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Uganda Dairy: Policy brief

Dairy farming in Uganda: production efficiency and soil management strategies under different production systems

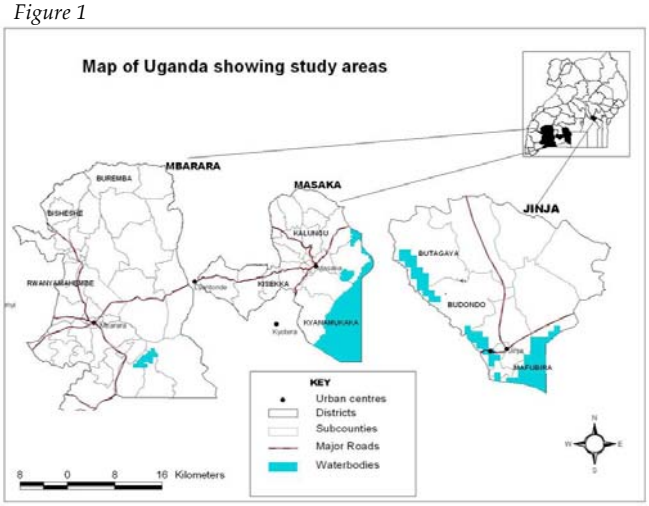
Key points

- Current policies and some development projects have promoted dairy intensification systems, such as zero grazing, in a variety of settings. However, the results show that less intensive production systems are just as appropriate in most areas.
- Smallholder dairy production is shown to be profitable and competitive in a variety of settings, where level of intensification suits different local circumstances.
- There is need for targeted interventions to meet area-specific conditions and the farmers' specific circumstances, particularly those that place additional demands on the farmers' labour.
- Nutrient balances of nitrogen, phosphorus and potassium are positive (though small) at the farm level, but strongly negative at the land level. This indicates that organic fertiliser from the livestock enterprise is not always efficiently used on crops. This also suggests that farmers could improve soil productivity by using available on-farm resources. However, labour constraints may be an impediment.
- Development efforts should consider mutual benefit between farmer, environment and wider community.

Between 2001 and 2005, the National Agricultural Research Organisation (NARO) in Uganda, the International Livestock Research Institute (ILRI) in Kenya and the Danish Institute of Agricultural Sciences (DIAS) conducted an in-depth study on smallholder dairying in Uganda.

The project, funded by the Danish International Development Agency (DANIDA), was aimed at improving the contribution of smallholder dairying to the sustainable livelihoods of resource-poor farmers in Uganda through a better understanding of dairy production systems.

Figure 1



Box 1: Data sources and methods

Dairy systems at various levels of intensification were studied in Jinja, Masaka and Mbarara districts of Uganda (study sites shown in figure 1). Semi-intensive systems based on partial grazing and with low external inputs contrasted with more intensive systems featuring exotic animals, cut-and-carry feeding and high inputs.

Two surveys were conducted: a cross-sectional survey (one visit per household) in 2001 covering 300 farmers, and an in-depth longitudinal survey–comprising repeated visits to 24 farmers–over a one-year period between 2002 and 2003.

Data analysis focused on two main aspects, namely, economic efficiency and nutrient management.

Economic efficiency was assessed by "net farm benefit analysis". Net farm benefits were evaluated as: revenues from all farm activities, including consumption of farm outputs (crops and milk) by the household and relatives, minus all expenses relative to farm activities. Dairy benefits were evaluated as: revenues from sale of milk and dairy animals, plus the value of milk consumed by the household, minus all expenses relative to dairy.

A linear programming model was developed to evaluate the farmers' choices of crop and dairy activities. The model provided the combination of farm activities that maximises benefits and can therefore be used to assess individual farmers' efficiency by looking at the difference between current (or observed) farm plans, and profit maximisation plan.

Nutrient management was assessed by calculating detailed nutrient balances of nitrogen (N), phosphorus (P) and potassium (K) at farm- and land-levels. Farm nutrient balance was calculated as the quantity of nutrients entering the farm minus the quantity of nutrients leaving the farm. Land nutrient balance was calculated as the quantity of nutrients applied to the land minus the quantity removed from the land. Simulation analyses were carried out to assess what the nutrient balances would be if the farmers were to apply the organic manure available on their farms into the soil.

