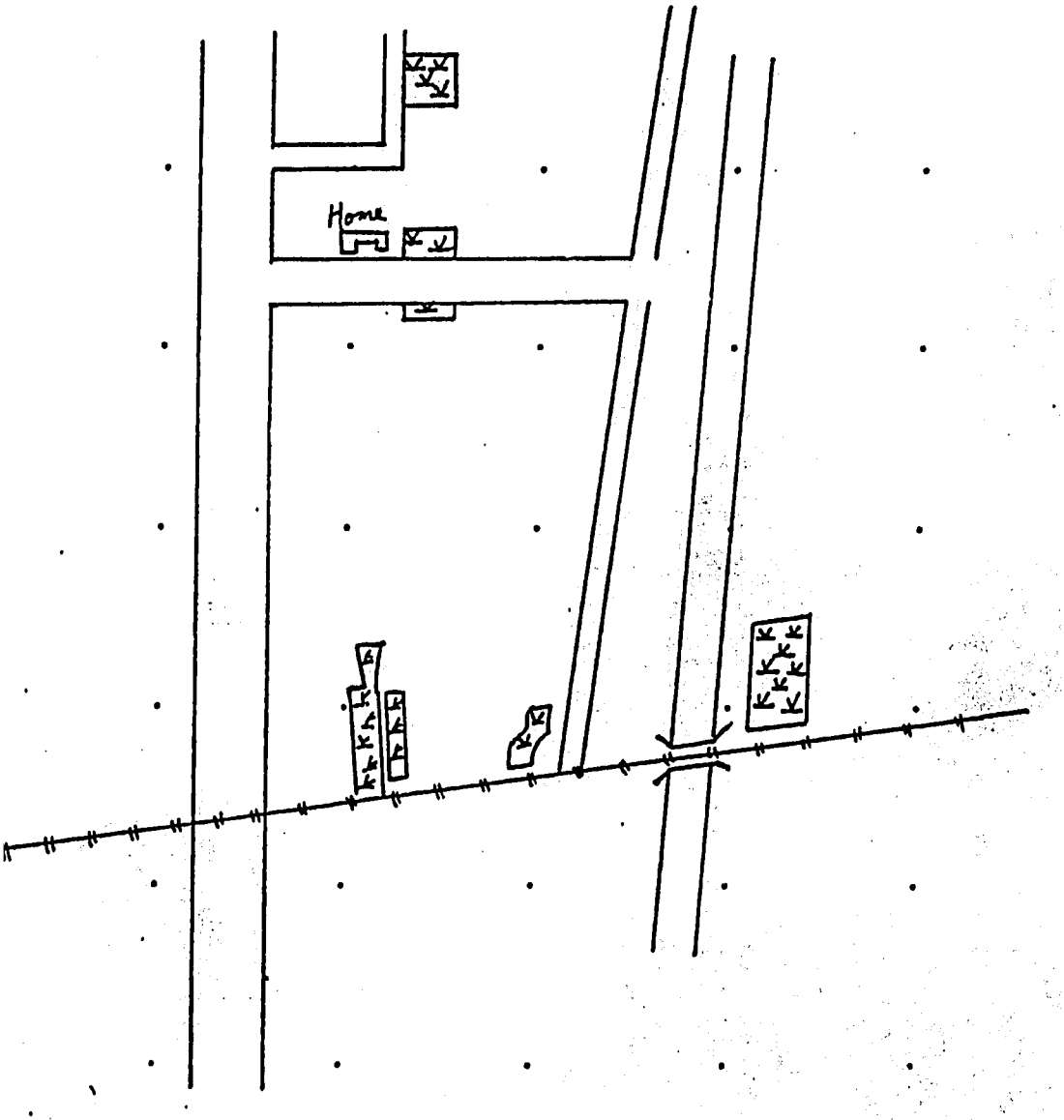
Total values from different parts of the inventory - farm land, buildings, machinery, supplies, etc. - are transferred to the Form 3 - the financial statement.

B. Farm Financial Statement (Balance Sheet)

Form 3 comprises three parts of the financial statement: assets, liabilities and net worth. All assets include farm assets and non-farm

Form 1
FARM MAP

Present System
Alternate. No.



Layout of Farmer Chiu's Six Farm Parcels at Matou

Form 2

INVENTORY OF RESOURCES

Name: Farmer Chiu P.I. First of Year 1976

I. FARM ASSETS:

A. FARM LAND:

1.	0.12 / 0.14 ha	x NT$800,000 / NT$700,000/ha	=	NT$96,000 / NT$98,000
2.	0.42 / 0.72 ha	x NT$500,000 / ____/ha	=	NT$210,000 / 360,000
3.	0.49 / 0.50	NT$400,000 / 800,000		NT$196,000 / 400,000
	Total land			NT$1,360,000

B. FARM BUILDINGS:

1.	Barn	____
2.	Machine Shed	____
3.	Warehouse	NT$10,000
4.	Compost house	NT$5,000
5.	Hog pen	NT$20,000
6.	Poultry house	NT$3,000
7.	Drying ground	NT$5,000
8.	Others	2,000
9.	Total Buildings	NT$45,000

C. MACHINERY & FARM EQUIPMENT:

1.	Tractors & Other Power	____
2.	Power sprayer	NT$4,600
3.	Manpower sprayer	NT$1,360
4.	Hand cart	NT$1,500
5.	Power thresher	NT$15,000
6.	Sweet potato shredding	NT$1,200
7.	Machine Ox cart	NT$15,000
8.	All Other	NT$26,000
9.	Total Equipment & Power Units	NT$64,660

D. LIVESTOCK:

	Kind	No.		Price/Head		Value
1.	Cows	0	x	____	=	0
2.	____	____	x	____	=	____
3.	____	____	x	____	=	____
4.	____	____	x	____	=	____
5.	____	____	x	____	=	____
6.	____	____	x	____	=	____
7.	____	____	x	____	=	____
8.	____	____	x	____	=	____
9.	Total Livestock for breeding					NT$ 0

E. FEED, GRAIN, & SEED

	Kind	Amount	x	Price	=	
1.	Corn	____	x	____	=	____
2.	Rice	____	x	____	=	____
3.	Lima bean	50 Catty	x	50 NT$/Catty	=	2,500
4.	Califlower	1 Catty	x	1,600 NT$/Catty	=	1,600
5.	____	____	x	____	=	____
6.	____	____	x	____	=	____
7.	____	____	x	____	=	____
8.	____	____	x	____	=	____
9.	Total Feed, Grain Seed					4,100

F. OTHER FARM ASSETS:

1.	Fertilizer	NT$6,100
2.	Chemicals	NT$3,280
3.	Total, Other Assets	NT$9,380

one Catty = 600 grams

Form 3

FARM FINANCIAL STATEMENT

		First of Year 1976
II. SUMMARY OF ALL ASSETS:		
A. FARM ASSETS:		
1. Farm Land (Line A-3, Form 2)	NT$1,360,000	
2. Farm Buildings (Line B-9, Form 2)	45,000	
3. Farm Equipment (Line C-9, Form 2)	64,660	
4. Livestock (Line D-9, Form 2)	0	
5. Feed, Grain, & Seed (Line E-9, Form 2)	4,100	
6. Other Farm Assets (Line F-3, Form 2)	9,380	
7. Total Farm Assets		NT$1,483,140
B. NON-FARM ASSETS:		
1. Cash on Hand	NT$80,000	
2. Household & Personal Items	NT$254,800	
3. Other Non-Farm Investments	NT$4,000	
4. Total Non-Farm Assets		NT$338,800
C. TOTAL FAMILY ASSETS:		NT$1,821,940
III. LIABILITIES (DEBTS):		
A. FARM DEBTS:		
1. Farm Real Estate Loans	NT$30,000	
2. Notes		
3. Accounts Payable		
4. Other		
5. Total Farm Debts		NT$30,000
B. ALL OTHER DEBTS (PERSONAL & BUSINESS)		
C. TOTAL ALL LIABILITIES		NT$30,000
IV. NET WORTH: (LINE II-C — LINE III-C, Form 3)		NT$1,799,940
NET WORTH ONE YEAR EARLIER (Jan. , 1975)		NT$1,766,240
CHANGE IN NET WORTH (INCREASE + OR DECREASE -)		NT$(+) 33,700

liabilities and net worth. All assets include farm assets and non-farm assets and make a total value of NT$1,821,940. Different kinds of liabilities (debts) - short-term, intermediate, and long-term - are also summed to determine total liabilities valued at NT$30,000. By subtracting total debts from total assets, the net worth is NT$1,799,940. As compared with the net worth one year earlier, the change showed a positive increase of NT$33,700.

C. Summary Farm Investment Capital

Form 4 shows the summary farm investment capital. Data from the inventories and financial statement are also transferred to Form 4 to summarize capital investments in machinery, buildings, land, and land improvements. Chiu's Farm is a vegetable farm without breeding livestock, thus the total farm investment capital, including farm land, farm buildings, and farm equipment, is NT$1,469,660.

Farm investment capital is defined as the average value of intermediate and long-term farm assets owned. It can be used for present farm plans and for each alternative plan considered.

D. Summary of Cropping System

Form 5 shows a summary of physical and labor inputs, and income over variable costs for each crop. Crops and land use are accounted for in columns 1 and 2. Per hectare crop budget information (columns 3, 4 and 5) is used to calculate the totals.

Summary of cropping system is analyzed to evaluate the productivity of the present system. It should be done by each crop and each plot. Whether or not this is economically desirable will be revealed by the evaluations on Forms 6 to 9 and 11.

INSTRUCTIONS: FORM 4. FARM INVESTMENT CAPITAL

Use this form to estimate the farm investment capital for your present plan and for each alternative plan considered. Farm investment capital is defined as the average value of intermediate and long-term farm assets owned. Current farm assets (inventories of market livestock, feed, crops; etc.) are not included as farm investment capital.

Average value of breeding livestock units include: investment in the breeding animal (sow, cow, etc.) plus the share of sire and replacement animal per unit. Average value for machinery, equipment, buildings, land, etc., is explained in footnote 1.

