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Characterisation of smallholder pig production systems in mountainous areas of North Vietnam

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Abstract

Situation of farmers in Vietnam's mountainous areas is hampered by low and unsteady resource availability and less developed infrastructure. Smallholders seek to improve their livelihood by extending livestock husbandry with main focus on pig keeping. Local pig breeds are progressively replaced by genotypes with higher production potential. Keeping high-yielding genotypes may generate higher revenues from pig production but also implies an economic risk for farmers due to higher input required. This study assesses the suitability of local pig breeds and introduced improved genotypes for smallholders in different production systems. Pig production intensity, farmers' production aims and management strategies are described. Reproductive and productive performances of genotypes are given. Output from pig production is determined. Data collection was carried out in two research periods in 2001 and 2002 in North Vietnam, Son La province. Four selected villages of ethnic Black Thai cover a gradient from semi-intensive pig production in the mountain valley, near-town to extensive pig production at the hillside, far from town. Research methods include structured household interviews, communication tools (from RRA methodology), recording production/ reproduction data and weighing pigs. Preliminary results show that near town farmers keep the introduced Mong Cai pig with relatively high performance. The more market-oriented pig production returns a higher cash revenue, but requires higher production costs. Far from town, pig production fulfils mainly social functions. Farmers keep the local Ban pig with low performance and yield lower cash revenue, however, have lower production costs. Data analysis yielded factors influencing variation of productive/ reproductive performances on-farm and production efficiency. The results are prerequisites for the set-up of on-farm performance testing and thereby for the determination of production efficiency of different pig genotypes in the production systems investigated.[1]

1 Background and objectives

Livestock husbandry is an important component of the mixed farming systems in South-East Asia in general and Vietnam in particular (DEVENDRA et al., 1997). Pig keeping is wide spread and pigs are considered to be one of the most important livestock species in Vietnam (SINGH et al., 1996).

Compared to the lowland and delta areas of Vietnam, the mountainous areas of North Vietnam are a marginalized region characterised by low and unsteady resource availability and a less developed infrastructure (DEVENDRA et al., 1997; JAMIESON et al., 1998). These mountainous areas are not a homogenous region but have to be divided in zones with specific characteristics.

The mountain valleys and areas near towns are densely populated and therefore affected by a high land pressure. The infrastructure is relatively well developed. Pig production is conducted on a semi-intensive

[1] The financial support granted by the German Research Council DFG, the German Academic Exchange Service DAAD and the Federal State of Baden-Württemberg is gratefully acknowledged.

level and can be characterised as demand driven (STEINFELD & MACK, 1997). Farmers keep almost exclusively high-yielding pig genotypes, namely Vietnamese improved breeds, imported pig breeds and their respective crossbreds. The variety of genotypes kept is the result of a breed replacement process that started in the 1950s (NIAH, 1997).

On hillsides and hilltops, population density is lower, and therefore land pressure is quite low. The infrastructure in the area is poorly developed. Pig production is conducted on an extensive level and can be characterised as resource driven (STEINFELD & MACK, 1997). Local pig breeds are still predominant, though they are subject to an ongoing process of breed replacement by high-yielding genotypes coming from the lowland regions (THUY, 1999). By keeping high-yielding genotypes, farmers may yield a higher revenue from pig production but may on the other hand undergo financial stress and economic risk due to the required purchase of feed and breeding animals as well as the higher care intensity and the more complex veterinary care for the high-yielding pig breeds.

The objectives of this study are:

- To assess the suitability of local pig breeds and improved introduced pig genotypes for smallholders in the research area Son La province,
- To identify potentials and limitations for future development of the existing pig production systems.

These objectives lead to a comparison of the Vietnamese improved breed "Mong Cai" in a demand driven production system with the Vietnamese local breed "Ban" in a resource driven production system and thus to the central question: Is it reasonable to integrate Ban breed in a breeding and marketing program in the resource driven system, or is it better to replace the local breed by higher-yielding genotypes?

2 Material and methods

The study was conducted in the frame of the Thai Vietnamese German collaborative research program "The Uplands Program/ SFB 564". Fieldwork was conducted from February to July 2001 and from January to August 2002 in four villages of ethnic Black Thai in the province Son La, located in the mountainous area of North West Vietnam (for characterisation of the study location see table 1).

