Diversity of pig farm types and their sustainability in the northern mountain of Vietnam

Le Thi Thanh Huyen (NIAS)
Nathalie Hostiou (INRA)
Sylvie Cournut (VetAgroSup)
Samir Messad (Cirad)
Guillaume Duteurtre (Cirad)

Introduction

The 1st animal production

23 millions pigs

71% of farm households own pigs

Pork accounts for 70% of all livestock production

80% of pig production raised in small-scale farms
- 1-2 sows + 10 fatteners
- use of local available feeds

Development of intensive large-scale farms
- market-oriented production
- industrial inputs (feed…)
- dominated in South Vietnam but also developing in the North

=> A diversity of pig farms but with policies support for specialized and intensified pig farms

Questions

- What is the diversity of pig farms due to a better access/integration to the market ?

- Are some types of pig farms more sustainable than another? Is specialization in pig production more sustainable?

Materials and Methods

Mai Son district

One of the poorest due to poor access to profitable markets but also to various biophysical constraints to agriculture especially remote mountainous terrain

Data collection

One directive questionnaire with farmers
- Production structure
- Livelihood : natural, physical, financial, social and human capital
- Livestock management
- Livestock technical performances
- Sustainable indicators : environment, social, economical

160 pig farms selected :
- Large scale farms / family farms (< 99 pigs)
- Closed to the main road or in more remoted areas

Data analysis

Selection of variables to build the typology :
- Livelihood capital : natural (1), physical (4), human (5), financial (3), social (2)
- Pig production
- Sustainability : economical (5), social (5), environmental (5)

The typology analysis: multiple factor analysis (MFA) using R software

Identification of 4 types of farms

Results : The farm typology

	Type 1 "small diversified farms with low levels of productivity" (39 farms)	Type 2 "small farms with off farm activity and high productivity on land" (47 farms)	Type 3 "specialized farms with large pig herd" (36 farms)	Type 4 "large mixed crop-livestock farms" (36 farms)
Dimension	Small herd (9 pigs) and medium land (0.9 ha)	Medium herd (45.3 pigs) but small land (0,42 ha)	Large land area (> 1,3 ha) and large herd (> 58 pigs)	

Results : The farm typology

	Type 1 "small diversified farms with low levels of productivity" (39 farms)	Type 2 "small farms with off farm activity and high productivity on land" (47 farms)	Type 3 "specialized farms with large pig herd" (36 farms)	Type 4 "large mixed crop-livestock farms" (36 farms)
Dimension	Small herd (9 pigs) and medium land (0.9 ha)	Medium herd (45.3 pigs) but small land (0,42 ha)	Large land area (> 1,3 ha) and large herd (> 58 pigs)	
Activities	Mixed crop-livestock + on-farm and off-farm activities	Mixed crop-livestock + on-farm and off-farm activities	No off farm activities	Mixed crop-livestock + on-farm and off-farm activities

Results : The farm typology

	Type 1 "small diversified farms with low levels of productivity" (39 farms)	Type 2 "small farms with off farm activity and high productivity on land" (47 farms)	Type 3 "specialized farms with large pig herd" (36 farms)	Type 4 "large mixed crop-livestock farms" (36 farms)
Dimension	Small herd (9 pigs) and medium land (0.9 ha)	Medium herd (45.3 pigs) but small land (0,42 ha)	Large land area (> 1,3 ha) and large herd (> 58 pigs)	
Activities	Mixed crop-livestock + on-farm and off-farm activities	Mixed crop-livestock + on-farm and off-farm activities	No off farm activities	Mixed crop-livestock + on-farm and off-farm activities
Labor	Family		Family + hired workers	

