

**Emerging supply chains of indigenous pork and their impacts on small-scale farmers in upland areas of Vietnam**

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### **Abstract**

Rising incomes, urbanization and globalization have been leading to profound changes in the consumption habits of an increasing number of people in developing and transition countries, particularly in Asia. These changes are linked to increasing concerns that small-scale farmers are becoming marginalized in new market set-ups. On the background of these developments we analyze how growing demand for indigenous pork – considered a specialty product among consumers in Vietnam – impacts through newly emerging supply chains on small-scale farmers in upland areas. We analyze supply chains and price transmission as well as compare the impact of marketing institutions on the economics of primary production. Results of market surveys show that carcasses of indigenous breeds are highly appreciated in the market with high retailer prices. Trading of local indigenous pigs is associated with higher net marketing margins. Farmers benefit economically from institutionalized marketing arrangements. Our results highlight the potential of high-value specialty products from uplands areas to be marketed profitably in urban lowland areas. In this way, improvements for the livelihoods of marginalized small-scale producers and the preservation of an endangered agro-genetic resource could be achieved.

*Keywords:* high-value products; supply chains; developing countries

## **1. Introduction**

Rising incomes, urbanization and globalization have been leading to profound changes in the consumption habits of an increasing number of people in developing and transition countries, particularly in Asia. These changes are often referred to as the “Westernization” of diets (Pingali, 2007) and include the consumption of more high-value agricultural products like fresh fruits and vegetables, and more animal products like seafood, dairy products and meat. These changes lead to profound transformations in the national and international food system. Agricultural producers are challenged to integrate into more commercialized commodity markets and to diversify into new product supply chains.

Given its rapid economic development and recent policy reforms, Vietnam is an interesting developing country to study details of the food system transformation. Restructuring of food supply chains in Vietnam is observed in the context of ongoing economic liberalization (Mergenthaler et al., 2009b). The Vietnamese economy has been growing rapidly over the last decade, leading to the increase of the people’s living standards and higher consumer demand for animal products such as meat, eggs and milk (Maruyama and Trung, 2007). New demand patterns are emerging, entailing a growing importance of food quality and food safety at the retail level (Mergenthaler et al., 2009a). The pig sector is affected in many respects (Lemke et al., 2008), making it an interesting case for a more thorough investigation. In the context of food system transformations in the pig sector, specialized supply chains for indigenous pigs are emerging – although not formalized yet (Cuong, 2004). Therefore, prices at retail level of indigenous pig breeds, their marketing channels, and economic effects on primary producers are of crucial in-

terest. The objective of this study is therefore twofold: (1) to analyze marketing channels of indigenous pork from the producing areas in the mountainous North of Vietnam to the retail level and (2) to assess economic impacts of marketing arrangements on primary producers.

The paper goes on in section two with describing the potential of indigenous pork production in Vietnam. Section three, analyzes price transmission and efficiency of supply chains while section four addresses the objective of how small-scale producers benefit by the different supply chain arrangements. The last section summarizes and draws up conclusions.

## **2. The potential of indigenous pork production**

Vietnam's pig herd is the largest in Southeast Asia. Pigs are of high economic importance because of their contribution to human nutrition and their role in agricultural production systems. In addition, pig production is considered to play an important role in the livelihood strategies of smallholders in rural areas of Vietnam (Ly, 2000). They are important for smallholders as they contribute to farm income, enhance crop production, provide additional economic goods (Steinfeld and Mac, 1997), create employment, reduce poverty, improve the family diets, allow some basic financial security, and support farmers' livelihoods (Tuyen et al., 1998). Especially, in the mountainous regions, pig rising is closely linked with the culture, tradition, customs and local feasts of ethnic minorities (Xuan et al., 1995; Valle Zárate et al., 2003).