Total values (Column 4) are transferred to Form for further analysis.

Form 4

Present Plan ____

SUMMARY FARM INVESTMENT CAPITAL

Alternative No. ____

LINE	Item and Description	Year to Invest	New Cost	Average Value[1]	Total Value
	(1)	(2)	(3)	(4)	(5)
1	Breeding Livestock: (Show King)				
2	_____ _____(units) x ___NT$___/unit =			NT$	
3	_____ _____(units) x ___NT$___/unit =			NT$	
4	Total Breeding Livestock Capital (Line 2 = Line 3)				NT$0
5	Machinery & Equip. (Present)(Form 3, II-A-3)			NT$	
6	Added:[2]				
7					
8					
9	Carabao				
10	Total Mach. & Equip. Capital (Lines 5 thru 9)				NT$ 64,660
11	Bldgs. & Facilities (Present)(Form 3, II-A-2)			NT$	
12	Added:[2]				
13					
14					
15					
16	Total Bldgs. & Facilities Capital (Lines 11 thru 15)				NT$ 45,000
17	Land and Land Improvements[3] (Present) _____ ha. x NT$ ____ /ha. =				
18	Added:[2]				
19					
20	Total Land & Land Improvement Capital (Lines 17 thru 19)				NT$ 1,360,000
21	Total Farm Investment Capital (Sum of Lines 4, 10, 16, and 20)				NT$ 1,469,660

[1] Present system values for Lines 5 and 11 are depreciated values (such as those on depreciation schedule). For new machinery and equipment added in alternative system, average value equals approximately 1/2 of new cost. For new buildings, fences, and facilities added, average value equals approximately 3/4 of new cost. For non-depreciable items (such as land), average value equals new cost.

[2] Disinvestment may also considered in alternative plan. Values of machinery, equipment, facilities, land, etc., not needed in alternative plan are entered as negative figures in Column 4.

[3] Does not include value of dwelling, farm buildings, fences, and facilities.

INSTRUCTIONS: FORM 5. CROPPING SYSTEMS

Use this form to calculate total income over variable costs, hours labor, and farm feed production for the cropping system of each plan considered.

Crops and land use are accounted for in Columns 1 and 2. Per hectare crop budget information (Columns 3, 4, and 5) is used to calculate the totals (Columns 6, 7, and 8). Note: interest paid on crop operating capital is part of the variable costs per acre. Per hectare budgets for rented crops should be adjusted for yields and income over variable costs as needed.

On Line 20, sum Columns 2, 7, and 8. Transfer totals of Columns 7 and 8 to Form , Line 6.

Form 5
SUMMARY: CROPPING SYSTEM

Present Plan
Alternative No.

LINE	Crop & Land Use	Total Ha.[1]	PER ha BUDGETS			BUDGET TOTALS			OTHER CROPS DATA		
			Average Yield (kg)	Income over variable costs	hrs direct labor	Production	Income over variable costs	hrs direct labor	Crop variety	Fertilizer Needed Kind	Fertilizer Needed Amount/ha. (kg)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
						2x3	2x4	2x5			
1	Cauliflower	0.41	10,910	80,682	1.011	4,473	33,080	415		Chemical fertilizer	300 kg/ha
2	Spinach	0.41	26,664	52,371	3,227	683	21,472	1,323		"	619 kg/ha
3	Processing tomato	0.82	62,916	9,411	1,091	51,591	7,717	895	UC	"	452 kg/ha
4	Lima bean	0.59	12,395	77,721	2,971	7,313	45,855	1,753		"	464 kg/ha
5	Sweet potato	0.85	29,500	4,250	626	25,075	3,613	532	New 31	"	130 kg/ha
6	Kohlrabi	0.27	16,032	20,910	1,156	4,329	5,646	312		"	357 kg/ha
7	Celery	0.03	41,492	158,707	9,833	1,245	4,761	295		"	442 kg/ha
8	Rice	1.6	2,725	14,914	1,283	4,360	23,862	2,053		"	750 kg/ha
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20		2.38					146,006	7,578			

[1] When land is double cropped, list first and second crops separately. Circle acreage of second crop and do not add circled figures in Col. 2.

Present System___
Alternative No.___

Form 6
SUMMARY; LIVESTOCK SYSTEM

LINE	Livestock Enterprise	Total Units	Per Unit Budgets: Income over var. Costs	Per Unit Budgets: Hrs Labor Needed	Budget Totals: Income over var. Costs	Budget Totals: Hrs Labor Needed
	(1)	(2)	(3)	(4)	(5)	(6)
			NT$		2x3	2x4
1	Hog	10	1,687	54	NT$ 16,870	540
2						
3						
4						
5						
6	Totals (Sum of Lines 1 thru 5				NT$ 16,870	540

Form 7
VALUE OF FARM PRODUCED FAMILY FOOD (VFP)

LINE	Food Item	Unit	Amount used	Price Per Unit	Total Value
	(1)	(2)	(3)	(4)	(5)
1	Grains: Rice	kg	668	NT$11	NT$7,348
2	Green Corn				
3					
4					
5					
6	Total Value of Grains Consumed				NT$7,348
7	Fruits and Vegetables: Okra			NT$	
8	Squash				
9					
10					
11	Melons				
12					
13					
14	Total Value of Fruits and Vegetables Used				NT$
15	Livestock and Fish			NT$	
16					
17					
18					
19					
20					
21	Total Value Livestock and Fish				NT$0
22	Total VFP (Sum of Lines 6, 14, and 21)				NT$ 7,348

Form 8
LABOR SUMMARY

L.	Labor Required for	Total Labor Needed*: M.D.s	M.G.	Hours
	(1)	(2)	(3)	(4)
1	Crops: (Form 4-Line 20, Col. 8)			7,578
2	Livestock: (Form 5A-L. 6, Col.6)			540
3	Producing Grain for Family Food (Est.)			520
4	" Fruits & Veg. " " " "			0
5	" Livestock & Fish " " " "			0
6	Total Production Labor (Sum of L.1-5)			8,638
7	Miscellaneous Labor (10% x L.6)			864
8	Total Labor Needed (L.6 + L.7)	1,188		9,502
9	Total Family Labor Available	1,320		10,560
10	Hired Labor Needed (L.8 - L.9)			0

*If preferred, labor in Man Days (Col. 2) may be converted to either months or hours: 1MD=8 hrs: 25 MDs (200 hrs.)=1 month.

Form 9

Labor[1] Distribution Analysis — Complete Farming System Labor

Cooperator Name P. I. Chiu Address _____ Size of Unit _____ Owned _____ Rented _____

Line	Labor[1] Item	Total Hours	Jan. %	Jan. Total	Feb. %	Feb. Total	March %	March Total	April %	April Total	May %	May Total	June %	June Total	July %	July Total	August %	August Total	Sept. %	Sept. Total	Oct. %	Oct. Total	Nov. %	Nov. Total	Dec. %	Dec. Total
			Labor in Adult Labor Equivalent Hours by Months																							
		(2)		(3)		(4)		(5)		(6)		(7)		(8)		(9)		(10)		(11)		(12)		(13)		(14)
1	Family Labor[1] Available	10,560	8	878	9	896	8	792	9	960	5	534	7	720	8	866	4	420	8	840	13	1382	12	1280	9	992
2	Labor Required:	2,053							1	22	4	91	19	387	27	547	10	208	7	134	22	448	10	216		
3	Cauliflower	415																	39	163	34	139	27	113		
4	Spinach	1,323	15	195	22	287	7	98	12	156									10	129	18	237	6	88	10	133
5	Processing Tomato	895	9	84	10	92	23	201	8	72									5	44	13	115	25	222	7	65
6	Limabean	1,753	11	195	15	266	21	366	11	201									2	32	6	97	18	320	16	276
7	Sweet Potato	532	14	76			17	90	19	102									24	126	11	60	10	54	5	24
8	Kohlrabi	312																	29	90	31	97	38	119	2	6
9	Celery	295	57	170															3	8	3	8	10	29	27	80
10																										
11	Livestock Labor: Pigs	540	8	45	8	45	6	31	11	59	10	52	7	40	7	37	9	49	12	63	7	35	6	33	9	51
12	Farm Produced Family Labor: Rice	520									5	24	13	66	38	200	13	70	8	40	23	120				
13																										
14	Miscellaneous Labor	864	4	32	3	28	0	0	37	320	27	231	14	124	5	40	6	54	0	0	0	2	3	25	1	8
15																										
16																										
17	Off-Farm LABOR	615	0	0	16	96	0	0	0	0	16	96	0	0	7	42	2	16	0	0	4	24	10	61	45	280
18	Total Labor Required	10,117	XX	797	XX	814	XX	786	XX	932	XX	494	XX	617	XX	866	XX	397	XX	829	XX	1382	XX	1280	XX	923
19	Labor Balance (+ or −) L.1. vs L.18	443	XX	81	XX	82	XX	6	XX	28	XX	40	XX	103	XX	0	XX	23	XX	11	XX	0	XX	0	XX	69
20	Labor to be Hired		XX		XX		XX		XX		XX		XX		XX		XX		XX		XX		XX		XX	

1) All labor hours represent Adult Labor Equivalent hours: To be calculated from household Composition data for Pilot-scale Farms

E. Labor Summary and Value of Farm Produced Family Food (VFP)

Forms 6 to 9 show the value of farm-produced family food and a labor summary. Chiu's family consumed 668 kg of farm-produced rice, valued at NT$7,348. Form 8 and 9 show that the total farm labor needed was 9,502 hours for the year, of which 7,578 hours (80% of total labor needed) were applied to crop production. The total family labor available was 10,560 hours in 1976. Since the family labor was more than the total labor needed, and children or exchange labor can solve the peaks in labor use, Chiu's farm had no need for hired labor during the year.

F. Income and Profitability

Form 10 was designed for computing the approximate profitability of farm business. Much of the data are summarized from earlier worksheets. Farm investment capital figures were transferred from Form 4, while labor requirements and income over variable costs for crop production were transferred directly from Forms 5 to 9.

