Conference Proceedings

The 9th ASAE International Conference 2017 :

Transformation in Agricultural and Food Economy in Asia

Hosted by:

Asian Soceity of Agricultural Economics
Kasetsart University
Thailand Development Research Institute
Agricultural Economics Association of Thailand under Royal Patronage

11-13 January 2017
Bangkok, Thailand

An Evaluation of Economic Viability of Small Scale Slaughterhouses in Vietnam: Implication for Pig Value Chain Development

Nguyen Thi Duong Nga*[,1], M. Lucila Lapar[2], Pham Van Hung[3], Tran Van Long[4], Pham Kieu My[5], Pham Thi Toan[6] and Fred Unger[7]

Abstract

Slaughterhouse plays important role in pig value chain in Vietnam, not only for the functions it plays and economic added value it generates, but also for product quality relates to food safety standards that is much affected under slaughtering activity. The study is aimed to get a better understanding of structure, conduct, performance and economic viability of small scale slaughter houses in the pig value chain, and draw key implications for pig value chain development in Vietnam. Nghe An and Hung Yen are selected as study site. Data is collected from 51 small scale slaughterhouses in 18 communes. Descriptive and comparative statistics are employed with t-test for mean comparison. Results show that slaughterhouse plays multiple functions in the pig value chain, generate permanent jobs for at least 2 family labors, and provides an income of about 18 USD/working day for family labor, contributing about three-fourths of total family income. Slaughtering activity generates an added value of 165 USD/one ton of live pig, accounting from 24%-44% total value added in the pig value chain. Upstream and downstream linkages of slaughterhouses in the chain are quite loose with no formal contract. The majority of small scale slaughterhouses do not meet the standards for pig slaughterhouse as required by the Ministry of Agriculture and Rural Development. The setting up as well as slaughtering practices are perceived to contribute to exposure of meat to contamination that could lead to higher incidence of salmonella in pork, a common cause of foodborne illness for consumers. Rising concerns of consumers about food safety as well as increasing level of economic integration of Vietnam are factors potentially having great impacts on economic viability of small scale slaughterhouse in Vietnam. Several recommendations for upgrading slaughterhouse are proposed accordingly.

Key words: small slaughter house, pig value chain, economic performance, Vietnam

[1] Lecturer, Vietnam National University of Agriculture, email: ngantd@gmail.com
[2] Senior Researcher, International Livestock Research Institute, email: L.Lapar@cgiar.org
[3] Lecturer, Vietnam National University of Agriculture, email: pvhung@vnua.edu.vn
[4] Researcher, Vietnam National University of Agriculture, email: tranlong2588@gmail.com
[5] Researcher, Vietnam National University of Agriculture, email: p.kieumy@gmail.com
[6] Researcher, Vietnam National University of Agriculture, email: phamtoan.n2@gmail.com
[7] Senior Researcher, International Livestock Research Institute, email: F.Unger@cgiar.org

Introduction

The transformation of the pig value chain to meet emerging consumer demand for fresh, safe pork requires a coordinated effort among the different actors in the value chain from production all the way to the market. Among the different functions in the value chain, the slaughterhouses are perceived to be critical nodes as sources of health risks beyond the point of production. Previous work on risk assessment in the pig value chain in Hanoi (Fahrion et al. 2013) shows slaughterhouses to be the node with the highest level of hazards tested in pork samples. Recent policy directives to address consumer concerns about health risks impose stricter standards for slaughterhouses, putting at risk the viability and continued participation of small-scale slaughterhouses in the pig value chain. Slaughterhouses play an important role in the pig value chain in Vietnam given their specific functions and contributions in the chain, as well as the livelihood opportunities created for rural labor. It is thus important to understand how they can be ably supported in this process of value chain transformation.

Hung Yen and Nghe An represent provinces with high pig population in Northern Vietnam. The first represents a more industrialized rural, and more developed area where a considerable number of industrial zones appear. The latter represents a less developed area where agriculture is dominant and pig production is predominantly small scale. In rural areas, slaughterhouses play important roles in buying products from pig smallholders and supplying meat to rural markets. The study aims to get a better understanding of structure, conduct, performance and economic viability of small scale slaughter houses in the pig value chain, and draw key implications for pig value chain development in Vietnam, in the case of rural Hung Yen and Nghe An provinces.