Market demand and home consumption of pork producing households has been growing in Vietnam over the last years. Consequently, the focus on both quantity and quality of pork production has increased. Indigenous pork has become a special case in this respect

as it has started to attract renewed consumer interest due to its special flavor. In recent years, specialized supply chains have been emerging to meet the growing demand for indigenous pork as specialty food in urban lowland areas. The participation of upland farmers in these high-value supply chains could possibly contribute to improvements of their livelihoods and to a reduction in rural poverty – which is widespread in the highland areas. Furthermore, economic sustainability in the production and marketing of indigenous pigs could possibly constitute a viable mean to preserve endangered agro-genetic diversity within a traditional agro-ecosystem (cf. Halladay and Gilmour, 1995; Devaux et al., 2009)

In the mountainous Northwest of Vietnam, Mong Cai (MC) and local Ban are two common indigenous pig breeds kept under smallholder conditions. Genetics of exotic breeds have been crossed into MC pigs over the last couple of years within a leanization breeding strategy supported by government strategies, private commercial interests and development strategies (Lemke et al., 2008). On the other side, local Ban is much less influenced by exotic genetic improvement. Ban is even in danger to be extinct as the public sector and extension services focus on the promotion of “modern” breeds. Although production systems of indigenous pigs are increasingly better understood (Lemke et al., 2006), successful market integration is required to sustain them in the long-term.

With a perspective of targeting lucrative urban consumer markets, it is important to understand better the supply chains of indigenous pork. So far, markets for indigenous pigs in the mountainous areas are highly segmented. Producers sell mainly in nearby local markets. They are hardly linked to more profitable urban markets in the lowland areas. A lack of integration is assumed to lead to low price transmission between actors in

supply chains and inefficient marketing channels. In addition, distribution of marketing margins is often not equitable among actors. It is believed that this leads to low prices for farmers and persistent poverty for farmers in highland areas (Cuong, 2004).

For some indigenous pork, special supply chains with new institutional set-ups are emerging. Farmers have a preferred trader to whom they sell their pigs and who ensures stable market access for farmers (Cuong, 2004). It is however not clear if and how these farmers may possibly be affected economically by these new institutional arrangements. As this is considered a crucial link of a successful integration, a more in-depth analysis is required to understand better the link through preferred traders and its impacts on small-scale producers.

### **3. Analysis of price transmission and supply chain efficiency**

#### **3.1 Methodology and data**

Changes in supply chain structures as well as the recent appearance of new supply chain set-ups will have impacts on prices and price transmission, reflected in net marketing margins. We therefore analyze how net marketing margins are distributed in the supply chains among the different actors.

Net marketing margins per kilogram are compared between MC and local Ban at each stage of the supply chain considering conversion through slaughtering and further processing. Marketing costs include the costs of converting a live animal to a retail product and all costs involved in moving commodities from the farm to the final market, i.e. costs of collecting, cutting, processing, packaging, transporting, and distributing. Marketing margins are commonly used to measure market efficiency at different stages of supply chains. In addition, we use the share of producers' price in retail price to derive

conclusions about the overall efficiency of marketing chains. The farm-to-retail marketing margin is computed by the price difference between what the farmer receives for the live animal and what the consumer pays for a final meat product (Mendoza, 1995).