Results : The farm typology

	Type 1 "small diversified farms with low levels of productivity" (39 farms)	Type 2 "small farms with off farm activity and high productivity on land" (47 farms)	Type 3 "specialized farms with large pig herd" (36 farms)	Type 4 "large mixed crop-livestock farms" (36 farms)
Dimension	Small herd (9 pigs) and medium land (0.9 ha)	Medium herd (45.3 pigs) but small land (0,42 ha)	Large land area (> 1,3 ha) and large herd (> 58 pigs)	
Activities	Mixed crop-livestock + on-farm and off-farm activities	Mixed crop-livestock + on-farm and off-farm activities	No off farm activities	Mixed crop-livestock + on-farm and off-farm activities
Labor	Family		Family + hired workers	
Pig management	Local breed + self sufficiency	Exotic breed + industrial feed		

Results : The farm typology

	Type 1 "small diversified farms with low levels of productivity" (39 farms)	Type 2 "small farms with off farm activity and high productivity on land" (47 farms)	Type 3 "specialized farms with large pig herd" (36 farms)	Type 4 "large mixed crop-livestock farms" (36 farms)
Dimension	Small herd (9 pigs) and medium land (0.9 ha)	Medium herd (45.3 pigs) but small land (0,42 ha)	Large land area (> 1,3 ha) and large herd (> 58 pigs)	
Activities	Mixed crop-livestock + on-farm and off-farm activities	Mixed crop-livestock + on-farm and off-farm activities	No off farm activities	Mixed crop-livestock + on-farm and off-farm activities
Labor	Family		Family + hired workers	
Pig management	Local breed + self sufficiency	Exotic breed + industrial feed		
Ethnicity and localisation	Thai and Muong in highlands	Kinh in lowland and intermediate highland	Kinh in the lowland	

	Type 1 "small diversified farms with low levels of productivity" (39 farms)	Type 2 "small farms with off farm activity and high productivity on land" (47 farms)	Type 3 "specialized farms with large pig herd" (36 farms)	Type 4 "large mixed crop-livestock farms" (36 farms)
Sources of income	Livestock = 28% Crops = 55%	Livestock = 60%	Livestock = 73%	Livestock = 60% Crops = 20%

	Type 1 "small diversified farms with low levels of productivity" (39 farms)	Type 2 "small farms with off farm activity and high productivity on land" (47 farms)	Type 3 "specialized farms with large pig herd" (36 farms)	Type 4 "large mixed crop-livestock farms" (36 farms)
Sources of income	Livestock = 28% Crops = 55%	Livestock = 60%	Livestock = 73%	Livestock = 60% Crops = 20%
Total income	Low (2600 euros/y)	Medium (6500 euros/y)	Medium (7770 euros/y)	High (10000 euros/y)

	Type 1 "small diversified farms with low levels of productivity" (39 farms)	Type 2 "small farms with off farm activity and high productivity on land" (47 farms)	Type 3 "specialized farms with large pig herd" (36 farms)	Type 4 "large mixed crop-livestock farms" (36 farms)
Sources of income	Livestock = 28% Crops = 55%	Livestock = 60%	Livestock = 73%	Livestock = 60% Crops = 20%
Total income	Low (2 600 euros/y)	Medium (6 500 euros/y)	Medium (7 770 euros/y)	High (10 000 euros/y)
Economical productivity	Low for land (323 €/ha/y) Low for labor (820 €/labor/y)	High for land (3 400 €/ha/y) Medium for labor (2 600 €/labor/y)	Low for land (585 €/ha/y) High for labor (3 000 €/labor/y)	Low for land (663 €/ha/y) Medium for labor (2 800 €/labor/y)

Company farms

Quite new and specific in Mai Son town (2 farms)

Large farms (> 2000 piglets)

Closed system with own boars and sows to produce gilts and piglets for fattening

Large total income derived from pig production (243 – 3000 million VND/year)

Labour mainly run by men and hired labor

Use of industrial feed

Result : a complex relation between farms' types and sustainability

Environment

Treatment of waste :
- Small farms (T1) not equiped with biogas but use of compost for crops as in large mixed farms (T4)

Diversity of crops/animals :
- More diversity (and local breed) in small diversified farms (T1)

Pollution by chemicals :
- No relation between the size and use of products, related to crops

Economical

Relation between the size of the herd and the income :
+animals, + incomes

Lower economical productivity in small mixed farms (T1) in comparison with the 3 other types, with some differences :
- high labor productivity for T3 and high land productivity for T2
- but specialisation can be less secure than diversification (for example in case of decrease of pig price)(T3)

Large farms (T4) depend more on credits => more vulnerable?

