Chapter 3

Pig Farmers' Preferences for the Adoption of Good Animal Husbandry Practices in Vietnam: A Choice Experiment

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Summary: In response to increasing food safety concerns, consumer demand has risen substantially for pork products featuring robust safety certifications and comprehensive tracking systems. The Good Animal Husbandry Practice (GAHP) guidelines for pig farming establish a systematic framework to enhance food safety standards in Vietnam. GAHP guidelines establish a framework for food safety standards in Vietnam's pig farming sector. However, widespread adoption faces significant challenges related to the substantial initial investment required to implement these guidelines. The study aims to investigate the key factors influencing Vietnamese pig farmers' willingness to implement GAHP protocols. The results indicate strong farmer support for GAHP implementation when accompanied by secured contractual agreements, enhanced productivity metrics, and premium pricing structures. These empirical findings provide valuable insights for policymakers to develop effective regulatory frameworks supporting GAHP adoption. Additionally, the research outcomes offer strategic guidance for stakeholders across the supply chain to establish optimized distribution channels for GAHP-certified products. For pig farmers specifically, these insights facilitate informed decision-making regarding contractual arrangements, operational efficiency, and market accessibility for GAHP-certified livestock.

1. Introduction

Pig farming represents one of the cornerstones of Vietnam's diverse agricultural landscape, playing a vital role in both the nation's food security and economic development. The scale of this sector is substantial, with Vietnam currently supporting approximately 2.6 million pig farm households that collectively provide employment opportunities for around 7 million workers across the country (Ministry of Agriculture and Rural Development, Livestock Department 2022). Within Vietnam's regional distribution of pig farming, the Southeast region emerges as a significant contributor, hosting 11.5% of the country's total pig population, which translates to approximately 2.86 million pigs, highlighting the region's important role in the national pork production ecosystem.

The industry currently grapples with increasingly complex sustainability challenges that demand immediate attention. Pig farms face persistent difficulties in maintaining control over the unauthorized use of growth-promoting substances, particularly salbutamol and clenbuterol, which pose serious risks to both livestock welfare and human health. Additionally, the sector continuously confronts the devastating impact of recurring disease outbreaks, most notably the highly infectious African Swine Fever and Porcine Reproductive and Respiratory Syndrome (Blue Ear), which have the potential to devastate entire pig populations and severely compromise the operational efficiency and economic viability of farming enterprises.

In response to these pressing challenges and the increasing consumer demand for verified safe pork products, Good Animal Husbandry Practice (GAHP) safety standards have emerged as a comprehensive and systematic solution. These meticulously developed standards serve multiple critical objectives: the complete elimination of prohibited substances from the

production chain, the implementation of robust biosecurity measures to prevent and control disease outbreaks, and the significant reduction of environmental impacts through the adoption of advanced waste management techniques and environmentally conscious farming practices.

GAHP represents a comprehensive framework of standardized guidelines designed to optimize pig farming operations. These carefully developed protocols encompass various aspects of livestock management, with a specific emphasis on implementing evidence-based practices that effectively reduce piglet mortality rates while simultaneously enhancing overall farm productivity and operational efficiency. Initially implemented in Vietnam in 2008, the GAHP framework consisted of 17 detailed criteria for farm management. In response to practical practical experience and evolving industry needs, these guidelines underwent strategic refinement in 2015, resulting in a more streamlined set of 14 essential criteria that better addressed the practical challenges of modern pig farming operations. Figure 3.1 shows a certificate of VietGAHP.

Figure 3.1. A Cerificate of VietGAHP by a Private Livestock Company
Source: Author's survey

Despite the clear benefits of GAHP for pig farming operations, its adoption rate among Vietnamese pig farmers remains notably low, with statistical data from 2019 indicating that only 18% of Vietnam's pig farming operations had implemented these standardized practices. This relatively modest adoption rate presents an intriguing challenge for agricultural policymakers and industry stakeholders.

Various scholarly investigations and field studies have identified multiple interconnected factors contributing to this limited adoption (Ngoc et al. 2016; Nguyen et al. 2021; Vu et al. 2016). These barriers encompass significant financial considerations, such as the substantial initial investment requirements and difficulties accessing credit facilities. Economic uncertainties also play a crucial role, including fluctuating market prices for pork products and concerns about achieving consistent profitability. Additionally, structural challenges such as the predominance of small-scale farming operations, limited access to agricultural extension services, and the absence of established contract farming arrangements further complicate adoption decisions. The influence of neighboring farms' practices and success rates has also been documented as a significant factor in farmers' decision-making processes regarding GAHP implementation.

