



The Impact of Changes in Crop-Livestock Interaction in Banteay Chmar Commune, Thmar Puok District, Banteay Meanchey Province, Cambodia

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Abstract Banteay Meanchey Province is located in the northwest of Cambodia with agricultural, tourism, and handicraft economic sectors. The main agriculture products were crops (rice, cassava and banana) and livestock (cattle, buffalo, pigs and poultry when water is available). In between 750-1,500 families raised livestock for cash income, field operation, transportation and other uses. In the last few years, the number of livestock heads significantly decreased because of the introduction of hand tractors, lack of feed, and diseases. The observation of such decreases led to a study focused on income flow through different farming systems, linkages between crop and livestock production and analyzing strengths, weaknesses, opportunities and the huge challenges in the region. Appropriate samples were used according to spatial/grid-cell method from Googleearth. GPS was used to identify the locations based on the grid-cell data. Many tools such as Participatory Rural Appraisal (PRA and Rapid Rural Appraisal (RRA), were included. Local authorities, relevant NGOs such as Economic and Social Relaunch of Northwest Provinces in Cambodia (ECOSORN) and Agricultural Development Denmark Asia (ADDA), agricultural extension workers and farmers were involved. The results revealed that there were two kinds of farming systems - with livestock and without livestock. It indicated that farming with livestock could produce much more income than without livestock because farmers could sell both crop and livestock production to the market. Moreover, livestock could be fed easily with crop residues. In most of the cases, livestock's manure could also be used to fertilize fields. Although livestock production was economically important for farmers, the shortage of water and feed throughout the year and the existence of diseases discouraged farmers from raising livestock in great numbers even if there was intervention from NGOs, local authorities, or veterinarians. Such conditions led most of the farmers to change to the use of hand tractors as a means of transportation and field work.

Keywords farming system, crop-livestock interaction, SWOT

INTRODUCTION

Banteay Meanchey Province is located in the Northwest corner of Cambodia, bordering with Thailand, Oddar Meanchey and Siem Reap and Battambang Province. Its economy was based on agricultural, tourism, and handicraft sectors (SOLD, 2006-2007). The main livestock products were cattle (buffalo, oxen, and cows), pigs, and poultry, (mainly chicken and ducks when water was

available) (Vinvien, 2004). Banteay Chmar is the commune of Banteay Meanchhey Province with the highest number of families. Between 750 and 1,500 families were engaged in feeding cattle and pigs for substantial daily life (Cambodia, 2007; ECOSORN, 2007).

The number of livestock increased in previous years mainly as a reflection of improved production and income. The main livestock were cattle, pigs, and poultry. Cattle were most often raised as draft animals for field operations and transportation, and were also seen as an important investment/insurance in terms of urgent cash needs. Pigs, however, were mainly a cash enterprise for farm families. Chickens and ducks were kept by most families for their own consumption, and were probably the most important animal protein after fish (Cambodia, 2007).

Cattle are important as a source of draft power, and the use of manure was an essential crop-livestock interaction. Dried manure or manure-based compost was often important for crop production, particularly on the low fertility soils in the area (Cambodia, 2007).

The importance of crop-livestock interactions were, however, challenged by a number of factors in the last few years. In the case of more resourceful farmers, animal draft power was out-competed by motorized mechanization (hand tractor). In addition, subsidized fertilizers displaced more labour-intensive animal manure application. Finally, the lack of fodder in the wet season restricted the number of cattle, and was further constrained by the expansion of agriculture (primarily cassava cultivation) instead of the previous important grassing areas (Cambodia, 2007).

The purpose of this study of crop-livestock interaction is to identify the income flow through different farming systems, the linkages between crop and livestock production, and achievements and difficulties in the agriculture of the study area.

METHODOLOGY

The study site was proposed in Banteay Chmar Commune, Thmar Puok District, Banteay Meanchey Province, as the site was economically based on crop-livestock production.

The following approach was used to sample the study area. A spatial/grid-cell method was applied using a map from Google Earth mapping software. The map was split into columns and rows. Selected households were pointed in yellow colour and the latitude/longitude coordinates were obtained from the points. GPS was then used to identify the sampling locations in the field. Moreover, some tools such as Participatory Rapid Appraisal (PRA) including Seasonal Calendar, Ranking Matrix, Map Sketching/Mapping, and Rural Rapid Appraisal (RRA) including Semi-Structured Interview, Structured Interview, Focus Group Discussion (FGD), and Direct Observation were applied.