As shown in Form 10, farm business profit was the first returns measure calculated - net cash farm income minus depreciation. For Chiu's farm, the farm business profit was accounted for as NT$136,205 (line 20). Then, adding the value of farm produced family food (line 21), the total profit was obtained (line 22). Chiu's farm showed a total profit of NT$ 143,553. Total profit minus family labor and management charge is the return to capital. Line 25 shows a minus NT$126,962 for Chiu's farm, representing a negative return to capital.

Return to family labor and management (line 28), return to family labor (line 29), and return to family labor per man-day (line 30) are other profit measures calculated on Form 10.

Form 10

Present System

SUMMARY: CAPITAL, LABOR, INCOME & SUMMARY

Alternative No. ___

LINE	Item	Details	Totals
	(1)	(2)	(3)
	Farm Investment Capital: (Data From:)		
1	Breeding Livestock (Form 4, Line 4, Col. 5)	NT$ 0	
2	Machinery & Equipment (Form 4, L. 10, Col. 5)	64,660	
3	Buildings & Facilities (Form 4, L. 16, Col. 5)	45,000	
4	Land & Improvements (Form 4, L. 20, Col. 5)	1,360,000	
5	Total Farm Investment Capital (Form 4, Line 21)		NT$ 1,469,660
6	Total Labor Needed (Form 8, L. 8, Col. 2 (M.D.)		
	Income Over Variable Costs		
7	From Cropping System (Form 5, Line 20, Col. 7)	NT$ 146,006	
8	From Livestock System (Form 6, L. 6, Col. 5)	16,870	
9	Total Income Over Variable Costs (L. 7 + L. 8)		NT$ 162,876
	Other (Unallocated) Cash Costs & Net Cash Income:		
10	Hired Labor (Form 8, L. 10, ____ MD x ____ /MD =	NT$ 0	
11	Cash Rent Paid: ____ ha. x ____ /ha. =	0	
12	Real Estate Taxes: (Est. ____ % x L.5 =)	14,697	
13	Bldg. Insurance & Repairs (Est. ____ % x L. 3 =)	0	
14	Miscellaneous Expense (Est. 2% x L. 9 =)	3,258	
15	Total Unallocated Costs (Sum of Lines 10 thru 14)		NT$ 17,955
16	Net Cash Farm Income (L. 9 – L. 15)		14,921
	Depreciation:		
17	Machinery & Equipment (Est. 10% of L. 2)	NT$ 6,466	
18	Buildings & Facilities (Est. 5% of L. 3)	2,250	
19	Total Depreciation (L. 17 + L. 18)		NT$8,716
	Returns:		
20	Farm Business Profit (L. 16 - L. 19)	NT$ 136,205	
21	Value of Farm Produced Family Food (VFP) (Form 7, L.22)	7,348	
22	Total Profit (L. 20 + L. 21)		143,553
23	Family Lab. (Form ____, L. 9) 1,320 MD x NT$200/MD =	264,000	
24	Management Charge (Est. 4% x L.9)=	6,515	
25	Return to Capital (L. 22, - L.23 - L. 24)		-126,962
26	Percent Return to Capital (L. 25 ÷ L. 5 x 100)		-8.64 %
27	Charge for Investment Capital (L. 5 x 12%)	NT$ 176,359	
28	Return to Family Labor & Management (L. 22 - L.27)		NT$ -32,806
29	Return to Family Labor (L. 28 - L. 24)		-39,321
30	Return to Family Labor Per M.D. (L. 29 ÷ 1,320 M.D. (Form 8 L. 9)		-29.79

With respect to the negative return to capital, it seems that Chiu's farm business could not survive in the long-run without providing a profit. Thus, an alternative farm plan should be selected for improving farm business.

G. Cash-Flow Feasibility

Form 11 together with Form 12, for estimating principal and interest payments, provide a method of calculating the feasibility of a proposed plan from the standpoint of cash flow.

As shown in Form 11, total net cash income (line 3), estimated cash available before family living expenses, debts, and taxes) was NT$144,921 for Chiu's farm. After deducting interest paid and family living expenses, cash available before payments (line 8) was NT$53,421. Compared with total annual principal payments, Chiu's farm could have a balance of NT$43,421. In view of cash flow, the balance could be used for savings although both capital return and labor return show negative figures in the accounting procedure.

H. Comparing the Profitability of Chiu's Farm

For comparing the profitability of adding alternative garden enterprises to Chiu's farm, we used AVRDC's garden cropping patterns in Chiu's farming system for comparative analysis. As shown in Form 13, Thailand garden (alternative No. 2) ranked first in value of farm-produced family food while the market garden had a highest value of total farm profit.

DIRECTIONS: FORM11, DEBT REPAYMENT AND AVAILABLE CASH

Use this form (along with supporting Form12) to determine the expected cash flow consequences of each plan being considered:

1. Total net cash income (line 3) is the estimated cash available before family living, debts, and taxes.
2. Interest paid on I.T. and L.T. debts (Line 4) is calculated on Form12.
3. Family living expenses include: food, clothing, household operation, recreation, helath, auto expense, life insurance, education, contributions, etc. Cash costs of family living often exceed expectations of those who do not keep complete records through the year. Estimated family living expenses for Chiu Farm in 1976 was summarized below.

	Value	%
All food	NT$28,827	32.03
Clothing	5,508	6.12
Household operation	6,489	7.21
Household equipment and furnishings	5,202	5.78
House expenses (rent, repairs, etc.)	4,005	4.45
Personal items	12,231	13.59
Recreation	1,809	2.01
Education	1,350	1.50
Doctor, dentist, medicine and drugs	9,648	10.72
Temple, charity	13,284	14.76
Gifts	1,647	1.83
Total family living expense	NT$90,000	100.00

Number of persons in household was: adult 5

child 6

FORM 11
SUMMARY: DEBT REPAYMENT & AVAILABLE CASH
(optional)

Present Plan____
Alternative No.____

	Item	Details	Totals
	(1)	(2)	(3)
1	Net cash farm income (Form 10, Line 16)	NT$144,921	
2	Non-farm income	0	
3	Total net cash income (Line 1 + Line 2)		NT$144,921
4	Interest paid on I.T. & L.T. debts (see Form 12, Line 6)	NT$1,500	
5	Est. income tax	0	
6	Family living expenses (estimate)	90,000	
7	Subtotal (sum Lines 4, 5, 6)		NT$91,500
8	Cash available before payments (Line 3 minus Line 7)		53,421
9	Total annual principal payments (Form 12, Line 5)		10,000
10	Net cash available or balance (Line 12 minus Line 9)[1]		43,421

[1]May be used for replacement of capital items, new investments, and cash reserve.

FORM 12
ESTIMATING ANNUAL PRINCIPAL & INTEREST PAYMENTS
(optional)

Present Plan____
Alternative No.____

	Item[1]		Average[2] principal payment	Average[3] debt	Average interest rate	Average[4] interest paid
	(1)		(2)	(3)	(4)	(5)
	BEGINNING DEBTS:					
1	Intermediate (1-9 years)	NT$30,000	NT$10,000	NT$15,000	10 %	NT$1,500
2	Long term (10+ years)	NT$	NT$	NT$	%	NT$
	ADDED DEBTS:					
3	Added intermediate	NT$	NT$	NT$	%	NT$
4	Added long term	NT$	NT$	NT$	%	NT$
5	Total Principal Payments (sum Lines 1, 2, 3, 4)		NT$10,000			
6	Total Interest Paid (sum Lines 1, 2, 3, 4)					NT$1,500

[1]Enter beginning debt amounts in Col. 1 blank.

[2]Estimate the average principal payment on the beginning debts over the next 5 years.

[3]Estimate of average debt over next 5 years = beginning amount (Col. 1) less 2½ principal payments (Col. 2).

[4]Estimate average interest paid on I.T. and L.T. debts = average debt (Col. 3) times average interest rate (Col. 4).

Form 13 Comparing the profitability of adding alternative garden enterprises to Chiu's farm

Analysis Factor	Farmer's Present System	Alternative No. 1 Indonesia Garden	Alternative No. 2 Thailand Garden	Alternative No. 3 Philippine Garden	Alternative No. 4 Vitamin A Garden	Alternative No. 5 Market Garden
	(NT$)	(NT$)	(NT$)	(NT$)	(NT)	(NT$)
1. Investment capital	1,469,660	1,469,660	1,469,660	1,469,660	1,469,660	1,469,660
2. Labor requirement	(MD) 1,188	1,197	1,197	1,196	1,198	1,253
3. Income over variable cost	162,876	162,876	162,876	162,876	162,876	175,295
4. Unallocated variable cost	17,955	18,307	18,385	18,343	18,313	24,230
5. Net cash income	144,921	144,569	144,491	144,533	144,563	151,065
6. Farm business profit	136,205	135,853	135,775	135,817	135,847	142,349
7. Valur of farm produced family food	7,348	10,367	10,607	9,224	10,115	7,348
8. Total farm profit	143,553	146,220	146,382	145,041	145,962	149,697
9. Return to capital	- 126,962	- 124,295	- 124,133	- 125,474	- 124,553	- 121,315
10. % return to capital	- 8.64%	- 8.46%	- 8.45%	- 8.54%	- 8.47%	- 8.25%
11. Return to labor and management	-32,806	-30,139	-20,977	- 31,318	-30,397	-26,662
12. Return to labor/month	-3,277	-3,055	- 3,041	-3,153	-3,076	- 2,806
13. Return to management	6,515	6,515	6,515	6,515	6,515	7,012
14. Net cash available	43,421	43,069	42,991	43,033	43,063	49,565

VIII. CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions:

The feasibility study of the AVRDC garden system is economically sound for an evaluation of comparative advantages among gardens. The main points obtained from the economic analysis are:

1. Among four types of home garden demonstrated in AVRDC there is more labor used than capital inputs (which can be afforded by the poor) and the input costs of nutrient type are far lower than their relative nutrient costs in Taiwan. It's economically sound and extendable to the rural poor in Taiwan. In countries like Thailand the wage rate is lower than that in Taiwan and there are many subsistence-type farms employing female family labor. Our data conclude that the AVRDC home garden type is economically applicable to Thailand.
2. There are 15 kinds of vegetables chosen from the home gardens which are lower in input costs of nutrient production (i.e., low cost, high nutrition). These crops can be introduced to the rural poor for planting in Taiwan.
3. There is no significant correlation between intensive land use and low input costs of nutrient production. However, we still want to suggest intercropping some garlic or shallot in the home gardens in order to get rid of insects (i.e., biological control).
4. Daily harvests should be made both for more efficiency in family labor use and to maintain a daily supply of vegetables.

