

# Integration of livestock and crops in a smallholding, a project in Sri Lanka

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A smallholder usually manages to attain a fairly high productivity. But with still decreasing units of land, it gets more difficult to survive on farming, alone. The Mid-Country Livestock Development Centre (MLDC) <sup>1)</sup> searches to increase productivity within the possibilities of the smallholder and to disseminate these experiences. Main focus is on the importance of integrating livestock and crops.

## Situation of the smallholder

The project is situated in the wet and intermediate zone of the Mid-Country in Sri Lanka. Most of the region comprises highlands. The common cropping system sustains a profusion of tree crops with root crops and herbs stratified into overlapping layers of foliage canopies. The most common crops are coconut, jackfruit, breadfruit, nutmeg, kitul, areca nut, coffee, pepper and banana. In terms of outputs and returns from land, productivity is at a very low level. Most of the farmers have one or two crossbred cows with their followers. The roughage is obtained mostly from outside their homesteads. The average number of liters of milk per cow per day is 3.

Apart from the existing farmer population, new farmers settle down on wastelands of e.g. abandoned tea estates. 75% of the small holdings are less than 2 acres in size and about 50% are even smaller than 1 acre. More and more holdings with the passage of time get split into micro-units which cannot generate sufficient income, employment and food for the household. Thereby farming is becoming more and more a part-time activity for the rural population: On average only 25% of their income is derived from agriculture. The following constraints to be overcome in the agricultural practices of the village smallholder were identified by the project:

- underemployment of the smallholder within the farm;
- highlands are not intensively / cultivated;
- the planting distance between crops is sub-optimal: Perennial crops are planted too dense to produce well and their shade prevents other crops to thrive;
- dairying is a side-line activity; Production levels are low;
- crop/stock integration is low. Dung, urine, roughage left-overs and crop residues are not fully utilized.

## Overcoming the constraints

In the Mid-Country Livestock Development Centre three demonstration farms of respectively 2, 1 and 0.5 acre(s) were established from



Excreta are canalised to the biogas plant. Photo: Jos Hoenen.

1982 onward. The aim is to find out what kind of production activities would fit best into a certain size of land with an average family labour capacity and to show small farmers how to optimize rentability of their holding and to train them in these practices.

In the demonstration units, all inputs (financial, material and labour) and outputs are recorded. According to Mr. Kuruppu the whole set of constraints became clear over a period of time. As the Development Centre is rooted in the sector of livestock development, the first prospect was to improve the productivity of the dairy cattle in the village. This was sought for by improving the feeding, the housing by building cattle sheds and the utilization of the dung and urine by a biogas plant. Later also the other mentioned aspects, like planting distance and use of slurry/dung as a crop fertilizer, entered the scope of demonstration. Demonstrations and residential courses are organized regularly at the Centre for interested farmers. As a means for further propagation, recently several farmers in remoter areas have been motivated to adopt their farm to the alterations suggested by the Centre which are also becoming demonstration farms.

## Dairying compared to crops

It has often been a point of discussion whether or not dairying is profitable, given the low local milk price. Farmers share the opinion that cropping provides a higher income. In fact, there are a lot of positive and negative arguments for concentrating either on dairy cattle or on crops, which will be summarized here. But, as will be clarified later, it appears that stable and profitable farming on a small scale is obtained by integrating the two production systems!

## Disadvantages of dairy cows:

- Income from dairying in terms of land, labour and capital invested is generally lower than that from crops.
- Dairying involves a complex technology which takes much time to grasp, especially for farmers who are new-comers to dairying.
- High initial capital investment is required (cows, sheds).
- Low triability. Dairying can hardly be tried out by a small farmer on a small scale as with crops.

## Advantages of dairy cows:

- Dairying has fewer marketing risks, especially assured through the cooperative milk producers' societies in the area.
- Dairying ensures a ready and sure though moderate source of income.
- Cattle is easily convertible to cash in time of need.
- A small dairy can be maintained with little or no land, as long as the farmers are able to find other fodder resources.

## The demonstration farms

The demonstration farms combine livestock with perennials, vegetables and pasture. As an example a description of the one acre farm will be given as well as differences with the 0.5 acre and the 2 acres farm.

All farms have more or less the same infrastructure: Dwelling, cattle shed, biogas plant, and for the 0.5 and 2 acre farm a poultry shed on about 330 sq.m of land.

### The 1 acre farm:

This is the type of homestead which is a prototype of the ones usually developed by new settlers. It contains: Livestock: Dairy cows (2); Heifers (2). Permanent crops: Coconuts (30); Pepper (*Piper nigrum*) attached to glyceridia (176); Coffee (52); Fruit trees (12). Semi-permanent crops: Banana clusters (173); Papaws (6); Pasture under crops: 3330 sq.m

Tree fodder: 575 m of *Glyceridia* and *Leucaena* as fences and hedges. Vegetables: 780 sq.m

In the 0.5 acre farm, apart from being less numerous, the cropping pattern is the same as above. Livestock consists of one dairy cow, 120 hens (layers) and 7 goats. For the efficient operation of the biogas unit the one-cow unit being insufficient, the dung from the poultry and the goats has made good this deficiency.

The 2 acre farm was the first one established and is mainly a dairy farm with pasture based cropping. Its livestock consists of three dairy cows, one heifer and 59 hens. Contrary to the other two farms, all fodder requirements are produced within the farm itself.