Methodology

Site selection: In each of the two provinces, three districts were selected based on pig density (high, medium, and low) and hypothetical value chain gradient, namely Rural – Rural (R-R), Rural to peri urban and/urban[1] (R-PU). The former is characterized by localized production and sales of pigs within the rural area, whereas the latter is characterized by pigs beings produced in rural areas and predominantly sold to peri urban or urban areas. The selected districts are Tien Lu (peri urban-urban), Van Giang (rural-urban), and Khoai Chau (rural-rural) in Hung Yen, and Do Luong (rural-rural), Hung Nguyen (Peri urban- urban), and Dien Chau (rural-urban)in Nghe An. Communes in each district were selected randomly based again on pig density and small scale dominant pig production, with 18 communes meeting these criteria (i.e., Minh Phuong, Duc Thang, Thu Sy, Nhue Duong, Dai Hung, Binh Kieu, Tan Tien, Nghia Tru, Thang Loi, Thuong Son, Da Son, Lam Son, Dien Nguyen, Dien Kim, Dien Lam, Hung Dao, Hung Phuc, and Hung Thong).

[1] Hypothesis on value chain gradient is based on expert's opinion in department of agriculture and rural development

Primary data was collected through a survey of 51 small-scale slaughterhouses, selected from the 18 communes chosen in 6 districts of the two provinces.

Descriptive and comparative statistics were employed for hypotheses testing. Qualitative information obtained from key informant interviews were used to complement the quantitative analysis.

Results and Discussion

Slaughterhouse in Pig Value Chain

Slaughtering activity is an important node in pig value chain in Vietnam, where live pig is processed to carcass and other pork products, and moved to markets. Pig production in Vietnam traditionally is small scale, and mostly as a complement in the farming system (i.e. use by-products from crop production and provide manure for crops or for fish production).

According to Nga *et al.* (2013), Slaughterhouses operate at different scales in Vietnam. Large slaughterhouses are more likely located near big cities such as Hanoi, Ho Chi Minh City, and Da Nang City. FAO (2008) reports that there is one large-scale pig abattoir in Hai Phong designed in the 1980s for export purposes, especially for suckling pigs to HongKong. The second abattoir with continuous-line slaughter of cattle and pigs is the VISSAN abattoir in Ho Chi Minh City, built in 1974 by the German Government. VISSAN abattoir has further developed overtime and is now one of the top food (meat) processors and exporters in Vietnam.

In Vietnam, the trend in pig production over the last decade has been slowly transforming from small scale pig production to larger scale with use of commercial feed instead. Similarly, slaughtering activity has been trending towards the same pattern (even very slowly) from very small scale to larger scale, depending on the market being served. For example, in rural areas where the demand for pork is generally lower than in urban areas, some households are doing slaughtering activity mainly to supply pork to the local market. But in urban areas with higher demand for meat, larger scale slaughtering operators are more prevalent, and located in the proximity of peri- urban or urban area supplying meat for either wholesale market, or a number of retailers, or restaurants in urban areas (Nga *et al*., 2013).

Total number of slaughter houses was stated as 29,281 in 2011, of which about 50% is for pig slaughter (Table 1). Most of slaughter houses are slaughter points, which have a slaughtering capacity of less than 10 heads of buffaloes/cow/goat/sheep slaughtered/night; or less than 20 heads of pigs/night; or less than 100 heads of poultry slaughtered/night.

In the pig value chain in Vietnam (for smallholders), local rural slaughterhouses are the most important buyer of pigs from farmers, who buy about 56% of pigs from smallholders (Figure 1). Local slaughterhouses also act as important retailers in local rural meat market, selling about one-third of total slaughtered products directly to consumers.

In the pig value chain, rural slaughterhouses perform several functions, and even some of them perform all functions in the chain. About more than half of them raise pigs, some of them do process meat (i.e. meat loaf) to sell in local market, and most of them sell pork to household consumers, either at home or in wet market (Table 2).