5. Limabean and soybean are nutritious crops (rich in vegetable protein). Technology on planting these crops should be carefully developed and extended to small farmers.
6. Vegetables from the AVRDC school garden can significantly contribute to the daily intake of protein, Vitamin A and C, and minerals for 100-200 children aged 10-12 years. These results make the school garden suitable for transfer from AVRDC to Asian countries.
7. During the typhoon or rainy season, short duration leafy vegetables (such as ching-chiang pai-tsai, and rape green) have potential to earn a good price. Thus, these crops are worth planting in the market garden.
8. Since vegetables are perishable, proximity to transportation facilities and appropriate markets are important for market garden production.
9. Unmarketable yield can be consumed by farmers themselves. Market gardens can thus have a combined function between home garden and income-generation garden. Therefore, a market garden system is suitable to introduce to those areas that are close to the market.
10. To Chiu's farm the Thai garden could provide a better food supply for home consumption and the market garden could provide a good profit for farm business.
11. There are all negative return to capital and labor for Chiu's farm and AVRDC's gardens. The persistence of low returns to farm resources implies that it is very difficult for the Taiwan farm sector to compete with non-farm sector (Taiwan has an expanding industry and hourly wage rates are relatively high). In the long-run, Taiwan's farm sector could not survive unless appropriate

government policy is undertaken for the purpose of agricultural protection. This suggests that, as developing countries such as Thailand develop to the point where Taiwan is today, government price-support programs may have to be instituted to keep farmers on the farms.

Not only are the gardens economically feasible but they have demonstrated their technical feasibility. AVRDC has tested these gardens for a full year under Taiwan conditions to see if they are able to reach the objectives set for them. After a year of data collection and analysis we found that the three gardens we analyzed (home, school and market gardens) all more then met their measurable objectives[1/].

The objective of the school garden is to develop a garden that can be grown at a school and that will provide ½-cup (approximately 113 grams, edible portion) of nutritious vegetables to each of 40 or 80 children, 5 days per week, throughout a school year growing and harvesting period. The analysis showed that this garden will provide the ½-cup of vegetables to 134 children.

The objective of the home garden is to provide for a family of five (two adults; three children) certain percentages of their recommended daily allowance (RDA) of Calcium (40%), Iron (40%), Vitamin A (80%), Vitamin C (100%) and measurable amounts of protein. After analyzing the four AVRDC gardens for a year the data showed that the gardens can produce for a family of five the following percentage ranges of their RDA: Calcium (49-81%), Iron (77-112%), Vitamin A (128-213%), Vitamin C (425-524%) and protein (20-25%).

[1/] A summary report of the garden program, 1981-82 can be obtained from AVRDC.

The objective of the market garden is to increase a family's income by 30%, based on an annual household income among the rural poor of US$ 1000 per annum. This is to be done by developing a garden that grows quality vegetables for sale at local markets. The results of the market garden show that over the year the garden made a net income of US$310, slightly exceeding its measurable objective of US$300.

B. Recommendations

The project is concerned with the need for the rural poor to increase their income and nutritional status. For the problem to be solved, we must analyze its nature and then be in a position to respond to measures being taken to reach a better nutrition intake. At the same time integrated programs, with an increase of farm production and its impact on both the income and nutrition of farmers, will be priority areas in rural development. With respect to the project purpose, the following would be recommended for further consideration:

1. An additional objective of the project could be higher output per man (through education) rather than only higher output per land unit, for this is another quantitative way to measure a rising standard of living. There should be scope in farming for the man with skill. Thus, farmer training programs are essential to this project.
2. Achieving self-sufficiency for the rural poor will be characterized by increasing marginal costs as cultivation is intensified. Some kind of extension assistance is recommended for the project so the rural poor will eventually adopt it.

3. The study still lacks family farm data, thus further planning for the family farm is presently impossible. It is recommended that detailed studies of the Taiwan family farm as an economic unit be conducted for ongoing success of this project. This means expansion of AVRDC's Agricultural Economics group to gain in-depth experience in F/FLS data-gathering and analysis.
4. It is necessary to explore additional technological alternatives. Diagnosis of a farmer's background on social or cultural acceptance, resources and production alternatives should also be made.
5. There should be an institutional and organizational structure to support the extension of the new technology to a large number of farmers. The project research program must have an institutional component (e.g., Dept. of Agricultural Extension of the Ministry of Agriculture) directed specifically at the institutional issues associated with the major technolgical problems to be attacked.
6. AVRDC collected in-depth, comprehensive data for the overall analysis. For Thailand conditions, simpler forms of data may be collected, but with the approval of the responsible Thai Ag Economist.
7. Both the garden technology and the economic methodology are feasible. We recommend these technologies be transferred to developing countries in the form of training of scientists and agricultural extension agents. In the transfer of the technologies to Thailand, AVRDC is planning to train agricultural extension agents from the Thai Ministry of Health, and also train

scientists from Kasetsart University. This could result in not only an efficient transfer of technology, but it can further result in the building of the institutional capabilities of Kasetsart University and the Thai Dept. of Agricultural Extension, and enable them to be able to do such work in the future.

8. The complete gardens system technology will enhance the role of women in development because the gardens are mainly an activity carried out almost exclusively by women and children. In developing countries women are often completely responsible for providing the household food and in augmenting household income. Engaging in AVRDC-designed garden activities can serve both purposes. We recommend to USAID missions concerned with women in development, that they consider adopting one or more of these garden programs as a culturally acceptable form of getting women more involved in activities that relate to nutrition and income-generation in the short run, and to national development in the long-run.

9. This feasibility study should be continued at AVRDC to further improve the technology and to tailor it to Asian conditions.

APPENDICES

I. WORKSHEETS FOR ANALYTICAL PROCEDURES TO BE USED IN EVALUATING GARDENS AND FARMING/FAMILY LIVING SYSTEMS (F/FLS)

Worksheets for making essential calculations for evaluating gardens and farming family living systems are compiled as follows:

A. Data Collection Worksheets on Farm

Worksheet 1	Farm map
Worksheet 2	Family members and available labor
Worksheet 3A	Inventory of resources
Worksheet 3B	Farm financial statment
Worksheet 3C	Saving and credit
Worksheet 4	Recordkeeping of each cultural practice, produce sale and expense from F/FLS
Worksheet 5	Summary farm investment capital

B. Coding Worksheets at Office

Worksheet 1-A-1	Continual coding sheet for each cultural practice from crop system
Worksheet 1-A-2	Production cost form
Worksheet 1-B	Continual coding sheet for each farm operation from live-stock system
Worksheet 1-C	Continual coding sheet for each expense from family living system
Worksheet 2	Yearly cropping patterns of each plot from farming system
Worksheet 3	Agricultural commodities price list

C. Summary Worksheets for Analysis

Worksheet 1	Summary of annual value of production and variable costs from farming system by crop
Worksheet 2	Monthly labor used and nutrition acquired by crop
Worksheet 3	Agronomic, economic and nutritional evaluation of crop type

D. Analysis Worksheets

Worksheet 1	Summary of annual value of production from garden unit
Worksheet 2	Economic evaluation of garden enterprise
Worksheet 3	Labor distribution analysis - garden project
Worksheet 4	Summary: cropping system
Worksheet 5A	Summary: livestock system
Worksheet 5B	Value of farm produced family food (VFP)
Worksheet 5C-1	Labor summary
Worksheet 5C-2	Labor distribution analysis - complete farming system labor
Worksheet 6	Summary: capital, labor, income and summary
Worksheet 7	Summary: debt repayment & available cash (optional)
Worksheet 8	Estimating annual principal & interest payments (optional)
Worksheet 9	Comparing the profitability of adding alternative enterprise to farmer's present farm.

APPENDICES

II. PLAN OF ACTION FOR FY 83/84

A. Pre-tasks

Before the AVRDC garden technologies and the farming/family living system (F/FLS) methodologies can be transferred to Thailand some pre-tasks must be accomplished. Inasmuch as the transfer of the project to Thailand will involve cooperation with various agencies in Thailand in order for the project to succeed, these agencies must first be introduced to the project. These pre-tasks are:

1. Introduce the project to USAID-Thailand Mission personnel.
2. Introduce project to cooperating institution, Kasetsart University.
3. Introduce project planning activities to Thai Dept. of Agricultural Extension.
4. Develop working budget with in-country administrator of project, Dr. Charles Yang, AVRDC/Thailand Bilateral Program Director.
5. Develop a work plan with Dr. Yang that will cover the period for which the project is presently funded (i.e., FY 83 +).

B. Tasks

1. AVRDC Garden Program

1.a. Transfer of gardens to Thailand

1.a.1. Familiarize the Thai scientists (Kasetsart University staff; also AVRDC/Thailand Bilateral Program staff), who will be responsible for the gardens, with the

1.a.2. Transfer the garden technologies, data-collection worksheets and analysis procedures to the AVRDC/Thailand Bilateral Program site.

1.a.3. Plant the four gardens at the site.

1.b. Testing of gardens:

1.b.1. Adapt the AVRDC technologies and methodologies to Thai conditions and collect ongoing data for a full agricultural cycle.

1.b.2. Collect data on (at least) the following:

- Yield and nutritional output, by crop and by garden.
- Capital & labor inputs by garden, by bed, by vegetable and by operation.
- Generally, collect data on all inputs/outputs that will measure whether the objectives of each garden has been met.

1.b.3. Collect the following data on data-collection sheets developed at AVRDC:

- The actual weight, in kilograms, of each vegetable crop harvested.
- The nutritional output of each crop in the home and school gardens.
- The gross and net profit (in NT dollars) of the market garden.
- The actual market sale value of each crop in the market garden.