Feed self-sufficiency in small mixed farms (T1) no feed self-sufficiency in specialized farms (T2, and T3), intermediate one in large mixed farms (T4)

Social

In small mixed farms (T1, T2) : use of family workforce
In specialized (T3) and large mixed farms (T4) : use of family workforce + hired workforce

Work duration (per pig or per 1000 L/milk) higher in small mixed farms (T1) because less equiped but work shared between different workers and the size of the family living from the farm is more important

Women have an important contribution to livestock activity, in particular in diversified farms

Discussion and conclusion

- Pig production in the study site can be sorted into 4 major types and a new company farm type

- There is strong association of localization in terms of zones and ethnicity to the typologies of farms. Pig production is more specialized in the lowland zone

- The specialized model promoted by the Vietnamese government, one of the farm's type (T3) but not the single

- Combinaison of on farm and off farms activities in 3 types, various "advantages" (income, manure, workforce….)

- Not compared these different farms but to better understand the complementarities between the different pig farms in a same region

Thank you very much for your attention!!!

Methods

Data collection via farmer interviews by using structured questionnaire

Farm type	Identification	Location	Randomly selected (n)
1. Large scale farm	- a contracted farm; - a company farm; - and family farms (from 20 sows or from 100 fatteners as large scale farms but did not register).	Whole district: mainly distributed in Hat Lot commune; Hat Lot town; and Chieng Mai commune; and few in Co Noi, Muong Bon and Chieng Mung communes (zone 1)	30
2. Household farm	With less than 100 pigs	Hat Lot commune (zone 1 – lowland); Chieng Mai comune (zone 2 – intermediate high land); some from Hat Lot town (zone 1 – lowland)	*Total of 130*
- large	With 50-99 pigs	Hat Lot commune; Chieng Mai comune; some from Hat Lot town	40
- medium	With 25-49 pigs	Hat Lot commune; Chieng Mai comune; some from Hat Lot town	40
- small	With < 25 pigs	- farms from Hat Lot commune (sows/ fattenners; mainly crosses of exotic pigs) (zone 1) - from Chieng Mai commune (Bản pigs/ MC/crossbred/exotic pigs; sows/ fattenners) (zone 2)	50

Variables selected to create the typology of farms

Group	Variable	Definition of the variable for pigs in Mai Sơn
Natural capital	Total land	Land for 50 years + Land for 20 years + Land for > 50 + hired land + other (m²)
Physical capital	N° of animal species	**Number** of animal species (pig + poultry + …)
	Pig herd size (scale of production)	Current pig herd size at time of interviews
	Reproductive herd	(sow + boar)/ total pig size (%)
	Investment in pig production	Value of equipment for pig housing (in million VND)
Human capital	Family size	Total number of persons in the family (all members living together)
	Family labor	Total number of persons of the family ? working on the farm (> 15 years old and < 60 years old)
	Number of workers with pig production	Total number of persons working with pig production (> 15 years old and < 60 years old) including hired workers
	Ration of Hired workers	Percentage of hired workers in the total of workersworking on the farm (%)
	Ration of labors for pig in total labor on the farm	Ration of labors for pig in total labor on the farm (including hire workers) (%)

Group	Variable	Definition of the variable for pigs in Mai Sơn
Social capital	Off farm activities for family	With or without off-farm activities
	Diversity of activities	Number of activities on the farm (crops, livestock, off farm…)
Financial capital	Income structure	- Share of livestock income per total income (%) - Share of crop income per total income (%)
	Total income per 1000m^2	Total income per 1000m² total land area (million VND)
	Total income per labor	Total income of the farm per family labor (> 15 years old and < 60 years old) (million VND)
Pig production	Feed self- sufficiency for pig	Months using own feed for pig
	Pig productivity	average weight gain of fatteners
	Pig breed	Kind of breed (exotic or local/ crossbreed)