Profitability of dairy systems

The surveyed smallholders kept cattle under four main cattle farming systems–herded, tethered, fenced and zero-grazed. Herding is the most extensive system and features low use of external inputs. In fenced systems, cattle are kept on a designated piece of land. The more intensified zero-grazing system involves keeping cattle in stalls and feeding them on specialised fodder and high protein supplements to increase milk production.

Herded systems were more common in Masaka and fenced systems in Mbarara, while in Jinja, all the four production systems co-existed (figure 2). The results of the distribution of farming systems in Jinja may seem surprising, given the apparent incentives to intensify in this district due to its proximity to Kampala, the largest milk consumption area in Uganda.

Due to the strong population increase in Uganda and the growing awareness of the benefits of consuming milk and milk products, many projects and policy initiatives have focussed on increasing milk production through intensification and zero-grazing, sometimes irrespective of farmers' needs.

It is, however, important to understand that farmers are very diverse and there are many factors that influence farmers' ability and willingness to increase milk production and intensify their dairy activities. These reasons range from the farmers' own experience and level of education, availability of labour (either family or hired), to availability of a profitable and secure milk market. Agro-climatic characteristics also play an important role, by influencing risks associated with keeping improved cattle breeds for example, but relative costs of labour and land should also be taken into consideration when assessing the benefits of intensive systems.

Analysis of milk productivity of the different farming systems revealed that increasing the level of intensification resulted in an increase in the milk productivity and the percentage total production of milk sold (figure 3). However, despite the variability in milk productivity and market orientation between farming systems, the net farm and dairy benefits per hour invested remained above the cost of labour (figure 4) and there was no apparent relationship between degree of intensification and dairy benefits per hour.

This indicates that in the current situation, all systems are remunerating the farmers' labour above what they could get if they were to offer their services outside their farms. Therefore, dairy production is profitable along the whole spectrum of intensification.

Figure 2: Distribution of cattle farming systems by district

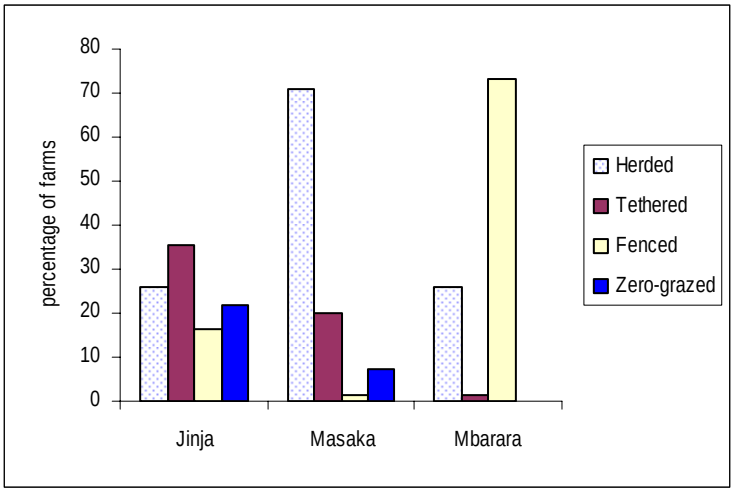


Figure 3: Relationship between milk productivity and market orientation, and cattle farming system