General Profile of the Slaughter Operator

All slaughterhouses in the rural area are actually small scale slaughtering households, which are operated by two main labor: husband and wife in the family, where the husband is mainly responsible for killing animals and sourcing pigs and the wife assisting him. About half of the respondents is male (Table 3). On average, a household doing slaughtering activity has about 4 people, and as mentioned above, at least 2 labors participate in slaughtering and/or processing and retailing. Majority of them have completed secondary school, with about 15 years of working experience in slaughtering. The majority of them reported that they went into slaughtering as an occupation to continue the business started by their parents or grandparents generation (parents, grandparents).

Settings of the Slaughterhouse

Average area of a household slaughterhouse is about 120m^{2,}; slaughterhouses in Hung Yen province are about half the size of those in Nghe An, on average (Table 4). This size difference is mainly due to relatively smaller landholdings given higher population density and higher level of industrialization in Hung Yen province. The area for killing animals is smaller in Hung Yen, roughly 26m^2, compared to Nghe An. However, barn area (for storing pigs) in Hung Yen is larger than in Nghe An because of higher operation scale. The settings of killing area is quite simple, normally with cement floor, reservoirs, table/cage for taking blood, table for cutting meat. Some slaughterhouses have equipment for processing such as meat grinder, cookers, stove/gas cooker. In this area, there also places with knife, pots, basket for containing meat. All slaughterhouses in rural area practice manual slaughtering.

Slaughtering activity normally starts from 2 am – 3 am in Hung Yen and a bit later in Nghe An, until approximately 5 am. Following this the slaughter man (male) usually helps the wife in selling meat at slaughtering place , or processing meat. Pork and other products then are moved to wet market (local) and the wife is responsible for selling the products, while the husband may rest at home or search for live pigs ready to slaughter.

Operation Scale

On average, a slaughter operator kills about 1.6 pigs/day with minimum of 1 and maximum of 6 pigs. The number of pigs slaughtered in Hung Yen is about 2, double than in Nghe An (Table 5). Differences in operation scale is mostly attributed to market size that they serve, with higher demand in Hung Yen mostly due to higher population and income on average[1] (General Statistics Office (GSO) 2012). A slaughter operator in Hung Yen buys pigs

[1] In 2010, monthly per capita income is 1199.100 VND in Hung Yen and 919.6 VND in Nghe An

about 3 times/week, whereas those in Nghe An buy everyday (Table 5). This explains the smaller area used for keeping pigs before slaughter and the lower scale of operation in Nghe An.

Sources of Inputs

The main sources of live pig for slaughter house are local smallholders with about 86% of pigs bought from them (Table 6). In Hung Yen, some slaughter operator buy pigs from commercial farms especially during peak season (i.e. Tet holiday), or simply find any source of good quality pigs for a good price. In Nghe An, there are 7 slaughter operators. They reported that they purchase live pigs from collectors, and this happens when they have to find live pigs in other communes or other districts that are not familiar with them. About half of live pigs is bought within the commune.

Main Buyers of Slaughterhouse

For carcass and other by – products from pigs, buyers from slaughterhouse are local meat retailers, household consumers, and restaurants. About two-thirds of local retailers and one-fifth of household consumers buy carcass and other products from the slaughter house. The rest is sold at market for retailer, consumer and restaurant (Table 7).

Upward and Downward Linkages Of SH in the Pig Value Chain

Small scale slaughter operators generally set up close relationship with live pig suppliers for reliable source of inputs, good price and guaranteed quality. However, with operation scale being limited and probably not much competition in source of live pigs, not many slaughter operators establish regular relationship with producers. Less than half of them reported they had regular relationship with smallholders, and no formal contract is set up among them (Table 8). However, majority of them felt confident with such relationship with only verbal agreements and the level of trust seems to be higher in Hung Yen than in Nghe An (Table 8).Because of the nature of verbal agreement, breaking of contract happens, but not always (Table 8). This happens sometimes in Hung Yen but most of the case never happens in Nghe An, even if not many slaughter operators in Nghe An feel confident with the relationship as in Hung Yen. On average, nearly half of slaughter operators reported cases of breaking verbal agreements with their supplier. This sometimes causes bottlenecks arising from insufficiency or unstable supply of inputs going into the slaughterhouse, thus resulting in higher transaction costs from seeking alternative sources of live pigs that may not meet the quality that slaughter operators desire.