Variables selected to identify farm sustainability

Group	Variable	Definition of the variable for pigs in Mai Sơn
Economic sustainability	Share of income from pig production in the total income	Pig income / total income (%)
	Income from pig production per pig	Income from pig per pig (million VND)
	Pig income per 1000m2	Income from pig per 1000 m2 total land (million VND)
	Pig income per family labor	Income from pig per family labor (million VND)
	Economic self sufficiency	Value of credit (million VND)
Social sustainability	Time spending for a pig per day	Time spending for a pig per day (minute)
	Percentage of time spending by women for pig	Number of hours per day by women/ Number of total work per day in pig production (%)
	Experience with pig production	Number of year with pig production (year)
	Number of sources for the formations	Number of sources for the formations in last years
	Participating in training course on pig husbandry	Participation in training courses

Variables selected to identify farm sustainability (cont.)

Group	Variable	Definition of the variable for pigs in Mai Sơn
Environmental sustainability	N° of crops	Number of crops in the farm
	Manure treatment	Ways of treating pig manure
	Chemical products	Use of chemical products in cropping
	Pig density	A space (N° of m2 of stable) for a pig
	Distance to other farm raising pigs	Distance to other farm raising pigs (m)
Localisation	Ethnicity	Types of ethnic group (major group- Kinh or ethnic group of Thai or Muong)
	Zone	Location identified as zone 1 - low land or zone 2- intermediate highland according to classification of the province and district

Data analysis

▶ The typology analysis: multiple factor analysis (MFA) using R software.

▶ The description of different types: via Means and Standard deviations or percentages and the comparison for significant difference of the value within the class from the value of the total population using SPAD software.

▶ Qualitative data were summarized and analyzed by synopsis to obtain interpreted results.

Description of the typology with 'capital' (active variables) criteria

Variables	n	Type 1 Mean ± sd	n	Type 2 Mean ± sd	n	Type 3 Mean ± sd	n	Type 4 Mean ± sd
Natural capital								
Total land (m^2)	39	9024.4± 2672.3	47	**4220.5 ± 3336.0#**	36	**13472.2 ± 5834.3***	**36**	**17601.7±7196.8***
Physical capital								
N° of animal species (n)	39	**2.7 ±0.9***	47	2.2 ± 0.9	36	2.2±0.7	36	2.2±0.7
Pig herd size (n)	39	**9.0 ± 7.7#**	47	45.3 ± 51.3	36	**60.1 ±53.4***	36	**57.5±25.4***
Reproductive herd (%)	39	**31.6 ± 34.5***	47	11.7 ± 12.3	36	10.3 ±16.4	36	**6.2 ± 6.7#**
Investment in pig production (mil.VND)	39	**0.2 ± 0.8#**	47	19.0 ± 81.9	36	19.1± 42.2	36	18.2±15.2
Human capital								
Family size (n)	39	**4.9 ± 1.3***	47	**4.0 ± 1.2#**	36	4.4±0.9	36	4.6±1.1
Family labor (n)	39	**3.5 ± 1.2***	47	**2.7 ± 1.1#**	36	**2.8±0.9#**	36	**3.8±0.9***
Workers with pig production (n)	39	**2.1 ± 0.9***	47	1.6 ± 0.7	36	2.0±0.7	36	**1.5±0.5#**
Ration of Hired workers/labors (%)	39	**0.0 ± 0.0#**	47	10.0 ± 24.5	36	**19.0±23.5***	36	**21.4±9.9***
Ration of labors for pig in total labor (%)	39	**65.2 ± 29.1***	47	59.3 ± 34.8	36	61.1±29.8	36	**34.9±16.7#**

Note: the variables with "*" ; "#" which are statistically different in the class from the whole sample (*: higher; # lower)
Type 1: small diversified farms with low levels of productivity; Type 2: small farms with off farm activity, high productivity on land;
Type 3: specialized farms with large pig herd; Type 4: large mixed crop-breed farms

