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doi:10.1017/S2040470010001093

The farmer's viewpoint: Payment for ecosystem services and agroecologic pasture based dairy production

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Introduction

Ecosystems provide a variety of services essential to human survival and well-being. For example, forests provide food and fiber, regulate climate and water, generate cultural benefits such as recreation, and create habitat for biodiversity. All economic production requires both energy and raw materials provided by nature, and unavoidably produces high entropy waste. Most raw material inputs into economic production otherwise serve as the structural building blocks of ecosystems. When economic activities remove ecosystem structure and return waste, the result is a loss of function, including ecosystem services. Perhaps the most important problem our society currently faces is how to allocate ecosystem structure between conversion to economic production and conservation to provide ecosystem services, both of which are essential to our well-being (Farley, 2010). Different agriculture systems provide distinct conditions for the flow of ecosystems services. Farmers are required to produce food on an increasingly degraded environment for an ever growing population. Markets compensate for goods from the provisioning functions (food, raw materials, ornamental). Provisioning functions are tangible and can be tradable, such as the case of dairy products. On the other hand, the market does not account for the value from regulating functions such as water, forest, habitat and biodiversity protection among others (Alves, 2010). When best management practices are adopted livestock management, especially dairy farming has the potential to promote ecosystem services such as water supply and regulation, soil formation, biodiversity, carbon sequestration, food provision, as well as supporting rural livelihoods (Meurer *et al.*, 2009). The aim of this study is to assess farmers' perception about the flow of Ecosystems Services (Farley, 2010) associated to the transition from confined dairy production to pasture based dairy system called management intensive grazing – MIG (Meurer *et al.*, 2009).

Material and Methods

The geographic area of this research is a typical dairy region in the subtropical coast of Santa Catarina State, Brazil. In Southern Brazil the dairy industry consists mostly of small farms, which constitute a major component of the economies of most municipalities. The dairy activity is very important to the economy of Santa Catarina. It is an element of local culture and it promotes a monthly income to family farms (Freitas, 2009). Eleven percent (110 farms) of the pasture based dairy farmers from four Dairy Industries (*Darolt Co., Della Vitta Dairy., Doern Dairy* and *Generation*) were randomly sampled and surveyed. Data collection was performed through structured interviews (Rizzoli and Schmitt, 2007) from April to June of 2009. Interviewed farmers were responsible for the farm activities. Spontaneous answers were recorded and then categorized. Uni-variate and bi-variate tools were used to analyze the results. The software used for the analysis was BrOffice Calc.

Results and Discussion

The survey showed that 24% of the farmers used herbicide in the entire area. For 84% of farmers, the ground was well covered when managed under MIG. For 82% of the interviewees, the soil was more resistant to drought and showed higher organic matter content. The silage represented the main source of feed in all farms before the transition to pasture. Currently, silage is the main feed in 16% of the farms surveyed. According to farmers, after implementing grazing there was no need to treat for the tick incidence anymore on 77% of the farms. Before the transition to management intensive grazing tick incidence was treatments were undertaken every 3 months in all herds. Chronic mastitis was also a widespread health problem in all farms. After the transition it is still a serious health problem in 28% of the farms surveyed. Forty four percent of the farms maintain riparian areas on their properties although these are narrower than required by the Forest

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Code -between 2 and 15 m wide on each side- instead of the 30 m required. About 90% of the farmers pointed out the incompatibility between environmental legislation and the size and geometry of their farms. Amongst the respondents, 89% said that only punitive law enforcement would be able to force them to maintain all the APP (in-farm permanent protection areas). About 88% of the farms that adopted pasture base dairy-MIG, fenced off springs and remaining forests. The use of electric fences in MIG system minimizes animals contact with water, streams and forest areas. Finally, for 91% of the famers interviewed pasture carrying capacity and milk sales increased substantially when they switch from traditional semiconfinement to pasture based dairy.

Conclusions

For the farmers pasture based dairy through management intensive grazing reduced environmental impact and improved the flow of ecosystem services. These environmental assets should be further measured and recorded.

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doi:10.1017/S204047001000110X

Assessment of water productivity and entry points for improvement in mixed crop-livestock systems of the Ethiopian highlands

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Introduction

Crop-livestock systems are very important both in terms of area and contribution to people's livelihoods in the Ethiopian highlands. However, a common problem in these systems is low livestock and crop productivity, which is partly caused by water scarcity and environmental degradation. As water is a key and often limiting input for agriculture and environmental functioning, there is an urgent need to improve water productivity in order to sustain both people's livelihoods and a healthy environment. Water productivity, generally defined as the ratio of agricultural outputs to the volume of water depleted, measures the ability of agricultural systems to convert water into food. In the crop sector, crop water productivity (CWP) has been investigated for many years. By contrast, livestock water productivity (LWP) is a new concept (Peden *et al*., 2009), for which reference points, standardized definitions and adequate methods for water partitioning are still in their infancy (Descheemaeker *et al*., 2010). Also, a systems approach for analyzing water productivity in mixed systems is still to be developed, tested and adapted. This paper therefore examines how water productivity can be assessed in mixed crop-livestock systems, and identifies entry points for water productivity improvement with the wider aim to improve the sustainability of the systems.

Materials and Methods

The study was carried out in two micro-watersheds, which are characteristic of water scarce (Lenche Dima) and water abundant (Kuhar Michael) conditions in the Ethiopian highlands. The determinants of water productivity were identified through farming system characterization, based on a household survey, key informant interviews and farmer group discussions. The biomass production of different feed types was measured. Water flows were determined based on measurements of climate, crop and soil variables and soil water balance modelling. The water flows were then partitioned into water flows for livestock and for crops, based on harvest indices and the percentage of the available feed that is consumed by the animals. The identification of entry points for improvement was based on the farming system analysis taking into account water resources, feed, livestock and crop management and production levels.

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