- The cash costs of inputs used in production of the gardens.
- The actual time (minutes and hours) used for producing and harvesting each crop in home gardens.
- The additional time required for transporting market garden vegetables to the market.
- The amounts of fertilizers and pesticides applied.
- General crop management procedures.

1.b.4. Transfer data to coding sheets for analysis.

1.c. Evaluation of economic viability of the gardens:

1.c.1. Analyze production costs & revenues of each garden.

1.c.2. Analyze output per day of each garden and each crop.

1.c.3. Analyze nutrient output (protein, calcium, iron, Vitamins A & C) of each garden and each crop.

1.c.4. Analyze input per nutrient output by garden, by crop and by cropping pattern.

1.c.5. Prepare analyzed data from three of the four garden (not school garden) so that a dual analysis can be conducted on both the gardens and the F/FLS farm families.

1.c.6. Analyze school garden data.

2. Farming/Family Living Systems Methodology

2.a. Familiarize the Thai Agricultural Economist (Kasetsart University staff; also AVRDC/Thailand Bilateral Program staff) with the F/FLS concept, its analytical procedures and data-collecting techniques.

2.b. Introduce Dr. Albert Hagan's specific Farming Systems Approach components to the agricultural economist (prior to Dr. Hagan's pending visit to Thailand on USAID funds):

2.b.1. Family living component.

2.b.2. Land-use component (cropping system).

2.b.3. Livestock system component.

2.c. Adapt the following data-collection sheets to Thai conditions:

2.c.1. Layout of the farm (farm map).

2.c.2. Inventory of resources.

2.c.3. Farm financial statement.

2.c.4. Summary, farm investment capital.

2.c.5. Summary, cropping systems.

2.c.6. Summary, livestock system.

2.c.7. Value of farm-produced family food.

2.c.8. Labor summary.

2.c.9. Summary, debt repayment & available cash.

2.c.10. Summary, capital, labor and income.

2.c.11. Labor distribution analysis.

2.c.12. Comparison of the profitability of adding alternative garden enterprises to the F/FLS.

3. Descriptive/Diagnostic Surveys

3.a. Select an area in which to initiate potential pilot study.

3.a.1. Request assistance in area selection from Kasetsart University and the Thai Dept. of Agricultural Extension.

3.a.2. Choose an area that is in close proximity to the Bilateral Program site.

3.a.3. Choose an area where school gardens can be started at cooperating schools.

3.b. Conduct descriptive/diagnostic survey. Begin by determining characteristics of selected area:

3.b.1. Types of farming systems.

3.b.2. Types of enterprised presently being used in the farming systems.

3.b.3. Types of technologies currently used.

3.c. Choose the types of farming systems that most represent those in the potential pilot study area.

3.d. Survey families of the representative types of systems to find out:

3.d.1. Family size

3.d.2. Income

3.d.3. Education

3.d.4. Eating habits (if Kasetsart University or Ag Extension personnel can do it).

3.d.5. Family living costs

3.d.6. Farm size and makeup

3.e. From the type survey, select one family that represents each major type and begin to collect a full agricultural cycle of baseline data on these F/FLS families.

4. Selecting F/FLS Family Units

4.a. First, find at least one family of each type who will participate in a study that might take two years.

4.b. Then make the particular family selection using the following guidelines:

4.b.1. They want to improve their F/FLS but do not know how (i.e., they have a 'felt need' for improvement in their way of life).

4.b.2. They are willing to cooperate with the researchers.

4.b.3. The farm is in proximity to town or village markets.

4.b.4. The farmer feels his family has enough land, labor and time for initiation into his F/FLS of one of the garden enterprises.

4.b.5. The farm family is willing to provide data that may be of a personal nature (e.g., income).

4.b.6. There is someone in the family who can do the daily record-keeping (e.g., a middle-school family member who perhaps can do it as part of a school project).

4.b.7. They are not at present growing developed vegetable gardens.

5. Monitoring Performance of Pilot Studies

5.a. After cooperating farm families have been chosen, and baseline data collection is underway, performance of the methodologies should be watched. Monitor performance along the way using data-collection techniques recommended by Dr. A. Hagan

5.b. Analyze these data and prepare them for the dual analysis of the F/FLS and the gardens.

5.c. Conduct dual analysis and from the results choose the garden enterprise(s) that best fit each of the 3-4 F/FLS family units.

5.d. During second year of project, initiate the recommended garden enterprise(s) on each unit and monitor performance for another full agricultural cycle.

5.e. Initiate school gardens in pilot study area schools. Monitor performance for one full agricultural cycle.

The methods used for monitoring the performance of the pilot studies are the same as those used to apply the F/FLS analysis to farmer Chiu's data. The techniques for collecting and analyzing the data are explained in the text and are displayed in the various forms, tables and data collection sheets included in this report.

6. Additional Tasks

6.a. Develop curriculum for training of scientists and extension agents in gardening, nutrition, seed technology and economics.

6.b. Initiate training program at Kasetsart University and/or AVRDC.

6.c. Conduct a workshop to evaluate and review the performance of the various pilot studies.

6.d. Turn the project over to the Thai government; assist them in disseminating gardens and F/FLS methodologies to village level throughout the nation.

6.e. Write in-country report and submit to proper cooperating institutions and agencies.

C. Tentative Time Schedule

I. Description of Activities in Tentative Time Schedule

Activity A: Introduce project to USAID Mission in Thailand.

Milestone 1. Meet with Mission director and have him appoint Mission contact people.

Milestone 2-8. Periodically inform contact people of problems and progress.

Activity B: Introduce project activities to Thai Dept. of Agricultural Extension.

Milestone 1. Meet with horticultural, seed and nutrition personnel and introduce project. Request Dept. director to appoint department contact people. Discuss proposed seed production workshop.

Milestone 2. Meet with Dept. of Ag. Extension nutritionist to see if she can provide (or collect) data on food habits of families in target area.

Milestone 3-5. Periodically inform contact people of problems and progress.

Milestone 6. Help coordinate 2-week workshop: Overview of Vegetable Seed Production, sponsored by Thai Dept. of Ag. Extension & Kasetsart University, with AVRDC staff as faculty.

Milestone 7-9. Work with department contact people in planning farm surveys: seed sources.

Activity C: In-country administration

Milestone 1. Develop workable activities budget with in-country project director.

Milestone 2. Develop work plan with in-country project director.

Milestone 3-6. Periodically meet with in-country director and adjust budget expenditures and work schedule as necessary.

Activity D: Transfer of Garden Program to Thailand.

Milestone 1. Familiarize AVRDC/Thailand Bilateral Program scientists who will be in charge of gardens on the objectives of the gardens and what inputs/outputs are needed.

Milestone 2. Prepare land; select crops to be planted; plant first garden crops.

Milestone 3. Adapt data-collection sheets (designed at AVRDC) to Thai conditions; collect agronomic and microeconomic data until next seasonal change of crops.

Milestone 4-5. Analyze data; plant new crops; collect data until next seasonal change of crops.

Milestone 6. Analyze data from full agricultural cycle and see if gardens met objectives. Make data ready to analyze in terms of F/FLS analysis, prior to initiating gardens in the pilot project study.

Activity E: Nutritional Analysis.

Milestone 1. Meet with Kasetsart University biochemist and plan sampling and analysis procedures.

Milestone 2. Pre-test analytical procedures on some arbitrary crops to make sure methods work.

Milestone 3-5. Sample and analyze garden crops from each seasonally different garden or crop.

Milestone 6. Submit year-end report on findings.

Activity F: Transfer of F/FLS Analytical Procedures to Thailand.

Milestone 1. Meet with in-country administrator to select a Kasetsart University Ag. Economist who will be responsible for the F/FLS economic analysis. Brief the person on the project goals.

Milestone 2. Familiarize the Ag. Economist with the data-collection methods developed at AVRDC.

Milestone 3. Select pilot study area. Plan and initiate a descriptive/diagnostic survey in pilot study area to ascertain the different types of F/FLS families that exist.

Milestone 4. From survey select 3-4 representative F/FLS families who will be willing to cooperate in the study. Adapt the data-collection sheets developed at AVRDC to Thai conditions. Start collecting baseline data on F/FLS families.

Milestone 5. Conduct partial analysis of F/FLS baseline data. Adjust as needed.

Milestone 6. End baseline data collection and conduct analysis on the different types of F/FLS families. Make data ready for dual analysis with the gardens data to select project alternatives.

Milestone 7. Make preparations to initiate recommended garden enterprise(s) on selected F/FLS families.

Activity G: Research Monitoring.

Milestone 1. Check on data-collecting forms and make sure they contain all the necessary categories (i.e., all the input/output data needed to measure project objectives).

Milestone 2. Check on families selected in diagnostic survey for the F/FLS study.

Milestone 3. Monitor results of nutritional analysis.

Milestone 4. Monitor results of gardens, of descriptive survey and initiation of baseline survey among F/FLS families.

Milestone 5. Monitor analysis of the gardens and the F/FLS so that dual analysis can smoothly take place.

Activity H: Training

Milestone 1. Discuss training of extension workers with Dept. of Ag. Extension.