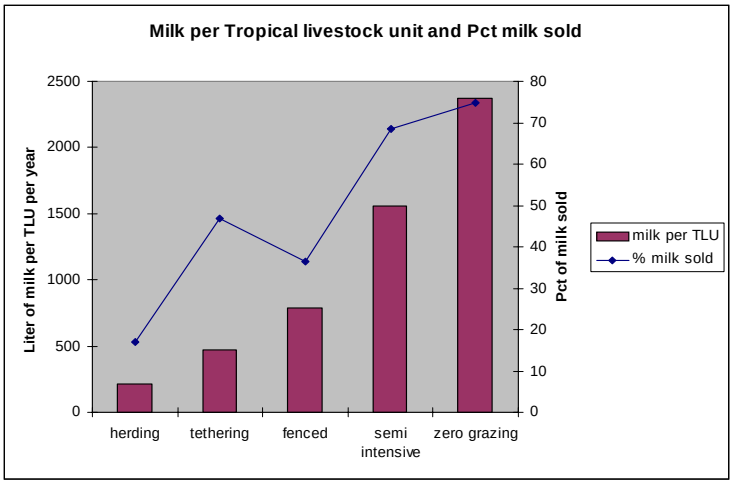
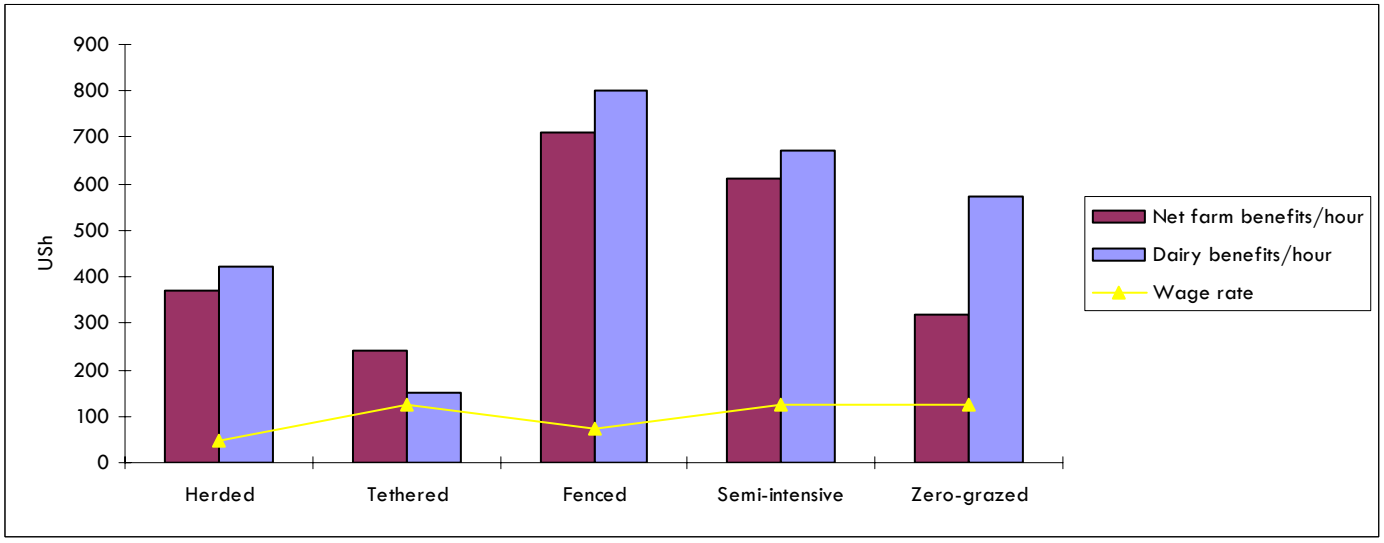
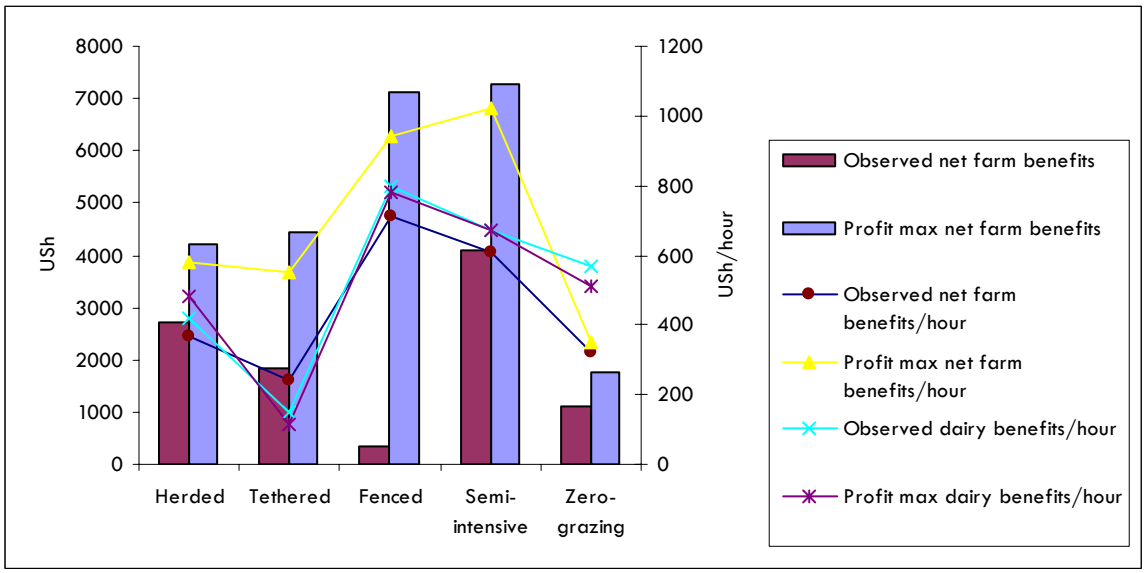


