

REDUCING THE EMISSIONS INTENSITY OF LIVESTOCK PRODUCTION: CASE STUDIES OF SUCCESS

GLOBAL
RESEARCH
ALLIANCE

ON AGRICULTURAL GREENHOUSE GASES

SRI LANKA

Scale: Local
System: Mixed
Sector: Dairy

Improving the productivity of integrated cattle-coconut systems

In southern Sri Lanka, smallholder farmers graze their cattle on local coconut plantations. Over the past three years, these farmers have been supplementing with tree fodder crops and low cost concentrates and have achieved significant improvements in both livestock and coconut productivity.

Background

Agriculture is the mainstay of Sri Lanka's rural economy and covers approximately 42% of its total land area. Food crops (rice, maize, pulses and vegetables), plantation crops (tea, rubber and coconut) and dairy production prevail. However, despite dairy farming being a major activity, it only provides about 15-20% of the country's total requirement, the balance having to be imported.

Dairy production in southern Sri Lanka is mostly a non-commercial activity, carried out by approximately 2,500 smallholder farmers, with an average herd size of 2-3 cows. The system is relatively extensive. Dairy cows are reared under tethered conditions or graze freely under coconut trees, a practice permitted by some plantation owners for several decades. Productivity is very low. The average yield is around 2-3 litres of milk per day, and financial returns are poor.



The cattle graze natural herbage, considered weeds by the plantation owners, which vary in supply due to the bi-modal pattern of rainfall. Coconut poonac (oil cake) and bran are often given as a supplementary feed as local availability is high. Rice straw is occasionally used in dry seasons.

The potential to use additional land in order to meet the growing demand for food and other supplies in southern Sri Lanka is extremely limited. Around 0.5 million hectares of coconut land is estimated to be available for intercropping and cattle grazing, but is hampered by ongoing low productivity.

Key actions & their effects on productivity, income & food security

Dairy farmers in Mirissa, a village in southern Sri Lanka, have spent the last three years learning how to improve the productivity of cows grazing on coconut plantations. These efforts – largely centred on dietary management and coconut-livestock integration – have demonstrated real potential as a long-term strategy not only for food security but for other environmental gains.

Farmers were shown how to supplement the natural herbage that the cattle were grazing with a high protein tree fodder crop (*Gliricidia sepium*). *G. sepium* is a widely cultivated, multi-purpose tree in southern Sri Lanka. It is used in living fences; to stabilise soils, prevent erosion and shade plantation crops; as a green manure; as an ornamental plant; and in traditional medicine for eczema. It has also recently been discovered to be completely resistant to the defoliating psyllid, *Heteropsylla cubana*. *G. sepium* can be supplemented in normal ruminant diets (up to 30% fresh matter per day) as a cheap protein source that is rich in vitamins and minerals. At the same time as the tree fodder, farmers also introduced a low cost concentrate comprising urea, rice bran, molasses and minerals. This was fed to heifers at a rate of 200g/head/day, and 250g/head/day during lactation.

Different manure management practices were also tested. The lengths of cows' tethered ropes were adjusted to allow them to graze an area with a radius of 4m during the day, reduced to 2m at night. This incorporated more dung and urine to the manure circle of the coconut palm. In addition, fallen fronds, coconut husks etc were deposited inside the manure circle to promote nutrient recycling.



The impact on animal productivity has been significant (see table 1). Cows have achieved considerably larger body weight at calving – nearly 10% more than animals not receiving the supplemented diet. The age at the first calving has dropped from 46 months to 38 months – around a 17% reduction. The average birth weight of calves from mothers receiving the supplemented diet increased by 13% and milk yield increased by up to 47%.

Another outcome was that nut and copra yields were much higher (almost double) where cattle were permitted to graze under coconut trees compared to where cattle were excluded. These gains are likely due to the recycling of valuable organic manure waste and more rapid turnover of biomass. Supplemented grazing offered only marginally higher nut and copra yield than standard grazing.

Nitrogen, phosphorus and potassium levels also all increased, no doubt as a result of the enriched manure content. Though not significant, soil water holding capacity also increased due to treading and higher organic matter content.

Effect of actions on emissions intensity of livestock production

The productivity gains achieved through feed supplementation imply a reduction in the emissions intensity of milk production in Mirissa. The actual effect on emissions intensity has not yet been measured, so this assumes that the methane yield under the supplemented diet does not differ fundamentally from the methane yield for forage grazing only.

The changes to manure management and the substitution of chemical fertiliser by dung and urine have improved plant nutrient and soil fertility status. As dung and urine remain largely aerobic, the production of greenhouse gases is minimised. The increase in nut and copra yield reinforces the willingness of landowners to permit cattle grazing on their land and, via reduction of fertiliser inputs, is also likely to have reduced the emissions intensity of nut and copra production.

Further information

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Table 1. Effect on body weight at calving, age at calving and milk yield of female cattle

Productivity measure	Grazing cattle under coconuts, no dietary supplementation	Grazing cattle under coconuts with supplementation of tree fodder and concentrates
Body weight at calving (kg)	185.90±4.44	203.17±4.71
Age at calving (months)	46± 2.1	38± 1.9
Average birth weight of calves (kg)	13.5	15.25
Milk yield kg/day	2.35±0.13	3.46±0.19

Co-benefits and trade-offs

The results demonstrated in Mirissa show real potential for application as a mixed farming model in other parts of Sri Lanka where there are smallholder dairy farmers with marginal monoculture coconut plantations and access to tree fodder crops. The integrated system and supplemented diet approach promotes self-employment and raised living standards through diversified income. *G. sepium* is readily available and the relatively small cost to the farmer of the concentrates is offset by the increase in income from a higher producing herd. Coconut plantation owners' benefit from higher nut and copra yields and from reduced inorganic fertiliser, herbicide and weeding costs (up to 40%).

Implications for adaptation

Scarcity of feed during the dry season is a major problem in Sri Lanka, including for dairy cattle grazed under coconut palms. The experience in Mirissa has demonstrated the benefits of supplementing with tree fodder and the low cost concentrate during the dry season – a practice that is possible when other feed supplies are scarce. Significant improvement of soil health in the integrated cattle-coconut system is another co-benefit as it improves resilience against climate variability.

Challenges to implementation and adoption

Despite the many positive outcomes of the experience in Mirissa, there are challenges to have these practices adopted elsewhere in Sri Lanka. There is a lack of awareness of the production requirements of dairy cows, with grazing on coconut plantations simply occurring for weed control purposes. In addition, not all owners of coconut plantations are amenable to opening their land up to dairy grazing.

Raising awareness of the benefits of dietary supplementation is also difficult. Even with practical demonstrations it can be challenging to encourage smallholder farmers to adopt new techniques, with many preferring to stick to traditional methods. Farmers may also be unwilling to establish and maintain tree fodder crops, and in parts of the country availability (and sometimes cost) of the concentrates can be prohibitive.

Positive outcomes were seen where farmers were supported to establish live fences, e.g. by providing cuttings, and where repeated practical demonstrations were provided. Education of livestock extension officers and farmer societies on these simple technologies will be important to further support and encourage uptake of the practices.