Regular relationship between slaughterhouse with buyers is found more widely practiced in both Hung Yen and Nghe An, especially for larger and regular buyers (such as retailer and restaurant). All slaughterhouses have regular relationship with retailers, and about three-fourths of respondents have regular relationship with consumer; This is commonly observed in rural areas and local markets, where the sellers and buyers are either relatives, neighbors, or friends. All of respondents felt confident with relationship with large buyers, but not all felt confident with loyalty from consumers, especially in Nghe An. Case of breaking verbal agreement is very rare (Table 9).

Economic Performance

Products

Products from slaughtering activity are carcass, pork of all types, offal, blood, internal organ. Carcass is sold directly to retailer, and carcass rate varies among pig breeding as well as province. Exotic pig usually has higher carcass rate than cross – breed pigs, but this is seen in Hung Yen only; also, carcass rate in Hung Yen is higher than in Nghe An, mostly due to quite low weight of live pig at slaughtering. In Hung Yen, average weight of live pig at slaughtering is about 90.6kg in Hung Yen and 58.3kg in Nghe An (Table 9).

Cost & Income

Live pig cost accounts for almost all the total cost of inputs in slaughter house. There is a difference in cost and revenue for 100kg of live weight slaughtered between the two provinces, with costs being higher in Hung Yen than Nghe An, due to higher pig price in the former. Accordingly, pork price is higher in Hung Yen, so that revenue/100kg of live pig slaughtered is also higher. Total cost for 100 kg of live pig slaughtered is estimated at about 4,163 thousand VND in Hung Yen, and 3,519 thousand VND in Nghe An (Equivalent to about 208 USD and 178 USD, respectively) (Table 11).

On average, a slaughterhouse generates a value added of about 330 thousand VND – 380 thousand VND/100 kg of live pig slaughtered, accounting for about 24%-44% total value added in the pig value chain. This activity also provides an income of about 360,000 VND /100kg of live pig slaughtered for slaughter operator (equivalent to about 18 USD). For higher scale of operation, slaughter operators in Hung Yen generate higher income from the activity per day, estimated at about 500,000 VND/day, about double that of slaughter operator in Nghe An (Table 12). Accordingly, a family labor working in slaughterhouse in Hung Yen gets an income of about 250,000 VND/day, double that in Nghe An. Slaughtering activity, apart from providing jobs for 2 main labors in family, on average, also contributes about two-thirds of total household income in year 2012 (Table 12).

Main Issues with Slaughterhouse in Rural Areas

Majority of slaughterhouse is located within the residential area (within the homestead), which is joust about 20 m away from living area of the family, on average (Table 13). This does not comply with the rule of Government about where slaughterhouses should be located. In this setting, the slaughterhouse could be a potential source of environment problem as well as health problems for the family and the community. Also, all slaughter operators reported that they transported meat to market by motorbikes, where meat is contained in open steel basket, or even not covered. These practices are perceived to contribute to exposure of meat to contamination that could lead to higher incidence of salmonella in pork, a common cause of foodborne illness for consumers. There is still about one-fourth of slaughterhouse without separated killing area, and no slaughterhouse having separated internal organs/viscera (Table 14). These conditions do not meet Government's rule on slaughterhouse operation.

Environmental issues are likely caused by small scale slaughterhouse because of the setting of the facility, with nearly three-fourths of slaughterhouses being located within the residential areas (Table 13). Coupled with that, treatment method of waste from slaughtering activity cause environmental pollution in residential areas, with just about one- fifth using biogas, and the rest just letting liquid waste out to sewers, rivers, and public places (Table 14). This, coupled with setting up of pig barns of households and other farmers in the community, could potentially cause or spread pig disease, as well as human disease.