Variables	Type 1		Type 2		Type 3		Type 4	
	n	Mean ± sd	n	Mean ± sd	n	Mean ± sd	n	Mean ± sd
Social capital								
Off farm activities for family (n)	39	0.7 ± 0.6	47	**1.0 ± 0.6***	36	**0.1±0.3#**	36	**1.0±0.5***
Diversity of activities (n)	39	2.6 ± 0.5	47	**2.7 ± 0.5***	36	**2.0±0.2#**	36	**2.8±0.4***
Financial capital								
Total income (million VND)	39	**71.4 ± 43.2#**	47	169.7±179.1	36	199.4±143.3	**36**	**259.4±119.4***
Share of crop income in total income (%)	39	**54.7 ± 17.6***	47	**12.3 ± 16.0#**	36	25.5±31.9	36	20.4±22.0
Share of livestock income in total income (%)	39	**28.2 ± 17.2#**	47	61.1 ± 28.5	36	**73.1±32.0***	36	29.0±27.5
Total income per 1000m^2 (mil. VND)	39	**8.3 ± 5.3#**	47	**87.2 ±121.5***	36	15.8±11.5	36	17.1±10.8
Total income per labor (mil. VND)	39	**21.6 ± 12.3#**	47	67.5 ± 73.7	36	**80.4±66.4***	36	74.2±39.8

Note: the variables with "*" ; "#" which are statistically different in the class from the whole sample (*: higher; # lower)
Type 1: small diversified farms with low levels of productivity; Type 2: small farms with off farm activity, high productivity on land;
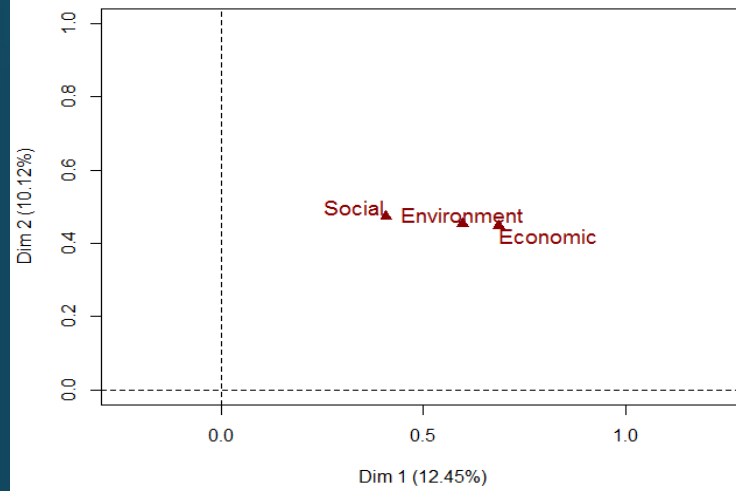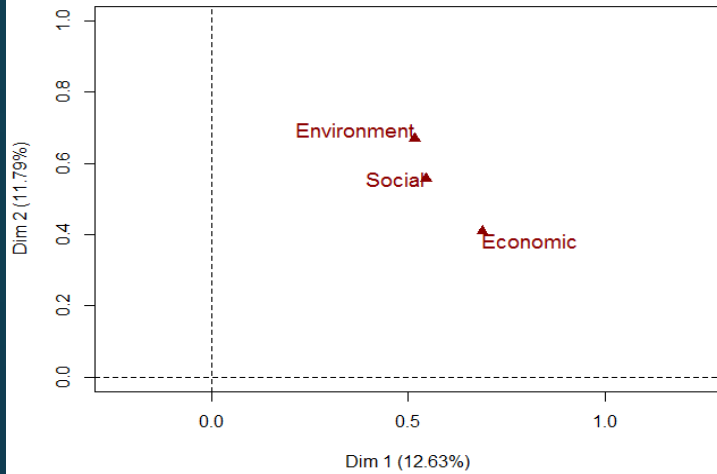Type 3: specialized farms with large pig herd; Type 4: large mixed crop-breed farms