This study aimed to examine farmers' preferences regarding GAHP adoption in Vietnamese pig farming. A choice experiment is used to simulate a real-world scenario where farmers must implement GAHP standards.

2. Materials and Method

(1) A Choice Experiment

A choice experiment is used to evaluate participants' preferences for specific goods or services not available in real markets (Louviere et

al. 2000). A choice experiment study involves four key steps: selecting attributes and corresponding levels, designing choice cards, collecting data, and analyzing farmers' preferences.

1) Careful Selection of Attributes along with Their Corresponding Levels

First, we created a list of potential attributes based on GAHP characteristics and previous studies. We then conducted group discussions with experts and pig farmers to identify key attributes from this list (Table 3.1). Attributes that could influence farmers' preferences and adoption of GAHP included initial investment, increased yield, output contracts, GAHP certification, higher prices, neighbor impact, uncertainty, farm scale, credit accessibility, and agricultural extension services. Twenty-one pig farmers from medium and large-scale farms evaluated these attributes through a group discussion session.

Table 3.1. The Potential Attributes, Statements, and Measurements about GAHP

No	Attribute	Statement	1	2	3	4	5
1	Initial investment	I believe that the initial investment required for implementing GAHP is too high.	0	0	14	48	38
2	Increased yield	I believe that GAHP helps increase yield in pig farming by decreasing the mortality rate.	0	5	14	43	38
3	Output contract	I expect that by adopting GAHP, I will no longer have to worry about pig price fluctuations.	0	0	24	33	43
4	GAHP certification	I expect that by adopting GAHP, pig products will be safe for consumers.	0	0	24	48	29
5	Traceability	I believe that by adopting GAHP, traceability will provide consumers with information about the raising process.	0	0	24	50	27
6	Price premium	I believe that the implementation of GAHP will result in higher pig product pricing.	0	0	14	48	38
7	Influence of neighbor	If other farms have successfully used GAHP, I will invest in it.	5	14	48	19	14
8	Uncertainty	I am concerned about the uncertainties associated with GAHP implementation.	0	14	38	29	19
9	Farm scale	I believe that farm scale influences the adoption of GAHP.	0	24	33	19	24
10	Credit accessibility	I am unable to invest in GAHP because of a lack of credit.	0	0	43	33	24
11	Agricultural extension services	I believe that extension services will be useful in my farm with GAHP.	0	19	29	24	29

Source: Author

The level of the initial cost attribute was established by conducting a survey among pig farmers. The attribute level for increased yield is based on the study of LIFSAP, which stated that pig farmers applied GAHP (Table 3.2).

Table 3.2. Attributes and Corresponding Levels

Attribute	Unit	Level
Initial cost	Million VND/1000 m^2 pigsty	1200; 1400; 1600; 1800
Increased yield	%	5; 10
Output contract	0 = No; 1 = Yes	0; 1
Price premium	%	10; 20; 30

Source: Author

2) Designing Choice Cards

The second step is to create choice cards that present various combinations of those attributes in a systematic and balanced manner. Using 2 attributes with 2 levels, 1 attribute with 3 levels, and 1 attribute with 4 levels would yield a full factorial design of 48 alternative sets. However, following the best practices of Allenby et al. (1998), each survey questionnaire should be limited to 10 choice sets or fewer. In this study, we presented six choice sets using choice cards that gave pig farmers two options: (1) non-adoption of GAHP or (2) adoption of GAHP. Table 3.3 shows an example of a choice card.

Table 3.3. An Examples of Choice Cards

Attribute	Non-Adoption GAHP	Adoption GAHP
Increased yield	0%	+10%
Output contract	0 = No	1 = Yes
Price premium	0%	+10%
Initial cost	1,200 million VND	1,400 million VND
Please choose your preferred option.	☐	☐

Source: Author

3) Data Collection

Data collection was from study participants, ensuring a representative sample and thorough documentation. The survey was conducted in two provinces: Dong Nai (Trang Bom and Thong Nhat districts) and Binh Duong (Phu Giao district) in May 2022 (Figure 3.2). These areas were selected for their high concentration of pig farms and their importance in promoting GAHP implementation. Using stratified random sampling in each district, we selected 50 pig farmers who operate open-cycle pig rearing systems. In total, we interviewed 150 pig farmers, each of whom was the primary decision-maker in their household.