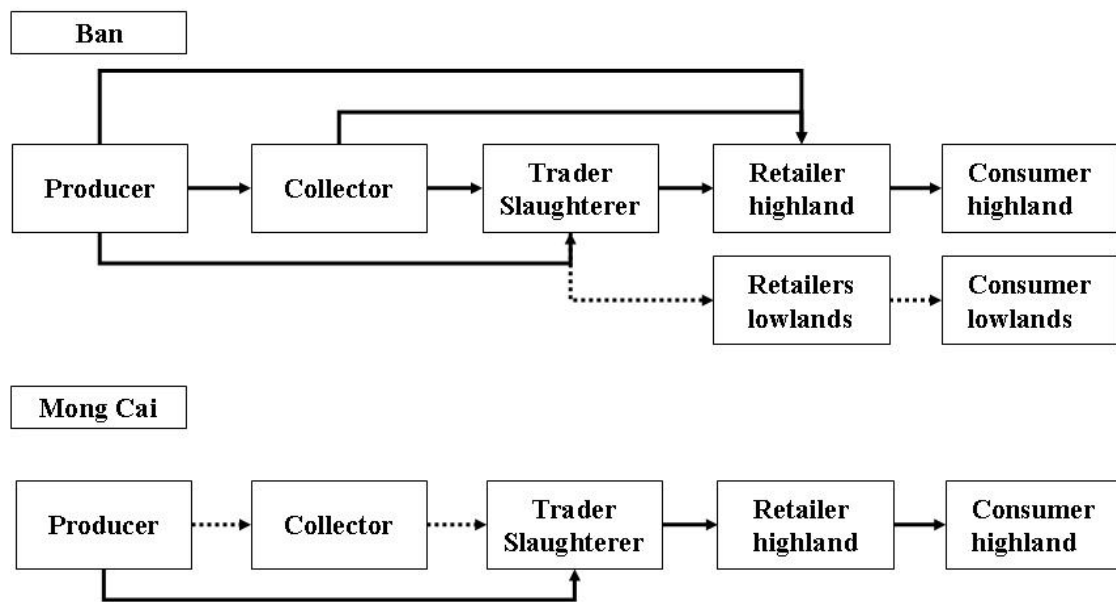
Four collectors, ten traders, and six retailers were sampled for interviews in supply chains of MC and local Ban. The selection of actors in the supply chains follows a snowball sampling procedure. The identification of an actor at one stage of the supply chain follows the identification of actors in the previous stage of the supply chain, starting at the farm level. Actors at the next step in the supply chain were chosen randomly from a list provided by actors of the previous step. In this way, also supply chain mapping can be achieved. During the interviews, we collected data about the selling arrangement between the actors at the different steps in the supply chain, prices and quantities.

### **3.2 Structure of marketing channels**

Linkages among producers in the uplands of Son La province and supply chain actors in the lowlands are currently rather weak. Regarding the marketing of pigs, two types of arrangements can be distinguished: On the one hand, there are farmers selling to changing buyers and on the other hand, there are farmers who have a preferred buyer to whom they have a firmly established trading relation. Especially in the case of Ban pig production, traders try to cooperate more closely with producers through dedicated and specialized collectors and informal marketing arrangements to reduce transaction costs.

Also at down-stream steps in the supply chains of Ban and MC differences are apparent (cf. Figure 1). While Ban pig producers can directly sell their products to not only traders, but also to collectors as well as retailers in the uplands, MC pig producers are only

able to sell their pigs directly to traders and seldom to collectors. Traders in Ban pigs are normally small traders (trading 1-3 pigs per day) while MC pig traders are mainly medium sized traders (trading 4-8 pigs per day). Restaurants as retailers normally buy part of the carcass of Ban pigs from traders. In addition, MC pork is only consumed within upland provinces while the destination of Ban pork is extended to lowland provinces. It might show that preference of consumers on Ban pigs has increased outside the province; a demand that is not supplied by lowland producers in the required quantity or quality. Schematic supply chains of Ban and MC pigs are displayed in (Figure 1).



----- minor importance

**Figure 1: Marketing channels of Ban and MC pigs in Son La province**

Long-term trading relations with primary producers reduce the level of asymmetric information, which would force farmers to sell at lower prices compared to a more transparent market. Besides receiving higher prices, households cooperate with trading partners because it offers them other advantages such as an ensured market outlet, on-time

payment, exact weight measurement, and reliable information. Most of the interviewed pig keepers indicated that their trading partners are normally honest and keep promises. However, some pig keepers also reported of collusive behavior of traders during times the supply of pigs increased in the market.