Description of the typology with criteria of pig production

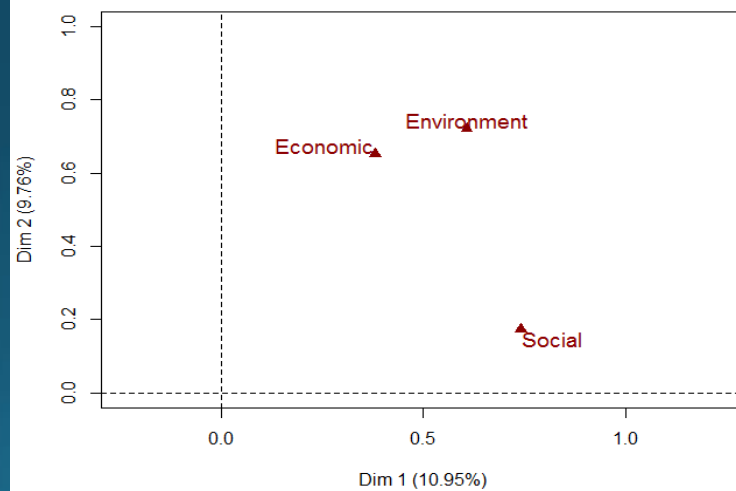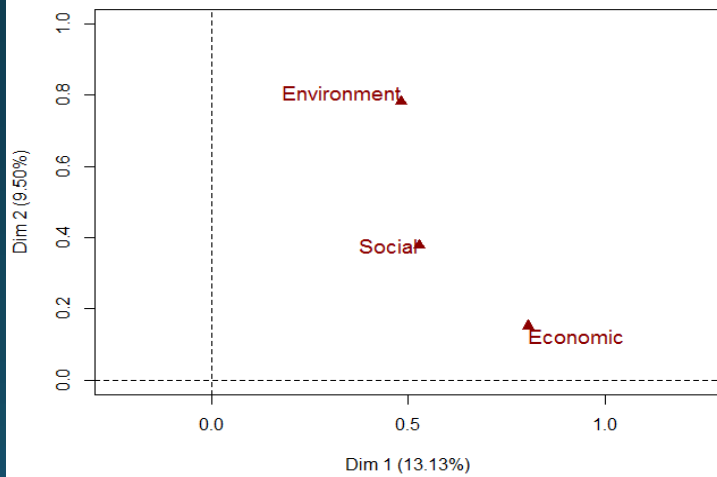| Variables	type 1		type 2		type 3		type 4	
	n	Mean ± sd	n	Mean ± sd	n	Mean ± sd	n	Mean ± sd
Feed self-sufficiency for pig (months/year)	34	**6.9 ±4.3***	43	**1.1 ± 2.2#**	36	**1.9±1.7#**	33	2.5±1.7
Fattener ration (%)	39	**50.4 ± 40.1#**	47	78.2 ± 29.2	36	83.1±22.4	36	**90.6±11.9***
Weight gain (kg/month)	32	**10.4 ± 5.8#**	46	18.7 ± 4.3	34	**20.8±2.6***	36	**20.3±2.3***
Reproductive sow life (month)	33	**59.8 ± 24.3***	39	49.4 ± 17.8	30	43.0±18.1	24	**38.7±13.0#**
Farrowing interval (month)	32	**6.5 ± 1.5***	39	5.5 ± 0.5	30	5.5±0.5	24	5.5±0.6
Wean piglet (n/litter)	33	**8.7 ± 2.0#**	39	10.0 ± 2.0	30	10.2±1.1	24	9.7±1.4
Age at weaning (days)	31	**40.3 ± 17.3***	39	**28.5 ± 7.4#**	29	30.2±5.1	24	28.6±3.9
Weight at weaning (kg)	33	6.0 ± 2.3	39	7.0 ± 1.5	30	**9.9±10.5***	24	7.3±1.7
Pig sold (n/year)	39	**19.6 ±19.0#**	46	101.1 ± 111.5	36	**141.8±119.1***	36	**132.8±56.5***

Company farms

▶ Quite new and specific in Mai Son town (2 farms)

▶ closed system with own boars and sows to produce gilts and piglets for fattening (3896 – 5711 pigs. with 11-16 boars; 180 – 350 gilts; and 350 – 1300 sows with 1000 – 2400 piglets)

▶ High productivity: 9.8 – 13.8 weaned piglets/litter/sow; 20.8 kg of WG /month; 700 – 30000pigs off-taken; total income derived from pig production of 243 – 3000 million VND/year.