Table 1: Characterisation of villages selected for the study

Village	Ban Buon	Ban Bo	Na Huong	Bo Duoi
Geographic location	District Son La capital Nearer to town Mountain valley		District Mai Son Farer from town Hillside	
Production system	Demand driven		Resource driven	
Predominant pig breed	Vietnamese improved: Mong Cai, MC crossbred		Vietnamese local: Ban breed	
Origin of pig breed	Red River Delta		Upland region, NW Vietnam	
Interviewed households (n)	17	16	16	15

Fieldwork started with a situation analysis (10 days in 2001) in the four selected villages. Based on the findings from the situation analysis, structured interviews were conducted in 64 households in the four villages. Each household was visited four times (twice per year). Household interviews covered socio-economic parameters, livestock production in general, pig production including reproductive and productive performance, and seasonal changes in pig production between the current and the previous interview. Additionally, communication tools following a RRA approach were used for in depth-assessment of special topics, such as feeding strategies in different seasons of the year or appreciation of pig breeds by

farmers (DHAMOTHARAN, 2001). Performances of pigs were recorded by repeated weighing (in total 731 individual measurements). Research results were discussed with farmers both individually and in feedback seminars conducted in the year 2002. Results were used to describe the two pig production systems. Based on the system description, suggestions for interventions were made. Suggestions were communicated to farmers in training courses and to local authorities, aiming at improvement of pig production.

3 Results and discussion

In the resource versus the demand driven system, pig production shows considerable differences. These differences are described starting from impact of pig production on the household economy via the production performances and the pig production output up to differences in feed input requirements.

The impact of pig production on the household economy is higher in the demand then in the resource driven system. In the demand driven system, cropping, off-farm activities, animal production and pig production make roughly the same contributions to the annual cash revenue of the household (see figure 1). The annual revenue from pig keeping is nearly four-fold higher than in the resource driven system (demand driven system Ban Buon 3.9 million VND; Ban Bo 4.6 million VND; resource driven system Na Huong 1.1 million VND; Bo Duoi 1.4 million VND).

In the resource driven system, farmers get the highest cash revenue from cropping (Na Huong 23.1 million VND, Bo Duoi 15.2 million VND). Off-farm activities, husbandry of pigs and other livestock make only minor contributions to the total household cash revenue.

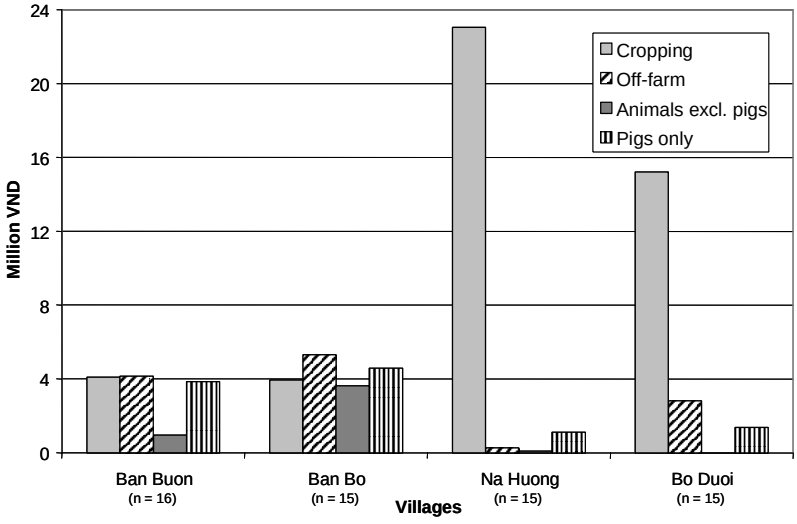

Figure 1: Average cash revenue/ household x year (million VND), weighted by percent of farmers getting the respective type of revenue/ income, by village. Household interviews 2002
VND = Vietnamese Dong, 1 USD ~ 15,500 VND (approximate exchange rate 2002)

From the different share of pig production in the annual household cash revenue it can be assumed that pig keeping fulfils different functions in the two production systems. These different functions are derived from farmers' answers to the question "Why do you keep pigs?" (table 2).

Results show that in both the demand and the resource driven system, pig keeping is perceived as an income generating activity. However, the proportion of farmers, who gave "income generation" as main reason for pig keeping, was considerably higher in the demand driven system. In addition, in the resource driven system, pigs/ pork are necessary to fulfil social obligations and are used in connection with customs

and for special occasions like weddings, funerals, worshipping, etc.. In the demand driven system, the proportion of farmers giving social-cultural reasons for pig keeping was negligible.