Yet, government management of these slaughterhouses is still quite weak. According to DAH (2011), only about one-fifth of slaughterhouses is under government control (Table 1). More than half of slaughter operators reported that there is no government agency checking slaughtering area, and less than one -fifth of them have been granted with permission from government (Table 15). Less than 50% of slaughter operators is aware of policies related to slaughter house.

Conclusion and Recommendations

Slaughterhouses provide important economic benefits to actors in the pig value chain. They generate employment to family labor, either part-time or full-time depending on scale of the slaughterhouse operation, thus providing livelihood opportunities. The majority of small scale slaughterhouses perform the tasks of butcher-cum-retailer. On average, slaughtering provides an income of about 18 USD/working day for family labor, contributing about three-fourths of total family income. Slaughtering activity generates an added value of 165 USD/one ton of live pig, accounting from 24%-44% total value added in the pig value chain, depending on types of marketing channel. No formal contract upstream and downstream between small scale slaughterhouse and other actors are found, but informal contract (verbal agreement) is widely practiced. More frequent violations of agreement is found in the upstream linkage as reported by nearly half of slaughter operators interviewed. This sometimes causes bottlenecks arising from insufficiency or unstable supply of inputs going into the slaughterhouse, thus resulting in higher transaction costs from seeking alternative sources of live pigs that may not meet the quality that slaughter operators desire.

The majority of small scale slaughterhouses do not meet the standards for pig slaughterhouse as required by the Ministry of Agriculture and Rural Development. Only less than half of slaughterhouse operators are aware of the standards required by MARD. By the very nature of their small scale operations (i.e., 1-2 pigs/day during normal operations and up

6 pigs/day during Tet holiday), these slaughterhouses are perceived to be critical sources of health risks along the pig value chain. Some of the commonly observed risky practices include slaughtering being done in residential areas or at farmer's residential area (as reported by nearly 90% of respondents); absence of separate areas for killing animals, processing organs/intestinal, and processing/cutting meat; or transporting meat from slaughterhouses to market in open containers on motorbikes. These practices are perceived to contribute to exposure of meat to contamination that could lead to higher incidence of salmonella in pork, a common cause of foodborne illness for consumers. The cost of upgrading is a critical constraint to small-scale slaughterhouse operators to comply with government mandated standards for slaughterhouses. It is not clear that compliance will automatically engender improved food safety outcomes, and this remains an area of future research.

The study highlights the importance of small scale slaughterhouse in rural Vietnam in the pig value chain for its role in creating value added, employment and income for rural labors, especially female labor. Several factors contributing to hygienic flaws in pork are identified, particularly on the set—up of slaughtering facility, practices and attitudes of slaughter men from slaughtering to handling meat. With stricter management of slaughterhouse as mandated by the Ministry of Agriculture and Rural Development, as well as rising concern among consumers about meat quality and traceability, small scale slaughterhouses potentially face challenges for their continued viability given the perceived need for them to upgrade their facilities, and change their practices and attitudes in animal slaughtering and meat handling. Upstream and downstream linkages of small-scale slaughterhouse need to be strengthened to foster greater coordination and efficient information flow to enable them to gradually meet the market demand for traceability and quality of pork. Training programs to improve slaughtering and meat handling practices, credible meat inspection and enforcement of compliance with hygienic standards, as well as credit programs to finance upgrading investment may be needed to support small-scale slaughter houses to remain economically viable participants in the pig value chain in Vietnam.

Tables and Figures

Table 12 Number of slaughter houses and slaughter points in Vietnam, year 2011.

