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Poultry blood pudding is a popular dish in Vietnam.

FORAGE TECHNOLOGY ADOPTION IN VIETNAM: A MODEL STUDY

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Introduction

The population of Vietnam is approximately 85 million people, more than 75% of which live in rural areas and depend on agriculture to make their living. Livestock makes up about 30% of aggregate agricultural production and is a strategic policy of the Vietnamese government due to its potential contribution to employment creation and income generation. As with many countries in Asia, Vietnam does not have a dairy tradition. However, with changes eating habits, the consumption of dairy products has significantly increased in recent times. The 100,000 herds of dairy cattle produced approximately 235,000 tons of milk in 2007 which satisfies 30% of domestic consumption. Even if there are real opportunities for dairy development in Vietnam, there are still major constraints to the profitability of dairy farming activities. These include low management skills of farmers, lack of suitable forage resources for feeding cattle and the high cost of concentrated feeds. New policies and agricultural innovations are being proposed in order to resolve the main issues related to sustainability in the dairy sector. Research has been carried out on alternative technologies based on intercropping temperate species (mainly Avena sp.). The first questions are: which decisions should be implemented? How should the impacts of agricultural innovations be assessed and evaluated? For this type of exercise, modeling appears to be an interesting decision tool as it helps to assess the complex interactions found in the farm system and analyze the configuration of alternative technical innovations (Louhichi et al., 2004).

Methods

Participatory methods were employed to analyze the farming systems and establish appropriate research and development activities. The first priority was to test and select alternative forage plants, temperate species, resistant to cold temperatures and able to produce enough biomass and quality grass during winter. The forage experiments were carried out under normal farming conditions and monitored by a team composed of farmers, extension workers and researchers. Periodic surveys and meetings were conducted to measure and observe species adaptation and evolution. Further, these activities served as a platform for discussion and provided an evaluation process. An exhaustive assessment survey comprising 120 representative dairy farms in the Moc Chau district was carried out in 2006 in order to establish a farm typology (Warter, 2006). Three main criteria were selected: soil quality, herd dimension, and farmers' dairy activity experience. Farmers began adopting temperate forage species in 2004. In order to assess and evaluate the impact of the adoption of new forage technology, a modeling approach was used. A descriptive linear programming model at farm level was created in GAMS (General Algebraic Modeling System) using a bio-economic and integrative approach. The approach is original in that it develops, on a monthly basis, dynamic relationships between animal nutrient requirements and farm feed (nutrients) supplies with the aim to maximize profit (under agronomic and nutritional constraints). Two indicators (profit and labor demand) were selected to evaluate the socio-economic impact of Avena adoption on Vietnamese dairy farms. Using this mathematical and data-processing tool, it will be possible to

identify and elucidate factors linked to the adoption of the new forage technology and tackle the question of the socio-economic sustainability of farms.

Results and discussion

The Avena species (oats) proved to be the best solution in terms of agro-ecological adaptation, high production yields, excellent nutritive value and low production costs. In addition, the incorporation of this feed in the ration results in regular production of milk throughout the lactation period. In the first year of the scaling-up experiments (2004), 36 farmers planted 2.0 ha of temperate forage species in the Moc Chau dairy basin. Two years latter, the area for oat production was about 60 ha and more than 140 farmers (28% of total farmers) were involved. However, a few farmers expressed dissatisfaction with the potential of the temperate forage species, which impeded further adoption. The reasons cited by farmers to justify their non-adoption include: low growth capacity of oat in poor soils; insufficient number of harvest periods; high input costs; high labor demand. In order to realize the importance of these adoption factors we created a multi-period farm-scale model (DAIVIE). The DAIVIE model evaluates the impact of oat forage adoption, over the profit (total income – total costs), labor time and more generally on the sustainability of farms in the Moc Chau dairy basin. The model takes into account the interactions between various components of the farm system (forage, feeding, and livestock) and the market.

In all model scenarios, Avena was selected as the optimal solution to maximize farmers' profit. This result confirms observations in the field concerning the economic interest of oat use during the winter period. The results obtained for the total profit (8 years) and labor time (days/month) on average farm types are presented in Table 1.

Table1. Socio-economic impact of oat adoption in average farm types

Typology	*No adoption*		*Oat adoption*		*difference (%)*	
criterion	*profit (€)*	*labor*	*profit (€)*	*labor*	*profit*	*labor*
Soil fertility	*17 118*	*20*	*18 994*	*27*	*+11*	*+35*
Experience	*21 627*	*27*	*25 321*	*37*	*+17*	*+37*
Herd dimension	*14 859*	*19*	*17 009*	*25*	*+14*	*+32*

The model shows that the adoption of oat forage will lead to an increase in farmers' income. This is directly related to an increase in the selling of milk and young animals, as well as the reduction in the feeding costs. However, the amount of increase depended on the typology and farm type used. The impact of oat forage adoption for the farmers is an increase in labor time during the winter period. According to the model results, the experience of farmers in dairy activity and the dimension of their herd did not seem to be crucial factors for oat adoption. On the other hand, the forage yields and the additional labor demand, especially in winter, could discourage adoption of oats by dairy farmers. These results are in total agreement with previous field evaluation processes (Salgado, 2008). Almost all farmers declared that the technical protocol for oat production is rather simple and do not pose difficulties even for farmers with less experience in dairy breeding. For labor requirements, it is important to note that during the winter period, farmers are engaged in other activities in addition to milk production. Considerations before adopting the forage not only include productivity, but also factors such as traditional practices or preferences. The introduction of labor-intensive technologies will result in higher costs for hiring agricultural workers to perform additional tasks and in some cases farmers may not wish to resort to hiring labor.

Finally, the DAIVIE model conceptualization illustrates the importance of the interdisciplinary work between modelers, agronomist and socio-economist researchers in order to obtain an accurate mathematical approach and a refined representation of a dairy farm system.

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