Table 2: Farmers' answers to the question "Why do you keep pigs?", by village

Production system	Demand driven		Resource driven	
Village	Ban Buon	Ban Bo	Na Huong	Bo Duoi
Interviewed farmers (n)	15	15	15	15
Answers (n)	21	15	34	33
Reasons given by farmers (%)				
Get income	71.4	93.3	26.5	42.4
Saving	13.3	0.0	0.0	0.0
Pigs for slaughter, pork for special occasions	4.8	0.0	61.7	48.5
Pay hired workers	0.0	0.0	11.8	3.0
Others	9.6	6.7	0.0	6.0

Multiple answers were possible. Household interviews 2002

It is known both from literature and own results that the utilization of pigs in North Vietnam has more aspects than mentioned in table 2 (e.g. PETERS, 1998). In the study area, pigs are used as a source of manure for cropping, as a source of pork for consumption, can be given away as a gift, and pig keeping is considered as a custom. Farmers did not explicitly mention those functions as reasons for pig keeping, which might be due to the fact that they are not the primary reasons for pig keeping or that farmers take these functions for granted.

The differences in total cash revenue from pig production in the two systems can partly be explained by the different reproductive and growth performances of the predominant genotypes. Up to now, a part of the recorded weight and reproduction data has been analysed, and preliminary growth and reproduction performance values have been derived (reproduction performance data figure 2, growth performance data figure 3).

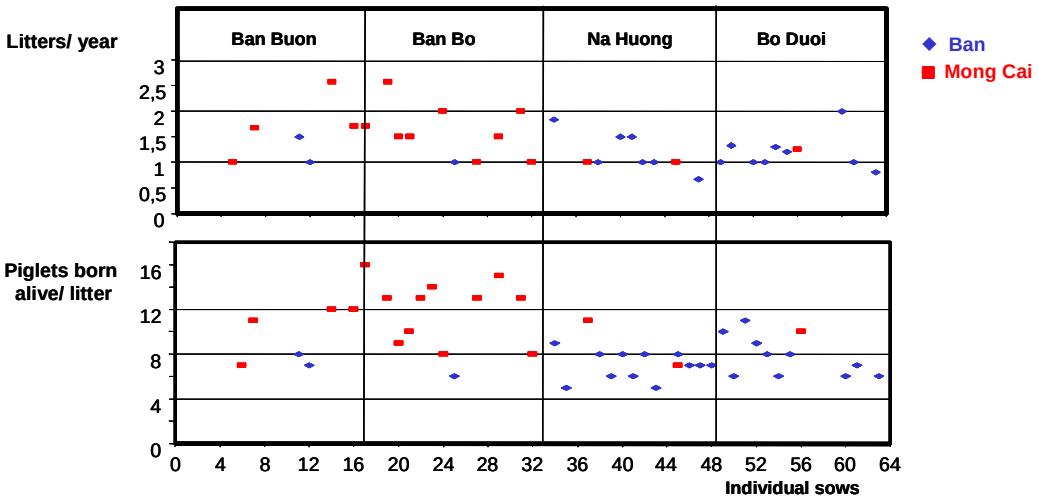

Figure 2: Reproduction data of currently kept sows by genotype and village.

Litters/ year = Total number of litters/ age of the sow at interview (age-at-first-litter was not considered)

Household interviews 2001

The average reproductive performance of Mong Cai in the demand driven system is higher than the performance of Ban: While Mong Cai sows yield 1.8 ± 0.7 litters/ year (n = 15 sows) with 11.2 ± 2.7 piglets born alive (n = 18 litters), Ban yield only 1.2 ± 0.3 litters/ year (n = 20 sows) with 7.3 ± 1.5 piglets born alive (n = 26 litters). However, figure 2 shows a high variation within breed for both performance parameters (number of litters/ year; litter size), indicating a considerable effect of management conditions on the performance.

Reproduction data were collected in structured interviews; validation by data recording will be conducted in on-farm trials.

In each visited household, in addition to the reproduction data of sows the growth performance of the respective offspring of these sows was recorded (figure 3). Data for Ban and Large White x Ban crossbreds (LW x Ban) were collected in villages of the resource driven system, data for Large White x Mong Cai (LW x MC) were collected in villages of the demand driven system.