Animal	Total	As % of total	% of slaughter house/point under control	No. of slaughter house	No. of slaughter point
Buffalo, cow, goat, sheep	1,882	6.43	2.46	121	1,761
Pig	14,537	49.65	21.16	561	13,976
Poultry	9,075	30.99	3.22	173	8,902
Poultry and cattle	3,787	12.93	3.33	141	3,646
Total	29,281	100	30.16	996	28,285

Sources: Department of Animal Health (2011) (DAH)

Note: Slaughter houses are those having more than 10 heads of buffaloes/cow/goat/sheep slaughtered/night; or more than 20 heads of pigs/night; or more than 100 heads of poultry slaughtered/night. Slaughter points are those having lower capacity of slaughtering as indicated above

Table 13 Other functions played by slaughter operator in the pig value chain in Vietnam (percent share of responses)

Functions	Hung Yen	Nghe An	All
Production	43.48	71.43	58.82
Collector	0	10.71	5.88
Retailer	100	92.86	96.08
Processor	39.13	10.71	23.53

Sources: Calculated from slaughterhouse survey, 2013

Table 14 Socio demographic characteristics of respondents

Item	Hung Yen	Nghe An	All
% respondent as male	52.17	50	50.98
Age of respondent	47.52	46.71	47.08
Education (% respondent)			
Secondary school	65.22	78.57	72.55
High school	26.09	21.43	23.53
Family size	4.3	3.5	3.86
Working experience (year)	17.48	12.18	14.57

Sources: Calculated from slaughterhouse survey, 2013

Table 15 Main characteristics of slaughterhouse

Items	Hung Yen (n=23)	Nghe An (n=28)	All
Total business capital (USD)	2935	1262.5	2016.5
Total area (m2)	50.45	137.3	121.3
Of which, killing area	26.31	122.2	104.9
Barn area (storing pigs)	24.14	15.13	16.38
Quantity of mortobikes/SH	1.57	1.14	1.33
Manual slaughtering (%)	100	100	100

Sources: Calculated from slaughterhouse survey, 2013

Table 16 Frequency of buying pig and number of pig slaughtered

Time	Hung Yen (n=23)	Nghe An (n=28)	All
1. No. of pig slaughtered/ day	2,08	1,05	1,55
2. No. of pig slaughtered/ month	64	31,89	43,36
3. Frequency of buying pigs/week	3.18	5.68	4.55
4. No of pigs bought/time (Range)	4-9	1-4	1-9

Sources: Calculated from slaughterhouse survey, 2013

Table 17 Sources of live pigs for slaughterhouse (% of quantity)

Sources	Hung Yen	Nghe An	All
By types of producer			
- Smallholders	73.04	96.79	86.08
- Commercial farm	26.96	0	12.16
- Other	0	3.21	1.76
By location			
- Within the commnue	54.73	58.42	56.80
- Outside the commune	45.27	41.58	43.20

Sources: Calculated from slaughterhouse survey, 2013

Table 18 Meat buyers from slaughterhouse (% of buyers)

	Hung Yen			Nghe An			All		
Buyers	At SH	Market	Delivery	At SH	Market	Delivery	At SH	Market	Delivery
Retailer	71.11	28.89	0	54.55	45.45	0	64.83	35.17	0
Restaurant	0	50	50	0	0	0	0	50	50
Consumer	21.74	78.26	0	20	79.18	0	20.82	79.18	0

Sources: Calculated from slaughterhouse survey, 2013

Table 19 Linkage between slaughter operator with live pig suppliers (%sh)

	Hung Yen	Nghe An	All
% slaughterhouse having regular relationship with pig supplier			
- pig supplier as smallholders	25.12	59.2	45.4
- pig suppliers as commercial farms	30	0	30
- pig suppliers as collectors	0	100	100
% slaughterhouse feeling confident with the relationship			
- pig supplier as smallholders	88.23	79.17	80.48
- pig suppliers as commercial farms	83.33	0	66.67
- pig suppliers as collectors	0	100	100
Frequency of breaking contract reported (% slaughterhouse)			
- Always	0	0	0
- Sometimes	78.26	17.86	45.1
- Never	21.74	82.14	54.9

Sources: Calculated from slaughterhouse survey, 2013

Table 20 Linkage between slaughter operator with meat buyers

	Hung Yen	Nghe An	All
% slaughterhouse having regular relationship with meat buyers			
- meat buyer as retailer	100	100	100
- meat buyer as restaurant	100	-	100
- meat buyers as counsumer	42.5	100	64.38
% slaughterhouse feeling confident with the relationship			
- meat buyer as retailer	100	100	100
- meat buyer as restaurant	100	-	100
- meat buyers as counsumer	91.67	85	87.51
Frequency of breaking contract reported (% respondent)			
- Always	0	0	0
- Sometimes	4.35	0	1.6
- Never	95.65	100	98.04