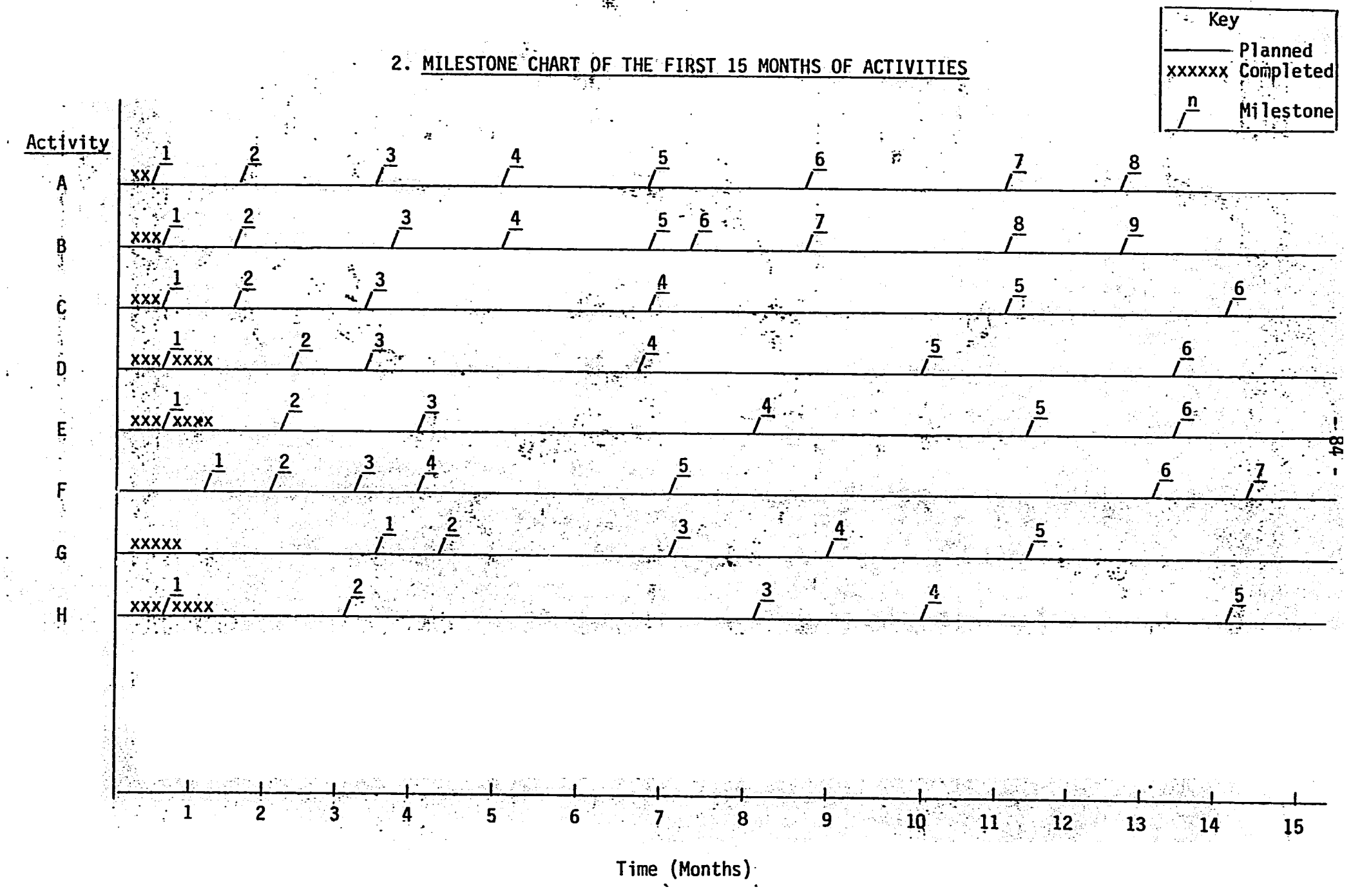
Milestone 2. Develop outline for training curriculum that will combine agriculture, nutrition and farming systems economics.

Milestone 3. Participate in Overview of Seed Production workshop.

Milestone 4. Plan training of additional Kasetsart University staff in gardening and F/FLS. Initiate informal training.

Milestone 5. Use experience in training of Kasetsart staff, plus experience gained in writing a curriculum for training in agriculture/nutrition/F/FLS economics, to plan a training program for Thai Agr. Extension Agents.

2. MILESTONE CHART OF THE FIRST 15 MONTHS OF ACTIVITIES



APPENDICES

III. APPENDED WORKSHEET A. F/FLS data collection worksheets modified for Taiwan

AVRDC Farming/Family Living System (F/FLS) Project

AVRDC
Data Collection
Worksheet 1

FARM MAP

Present System _____
Alternate No. _____

Farmer's name _____, Address _____

Farm size _____, Parcel numbers _____

AVRDC Data Collection
Worksheet 2

AVRDC FARMING/FAMILY LIVING SYSTEM (F/FLS) PROJECT

First of Year 19__

Family Name : _____

FAMILY MEMBERS AND AVAILABLE LABOR

Agricultural labor :

Best Helpers Names { _____ _____ _____ _____ _____

Occasional Helpers Names { _____ _____ _____ _____ _____

Non-Helpers Names { _____ _____ _____ _____ _____

	Name	Relationship to operator	Residence a)	Age (yr.)	Education b) (yr.)	Occupation	Working days/wk S	Working days/wk W	Working hrs/day S	Working hrs/day W	Leave c) days/yr	Off-farm work days/wk	Off-farm work hrs/day	Off-farm work days/yr
1)														
2)														
3)														
4)														
5)														
6)														
7)														
8)														
9)														
10)														
11)														
12)														
13)														
14)														

a) Resident: (#1) lives at home over ½ of the year, and (#2) lives at home less than ½ of the year.

b) If presently in school, state the grade or level.

c) Leaves include holidays, festivals, sick time, etc. on which the farmer doesn't work on farms.

AVRDC
Data Collection
Worksheet 3-A

INVENTORY OF RESOURCES

Name:_____ First of Year 19__

I. FARM ASSETS:

A. FARM LAND:

1. _____ ha x ₱_____/ha = ₱_____
2. _____ ha x ₱_____/ha = ₱_____
3. Total Land ₱_____

B. FARM BUILDINGS:

1. Barn ₱_____
2. Machine Shed _____
3. _____ _____
4. _____ _____
5. _____ _____
6. _____ _____
7. _____ _____
8. Others _____
9. Total Buildings ₱_____

C. MACHINERY & FARM EQUIPMENT:

1. Tractors & Other Power _____
2. _____ _____
3. _____ _____
4. _____ _____
5. _____ _____
6. _____ _____
7. Carabao _____
8. All Other _____
9. Total Equipment & Power Units ₱_____

D. LIVESTOCK:

	Kind	No.		Price/ Head		Value
1.	Cows	_____	x	_____	=	₱_____
2.	_____	_____	x	_____	=	_____
3.	_____	_____	x	_____	=	_____
4.	_____	_____	x	_____	=	_____
5.	_____	_____	x	_____	=	_____
6.	_____	_____	x	_____	=	_____
7.	_____	_____	x	_____	=	_____
8.	_____	_____	x	_____	=	_____
9.	Total Livestock					₱_____

E. FEED, GRAIN, & SEED

	Kind	Amount	x	Price	=	₱_____
1.	Corn	_____	x	_____	=	_____
2.	Rice	_____	x	_____	=	_____
3.	_____	_____	x	_____	=	_____
4.	_____	_____	x	_____	=	_____
5.	_____	_____	x	_____	=	_____
6.	_____	_____	x	_____	=	_____
7.	_____	_____	x	_____	=	_____
8.	_____	_____	x	_____	=	_____
9.	Total Feed, Grain Seed					_____

F. OTHER FARM ASSETS:

1. _____ ₱_____
2. _____ _____
3. Total, Other Assets ₱_____

AVRDC
Data Collection
Worksheet 3-B

FARM FINANCIAL STATEMENT

First of Year 19__

II. SUMMARY OF ALL ASSETS:

A. FARM ASSETS:

1. Farm Land (Line A-3, page 1)	₱_____	
2. Farm Buildings (Line B-9, page 1)	_____	
3. Farm Equipment (Line C-9, page 1)	_____	
4. Livestock (Line D-9, page 1)	_____	
5. Feed, Grain, & Seed (Line E-9, page 1)	_____	
6. Other Farm Assets (Line F-3, page 1)	_____	
7. Total Farm Assets		₱_____

B. NON-FARM ASSETS:

1. Cash on Hand	_____	
2. Household & Personal Items	_____	
3. Other Non-Farm Investments	_____	
4. Total Non-Farm Assets		₱_____

C. TOTAL FAMILY ASSETS: ₱_____

III. LIABILITIES (DEBTS): (For more detail information collecting please use AVRDC Data Collection Worksheet 3-C)

A. FARM DEBTS:

1. Farm Real Estate Loans	₱_____	
2. Notes	_____	
3. Accounts Payable	_____	
4. Other	_____	
5. Total Farm Debts		₱_____

B. ALL OTHER DEBTS (PERSONAL & BUSINESS) _____

C. TOTAL ALL LIABILITIES ₱_____

IV. NET WORTH: (LINE II-C — LINE III-C) ₱_____

NET WORTH ONE YEAR EARLIER (_____, 19__) _____

CHANGE IN NET WORTH (INCREASE + OR DECREASE -) ₱_____

AVRDC
Data Collection
Worksheet 3-C

AVRDC FARMING/FAMILY LIVING SYSTEM (F/FLS) PROJECT

SAVINGS AND CREDIT

Savings

Places Deposited	Amount	Interest Rate	Regularity of Deposits[a]	Major Source[b]

Credit Practices

Source[c]	Amount Borrowed	Amount Paid	Outstanding Loan	Interest Rate	Repayment Schedule	Purpose of Loan[d]

a) During harvest periods; monthly; etc.

b) Crop production, livestock sales, business, working sons' or daughters' contribution, etc.

c) Farmers Bank, Land Bank, FA, underground bank, relatives, neighbors, commercial banks (specify), and others (specify)

d) Agriculture inputs for crop production, buy land, buy equipment, purchase animals, buy animal feeds, major household items, consumption goods, wedding, funeral, etc.

AVRDC
Data Collection
Worksheet 4
Page_____

AVRDC Farming/Family Living System (F/FLS) Project

Worksheet for Record keeping of Each Cultural Practice, Product Sale and Expense from F/FLS

Farmer's name _____ Address _____

Date	(1)										(2)					(3)			
	Farm Operation Description 1/	Plot		Crop Name	Material		Power & labor			Other Expense	Product Sale					F/FLS Expense			
		No.	Area (m^2)		Kind & Amount 2/	Price & Value	Source & Kind 2/	hrs.	Wages		Item	Amount	Price	Value	3/ HC	Item	Amount	Price	Value

1/ Specify farm operation (such as land preparation, furrowing, sowing, transplanting, replanting, basal fertilization, top dressing, weeding, irrigation, mulching, drainaging, watering, transportation, banking, thinning, drying, storaging, staking.....) and their method (such as broadcasting, drilling, hilling...,).