37 households were selected to be interviewed, two FGDs (10 persons/FGD) were conducted, and other individuals were consulted and interviewed such as local guides, communal heads, ECOSON staff, and agricultural extension workers. The findings were presented at the local, district, and provincial levels and in Royal University of Agriculture.

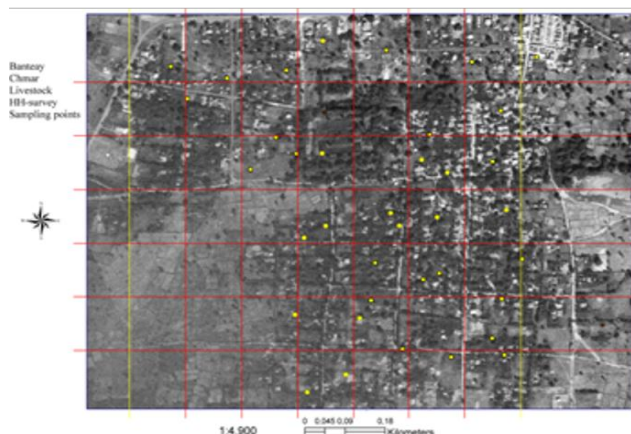


Fig. 1 Map of the research zone

RESULT AND DISCUSSION

Situational information

The Banteay Chmar Commune has had a large decrease in livestock since 2005. The decrease in livestock is due to the introduction of hand tractors, lack of feed caused by land use change, and diseases. Many actors were involved in supporting livestock production such as NGOs, local authorities, agricultural extension workers and local veterinarians. However, their involvement still did not encourage farmers to focus on the reproduction of livestock.

Hand tractor use

Hand tractors have been introduced in the region since 1999. The increase in use of hand tractors was caused by the perception of local people that there have been big losses in animal draft power, and that hand tractors are useful substitute. In some cases, the use of a hand tractor spread from one farmer to another as an effective tool.

Only about 6 percent of the total local people were using hand tractors at the starting time in 1999. In 2001, however, the number of tractors was slightly increasing. Many local farmers were starting to recognize the importance of hand tractors for field operations and other purposes.

By 2005, the number of hand tractor was rapidly increasing as farmers recognized their effectiveness. Moreover, shifting land use from grasslands to agricultural land decreased the feed available to livestock and potentially increased the use of hand tractors. This negative experience led local people to change their way of life from livestock-based farming to hand tractor-based farming.

It could be summed up that most farmers switched to hand tractors from livestock. Hand tractors could be used for land preparation, transportation, pumping. Some people were using tractor as a method of fishing (by pulling a net connected behind the tractor) as well.

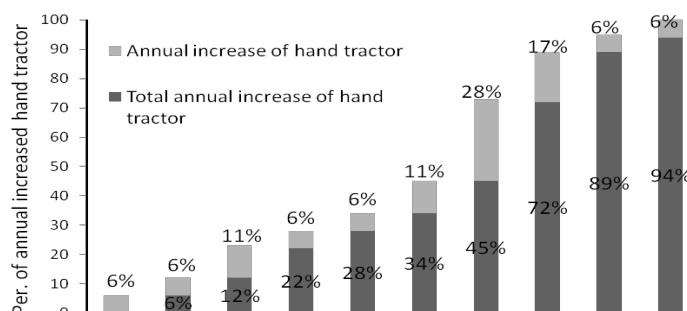


Fig. 2 Annual increase of hand tractors (1999-2008)

Land use change

Based on information from the field surveys, land use could be classified into six categories: settlement land, rice field, cassava field, crop field, grassland and rest land. The land use change has been occurring since 1996; however, a huge amount of change emerged in 2005 when the price of cassava was increasing and the diseases of livestock were a serious problem. Since 2005, land use has changed remarkably in the region, shifting from settlement land and grassland to cassava land. This significant land use change caused the shortage of feed for livestock, especially cattle. Even the rice fields, which provide a subsistence food source for the local people, were reduced.

The increases in cassava crops and livestock diseases had a negative impact on land use types such as settlement land, rice field, and grassland. Also, the decreases in grassland land use reduced the amount of feed available for cattle.

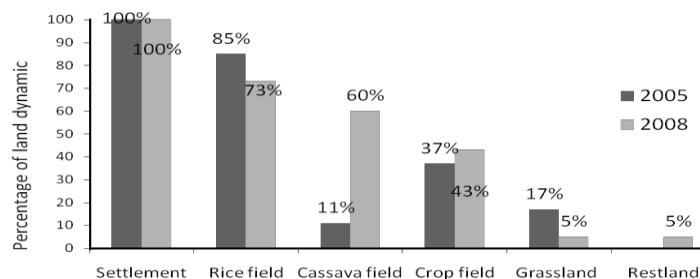


Fig. 3 Dynamic of land ownership

Land classification

In accordance with this classification, the land area of all categories changed. The amount of settlement land decreased slightly as well as the amount of rice fields. However, there was a significant increase in the land area of cassava fields. This is due to the market demand for cassava product.