Sources: Calculated from slaughterhouse survey, 2013

Table 21 Carcass rate of pig slaughtered

	Hung Yen	Nghe An
Carcass rate (%)		
Exotic pig	75.00	65.00
Cross pig	73.45	65.75
Domestic pig	-	64.1
Weight of live pig at slaughtering (kg)	90.6	58.3

Sources: Calculated from slaughterhouse survey, 2013

Table 22 Cost and family labor's income from slaughtering pig (for 100 kg of live pig slaughtered)

(Unit: '000 VND)

Item	Hung Yen (n=23)	Nghe An (n=28)	Mean Difference
A. Cost	**4163.9**	**3549.5**	614.4***
Live pig	4073.9	3436.2	637.7***
Energy, packs, water	46.4	92.5	-46.1**
Small equipments	6.3	7.1	-0.8ns
Depreciation	11.5	13.6	-2.1ns
Interest rate	0.3	0.1	0.2ns
Hired labor	25.4	0.0	25.4**
B. Revenue	**4457.2**	**3913.3**	543.9***
C. Value added	**330.6**	**377.5**	-46.9ns
D. Income	**293.3**	**363.8**	-70.5*

Sources: Calculated from slaughterhouse survey, 2013

Note: ***, **, *: Statistically significant at 1%, 5%, and 10%, respectively

Table 23Cost and family labor's income from slaughtering pig (for one working day)

Item	Hung Yen (n=23)	Nghe An (n=28)	All	Difference (Hung Yen- Nghe An)
No. of pigs	2.09	1.14	1.57	0.95**
Live weigh (kg)	189.5	66.43	121.93	123.07**
Total cost ('000VND)	7,824.6	2350.7	4819.33	5473.9***
Revenue ('000VND)	8,325.5	2597.85	5180.91	5727.65***
Income ('000VND)	500.89	247.2	361.58	253.69**
Income/family labor/day	250.45	123.6	180.8	126.85**
As % of total household' income	65.22	71.43	68.6	-

Sources: Calculated from slaughterhouse survey, 2013

Note: ***, **, *: Statistically significant at 1%, 5%, and 10%, respectively

Table 24 Main characteristics of the setting up of the slaughter house

Items	Hung Yen (n=23)	Nghe An (n=28)	Total (n=51)
1. Position of slaughter-house			
- Within residential area (% respondent)	65.22	78.57	72.55
+ Distance to house (m)	27.07	19.18	22.38
- Out of residential area (% respondent)	0	21.43	11.76
+ Distance to house (m)	0	900	900
-At producer’s house	34.78	0	15.69
2. In plan of local government (% respondent)	0	21.43	11.76
3. Having fence (% SH)	34.78	92.68	66.67
4. Having separated killing area (% respondent)	56.52	89.29	74.51
5. Having separate processing internal organs/viscera (% respondent)	0	0	0
6. Having separate processing meat area (% respondent)	17.39	7.14	11.76
7. Having freezing, Packaging area (% respondent)	0	0	0
8. Having storing equipment (% respondent)	0	0	0

Sources: Calculated from slaughterhouse survey, 2013

Table 25 Ways of treating waste from slaughtering activity (% respondent)

Item	Hung Yen (n=23)	Nghe An (n=28)	Total (n=51)
1. Ways of waste water treatment			
Biogas	26.09	39.29	33.33
Pond	47.83	46.43	47.06
Sewer	26.09	14.29	19.61
2. Eliminating waste water			
Biogas	26.09	39.29	33.33
Pond	21.74	17.86	19.61
Sewer	43.48	42.86	43.14
River, stream	8.70	-	3.92
3. Ways of hair treatment			
Biogas	4.35	25.00	15.69
Pond	26.09	14.29	19.61
Sewer	30.43	-	13.73
River, stream	8.70	-	3.92
Trash bin	4.35	-	1.96
Burry in household's land	21.74	35.71	29.41
Burry public land	-	3.57	1.96
Other	4.35	21.43	13.73

