SUSTAINABLE AGRICULTURE OF THE SMALL COCONUT FARMERS

by

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INTRODUCTION

Coconut cultivation is generally a small-holder enterprise. Production of nuts is low due to the various constraints faced by the farmers. Assuming that 20% of the area under cultivation in all the countries consist of non-bearing palms and vacancies, the average production for the period 1984-1988 was 4,900 nuts per hectare of bearing palms per year. If improved management practices arc carried out on the existing holdings, yield could be increased by at least 50 percent. But, they arc beyond the capacity of the farmers to implement.

A recent study on the constraints faced by small coconut farmers has indicated that lack of or non-availability of capital for investment and the high cost of inputs, amongst a number of other factors restrict their efforts to increase production (1)**. Methods to increase coconut production in smallholdings about one hectare in extent by the application of low-cost technology that the farmers could adopt arc discussed in this paper.

COST OF INPUTS

A number of items arc involved in the cost of maintenance of a small coconut holding, if production is to be maintained at a satisfactory level. They are listed in Table 1. Cultural practices include weed control, soil cultivation and moisture conservation. The cost does not include interest on working capital and recovery on investments.

The major high cost inputs arc fertilizer and cultural practices amounting to about 65% of the total expenditure on maintenance of land.

The cost of chemical fertilizers, and cultural practices is increasing yearly. Expenditure on them is already beyond the resources available to the small coconut farmers. If coconut production is to be increased, a low cost farm technology that is within the capacity of the farmers to implement has to be introduced. Researchers have developed a number of systems in this connection, but they have not filtered across sufficiently to the growers.

	Expressed as a percentage of the total expenditure	
Item	In India (2)	In Sri Lanka (3)
Fertilizer and application	44	50
Cultural practices	21	14
Plant protection	05	06
Harvesting	17	06
Miscellaneous	13	24

Table 1 Expenditure on maintenance of one hectare of a small coconut holding

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**Reference to literature

LOW COST TECHNOLOGY

Suitable improved coconut cultivars and use of compost, green manures and animal refuse to replace expensive chemical fertilizers to a large extent are options available to the small coconut farmers to increase production with low costs.

Planting material

Two new coconut cultivars are issued to the growers. Dwarf x Tall (DTC) and Tall x Tall (TTC). The former has been planted on a large scale and the latter in a few areas only.

DTC is early bearing (about 41/2 years) and high-yielding, giving 3 to 4 MT copra per ha/yr, provided all the necessary inputs are supplied combined with a high level of management and under a good distribution of rainfall. In the absence of anyone of these factors, the potential high production will not be realized.

TTC is late bearing (about 61/2 years), producing 21/2 to 4 MT copra ha/yr, depending on the input and management practices. TTC tolerates a wide range of environmental and management conditions, more resistant to pests and diseases compared to DTC. Thus, there is less risk for the small coconut farmers to grow TTC.

Chemical fertilizers

One of the recommendations to increase coconut production is the application of chemical fertilizer. The price of the ingredients used in the mixture has increased substantially in the recent past and is likely to increase further in the future. In the Philippines, during the period 1976 to 1984, ex-warehouse price of a 50 kg bag of urea has increased from 75 to 274 Pesos, superphosphate from 43 to 108 and muriate of potash from 52 to 190 (4).

There is no doubt that application of chemical fertilizer is a quick method to increase yield of coconuts, provided rainfall is adequate and well distributed. Its continued use does not improve the structure and fertility of the soil.

A system of sustainable agriculture with low cost technology has to replace chemical farming practised by the small coconut farmers to increase production.

Sustainable agriculture

Sustainable agriculture is described in a number of ways: biological farming, bio-farming, conservation farming, etc. The general principle in all of them is to eliminate or reduce the use of chemical fertilizers, herbicides and pesticides in crop production and replace them with organic material. Some of the nutrients required for plant growth could be derived from vegetable material and animal litter. Pests could be controlled with other insects.

Sustainable agriculture is said to be one of the fastest growing areas of agriculture in the western world. "Farmers ate kicking the chemical habit and finding that farming without chemicals is better for the soil and does no harm to the pockets" (5).