▶ Providing opportunity for a number of labor in the society.

▶ Industrial feed.

▶ The value of credit used for pig production:5500 – 40000 million VND.

type 1

type 2

type 3

type 4

Figure 5: Description of four typologies with sustainable criteria

31

Description of the typology with sustainable criteria

Variables	type 1		type 2		type 3		type 4	
	n	Mean ± sd	n	Mean ± sd	n	Mean ± sd	n	Mean ± sd
Economic sustainability								
Share of income from pig production in the total income (%)	39	**18.7 ± 14.4#**	47	51.3 ± 27.2	36	**67.4±34.2***	36	56.2±27.6
Income from pig production per pig (mil. VND)	39	1. 0.9	46	1. ± 0.6	36	0.9±0.6	36	1.1±0.5
Pig income per 1000m^2 (mil. VND)	39	**1.5 ± 1.6#**	47	**51.3 ± 98.6***		11.2±10.8	36	9.1±6.9
Pig income per family labor (mil. VND)	39	**3.9 ± 3.8#**	47	40.8 ± 60.0	36	**57.3±58.6***	36	41.4±30.4
Economic self- sufficiency (credit value, mil. VND)	39	**16.0 ± 19.1#**	47	65.7 ± 125.8	36	83.4±147.1	36	**108.3±187.2***

Note: the variables with "*" ; "#" which are statistically different in the class from the whole sample (*: higher; # lower)

Type 1: small diversified farms with low levels of productivity; Type 2: small farms with off farm activity, high productivity on land; Type 3: specialized farms with large pig herd; Type 4: large mixed crop-breed farms

Description of the typology with sustainable criteria

Variables	type 1		type 2		type 3		type 4	
	n	Mean ± sd	n	Mean ± sd	n	Mean ± sd	n	Mean ± sd
Social sustainability								
Time spending for a pig per day (minute)	39	**31.6 ± 31.6***	46	8.4 ± 7.0	36	**5.8± 4.2#**	36	**4.5±2.5#**
Percentage of time spending by women for pig (%)	39	61.7 ± 33.3	46	66.7 ± 48.7	36	56.9±27.2	36	52.9±40.7
Experience with pig production (year)	39	18.9 ± 10.8	47	13.9 ± 9.5	36	13.8±10.8	36	18.4±9.9
Participating in training course on pig husbandry (course/year)	39	0.7 ± 0.9	47	0.8 ±1.0	36	1.1±1.1	36	**1.3±2.3***
Environmental sustainability								
N° of crops (refer to chemical use)	39	**2.5 ± 0.9***	47	**1.4 ± 1.1#**	36	2.1±1.1	36	**2.5±1.2***
Pig density (m^2/pig)	39	**5.3 ± 6.1***	47	3.1 ± 2.5	36	3.2±2.5	35	2.5±1.9
Distance to other farm raising pigs (m)	39	**28.7 ± 30.2#**	47	**107.9 ± 113.4***	36	111.3±152.0	36	72.2±90.8

Note: the variables with "*" ; "#" which are statistically different in the class from the whole sample (*: higher; # lower)

Type 1: small diversified farms with low levels of productivity; Type 2: small farms with off farm activity, high productivity on land; Type 3: specialized farms with large pig herd; Type 4: large mixed crop-breed farms

Results : The farm typology according to the capital groups

Type 1 "small diversified farms with low levels of productivity" (39 farms)

Smallholders with small herd (9 pigs)

Mixed farming (several species and crops) with crop production more important in the income (55%)

Pig production based on local resource (feed and breed)