Figure 3.2. Map of Study Sites
Source: Author

4) Measurement and the Empirical Model

Farmers' preferences regarding GAHP adoption in Vietnamese pig farming were analyzed using the choice experiment. Based on Lancaster's Theory of Consumer Behavior, the Mixed Logit model (MXL) with 2 models was used:

The Main Effect MXL Model

The model is displayed as follows:

$V_{ab} = \beta_0 + \beta_1*$ initial cost $+ \beta_2*$increased yield $+ \beta_3*$output contract $+ \beta_4*$price premium

The MXL Model with Individual Characteristics

The MXL model with individual characteristics is shown as follows:

$V_{ab} = \beta_0 + \beta_1*$initial cost $+ \beta_2*$increased yield $+ \beta_3*$output contract $+ \beta_4*$price premium $+ \alpha_1*$gender $+ \alpha_2*$education $+ \alpha_3*$age $+ \alpha_4*$income

Where willingness to pay (WTP_a) for each attribute is the ratio of the marginal utility of the attribute to the marginal utility of the monetary attribute.

The monetary aspect considered in this study is the initial investment cost:

$WTP_a = -\beta_a/\beta_{cost}$

The model estimations and analysis preparation in this study were carried out using Stata 16.0.

3. Results and Discussions

(1) Social Characteristics of Pig Farmers

According to the survey data, 70% of pig farmers were male and 30% were female. The majority of farmers (56%) were aged 45–59, while 30% were aged 30–44, 10% were aged over 60, and 4% were aged under 30. More than half (54%) of the surveyed pig farmers had completed secondary school education. Regarding experience levels, 44% had 10–19 years of experience, 30% had 20–30 years, 22% had less than 10 years, and 4% had over 30 years. For farm size, 66% operated medium farms (30–300 pigs), while 34% managed large farms

(over 300 pigs). Annual household income distribution showed that 30% earned 100–199 million Vietnamese Dong (VND), 28% earned 200-299 million VND, and 20% earned 300-400 million VND. The remaining farmers earned either below 100 million VND (4%) or above 400 million VND (18%). Table 3.4 presents these characteristics in detail.

Table 3.4. Characteristics among Pig Farmers

Variables	Categories	Frequency	Percentage (%)
Gender	Male	105	70
	Female	45	30
Age	Under 30	6	4
	30–44	45	30
	45–60	84	56
	Above 60	15	10
Education	Primary school	39	26
	Secondary school	81	54
	High school	18	12
	University	12	8
Experience	Under 10	33	22
	10–19	66	44
	20–30	45	30
	Above 30	6	4
Number of pigs	30–300	99	66
	Above 300	51	34
Household income	Under 100 million VND (4200 USD) per year	6	4
	100–199 million VND (4200–8400 USD) per year	45	30
	200–299 million VND (8400–12,600 USD) per year	42	28
	300–400 million VND (12,600–16,800 USD) per year	30	20
	Above 400 million VND (16,800 USD) per year	27	18

Source: Author's calculation

(2) Pig Farmers' Preferences for the Adoption of GAHP

To examine pig farmers' preferences regarding GAHP attributes, we estimated a Mixed Logit (MXL) model. Table 3.5 presents the main effect model. The MXL results reveal that initial cost, increased yield,

output contract, and price premium attributes all had significant positive coefficients, suggesting farmers would favor adopting GAHP over other alternatives.

Table 3.5. The Main MXL Model

Attribute	Coefficient	Standard Error
ASC	2.6506 ***	0.9124
Initial cost	−0.0015 **	0.0007
Increased yield	0.1681 ***	0.0446
Output contract	0.9931 ***	0.3608
Price premium	0.0854 ***	0.0208
Standard deviations		
Increased yield	0.0595 **	0.081
Output contract	0.2929 *	0.899
Price premium	0.0612 *	0.3145
Model fit statistics		
Number of respondents	150	
Number of observations	1800	
Log-likelihood	−401.19	
Wald chi2	45.64 ***	
AIC	812.38	
Likelihood ratio test	9.67 ***	

Note: ***, **, * represent significant levels at 1%, 5%, 10%, respectively.
Source: Author's calculation

Table 3.6 presents the estimated results of the MXL model with individual characteristics. The model incorporating individual characteristics shows improved goodness-of-fit with better log-likelihood (−393.095) and AIC values (806.19) compared to the main model without these characteristics (−401.19 and 812.38). The Wald chi-square (47.64) and Likelihood ratio test (10.74), both significant at the 1% level, further confirm the goodness-of-fit of the model with

individual characteristics.