Sources: Calculated from slaughterhouse survey, 2013

Table 26 Compliance and awareness of slaughter operator of policies related to slaughterhouse (% respondent)

Item	Hung Yen (n=23)	Nghe An (n=28)	Total (n=51)
1. %sh granted with permission	8.7	28.6	19.6
2.Government agencies checking slaughtering area (%sh)	34.8	46.4	41.2
3. Aware of policies related to slaughter house	26.09	53.57	41.18
4. Aware of policies related to food safety	17.39	21.43	19.61
5. Complying with the policies	50.00	33.33	40.00

Sources: Calculated from slaughterhouse survey, 2013

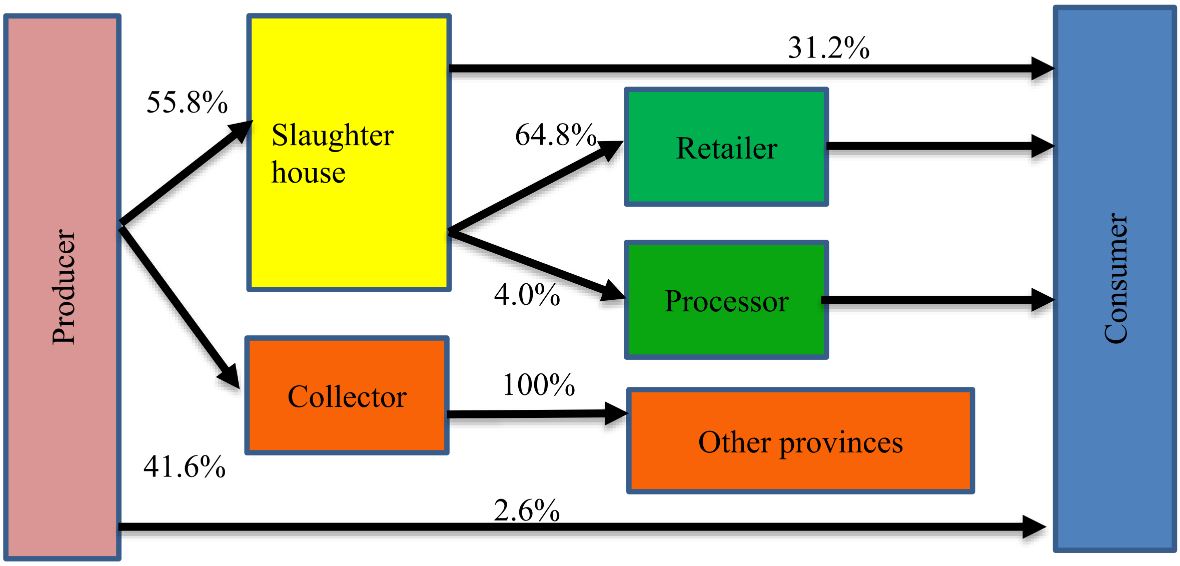

Figure 5 Pig value chain in Hung Yen and Nghe An

References

DAH (2011). Báo cáo họp giao ban trực tuyến về thực trạng hệ thống giết mổ và quản lý giết mổ gia súc, gia cầm

FAO (2008). Abattoir development: Options and DesignsFor Hygienic Basic And Medium-Sized Abattoirs. Rap Publication 2008/1

Fahrion AS, Lapar ML, Nguyen Ngoc Toan, Do Ngoc Thuy and Grace D. (2013). Food-borne hazards in a transforming pork value chain in Hanoi: Basis for future risk assessments. Vietnamese Journal of Preventive Medicine 23(4): 18-25.

GSO (2012). Report on Vietnam Living Standard Household Survey Nga, NTD, Ninh, HN, Hung, PV, Lapar, ML. (2013). The Pig Value Chain in Vietnam: A Situational Analysis Report. ILRI (Research Report). Nairobi, Kenya: ILRI.