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Smallholder cattle production in northern mountainous Vietnam in relation with the poverty status of the household

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Introduction

Since the 1980s Vietnamese government has put much emphasis on the development of the beef sector (Ly et al., 2002). About 90% of the total cattle population is raised on household farms (Department of Animal Husbandry, 2006). It is assumed that the potential for beef production is high in the mountainous regions, where land is available for improved pastures (Middleton, 1998). The northern uplands are reported to have the highest incidence of poverty, particularly in remote areas (Minot and Baulch, 2005). Ethnic minorities live there in less productive areas with poor infrastructure and low accessibility to market and off-farm work (Walle and Gunewardena, 2001). Cattle are raised for multiple functions on household farms (Perkins, 2002). Beef supply to the market from these regions plays still a minor role (Department of Animal Husbandry, 2006). A study of Millar and Photakoun (2008) in Laos indicated that there are serious constraints to poor farmers to benefit from livestock intensification. Huyen et al. (forthcoming) found that smallholder cattle production in Son La was affected by altitude and remoteness. To evaluate the potential and constraints for developing beef production in smallholder farms in the northern mountainous province, the present study aims to investigate the relation between beef cattle keeping and production and poverty level of household farms. In addition, the relation with altitude and remoteness and technology adoption for feasibility of smallholder cattle production are assessed.

Materials and Methods

Data on general socio-economic conditions were collected from 300 households randomly selected in Yen Chau district, Son La province, by using household interviews with structured questionnaires. The relative poverty status of the household was considered using a grouping into terciles. The population was split into 3 equal groups, based on household per-capita expenditures as a measure of monetary poverty or wealth, including the poorest, the middle, and the richest terciles (Zeller et al., 2009). Daily per-capita expenditure was calculated following the methodology of the Living Standard Measurement Survey (LSMS) of the World Bank (Grosh and Glewwe, 1998). From the poorest to the richest terciles, the elevation and the remoteness decreased and the share of two-season paddy land area increased. Further, the education levels of household heads increased from the poorest tercile to richer terciles. In all villages, the major

cash income came from maize, while rice was mainly used for household subsistence. Compared with the poverty line for international poverty comparisons of 9,375 VND/capita expenditure/day, which was calculated from the poverty line of 1.25 USD/capita/day by the World Bank (Ravallion and Shen, 2008) at purchasing power parity rates by the World Bank's International Comparison Program (World Bank, 2005), the poorest tercile laid below the poverty line. The other terciles laid above poverty line.

Data on livestock production were collected in a total of 299 households, including the ethnic groups of 225 Thai, 44 H'mong, 27 Kinh and 3 Kho-Mu. All investigated H'mong households belonged to 90 highland farms. Among 209 lowland households, 96% were Thai. All investigated farms were classified into two groups whether keeping cattle or not. Among cattle keepers, farms keeping less than three cattle were considered as small farms and those with three or more cattle as medium farms.

Data analysis was performed using SAS 9.2. The PROC GENMOD procedure was used in the analyses of response variables having nominal values, frequencies and count data. The considered effects included poverty level, altitude zone, and the farm group (cattle keeping farm vs. non-cattle keeping farms) or farm type (small vs. medium farms). Ethnicity was excluded in these analyses after the tests for two- and three-way associations because of its high correlation with zone. Discrete quantitative variables were analysed by the non-parametric Kruskal-Wallis test. The differences between observed frequencies of different types in application of new technologies in livestock production were examined using Chi-square tests.

Results and Discussion

Cattle keeping on smallholder farms

Cattle keeping farms comprised 44% of the total investigated farms and had more advantages in terms of more land and higher family size and thus labour force compared to the non-cattle keeping farms. The structure of raising other livestock species, breeds, types, and number of animals were similar between the two farm groups (see Table 1).

Table 1: General characteristics and livestock keeping on cattle keeping and non-cattle keeping farms

<i>Farm group</i>	Cattle keeping n=133	Non-cattle keeping n=166
Farm size (m ² /farm)*	17,859.6	13,469.0
Family size (person/farm)*	5.1	4.3
Share of cash income from maize in the total household cash income (%)	65.0	64.7
Farms keeping pigs (%)	34.6	34.9
Average number of pigs/farm (n)	1.9	1.8
Farms keeping buffaloes (%)	68.4	64.5
Average number of buffaloes/farm (n)	1.4	1.1
Farms keeping poultry (%)	86.5	82.5
Average number poultry/farm (n)	19.9	22.1
Farms keeping goats (%)	18.7	26.3
Average number of goats/farm (n)	0.8	1.5

* Significant difference between the two farm types: $\chi^2=11.3$; $P<0.001$ for farm size; $\chi^2=11.2$; $P<0.001$ for family size (Kruskal-Wallis test).

Among cattle keepers, the herd size and composition differed significantly by the main effect of the farm type ($P<0.0001$). Bigger herd sizes of the medium farms were associated with a higher share of cows and calves in the herd (Table 2). Household farms in Son La with larger herd sizes raised cattle mainly for breeding purpose to produce calves for cash generation, while small mixed farms kept cattle mainly as draught animals (Huyen et al., forthcoming).

Table 2: Herd size and herd composition, by farm type

Farm type	Small farms n=77	Medium farms n=56
Herd size (n)	1.4 ^b	4.8 ^a
Cows (n)	0.5 ^b	2.2 ^a
Bulls (n)	0.7	1.0
Calves (n)	0.2 ^b	1.6 ^a

LSMs in the same rows with different superscripts differ significantly at $P < 0.05$; decision is based on analysis of differences in least square means over farm type (saturated loglinear model).