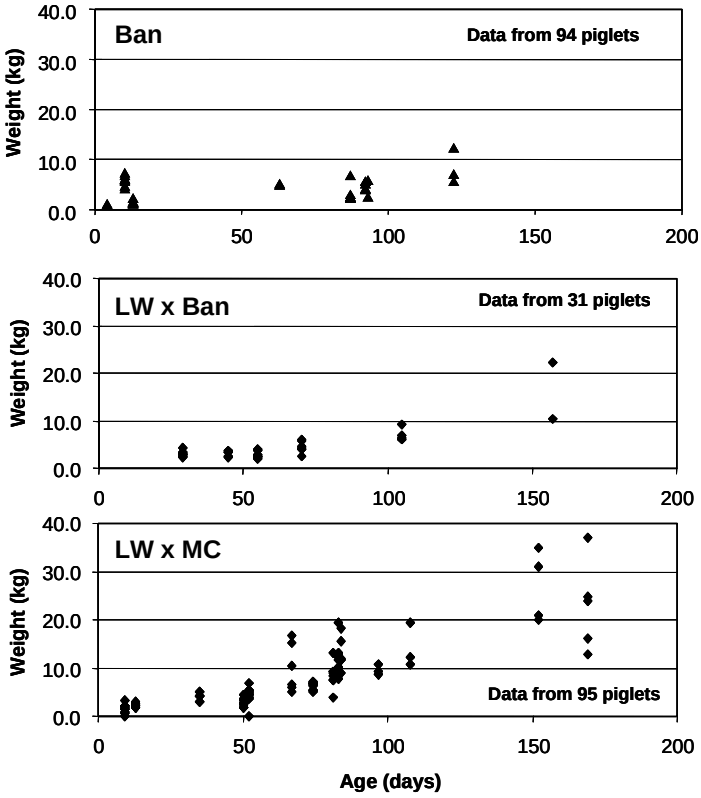

Figure 3: Growth performance of different pig genotypes. Weighing 2001

Among the three pig genotypes, the LW x MC offspring shows the highest growth performance with up to 20 kg live weight after 100 days of age. LW x Ban crossbreds show a medium growth performance and yield about 10 kg live weight after 100 days of age. Ban shows the lowest performance with about 5 kg live weight after 100 days of age. Due to the low sample size, the recorded data give only preliminary growth performance values. Data recording with a bigger sample size will be conducted in on-farm trials.

Different performances result in a different total output from the pig herd per year and allow different extraction levels (figure 4). The total annual extraction from the pig herd per household is in the demand driven system with 342.2 kg pig live weight/ hh x year in Ban Buon and 538.3 kg in Ban Bo higher than in the resource driven system with 297.8 kg pig live weight/ hh x year in Na Huong and 162.9 kg in Bo Duoi. On the other hand, between two villages of each system, differences in the extraction level are high. Ex-

traction from the pig herd in Na Huong is nearly as high as in Ban Buon (NH 297.8 kg, BB 342.2 kg live weight/ hh x year), hinting at the potential performance of pig production in the resource driven system.

In the demand driven system, pigs are almost exclusively sold; while in the resource driven system, pigs are also sold, but slaughtered to a higher extent than in the demand driven system.

The total amount of pigs sold seems to be very low in the resource driven system as compared to the demand driven system. However, the data show the result of a process of increasing market orientation. A market for pigs became available in this region as late as 1997. Since that time the number of farmers selling pigs and the amount of pigs sold has been increasing continuously.

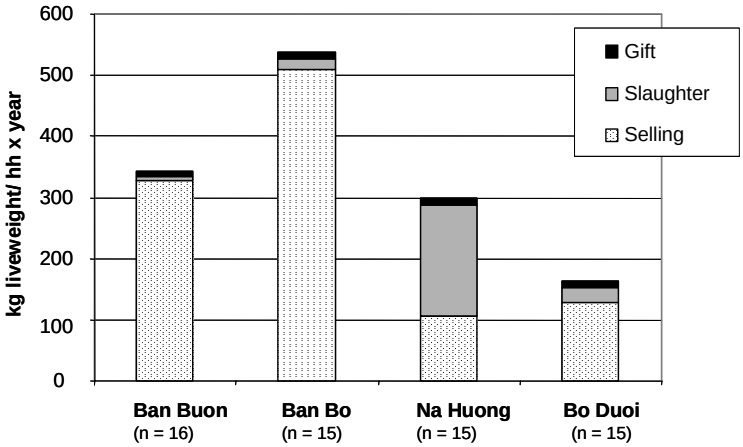

Figure 4: Average pig extraction/ household and year, weighted by percent of households selling/ slaughtering/ giving pigs as a gift, by village. Household interviews 2002

In addition to differences in the total extraction from the pig herd, different extraction patterns (here selling patterns) can be observed in the two systems (figure 5).