2/ Specify source by P as purchased, H as hired, S as self-owned, M as male and F as female (such as SF as Self female labor) and kind by animal, tractor.....

3/ Specify HC as home-consumed by using "X".

SUMMARY FARM INVESTMENT CAPITAL

Present Plan ____
Alternative No. ____

LINE	Item and Description	Year to Invest	New Cost	Average Value[1]	Total Value
	(1)	(2)	(3)	(4)	(5)
1	Breeding Livestock: (Show King)				
2	_____ _____(units) x ₱_____/unit =			₱	
3	_____ _____(units) x ₱_____/unit =			₱	
4	Total Breeding Livestock Capital (Line 2 = Line 3)				₱
5	Machinery & Equip. (Present)(Form 2, II-A-3)			₱	
6	Added:[2]				
7					
8					
9	Carabao				
10	Total Mach. & Equip. Capital (Lines 5 thru 9)				₱
11	Bldgs. & Facilities (Present)(Form 2, II-A-2)			₱	
12	Added:[2]				
13					
14					
15					
16	Total Bldgs. & Facilities Capital (Lines 11 thru 15)				₱
17	Land and Land Improvements[3] (Present) _____ ha. x ₱_____/ha. =				
18	Added:[2]				
19					
20	Total Land & Land Improvement Capital (Lines 17 thru 19)				₱
21	Total Farm Investment Capital (Sum of Lines 4, 10, 16, and 20)				₱

[1] Present system values for Lines 5 and 11 are depreciated values (such as those on depreciation schedule). For new machinery and equipment added in alternative system, average value equals approximately 1/2 of new cost. For new buildings, fences, and facilities added, average value equals approximately 3/4 of new cost. For non-depreciable items (such as land), average value equals new cost.

[2] Disinvestment may also considered in alternative plan. Values of machinery, equipment, facilities, land, etc., not needed in alternative plan are entered as negative figures in Column 4.

[3] Does not include value of dwelling, farm buildings, fences, and facilities.

APPENDED WORKSHEET B. F/FLS analysis worksheets modified for Taiwan

AVRDC Farming/Family Living System (F/FLS) Project

AVRDC Garden Project

AVRDC Analysis Worksheet 1

Summary of Annual Value of Production (Gross Income)[1/] From Garden Unit

Type of Garden _____ Irrigation: Yes ( ); No ( )

Location: _____ (Country) _____ (Area) _____ (Subdivis

Cooperator Name _____ Address _____

No. in Household _____ No. Adult Equivalents: Labor _____ Consumption _____

Line	Kind of Vegetable	Area	Seeding Rate	Total Product (Kg)	Weighted Average Price/Kg 3/ NT$	Total Valu NT$
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						

1/ 15. Gross value of production (Gross Income) ..... NT$ _____
(Transfer to AVRDC Analysis Worksheet 2, Line A)

TOTAL: _____ _____

1 For analytical purposes, Gross Value of Production will be considered "Gross Income".

2/ Equivalents to be calculated from household records from pilot-study family unit.

3/ If the product is only for home consumption and is not sold, we use local farm price as basis for calculation

AVRDC Farming/Family Living System (F/FLS) Proj

AVRDC Garden Project

AVRDC
Analysis
Worksheet 2

Economic Evaluation of Garden Enterprise

Type of Garden Unit _____ Irrigation: Yes ( ); No ( ).

Location: _____ (Country) _____ (Area) _____ (Subdivisio

Cooperator Name _____ Address _____

No. in Household _____; No. Adult Equivalents: 2/ Labor _____ Consumption _____

1/ A. Gross Income (Value of Production) from Garden Unit NT$_____
(Transfer total from AVRDC Analysis Worksheet 1, Line 15)

B. Cash Variable Costs/Garden Unit: (Unit size _____)

1. Seed ---------- NT$_____
2. Plants ---------- NT$_____
3. Fertilizers ---------- NT$_____
4. Chemicals ---------- NT$_____
5. Containers (bags, etc.) -------- NT$_____
6. _____ NT$_____
7. _____ NT$_____
8. _____ NT$_____
9. Cash Rent ---------- NT$_____
10. Hired Labor ---------- NT$_____

C. Total Cash Variable Costs ---------- NT$_____

D. Net Cash Income over Variable Costs ---------- NT$_____

E. Total Hours Family Labor Required (Form 5) ---------- Hrs._____

F. Net Cash Income/Hour of Family Labor ---------- NT$_____

G. Value of Family Labor (_____hrs. X NT$/hr_____) ---------- NT$_____

H. Total Variable Costs (L.C + L.G) ---------- NT$_____

I. Net Income Over All Variable Costs/Garden Unit ---------- NT$_____

J. Net Household Garden Income per Labor Equivalent Unit ---------- NT$_____

K. Net Household Garden Income per Consumption Equivalent Unit -------- NT$_____

1/ For analytical purposes, Gross Value of Production will be considered "Gross Income".

2/ Equivalents to be calculated from household records from pilot-study family unit.

AVRDC
Analysis
Worksheet 3

AVRDC FARMING/FAMILY LIVING SYSTEM (F/FLS) PROJECT

Labor[1] Distribution Analysis_Garden Project

Type of Garden _____ Location _____ Size of Unit _____; Owned ____ Rented ____

L. No.	Labor[1] Item	Total Hours (2)	Labor in Adult Labor Equivalent Hours, by Months																					
			Jan.		Feb.		March		April		May		June		July		August		Sept.		Oct.		Nov.		Dec.	
			%	Total (3)	%	Total (4)	%	Total (5)	%	Total (6)	%	Total (7)	%	Total (8)	%	Total (9)	%	Total (10)	%	Total (11)	%	Total (12)	%	Total (13)	%	Total (14)
1	Family Labor Available																									
2	Labor Required:																									
3																										
4																										
5																										
6																										
7																										
8																										
9																										
10																										
11																										
12																										
13																										
14																										
15																										
16																										
17																										
18	Total Labor Required		XX		XX		XX		XX		XX		XX		XX		XX		XX		XX		XX		XX	
19	Labor Balance (+ or −) L.1. vs L.18		XX		XX		XX		XX		XX		XX		XX		XX		XX		XX		XX		XX	
20	Labor to be Hired		XX		XX		XX		XX		XX		XX		XX		XX		XX		XX		XX		XX	

[1] All Labor Hours represent Adult Labor Equivalent hours: To be calculated from household Composition data for Pilot-study family Unit.

INSTRUCTIONS: AVRDC Analysis-Worksheet 4. CROPPING SYSTEMS

Use this form to calculate total income over variable costs, hours labor, and farm feed production for the cropping system of each plan considered.

Crops and land use are accounted for in Columns 1 and 2. Per hectare crop budget information (Columns 3, 4, and 5) is used to calculate the totals (Columns 6, 7, and 8). Note: interest paid on crop operating capital is part of the variable costs per acre. Per hectare budgets for rented crops should be adjusted for yields and income over variable costs as needed.

On Line 20, sum Columns 2, 7, and 8. Transfer totals of Columns 7 and 8 to AVRDC Analysis Worksheet 6, Line 6.

AVRDC
Analysis
Worksheet 4

AVRDC Farming/Family Living System (F/FLS) Project
SUMMARY: CROPPING SYSTEM

Present Plan____
Alternative No.____

LINE	Crop & Land Use	Total Ha.[1]	PER ACRE BUDGETS			BUDGET TOTALS			OTHER CROPS DATA		
			Average Yield	Income over variable costs	MDs direct labor	Production	Income over variable costs	MDs direct labor	Crop variety	Fertilizer Needed	
										Kind	Amount/ha.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
						2x3	2x4	2x5			
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

[1] When land is double cropped, lsit first and second crops separately. Circle acreage of second crop and do not add

INSTRUCTIONS: AVRDC Data Collection Worksheet 5. Farm Investment Capital

Use this form to estimate the farm investment capital for your present plan and for each alternative plan considered. Farm investment capital is defined as the average value of intermediate and long-term farm assets owned. Current farm assets (inventories of market livestock, feed, crops; etc.) are not included as farm investment capital.

Average value of breeding livestock units include: investment in the breeding animal (sow, cow, etc.) plus the share of sire and replacement animal per unit. Average value for machinery, equipment, buildings, land, etc., is explained in footnote 1.

Total values (Column 4) are transferred to AVRDC Analysis Worksheet 6 for further analysis.

AVRDC Farming/Family Living System (F/FLS) Project

Present System___
Alternative No.___

AVRDC
Analysis
Worksheet 5A

SUMMARY: LIVESTOCK SYSTEM

LINE	Livestock Enterprise	Total Units	Per Unit Budgets: Income over var. Costs	Per Unit Budgets: M.D. Labor Needed	Budget Totals: Income over var. Costs	Budget Totals: M.D. Labor Needed
	(1)	(2)	(3)	(4)	(5)	(6)
					2x3	2x4
1			₱		₱	
2						
3						
4						
5						
6	Totals (Sum of Lines 1 thru 5				₱	

AVRDC
Analysis
Worksheet 5B

VALUE OF FARM PRODUCED FAMILY FOOD (VFP)

LINE	Food Item	Unit	Amount used	Price Per Unit	Total Value
	(1)	(2)	(3)	(4)	(5)
1	Grains: Rice			₱	₱
2	Green Corn				
3					
4					
5					
6	Total Value of Grains Consumed				₱
7	Fruits and Vegetables: Okra			₱	
8	Squash				
9					
10					
11	Melons				
12					
13					
14	Total Value of Fruits and Vegetables Used				₱
15	Livestock and Fish			₱	
16					
17					
18					
19					
20					
21	Total Value Livestock and Fish				₱
22	Total VFP (Sum of Lines 6, 14, and 21)				₱

AVRDC
Analysis
Worksheet 5C-1

LABOR SUMMARY

L.	Labor Required for	Total Labor Needed*: M.D.s	M.G.	Hours
	(1)	(2)	(3)	(4)
1	Crops: (Form 4-Line 20, Col. 8)			
2	Livestock: (Form 5A-L. 6, Col. 6)			
3	Producing Grain for Family Food (Est.)			
4	" Fruits & Veg. " " " "			
5	" Livestock & Fish " " " "			
6	Total Production Labor (Sum of L.1-5)			
7	Miscellaneous Labor (10% x L.6)			
8	Total Labor Needed (L.6 + L.7)			
9	Total Family Labor Available			
10	Hired La... Needed (L.8 - L.9)			

*If preferred, labor in Man Days (Col. 2) may be converted to either months or hours: 1MD=8 hrs; 25 MDs (200 hrs.)=1 month.