### **3.3 Efficiency of marketing channels**

Looking at prices and price transmission, we find that Ban pork achieves considerable higher prices at the retail level than MC pork. This shows that Ban pork is highly appreciated by consumers as it is well-known for its good meat quality. In the supply chains, traders of Ban pigs achieve higher net marketing margins than traders of MC pigs (Table 1). Interestingly, the share of producers' price in retail price is higher for MC pigs. However, compared to a study by Cuong (2002) and Lapar et. al. (2003) this share is lower than that of MC pig keepers in the lowlands, where 85-90 % of the retail prices are captured by farmers. This is an indication of high transactions costs and less integrated markets in the uplands. Moreover, marketing margins ranged from 42% of the farm gate price for MC pigs to 52% for Ban pigs. This means that farmers producing Ban pigs get a relatively less remunerative price for their pigs than those producing MC pigs. This is mainly due to higher marketing costs. However, in absolute terms Ban producers receive higher prices than MC producers; reflecting that higher prices paid for the higher quality of Ban pork at the retail level is – at least partially – transferred to the producer level.

**Table 1: Prices at selling, marketing costs, and net marketing margins in MC and Ban marketing chains (in VND/kg)**

		Producer	Collector	Trader	Retailer
MC	Live weight price <sup>1</sup>	14,200		17,200	19,800
	Carcass price			19,000	21,900
	Marketing cost <sup>2</sup>			1,600	1,100
	Net marketing margin <sup>2</sup>			1,400	1,500
Ban	Live weight price <sup>1</sup>	15,000	16,000	19,300	22,100
	Carcass price			21,000	24,000
	Marketing cost <sup>2</sup>		600	1,200	1,200
	Net marketing margin <sup>2</sup>		400	2,100	1,600

Source: Retailer group interview and marketing survey, 2007

Notes:

<sup>1</sup> for traders and retailers live weight equivalents;

<sup>2</sup> per kg live weight or per kg live weight equivalent respectively.

Although Ban farmers receive higher prices than MC breeders this does not necessarily translate into tangible benefits for farmers as the cost structure of pig production is neglected. In order to assess the economic impacts of the different breeds and marketing arrangements, we compare gross margins and family income of different producers in the next section.

## **4. Analysis of pig production economics**

### **4.1 Methodology and data**

In order to assess the economic impacts of marketing different breeds through different marketing arrangements, we use a sample of pig producers from three villages in the North-Western mountainous province of Son La in Vietnam. The three villages were selected purposefully in order to represent a broad picture of different agro-ecological and socio-economic conditions. Complete lists of pig producers were generated in each village through participatory research approaches. These tools also provided valuable background information on the production and marketing of pigs and helped to fine tune

a standardized questionnaire that was used in the individual farmer interviews. Interviewed farmers were chosen randomly from the generated lists. In total, we interviewed 70 farmers.

In order to compare production economics, we calculate and compare gross margins on a per fattener basis, the net benefit ratio, and per capita family income. However, a simple comparison of means does not provide sufficient insights, as different factors might affect production economics and household income simultaneously. In order to take account of these factors, regression models are used. While controlling for the impact of covariates, it is aimed to estimate the isolated impact of Ban pigs and trading relations on production economics and household income. The following OLS model is estimated:

$$(1) \quad Y_i = \gamma_0 + \beta_i X_i + \delta_j Z_j + \alpha_1 D_1 + \alpha_2 D_2 + \alpha_3 D_3 + \varepsilon_i$$

$Y_i$  is the gross margin per fattener or household income per capita.  $\gamma_0$  is a constant term.  $X_i$  is a vector of production specific variables and  $Z_j$  a vector of farm and household characteristics. These variables serve as controlling covariates. Our main interest is in the treatment variables:  $D_1$  is a dummy variable for households keeping MC pigs and having a preferred trader,  $D_2$  is a dummy variable for households keeping Ban pigs and having a preferred trader,  $D_3$  is a dummy variable for households keeping Ban pigs and not having a preferred trader. MC keeping households without a preferred trader serve as the reference group.  $\varepsilon_i$  is an error term capturing the impact of unobservable variables.

## **4.2 Pig production economics**

The analysis of production economics shows that Ban production yields higher gross

margins and higher average net benefit ratios than MC production – the latter only if trading relations are accounted for (Table 2). The average net benefit ratio is significantly higher for Ban keeping households compared to their MC keeping counterparts. Comparing households keeping the same pig genotype, households with a preferred trader achieve a higher economic efficiency than those without a preferred trader.