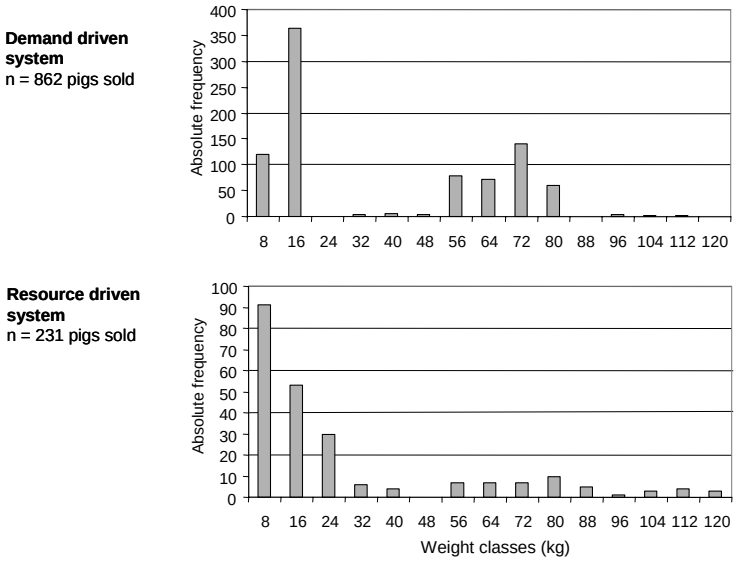

Figure 5: Selling management – weight distribution of pigs sold, by production system (household interviews 2002)

The selling management of farmers demonstrates typical characteristics described for demand and resource driven systems (STEINFELD & MACK, 1997). In the demand driven system, pigs are sold in two more or less clearly defined age/ weight periods, namely directly after weaning to other farmers for fattening or breeding purpose and as fatteners to dealers, following the requirements of the market. This is shown by two peaks in the frequency distribution. In the resource driven system, pigs are mainly sold directly after weaning, and to a smaller extent as fattening pigs. However, in several cases they will be sold regardless of age and weight when the household is lacking feed or cash (figure 5).

For the intended calculation of production efficiency, output and input parameters are required. Since feeding has a strong influence on the production efficiency, comparative data for feeding strategies and feed costs in times of feed abundance and feed shortage, respectively, are presented (table 3). Data for the "time of abundance" were collected in March/ April, when households still had sufficient feedstocks[2] from the last harvest. Data for the "time of shortage" were collected in June/ July, just before the harvesting season, when most households had finished the stocks.

Table 3: Farmers' feeding strategies for different feed components in times of relative feed abundance and shortage

		Demand driven system	**Resource driven system**
Concentrate	Abundance	- Higher amount/ day x pig - Regular purchase	- Higher amount/ day x pig - Irregular purchase
	Shortage	- Purchase by more farmers - Use of credits for purchase	- Purchase by more farmers, but still less than in the demand driven system - Almost no credits used
Maize	Abundance	- Higher amount/ day x pig - Produced maize mainly for feeding	- Lower amount/ day x pig - Produced maize mainly for selling
	Shortage	- Buy additional maize - Use of credits for purchase	- Replace by vegetable, cassava, rice bran
Cassava	Abundance	- Lower amount/ day x pig	- Higher amount/ day x pig
	Shortage	- Same or smaller amount/ day x pig - Purchase by few farmers	- Increase amount/ day x pig (replacement) - No purchase

Description derived from household interviews, communication tools 2001, 2002

The main feed components (beside concentrate feed, maize and cassava also rice bran, vegetable and dried fish) are used in both production systems. However, in the systems, composition of feeding rations and feeding strategies in time of feed shortage differ. The described feeding strategies again reflect characteristics of demand driven versus resource driven production systems (STEINFELD & MACK, 1997): In the demand driven system resources are made available or are reserved for the desired production level. This is shown by the purchasing of feed in times of shortage, taking up credits for feed purchase, and keeping produced maize for feeding. In the resource driven system, the production is adjusted to the utilisation of the available resources. When feed resources are finished, energy-rich high-quality feed (maize) is replaced by feed of lower quality and energy content still available on the farm (vegetable, cassava).