Low productivity on land (8.3 mil VND/1000m²), labor (21.6 mil VND/laborer) and low income (70 mil VND/y)

Most autonomous in feed and labor (3,5 family labours; not hire labor)

Thai and Muong in highlands

Type 1 "small diversified farms with low levels of productivity" (39 farms)	Type 2 "small farms with off farm activity and high productivity on land" (47 farms)
Smallholders with small herd (9 pigs)	Smallholders with medium herd (45.3 pigs) but small land (0,42 ha)
Mixed farming (several species and crops) with crop production more important in the income (55%)	High diversity of on-farm and off-farm activities
Pig production based on local resource (feed and breed)	Pig production the main income (60 % of the total income)
Low productivity on land (8.3 mil VND/1000m²), labor (21.6 mil VND/laborer) and low income (70 mil VND/y)	Family labor (2.7 laborers)
	Exotic breed (more intensive)
	Less autonomous in feed
Most autonomous in feed and labor (3,5 family labours; not hire labor)	High productivity on land (87.2 mil VND per ha)
Thai and Muong in highlands	Kinh group in lowland and intermediate highland

Type 1 "small diversified farms with low levels of productivity" (39 farms)	Type 2 "small farms with off farm activity and high productivity on land" (47 farms)	Type 3 "specialized farms with large pig herd" (36 farms)
Smallholders with small herd (9 pigs)	*Smallholders with medium herd (45.3 pigs) but small land (0,42 ha)*	Large land area (1,3 ha) and large herd (60 pigs)
Mixed farming (several species and crops) with crop production more important in the income (55%)	*High diversity of on-farm and off-farm activities*	No off-farm activitiy
Pig production based on local resource (feed and breed)	*Pig production the main income (60 % of the total income)*	Family labor (2.8 workers) and hire workers
Low productivity on land (8.3 mil VND/1000m²), labor (21.6 mil VND/laborer) and low income (70 mil VND/y)	*Family labor (2.7 laborers)*	Livestock the most important activity in the income (73.1%)
Most autonomous in feed and labor (3,5 family labours; not hire labor)	*Exotic breed (more intensive)*	Exotic breed
Thai and Muong in highlands	*Less autonomous in feed*	High productivity on labor (80.4 mil VND/worker)
	A high productivity on land (87.2 mil VND per ha)	Kinh people and in the lowland.
	Kinh group in lowland and intermediate highland	

Type 1 "small diversified farms with low levels of productivity" (39 farms)	Type 2 "small farms with off farm activity and high productivity on land" (47 farms)	Type 3 "specialized farms with large pig herd" (36 farms)	Type 4 "large mixed crop-breed farms" (36 farms)
Smallholders with small herd (9 pigs)	Smallholders with medium herd (45.3 pigs) but small land (0,42 ha)	Large land area (1,3 ha) and large herd (60 pigs)	Large household farms (> 1,7 ha), with a high number of pigs (58)
Mixed farming (several species and crops) with crop production more important in the income (55%)	High diversity of on-farm and off-farm activities	No off-farm activitiy	Mixed crop-livestock system + high diversity of on-farm and off-farm activities
Pig production based on local resource (feed and breed)	Pig production the main income (60 % of the total income)	Family labor (2.8 workers) and hire workers	High investment in equipment for pig breeding (from1 million up to more than 13 million VND)
Low productivity on land (8.3 mil VND/1000m²), labor (21.6 mil VND/laborer) and low income (70 mil VND/y)	Family labor (2.7 laborers)	Livestock the most important activity in the income (73.1%)	3,8 family workers + hired workers
Most autonomous in feed and labor (3,5 family labours; not hire labor)	Exotic breed (more intensive)	Exotic breed	Large income (260 m VND/y) from livestock (60%) and crops (20%) >130 pigs sold per year Kinh people located in the lowland
Thai and Muong in highlands	Less autonomous in feed	High productivity on labor (80.4 mil VND/worker)	
	A high productivity on land (87.2 mil VND per ha)	Kinh people and in the lowland.	
	Kinh group in lowland and intermediate highland		