Figure 4: Comparison of the net farm and dairy benefits per hour, and local wage rate for different cattle farming systems



Results from the linear programming model showed that farmers are operating near the profit maximisation levels for dairy but could improve their overall farm benefits by discontinuing fallow and switching to more profitable crops (see figure 5).

Figure 5: Comparison of observed and profit maximisation net farm and dairy benefits



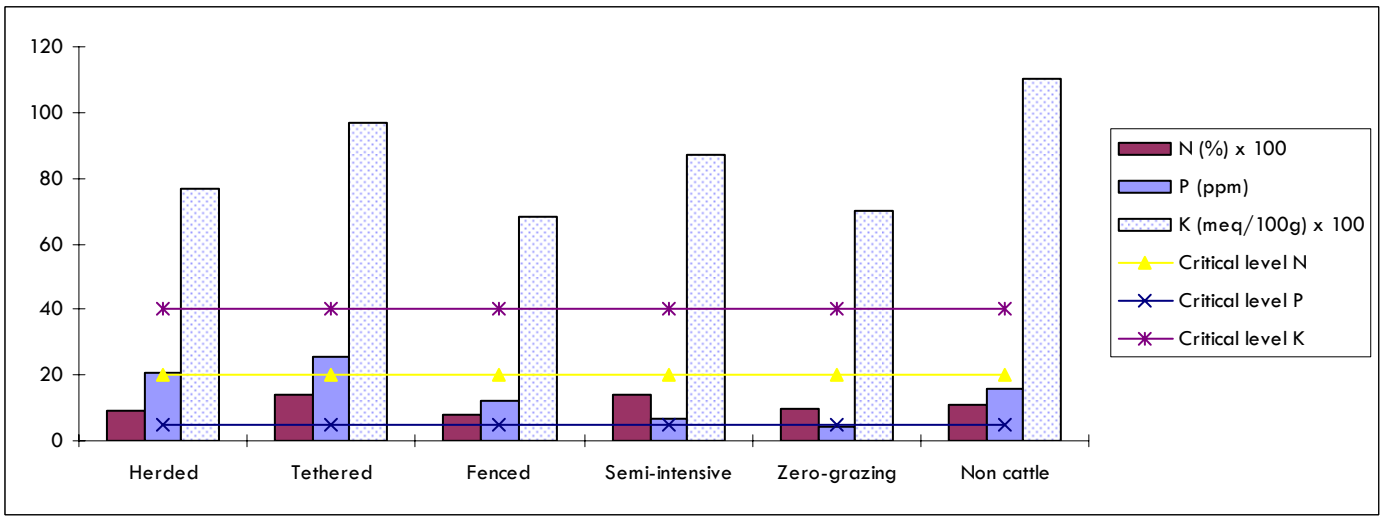
Nutrient management

Soil nutrients are important for good and sustained crop yields, and healthy feed for livestock. The three major plant nutrients–nitrogen, phosphorus and potassium are vital for crop growth. Applying livestock manure, a good source of nutrients, to the land can maintain or improve soil fertility. Thus, livestock keeping can positively contribute to sustainable nutrient management of smallholder systems.