Researchers have described a number of leguminous and other plants that provide nitrogen, phosphorus, potassium, calcium and magnesium-essential elements for the growth of coconut palms.

Amongst them are species of Leucaena, Gliricidia, Crotolaria, Centrocerna, Calapogonium, Puereria, etc.

Leucaena and Gliricidia are known for their huge herbage production. In a pure stand of Luecaena, about 120 MT of green foliage could be harvested per ha/yr. It contains 1,000 kg nitrogen, 200 kg phosphate and 800 kg potash (6).

<u>Gliricidia</u> loppings have been used as green manure in India and Sri Lanka on tea, coffee and coconut. When underplanted in coconut lands at a density of about 1,900 plants per hectare, the green matter production from loppings ranged from 8 to 11 MT per ha/yr. On a dry wight basis, leaves contain around 4.0% nitrogen, 2.0 % potassium, 1.4 % calcium, 0.4 % magnesium and 0.3 % phosphate (7).

The establishment and maintenance of cover crops arc expensive and labour intensive. They generally die back during the dry periods and regenerate after the rains. Regeneration is poor, if a drought prolongs over a long period. Further, it is difficult to grow food crops with a stand of cover crops. Hence, they arc generally unsuitable to he grown in small coconut holdings.

Crop-livestock farming also contributes to sustainable agriculture. Animal manure is more complete than green manure for it contains micro-nutrients in addition to the major elements. The nutrient value of animal manure varies according to feed and other factors.

Other important aspects of coconut cultivation arc checking soil erosion, conservation of moisture in the soil and control of weeds, pests and diseases. The farmers could attend to them without using chemicals except where there arc heavy outbreaks of pests and diseases which have to be controlled by a central organization.

DISCUSSION

There arc four salient factors involved in the improvement of small coconut holdings : use of appropriate planting material, low cost inputs and management practices, a satisfactory farm-gate price for the produce and increase of productivity. Any model for the development of small-holdings should take into consideration the funds available to the farmers, their priority for growing food crops and inability to undergo risks.

Planting material

In a perennial crop like coconut with a productive life span of about 50 years, the choice of appropriate coconut cultivars is the foundation of the industry. They should suit the agro-climatic conditions, management capability of the grower and easy marketing of the produce. The small coconut farmers require improved cultivars that produce more nuts, not necessarily very high yields, with low cost management practices.

In some countries in South East Asia, DTC has been promoted vigorously and large quantities have been distributed to the smallholders. Most of them have not performed upto the expectations in production and quality of fruits. Serious technical problems such as small size of nuts, alternate bearing tendencies, heavy damage due to droughts and diseases have created considerable losses to the farmers, after they have waited for five years to get an increased income (8).

The Malaysian experience in the introduction of a DTC has been described as follows (9). "The introduction of the MAWA variety in Malaysia in the early seventies, was thought to be a great innovation. It had been expected to give a big boost to farmers' income because of the high yield that

could be expected. While higher yield proved to be true, income did not however necessarily increase significantly in all cases. There was one cultural problem which had not been anticipated. Farmers were finding their MAWA fruit not readily marketable. Retail markets found it not popular among housewives. The fruit is too small for the home or shopkeeper's scrapers. More serious, it is said to be too oily and lacking in the right flavour In this context it is reasonable to accept the opinion that we have made a mistake in technology transfer".

Out of the improved coconut cultivars available, TTC is suitable to be grown - in small-holdings. It tolerates a wide range of environmental conditions low levels of management and yet give a satisfactory yield.

Low cost management practice

The foliage and tender shoots of <u>Gliricidia</u> and <u>Leucaena</u>, leaf litter of cover crops and animal refuse can provide all the nitrogen and a part of the phosphate and potassium requirements of the coconut palms. The cumulative effects of their continued application are :

- A living soil is created teeming with bacteria, fungi and earth worms, which help the plants to absorb nutrients from the soil;
- the earthworms by their constant burrowing, mixing and digesting turn organic waste into nutrients;
- keep the soil loose giving it a better capacity to retain air and water; allowing the plants to withstand drought for longer periods;
- earthworm excreta is said to contain twice the amount of phosphate and eleven times potassium than in the surrounding soil, and
- the soil is maintained in a fertile condition with gradual release of nutrients to plants.