The described feeding management is also reflected by data for the daily feed costs per household and their variation in times of feed abundance and shortage (figure 6).

In the demand driven system, the daily feed costs per household are higher than in the resource driven system (see figure 6). In both systems, daily feed costs increase in times of feed shortage. However, in the resource driven system, daily feed costs remain lower than costs in the demand driven system (Ban Buon

[2] "stocks" refers mainly to maize as main high-energy feed component fed by all interviewed farmers

5667 VND and Ban Bo 4151 VND/ hh x day versus Na Huong 1126 VND and Bo Duoi 597 VND/ hh x day).

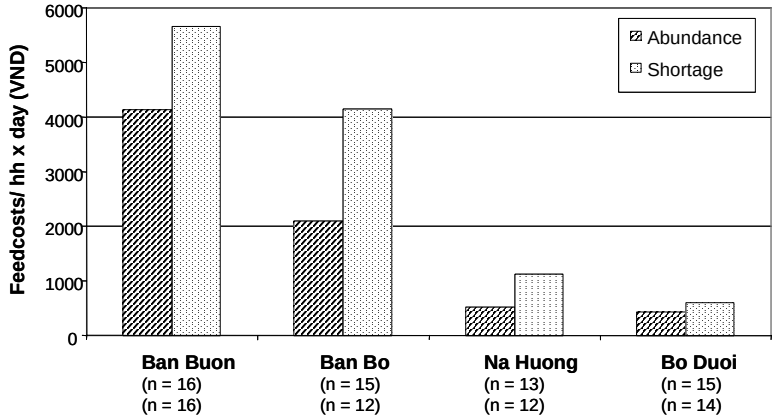

Figure 6: Average daily feed costs/ household in times of feed abundance and shortage, weighted by percent of households buying feed, by village. (n_1 = Number of households in time of abundance, n_2 = number of households in time of shortage). Household interviews 2002
1 USD ~ 15,500 VND (approximate exchange rate 2002)

In order to assess the future role of the local Ban breed in the resource driven production system, the opinion of farmers also regarding their appreciation of the Ban breed has to be considered (table 4).

Table 4: Appreciation of the local Ban breed by farmers, by production system

Production system Sample	Demand driven 23 Non-Ban keepers	Resource driven 29 Ban keepers
Keep Ban, no incentives required (%)	0.0	51.7
Keep Ban, but higher performance or economic incentives required (%)	91.3	44.8
Keep Ban under no circumstances (%)	8.7	3.4

Household interviews 2002

Most farmers of the demand driven system have already given up Ban keeping. 91.3% of the farmers interviewed could consider returning to Ban keeping again, provided that Ban would have a higher production performance, or there would economic incentives be granted (e.g. governmental subsidies). The main argument of non-Ban keepers for rejecting Ban was that “the output from Ban is too low”.

Farmers of the resource driven system still keep Ban. They either do not want to keep another breed (51.7% of farmers) or do intend to change the breed to a higher-yielding breed but could consider continuing Ban keeping without any economic incentives (44.8% of farmers). The main argument of Ban keepers for accepting Ban was that “input in non-Ban-breeds is too high”. It can be concluded that prospects for Ban in the demand driven system are rather negative, but positive in the resource driven system.

4 Conclusions

Two pig production systems in the mountainous areas working at different intensity levels have been investigated and compared. In the demand driven system, pig production aims on income generation; in the resource driven system, pig production has more diversified functions including income generation, con-

sumption and social functions. Both systems differ in management strategies applied. Development strategies in pig production have to be adapted considering the respective system characteristics.

Pig genotypes under study show different production performances in the two systems. The improved breed Mong Cai in the demand driven system yields a higher output but also requires a higher production input. The local Ban breed yields only a lower output but requires a lower input into pig production. Differences in production efficiency of the genotypes under the management strategies applied are indicated but have not yet been fully assessed.

Exogenous and indigenous influences (ongoing breed introduction, increasing market-orientation, market-influence) may lead to a (further) replacement of Ban pig despite its importance for and preference by smallholders in the resource driven system. Therefore, special breeding and marketing strategies have to be developed for further keeping and utilisation of Ban pig.

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