Table 3.6. The MXL Model with Individual Characteristics

Attributes	Coefficient	Standard Error	Pig farmers' WTP (million VND/1000 m²)
Initial cost	−0.0015 **	0.0007	
Increased yield	0.1729 ***	0.0457	115.9
Output contract	1.0215 ***	0.3705	685.3
Price premium	0.0878 ***	0.0213	58.9
ASC	3.5410 ***	1.3133	2360
Characteristics of respondents			
Gender	0.3943 *	0.2323	
Education	0.0139	0.0428	
Age	0.0277 *	0.0147	
Income	0.0004 *	0.0002	
Model fit statistics			
Number of respondents	150		
Number of observations	1800		
Log-likelihood	−393.09		
Wald chi2	47.64 ***		
AIC	806.19		
Likelihood ratio test	10.74 ***		

Note: ***, **, * represent significant levels at 1%, 5%, 10%, respectively.
Source: Author's calculation

Finally, the study used the Latent Class Model (LCM) to assess the heterogeneity of farmers' preferences (Table 3.7). The farmers surveyed were divided into three groups based on their priorities: productivity-concerned (22%), contract-concerned (48%), and price-concerned (30%). The productivity-concerned group valued higher productivity from GAHP adoption but needed additional incentives to participate. The contract-concerned majority preferred guaranteed market access

through output contracts and showed a willingness to adopt GAHP. The price-concerned group was motivated by premium pricing for GAHP-certified products, highlighting the role of economic incentives in adoption decisions.

Table 3.7. The MXL Model with Individual Characteristics

Variables	Class 1 (Productivity Concerned)		Class 2 (Contract Preferred)		Class 3 (Price Concerned)	
	Coefficients	S.E.	Coefficients	S.E.	Coefficients	S.E.
Initial cost	−0.005 *	0.061	−0.003 **	0.017	−0.007 **	0.094
Increased yield	0.468 ***	0.161	0.231	0.181	0.479	0.113
Output contract	2.597	1.131	1.538 ***	0.712	1.414	0.447
Price premium	2.267	1.072	4.213 *	1.365	2.105 ***	0.972
ASC	−4.877 **	1.638	4.125 ***	1.421	5.213	1.672
Class Prob.	0.22		0.48		0.30	

Note: ***, **, * represent significant levels at 1%, 5%, 10%, respectively. S.E. is standard error

Source: Author's calculation

(3) Clarification of GAHP Adoption Decision

According to the survey, pig farmers explained their reasons for adopting GAHP (Figure 3.3). The main motivations included guaranteed output contracts (68%), improved economic efficiency (44%), high and stable output prices (42%), and compatibility with existing farm conditions (30%). Farmers also cited their interests in technological innovation (18%) and access to training support (16%) as additional factors.
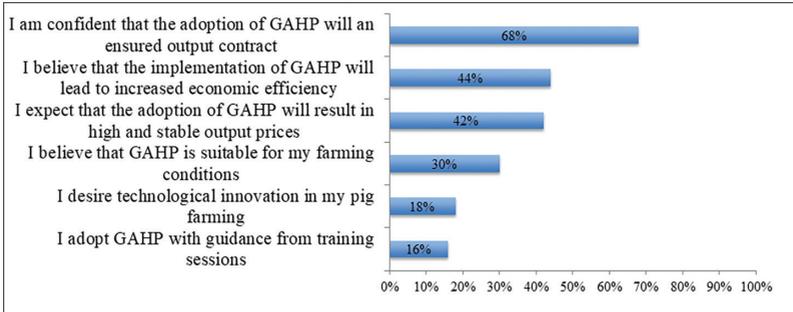
Figure 3.3. Reasons for the Adoption of GAHP