Table 1 Land classification

Land classification	2005 (%)				2008 (%)			
	< 0.5ha	0.5-<1ha	1-<3ha	>3ha	< 0.5ha	0.5-<1ha	1-<3ha	>3ha
Settlement land	73	27	0	0	92	9	0	0
Rice field	8	27	41	24	11	37	29	23
Cassava field	11	0	0	0	11	11	37	41
Crop field	19	23	37	19	19	23	37	19
Grassland	0	17	0	0	5	0	0	0
Rest land	0	0	0	0	0	0	0	5

Disease status

The rearing of livestock in the local area decreased due to several diseases that infected livestock throughout the region. The diseases which infected pigs and cattle included Foot and Mouth, Hemorrhagic Septicemia, Swine Fever, and fowl cholera and fowl pox infected poultry. The occurrence of serious diseases has increased greatly since 2005. The impact of this bad issue was locally and internationally considered. Although there were no intervention from others stakeholders, the damage of livestock was still happening. The bad experience to the local people did not encourage farmers to raise livestock in large amounts.

Still, in some cases, farmers continued to raise pigs and chickens. These types of livestock could be easily kept, grow quickly, and produce high income, so some farmers continued to raise these animals.

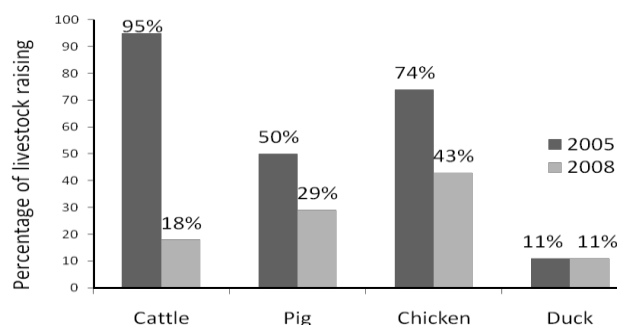


Fig. 4 Tendency of livestock rearing

Income flow through the farming system

Mostly, farmers in the region were growing rice, cassava and banana. According to the farming system classification, many types of products from the crops were used for both subsistence consumption and marketing. Out of the three sources of income, farmers were also fishing to supply their families. Moreover, it seemed that the outputs from crop production were not handled properly. Some farmers burned or left crop residue in the fields as an organic fertilizer. However, this is not an efficient way to improve soil fertility because if they had livestock, some kinds of crop residue could be effectively used as forage for the animal, which in turn produced manure to fertilize the fields. In addition, the animal can provide food and cash income.

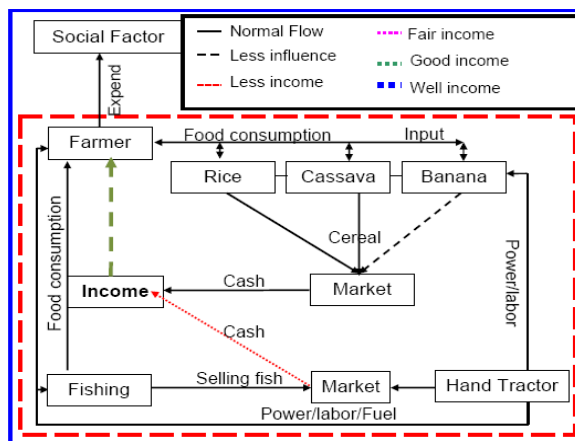


Fig. 5 Farming system without livestock

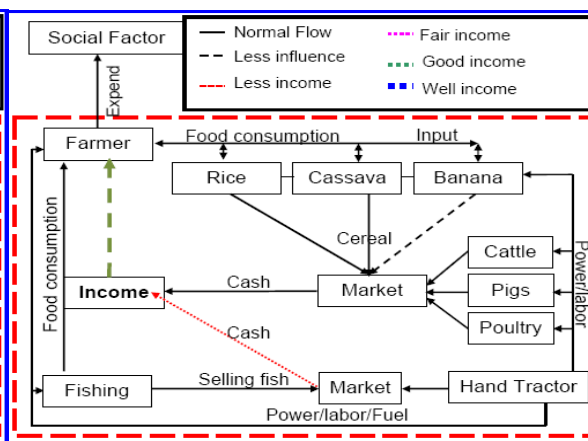


Fig. 6 Farming system with livestock

Crop-livestock linkage

Crop-livestock interaction was classified into two categories: with livestock and without livestock. In the local area, most farmers were growing rice, cassava and banana. Banana was found only in gardens while the other two crops were cultivated in the field. Farming without livestock did not effectively use crop residues and larger amounts of chemical fertilizers were applied in fields where livestock were absent. Information from the survey suggests that the soil became gradually less fertile with the application of inorganic fertilizers, indicated by the fact that some farmers bought manure from neighbors to re-fertilize their fields.