Cattle keeping in relation with the poverty level

Frequencies of cattle-keeping farms were significantly associated with the poverty levels (DF=2; $\chi^2=7.15$; $P=0.028$) and zone (DF=1; $\chi^2=7.8$; $P=0.005$). More than half of the farmers in the richer terciles kept cattle, while about 70% of farmers in the poorest tercile did not keep cattle (see Figure 1). Farmers of the poorest tercile accounted with only 22% of the total 133 cattle keepers, significantly less than the middle (37%) and the richest terciles (41%) ($P < 0.05$). This finding of our study is in agreement with statements of Dolberg (2001) and Millar and Photakoun (2008) that for poor households, who lack the necessary start up capital, it can be difficult to increase livestock beyond a few small animals. However, the better off and richer farmers were equally distributed between cattle keeping and non-cattle keeping farm groups (see Figure 1). This indicated that keeping cattle depended not only on the poverty level of the households. Larger farm sizes, where more crops and crop-by products could be produced, and larger family sizes providing more labour force in cattle keeping farms compared to non-cattle keeping farms (Table 1) hint to the dependence of cattle keeping on available feed and labour resources.

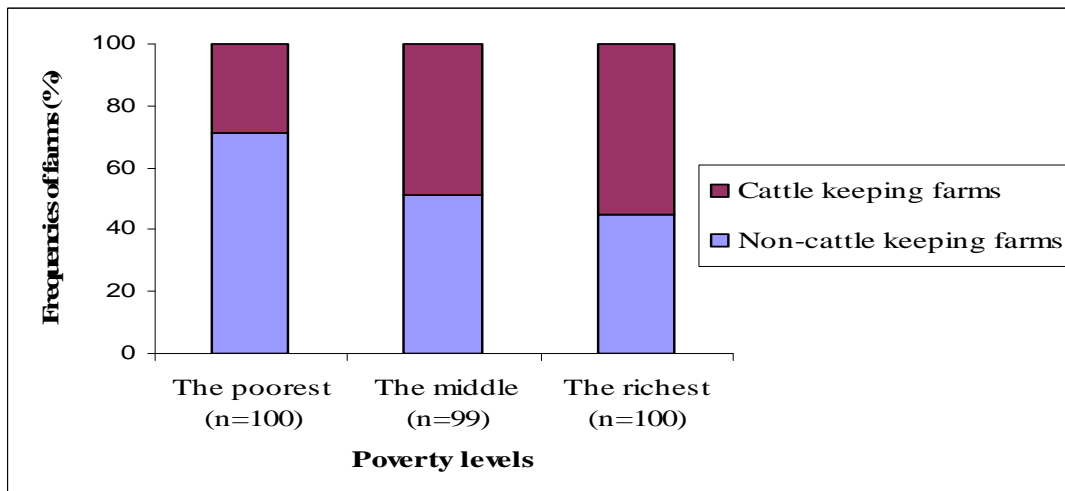


Figure 1: Frequencies of cattle keeping, by poverty level

Significant difference between frequencies of cattle keeping and non-cattle keeping farm groups: at DF= 1 $\chi^2=17.6$; $P < 0.0001$ for the poorest (chi-square goodness of fit test); $P < 0.05$ for cattle keeping farms of the poorest compared with the middle and richest terciles (threshold model)

The medium farms consisted mainly of the richer terciles (91% of the total), while 83% of the poorest farmers keeping cattle were presented in the small farms. The observation that richer farmers have more capacity to raise larger number of cattle compared to poorer is in agreement with the finding of Cramb et al. (2004) in the Central Highland. A higher number of farms keeping cattle in the lowlands can partly be explained by a higher proportion of richer farmers there, with more advantages in terms of infrastructure and access to the market than in the highlands (see Table 1).

During the last 5 years, the farms adopted different innovations for livestock production. The application of new feeding strategies occurred most often, followed by starting to rear new species, mainly ruminants (see Table 4).

Table 4: Frequency of new technology adoptions in livestock production

<i>Adoptions</i>	Frequencies	
	Farms	%
Application of new feeding strategies	51	35
Rearing new species or breeds	49	34
Vaccination	15	10
Start building new stables	13	9
Using AI	8	5
Stop rearing certain species	7	5
Other changes	3	2
Total	146	100

Significant differences between types of adoptions: $\chi^2=208.5$; $P<0.0001$ (Chi-square test). Multiple answers allowed.

Frequencies of technology adoptions in cattle production and livestock in general differed significantly between the poverty levels (DF=2, $\chi^2=11.69$, $P=0.0029$). The remoteness of the zone was not related to these adoptions. New practises in livestock management were adopted by farmers of all poverty levels, however, more frequently by richer farmers (see Table 5). This study agrees with Dolberg (2001) that those farmers who have the capacity of buying livestock and have access to the available resources are more likely to adopt new practices to intensify livestock production.

Table 5: Frequency of new technology adoptions in livestock production, by poverty level

<i>Poverty levels</i>	Frequencies	
	(n)	%
Poorest tercile	38	26 ^a
Middle tercile	43	30 ^b
Richest tercile	65	44 ^{bc}

Frequencies in the same column with different superscripts: a and b were significantly different at $P<0.05$; a and c at $P<0.001$ (decision based on analysis of odds ratios and their confidence intervals). Multiple answers allowed.

Conclusions and recommendations

The poorest households kept no cattle at all or a small number of cattle mainly for work force. Cattle keeping was more prevalent among households with advantages in availability of family labour and crop residues for cattle rearing. The poor were less likely to adopt new practises for intensifying livestock production than the non-poor. To engage poor farmers in the development of beef cattle production is only promising in regions where local feed resources are still available. In addition to giving support in feeding, breeding and marketing, it is required to adopt policies for providing credit for the poor to develop cattle production.

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