The study results show that while soil phosphorus and potassium levels were relatively satisfactory, the nitrogen levels on all farm types were very low and below the recommended critical levels (figure 6).

In addition to good levels of soil nutrients, a good nutrient balance is also important. Positive nutrient balances on a plot (as defined in box 1) mean that there more nutrients brought into the soil than are being removed, thus improving soil fertility. Conversely, negative nutrient balances mean that soils are getting depleted.

Figure 6: Comparison of soil nitrogen (N), phosphorus (P) and potassium (K) levels, and critical levels under different cattle farming systems



Nutrient balances at farm level were found to be positive or only slightly negative, which means that overall the nutrients taken off the farm through milk and crops are compensated for by inputs in feed and mulching. However, at the land level, the balances were strongly negative for most of the systems. This is because the nutrients available in the manure, although staying mostly on the farm, were not properly applied to the land.

This relation indicates that farmers could improve their soil nutrient balances by applying organic manure, which is available on farm. This is particularly the case in the zero-grazing system where manure is easily captured but still not returned to the land. Figure 7 shows that by applying manure, which is currently not used, the nitrogen balances would improve significantly, particularly for the tethering and zero-grazing

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This dairy research project was aimed at better understanding the process of intensification in smallholder dairy systems in Uganda.

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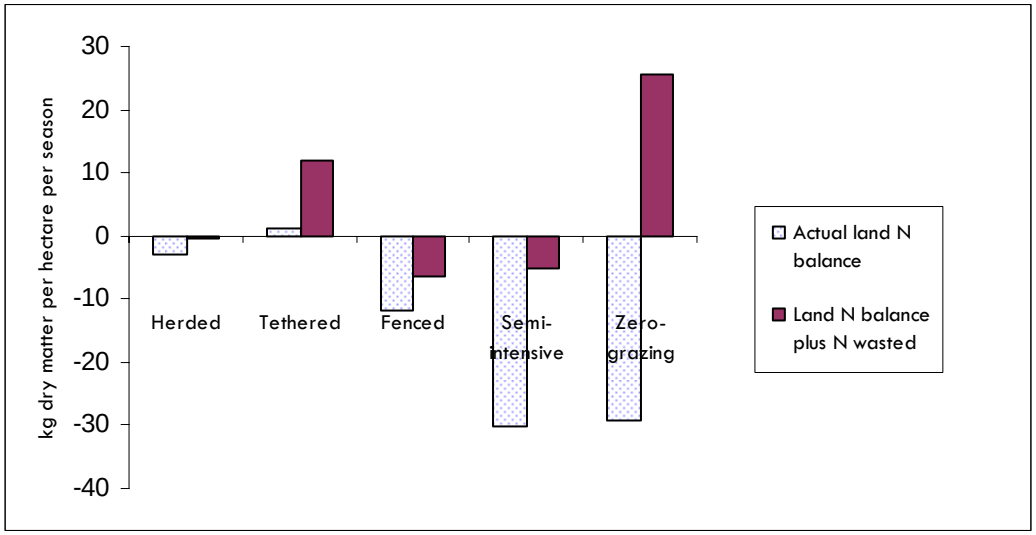
systems. The applicability of such a proposal depends on the labour costs and availability on the farms but it seems relevant to include objectives of improved efficiency in manure handling in future development efforts in smallholder dairy systems.

Figure 7: Changes in land nitrogen (N) balance by applying manure that is currently not used



Conclusions

- Dairy farming in Uganda is a profitable activity irrespective of the type of farming system. Due to local circumstances, such as labour costs and access to milk outlets, farmers in some areas are better off practising extensive or semi-intensive dairy farming.
- Dairy farming has the potential to increase crop production through soil improvement with manure. Although the current practices seem to indicate that manure is wasted on the farm, there is scope for improving soil fertility in the various farming systems, although labour constraints may be an impediment in some systems.

Policy recommendation

- Projects and policies aiming at promoting a specific dairy system should carefully evaluate farmers' incentives and the possible benefits vis-à-vis risks of increasing costs without increasing profitability.

National Agricultural Research Organisation

ILRI
INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

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