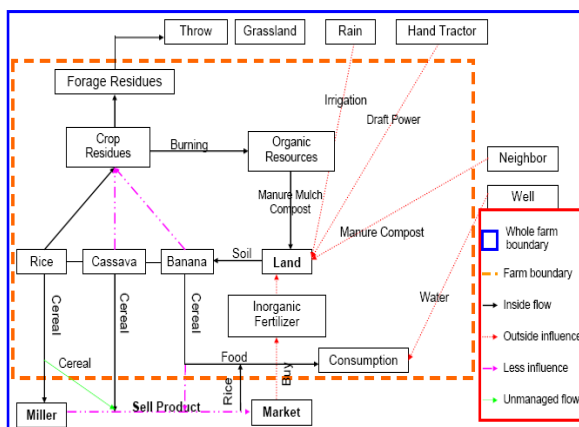


Fig. 7 Cropping without livestock

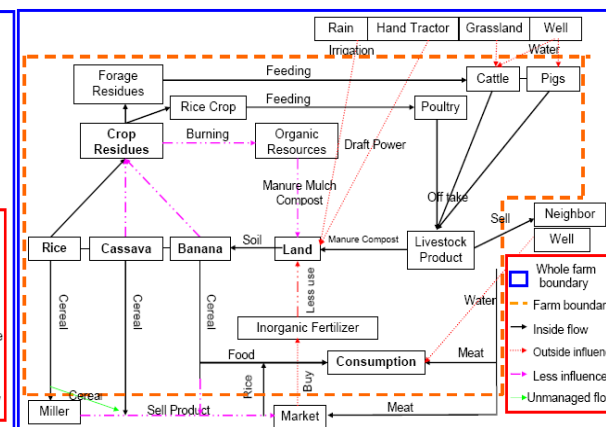


Fig. 8 Cropping with livestock

However, farming was more effective where farmers had livestock. Crop residue was used for animal feed, and manure, in return, was used as an organic fertilizer to enrich the field. Therefore, farming with livestock balances crop-livestock interaction and provides an additional source of cash income.

SWOT analysis

The SWOT analysis was used to determine proper strategies to deal with weakness and threats of the local farmers by using their strength and opportunities. After SWOT tool was analyzed, farmers suggested using their local resources in order to make better their livelihood.

Table 2 SWOT analysis for improving the crop-livestock interaction and livelihood

STRENGTH	THREATS
• Variety of crops were cultivated in the region • Crop residue was used for animal feed • Manure was used to improve field instead of chemical fertilizer application • Farmers had a lot of free time	• Soil pollution by using chemical fertilizers • Water pollution from chemical fertilizers negatively affected human and animal health • Increased new diseases from pesticide use • Lack of water supply in the dry months
WEAKNESSES	OPPORTUNITIES
• Lack of water in the dry season • Lack of forage for cattle in the wet months • Lack of prevention of animal diseases • Poor management of manure • Crop residue was burned in the field • Hand tractors played more important role than cattle in term of field operation	• Many NGOs were supporting local farmers • Full availability of local veterinarians • Water source around temple and Cheongcrosh Lake was used in dry months • Crop residue should be kept for animal feed • Local cattle should be considered and Manure should be kept for soil enrichment

CONCLUSION

Most farmers cultivated rice, cassava, and banana. At the same time, they raised cattle, pigs, and poultry. Since 1996, the linkage between crops and livestock had become more effective. They primarily used manure for their fields, and crop residue for feeding animals. In 2005, however, the increases in diseases, the market demand of cassava, and shortage of feed drove down the number of livestock. Farmers tended to rear animals in small numbers for home consumption and cash income only. Moreover, the introduction of the hand tractor positively affects the field work, and reduced the importance of animals in terms of farm operation.

Many farmers who did not engage in livestock rearing used chemical fertilizer instead of manure. Moreover, pesticides were applied throughout the area which has negatively affected the fields and water, and it impacted human and animal health. The soil fertility became poorer, so the farmers started recovering the soil by applying manure. The farmers without livestock bought manure from the neighbors to apply to their fields.

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