Source: Author's survey

The survey also shows the reasons why pig farmers did not adopt GAHP (Figure 3.4). The main barriers to GAHP adoption were high initial costs (50% of farmers), lack of knowledge about standards (43%), difficulty understanding certification (37%), limited credit access (33%), and skepticism about price premiums (30%).
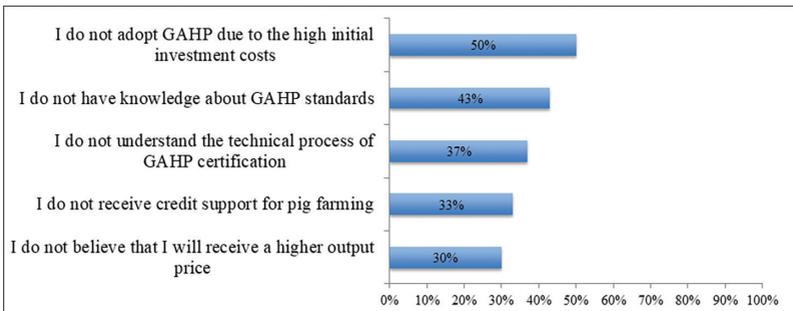

Figure 3.4. Reasons for Non-Adoption of GAHP

Source: Author's survey

4. Conclusion and Policy Implications

The implementation of GAHP in pig farming stands as a fundamental transformation in livestock management, representing a critical advancement toward ensuring comprehensive food safety standards for consumers while simultaneously creating opportunities for farmers to optimize their operational efficiency and economic outcomes. This systematic approach to pig farming integrates modern scientific practices with traditional knowledge to create a more sustainable and profitable farming model.

In-depth research investigations have demonstrated strong support among pig farmers for adopting GAHP protocols, with many expressing enthusiasm and willingness to make necessary investments when certain favorable conditions are met. The study identified three primary motivating factors that significantly influenced farmers' decisions to adopt these practices: the establishment of guaranteed output contracts that provide market security, the potential for achieving higher yields through improved farming methods, and the availability of price premiums that reward quality production and adherence to GAHP standards.

The findings from this research provide valuable insights with significant implications across the pig farming industry.

- Policymakers can implement comprehensive incentive programs and targeted support mechanisms to drive agricultural transformation. This includes offering substantial financial assistance for infrastructure modernization, facilitating access to guaranteed output contracts through strategic partnerships, and developing long-term sustainability frameworks that can effectively encourage more farmers to invest in GAHP,

ultimately enhancing the overall industry's sustainability and resilience.

- Buyers, processors, and retailers have a unique opportunity to leverage the growing willingness of pig farmers to invest in GAHP by establishing robust and well-structured market channels specifically designed for GAHP-certified products. Through the implementation of attractive price premium structures and the development of comprehensive marketing strategies that effectively communicate the superior quality and enhanced safety aspects of GAHP-certified pigs, market actors can stimulate stronger consumer demand and create compelling incentives for farmers to adopt these improved practices.

- The research findings provide valuable guidance for pig farmers in making strategic decisions about their farming operations. They can conduct thorough assessments of various opportunities, including the feasibility of securing and maintaining output contracts, implementing efficiency measures to increase productivity, and strategically positioning themselves to capitalize on emerging market opportunities specifically available for GAHP-certified pigs.

References

Allenby, G. M. and P. E. Rossi. 1998. Marketing Models of Consumer Heterogeneity. *Journal of Econometrics*, 89(1-2), 57–78.

Louviere, J. J., D. A. Hensher and J. D. Swait. 2000. Stated Choice Methods: Analysis and Applications. Cambridge, UK: Cambridge University Press.

Ministry of Agriculture and Rural Development, Livestock Department. 2022. *Pay Attention to Traceability in Pig Production*. Available at: <https://issq.org.vn/397-pay-attention-to-traceability-in-pig-

Ngoc, P. T. A., M. P. Meuwissen, T. C. Le, R. H. Bosma, J. Verreth and A. O. Lansink. 2016. Adoption of Recirculating Aquaculture Systems in Large Pangasius Farms: A Choice Experiment. *Aquaculture*, 460, 90–97.

Nguyen, L. T., T. Nanseki and Y. Chomei. 2021. Farmer Constraints on Implementing Good Animal Husbandry Practices in Vietnam: Case Study on Household Pig Production. *Asia-Pacific Journal of Regional Science*, 5, 933–950.

Vu, T. H., M. D. Nguyen and S. Santi. 2016. Litchi Farmers' Preference for the Adoption of Vietnamese Good Agricultural Practices in Luc Ngan District, Vietnam. *International Society for Southeast Asian Agricultural Science*, 22(1), 64–76.

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