**Table 2: Efficiency of pig production of selected households (VND 1,000)**

A preferred trader	Ban pig keepers		MC pig keepers	
	No	Yes	No	Yes
Households (n)	32	18	7	13
Price per kg of live weight	14.7	15.4	14.3	14.6
Variable costs fattener <sup>-1</sup> (VC)	638 ± 149	631 ± 99	748 ± 75	739 ± 56
Gross revenue fattener <sup>-1</sup> (GR)	893 ± 156	995 ± 140	973 ± 149	1015 ± 131
Gross margin fattener <sup>-1</sup> (GM)	254 ± 130	364 ± 75	225 ± 89	275 ± 96
Household income capita <sup>-1</sup> year <sup>-1</sup> (million VND)	3.4	4.4	4.6	5.9
Net benefit ratio (GR/VC)	1.4	1.6	1.3	1.4

Source: Household interviews, 2007

Notes: Table reports means and standard deviations.

Higher gross margins and higher per capita income among households with preferred traders seem to be achieved through higher farm-gate prices – despite higher net marketing margins in the marketing channel. As shown above, long-term relations with a preferred trader between farmers and pig traders have a positive effect on prices per kg of live weight paid to farmers. However, local Ban fatteners sold in a marketing arrangement without a preferred supplier still reach higher prices than MC fatteners with a preferred trader. This raises the question in how far Ban keeping could lead to improved production economics and higher incomes for small-scale farmers.

The results of the estimated regression model indicate a positive effect of Ban pig keeping with a preferred trader on gross margins (Table 3), i.e. if a farmer keeps Ban fatteners and simultaneously cooperates with his preferred buyers, he will earn a gross margin, which is around VND 131,340 higher than MC keepers without a preferred buyer.

These results apply once we control for the number of fatteners raised on a farm and different inputs used in pig production as proxies for production intensity.

**Table 3: Factors influencing gross margin per fattener**

		<u>Sample statistics</u>		<u>OLS regression model</u>	
		Mean	SD	Coef.	S.E.
Treatments:	MC with trading relation	0.19	-	5.49	55.57
	Ban with trading relation	0.26	-	131.34**	51.73
	Ban without trading relation	0.46	-	57.57	56.32
Covariates:	Number of fatteners raised (unit)	9.94	4.73	11.50**	5.17
	Quantity maize per fattener (kg)	152.24	33.96	0.56	0.47
	Quantity concentrate per fattener (kg)	18.87	10.59	1.97	1.69
	Family labor per fattener (hours)	91.20	44.05	1.05**	0.39
	Education of household head (years)	5.51	2.06	2.09	7.20
	Constant	-	-	-122.43	137.77
	Summary statistics:	F-value			3.41
	R <sup>2</sup>			0.31	

Notes: Dependent variable is gross margin per fattener in VND 1,000.

Table reports means, standard deviations, coefficients, and standard errors.

For treatments, MC keepers without trading relations serves as the reference group.

\*\*\* Significant at 1%, \*\* significant at 5%, \*significant at 10%

In order to know whether farmers benefit economically from Ban pig keeping and trading relations we estimate another regression model with per capita household income as the dependent variable (Table 3). For Ban pig keeping with or without trading relations, no significant effect is detected by the model. This might be because we control – in addition to standard socio-demographic household variables – for production intensity by the concentrate variable, i.e. on the same level of intensity, Ban keepers achieve the same level of household income than MC keepers without a preferred buyer. On the other side, MC keeping with a preferred trader has a significant effect on per capita household income, i.e. MC keepers can profit from a preferred trader relationship in terms of higher per capita income. In Ban keeping households higher gross margins per fattener do not lead to higher household income.