AVRDC
Analysis
Worksheet 5C-2

AVRDC Farming / Family Living System (F/FLS) Project

Labor[1] Distribution Analysis _ Complete Farming System Labor

Present System ____
Alternative No. ____

Cooperator Name _____ Address _____ Size of Unit _____ : Owned ____ Rented ____

No.	Labor[1] Item (1)	Total Hours (2)	Jan. %	Jan. Total (3)	Feb. %	Feb. Total (4)	March %	March Total (5)	April %	April Total (6)	May %	May Total (7)	June %	June Total (8)	July %	July Total (9)	August %	August Total (10)	Sept. %	Sept. Total (11)	Oct. %	Oct. Total (12)	Nov. %	Nov. Total (13)	Dec. %	Dec. Total (14)
			Labor in Adult Labor Equivalent Hours by Months																							
1	Family Labor Available ---																									
2	Labor Required:																									
3																										
4																										
5																										
6																										
7																										
8																										
9																										
10																										
11																										
12																										
13																										
14																										
15																										
16																										
17																										
18	Total Labor Required		XX		XX		XX		XX		XX		XX		XX		XX		XX		XX		XX		XX	
19	Labor Balance (+ or −) L.1. vs L.18		XX		XX		XX		XX		XX		XX		XX		XX		XX		XX		XX		XX	
20	Labor to be Hired		XX		XX		XX		XX		XX		XX		XX		XX		XX		XX		XX		XX	

[1] All Labor Hours represent Adult Labor Equivalent hours: To be calculated from household Composition data for Pilot-study family Unit.

AVRDC
Analysis
Worksheet 6

AVRDC Farming/Family Living System (F/FLS) Project

SUMMARY: CAPITAL, LABOR, INCOME & SUMMARY

Present System ___
Alternative No. ___

LINE	Item	Details	Totals
	(1)	(2)	(3)
	Farm Investment Capital: (Data From:)		
1	Breeding Livestock (AVRDC Data Collection Worksheet 5, L4, Col. 5)	₱	
2	Machinery & Equipment (" , L. 10, Col. 5)		
3	Buildings & Facilities (" , L. 16, Col. 5)		
4	Land & Improvements (" , L. 20, Col. 5)		
5	Total Farm Investment Capital (" , Line 21)		₱
6	Total Labor Needed (AVRDC Analysis Worksheet 5-C-1, L8, Col.2 (M.D.)		
	Income Over Variable Costs		
7	From Cropping System (AVRDC Analysis Worksheet 4, L.20, Col.7)	₱	
8	From Livestock System (AVRDC Analysis Worksheet 5A, L.6, Col.5)		
9	Total Income Over Variable Costs (L. 7 + L. 8)		₱
	Other (Unallocated) Cash Costs & Net Cash Income:		
10	Hired Labor (AVRDC Analysis Worksheet 5C-1, L10, MD x ₱ /MD =	₱	
11	Cash Rent Paid: ____ ha. x ____ /ha. =		
12	Real Estate Taxes: (Est. ____ % x L.5 =)		
13	Bldg. Insurance & Repairs (Est. ____ % x L. 3 =)		
14	Miscellaneous Expense (Est. 2% x L. 9 =)		
15	Total Unallocated Costs (Sum of Lines 10 thru 14)		₱
16	Net Cash Farm Income (L. 9 - L. 15)		
	Depreciation:		
17	Machinery & Equipment (Est. 10% of L. 2)	₱	
18	Buildings & Facilities (Est. 5% of L. 3)		
19	Total Depreciation (L. 17 + L. 18)		₱
	Returns:		
20	Farm Business Profit (L. 16 - L. 19)	₱	
21	Value of Farm Produced Family Food (VFP) (AVRDC Analysis Worksheet 5B, L22)		
22	Total Profit (L. 20 + L. 21)		
23	Family Lab. (Form , L. 9) ____ MD x ₱/MD =	₱	
24	Management Charge (Est. 4% x L.9)=		
25	Return to Capital (L. 22, - L. 23 - L. 24)		
26	Percent Return to Capital (L. 25 ÷ L. 5 x 100)		%
27	Charge for Investment Capital (L. 5 x 12%)	₱	
28	Return to Family Labor & Management (L. 22 - L.27)		₱
29	Return to Family Labor (L. 28 - L. 24)		₱
30	Return to Family Labor Per M.D. (L. 29 ÷ ____ M.D. (Form 5-C-1 L. 9)		₱

DIRECTIONS: AVRDC Analysis Worksheet 7
DEBT REPAYMENT AND AVAILABLE CASH

Use this form (along with supporting Analysis Worksheet 8) to determine the expected cash flow consequences of each plan being considered:

1. Total net cash income (Line 3) is the estimated cash available before family living, debts, and taxes.
2. Interest paid on I.T. and L.T. debts (Line 4) is calculated on Form 8.
3. Income tax and Social Security expense (Line 5) can be estimated using Form 9.
4. Family living expenses include: food, clothing, household operation, recreation, health, auto expense, life insurance, education, contributions, etc. Cash costs of family living often exceed expectations of those who do not keep complete records through the year. Average expenditures by 21 families who cooperated in the Mail-In Record Program in 1977, as summarized below, may be helpful in planning future expenditures.

All food	$ 3,360
Clothing	960
Household operation	1,209
Household equipment and furnishings	1,037
House expenses (rent, repairs, etc.)	340
Personal items	1,998
Recreation	322
Education	224
Medicine and drugs	238
Medical insurance	603
Doctor, dentist	845
Church, charity	690
Gifts	234
Home share of auto	580
Life insurance	630
Income tax	452
Total family living expense	$ 722

Average number of persons in household was

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AVRDC Analysis Worksheet 7

SUMMARY: DEBT REPAYMENT & AVAILABLE CASH (optional)

Present Plan____
Alternative No.____

	Item	Details	Totals
	(1)	(2)	(3)
1	Net cash farm income (AVRDC Analysis Worksheet Line 18)		
2	Non-farm income		
3	Total net cash income (Line 1 + Line 2)		
4	Interest paid on I.T. & L.T. debts (AVRDC Analysis Worksheet L.6)		
5	Est. income tax		
6	Family living expenses (estimate)		
7	Subtotal (sum Lines 4, 5, 6)		
8	Cash available before payments (Line 3 minus Line 7)		
9	Total annual principal payments (AVRDC Analysis Worksheet, L5)		
10	Net cash available or balance (Line 8 minus Line 9)[1]		

[1]May be used for replacement of capital items, new investments, and cash reserve.

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AVRDC Analysis Worksheet 8

ESTIMATING ANNUAL PRINCIPAL & INTEREST PAYMENTS (optional)

Present Plan____
Alternative No.____

	Item[1]	Average[2] principal payment	Average[3] debt	Average interest rate	Average[4] interest paid
	(1)	(2)	(3)	(4)	(5)
	BEGINNING DEBTS:				
1	Intermediate (1-9 years) ₱_____	₱	₱	%	₱
2	Long term (10+ years) ₱_____	₱	₱	%	₱
	ADDED DEBTS:				
3	Added intermediate ₱_____	₱	₱	%	₱
4	Added long term ₱_____	₱	₱	%	₱
5	Total Principal Payments (sum Lines 1, 2, 3, 4)	₱			
6	Total Interest Paid (sum Lines 1, 2, 3, 4)				₱

[1]Enter beginning debt amounts in Col. 1 blank.

[2]Estimate the average principal payment on the beginning debts over the next 5 years.

[3]Estimate of average debt over next 5 years = beginning amount (Col. 1) less 2½ principal payments (Col. 2).

[4]Estimate average interest paid on I.T. and L.T. debts = average debt (Col. 3) times average interest rate (Col. 4).

AVRDC
Analysis
Worksheet 9

AVRDC Farming/Family Living System (F/FLS) Project

Comparing the Profitability of Adding Alternative Enterprise to Farmer's Present Farm

Analysis Factor	Source	Date ____ Farmer's Present System	Adding Alternative Enterprise No. ____	Better	No. ____	Better	No. ____	Better	No. ____	Better
1. Investment capital	AVRDC Data Collection Worksheet 5, Line 21									
2. Labor requirement (MD)	AVRDC Analysis Worksheet 5C-1, Line 8									
3. Income over variable cost	AVRDC Analysis Worksheet 6, Line 9									
4. Unallocated variable cost	AVRDC Analysis Worksheet 6, Line 15									
5. Net cash income	AVRDC Analysis Worksheet 6, Line 16									
6. Farm business profit	AVRDC Analysis Worksheet 6, Line 20									
7. VFP (Value of farm produced family food)	AVRDC Analysis Worksheet 6, Line 21									
8. Total farm profit	AVRDC Analysis Worksheet 6, Line 22									
9. Return to capital	AVRDC Analysis Worksheet 6, Line 25									
10. % return to capital	AVRDC Analysis Worksheet 6, Line 26									
11. Return to labor and management	AVRDC Analysis Worksheet 6, Line 28									
12. Return to labor/month	AVRDC Analysis Worksheet 6, Line 29									
13. Return to management	AVRDC Analysis Worksheet 6, Line 24									
14. Net cash avaialable	AVRDC Analysis Worksheet 7, Line 10									
15. Analysis results and suggestion										

Farmer's Name _____ Location _____ Address _____

Researcher's Name