Thus, organic farming dispenses with the application of chemical fetilizers to a certain extent and some of the cultivation practices -ploughing, harrowing. The net result is increased production of coconuts and other crops, lower cost for maintenance of land and a lower cost of production of nuts.

It is not possible for the small farmers to adopt some of the organic farming systems described earlier, clue to the constraints faced by them. With cover crops <u>in situ</u>, it is difficult to grow food crops. Further, their establishment and maintenance are capital intensive, beyond the resources available to the farmers. Animal husbandry is possible to a limited extent, provided assistance is given to purchase the initial stock.

Alternatively, growing <u>Gliricidia</u> or <u>Leucaena</u> along the boundaries of the small-holdings for the supply of green manure does not pose any problems to the farmers. They are easy to grow and hardly any maintenance costs are involved. Under Sri Lankan conditions, <u>Gliricidia</u> is preferable to <u>Leucaena</u> as it is less susceptible to pests. Further the latter is very sensitive to soil acidity.

The Coconut - Gliricidia model

<u>Gliricidia</u> stands pruning, two to four loppings are possible in a year. One hundred plants, two to three years old, could provide about 500 kg of green loppings with two prunings per year. This amount increases as the plants mature. The nutrients supplied by the above quantity of loppings is

equivalent to approximately 13 kg urea, 4 kg saphos phosphate, 6 kg of muriate of potash and 5 kg of dolomite (7).

Application of 30 kg <u>Glliricidia</u> loppings per palm/year, provide all the nitrogen and 15-to 20 % of the phosphate and potassium requirements of the palm, plus small quantity of magnesium and calcium. The cost of chemical fertilizer used on coconut palms is about 50 % of the cost of maintenance of coconut land (Table 1). With the application of <u>Gliricidia</u>, a reduction of 36% is possible.

Is the application of an increased quantity of Gliricidia loppings, sufficient to maintain coconut production at a satisfactory level without the addition of phosphate and potassium ? If so, cost of maintenance of small-holdings will be considerably reduced making coconut cultivation more viable economically. Researchers have to find an answer to this question.

<u>Gliricidia</u> could be established from cuttings. Their availability is likely to be a limiting factor in popularizing the plant. Propagation by seed is more convenient and economical. In Sri Lanka, flowering is between January and March. Unpruned trees produce a large number of flowers, but only a few pods reach maturity, limiting harvesting period to about 20 days in April. A kilogram of seed contains 5,000 to 10,000 seeds (7).

Seed do not require pre-treatment and could be grown directly in seed beds or polybags. Plant the seedlings along the boundary in double rows, 60 cm apart (7). Assuming that one hectare of land has 400 m of boundary, 900 plants could be grown on the above system -allowing a liberal number for casualties. These plants when mature could produce sufficient green manure for one hectare of coconut.

A simple technology to bring fertility to denuded land has been developed in the Philippines. Giant lpil Ipil is planted in double hedges on contours four meters apart. The trees are cut back ten times a year and the loppings are used to fertilize the crops grown between the hedges without ploughing. Corn, beans, pineapples, coffee, bananas, peanuts, sweet potatoes and fruit trees have been grown successfully (10).

The same system could be followed in the <u>Coconut - gliricidia</u> model. In addition to planting double rows of gliricidia along the boundaries, three hedge rows could be planted in every third or fourth row of coconut palms. Then there would be sufficient green manure for coconuts and food crops grown in the small-holding.

This model is ideally suited to the small coconut farmers to increase production of coconuts and food crops without resorting to the use of expensive chemical inputs. A modest assumption is that the low cost technology covered by the <u>coconut - gliricidia</u> model could give about 7,500 nuts per ha/yr from the existing stands of palms and at least 10,000 nuts ha/yr with TTC planted in the small holdings. Further, the cost of production of coconuts would be about 40 percent of the current rates, allowing the farmer to get more net profits.

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