**Table 6: Factors influencing household income per capita per year**

		Sample statistics		OLS regression model	
		Mean	SD	Coef.	Std. Error
Treatments	MC with trading relation	0.19	-	1139.90*	614.81
	Ban with trading relation	0.26	-	654.15	588.59
	Ban without trading relation	0.46	-	918.59	632.23
Covariates:	HH head (1 man, 0 women)	0.94	-	-687.30	642.38
	Education of household head (years)	5.51	2.06	191.77**	84.78
	HH size (heads)	2.93	1.08	-590.19**	177.12
	Dependence ratio (times)	2.01	.59	-1111.4***	286.92
	Land area per HH member (m <sup>2</sup> )	2,063	585.9	1.26***	.27
	Age of household head	40.9	8.07	72.71***	19.46
	Concentrate per fattener (kg <sup>-1</sup> )	18.87	10.59	31.17*	18.07
	Number of fattener raised	9.94	4.73	70.03	47.63
	(Constant)	-	-	170.10	1756.71
	Summary statistics	F-value			14.81
	R <sup>2</sup>			0.67	

Notes: Dependent variable is per capita household income in VND 1,000.

Table reports means, standard deviations, coefficients, and standard errors.

For treatments, MC keepers without trading relations serves as the reference group.

\*\*\* significant at 1%, \*\* significant at 5%, \*significant at 10%

Our results have to be treated with caution, however: As our sample size is quite small, standard errors of the estimated coefficients could decrease, leading to a change in the significance level. In this way, our results have to be taken as preliminary.

## 5. Summary and conclusions

On the background of rapidly changing food systems in many developing and transition countries, we analyzed how growing demand for indigenous pork – considered a specialty product among consumers in Vietnam – impacts on supply chain actors. We mapped supply chains, analyzed price transmission and compared the impact of marketing institutions on the economics of primary pig production. The results showed that the Ban carcasses are highly appreciated in the market with higher retailer prices as compared to the MC carcasses. Trading of Ban pigs brings higher net marketing margins than trading of MC pigs to actors in the marketing chains. Long-term trading relations

with buyers of pigs bring many advantages to local producers such as higher prices, reliable information, on time payment, and lower transaction costs. However, a limited number of households have such kind of trading relations. Despite the fact that marketing efficiency is lower in Ban marketing channels than in MC marketing channels, Ban pigs yield higher farm gate prices than MC pigs.

Trading relations bring higher gross margins per fattener for households producing Ban pigs. Ban keeping, however, has no significantly statistic influence on household income per capita. Only MC keeping with a preferred trader does improve per capita household income. Due to the limited sample size, these results have to be interpreted with some caution, and warrant further investigation. Still our results highlight the potential of high-value specialty products from uplands areas to be marketed profitably in urban lowland areas. To scale-up these marketing chains, formalization of marketing institutions and infrastructure improvements would be required.

From a policy perspective, it can be concluded that further encouragement of pig smallholders in the uplands to participate in the economic development process and in the food market can constitute a viable mean for the preservation of agro-genetic diversity. While preventing smallholders from being marginalized and helping poor households, this would help at the same time supplying a highly valued consumer good to urban markets. However, the market efficiency for indigenous pigs is low in comparison with that in the lowlands and farmers suffer from different constraints in pig production. The challenges of how to increase the market efficiency and improve production and how to maintain and strengthen the existing trading relations are posed for the province authorities. In order to develop efficient pork market system, strengthen existing trading relations, improve pig production, and preserve indigenous pigs, dedicated actions will be

required.

Systematic contract farming arrangements could be a promising approach. In the study sites, marketing arrangements often emerge spontaneously and unsystematically among supply chain actors. In these arrangements, contract farming especially for Ban pigs should be encouraged and closely associated with supply of credit, inputs, technical information and also marketing information for local producers. By doing that, stable and long-term trading relations – which we found do positively contribute to the economics of small-scale producers – would be facilitated.

Also the promotion of marketing cooperatives could be a viable way. Our analysis showed that so far there is no integration among local producers related to marketing issues of pig trading. Therefore, consideration should be put on marketing issues in connection with social associations within villages or communes. Information on prices can be provided by marketing cooperatives or exchanged among members. The bargaining power of farmers will be improved and transaction cost for both producers and traders could be reduced. In addition, a detailed analysis of retail prices could enlighten our understanding on the willingness to pay for certain product attributes, which could be used to adapt breeding strategies and to build efficient demand-driven supply chains.

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