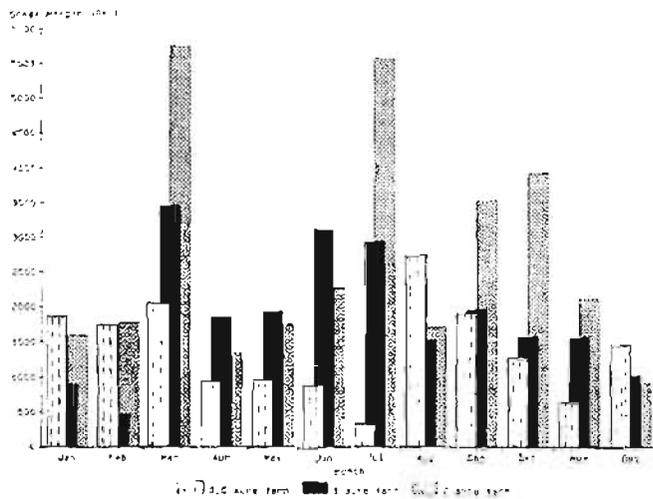


Fig. 1: Monthly gross margin during 1986.

Last year's monthly gross margins of the performance of the three units are given in figure 1. Repayment of loans for capital investment are not included in these graphs. The highest figures are obtained for the 2 acre farm, especially in the months of March and July due to the pepper. It should be noted that the 2 acre farm was the first one established and therefore yields of individual perennials are higher than those of the more recently developed farms.

#### Integration is more stable and profitable

In June 1986 an early evaluation was made, based on the existing data and extrapolations into the future. The following general trends could be discerned: Perennial crops are capable of giving higher returns on land and labour than dairying. This counts especially for the minor export crops pepper and coffee. The problem with these crops, however, is that they start producing only after some 3 years. In the meanwhile the farmer also has to live and be able to pay back the (interest on the) loans made for the capital investment. Furthermore, these crops require high inputs and involve more risks. The dairy, as a moderate but steady flow of income, can partially bridge this gap, and the vegetables and semi-perennials like bananas may make up for the other part. In the meanwhile, by utilising the excreta of the animals, soil fertility is being built up on the farm. (Still, up to 40% of the calculated need of fertilizer for the minor export crops is supplied in the form of commercial fertilizer.) Economically all three units are viable.

This means that, measured over a longer period, a farmer's household can sustain a reasonable life on it, while the loans necessary for starting the farm can be paid back. Internal (economic) rates of returns were forecast to be 15%, 23% and 18% respectively for the 0.5, 1 and 2 acre(s) farms, and will be higher if not all capital investments are required. It depends on the investments made in the beginning (how much will be spent on a house, on fencing, on a shed etc.) and on the conditions for refunding the loans whether this all will be financially feasible for the peasant or not. The 2 acre farm is not bound to face difficulties in this respect since the scale of the farm

and the heavy reliance on livestock imply a steady cashflow. The 1 acre and especially the 0.5 acre farm may encounter financial problems between the second and sixth year if all capital investments were to be financed by bank loan (the case of a new settler), due to a slow start in productivity of the perennials combined with the bank dept repayment. In reality however, high capital investment by the farmer is avoided by leaving out expensive fencing, housing etc. and by project's subsidies on e.g. biogas plant.

The 0.5 acre farm does not provide full employment to the average household. The 1 acre farm does almost, while the 2 acres farm violates labour constraints on the farm.

On the basis of the data from the three units, a cost-benefit analysis was made on three hypothetical one acre farms: One 'dairy model', one 'crop model' and one 'dairy-mix model'. It was calculated that the 'dairy-mix model' generates the highest net returns on land and capital, and makes optimal use of the family labour.

A physical explanation may be that *through the combination of crops and livestock the flow of nutrients, energy and to some extent water, are kept cycling and remain for a good deal within the farm.*

Therefore the cow is advocated as 'the saviour of your farm'.

#### Message to the farmers

Major improvements in the local Kandyan farms are aimed at by intensifying the use of land and labour and a better integration of livestock management and crop farming:

- 1) Improving the productivity of livestock is sought by:
  - \* Better feeding. Most of the cattle is more or less undernourished, which is a main cause for a low milk yield. The use of concentrates under normal conditions is not recommended, as the returns in financial terms do not counterbalance the extra costs involved.
  - \* Full utilization of dung and urine through
    - Better collection, possible by a cement floor which prevents seepage, and by zero grazing,

- which prevents the excreta being deposited elsewhere;
- Energy subtraction by a biogas plant and utilization of the gas for cooking and light;
- Using the slurry for returning fertility to the soil.
- \* Promotion of better care for the calf and heifer.
- \* Better utilization of leguminous fodder trees like leucaena and glyricidia. It used to be exploited only as a last resort in the dry season, while now it is recommended to plant more and harvest the canopies the year around.

- + Optimising crop and biomass production by better planning of the farm design, taking into account that a hierarchical stratification of foliage canopies makes better use of existing sun-light than a closed horizontal one; development of the crops over time and space; the economic value of each crop and the overall economic stability.

In concrete terms this means maintaining a fair planting distance between perennial crops, utilizing the space in between for semi-perennials in the first years and pasture.

According to Mr. Jayaratna it has been shown that through intensification and optimising a family can have a reasonable livelihood from 1 acre, whereas in traditional farming it used to take 3 to 5 acres.

Still, it remains not quite clear why, apart from the important introduction of biogas technology and the related practices, the traditional farmers have shown to be unable or unwilling to increase their income through farming to a higher level. Is it only a matter of knowledge, credits and planning? Rate of adoption of new practices among village smallholders in the near future may give an answer to this question.

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