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Quality solutions and food safety for wild pigs (Sus Scrofa) and pork processing in the North of Vietnam (Thai Nguyen) in globalization and experiences from asian countries

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Abstract

In recent years, competing with China and Thailand, Vietnam wild pork meat processing and wild pig feeding have become hot food processing issues. Currently, EU livestock products exported to Vietnam are subject to 10-20% tax rate. However, under the EVFTA agreement, frozen pork will be tax-exempt after seven years, processed foods after seven years, and the tax rate for chicken will gradually decrease to 0% in 10 years. This study will use qualitative analysis, synthesis, and inductive methods, with statistic data, examines experiences from Asian countries such as Thailand and China and meanings to Vietnam case of feeding wild pigs. Among present results is relating to wild pork meat and frozen pork processing in the case study of wild pigs in Northern provinces of Vietnam such as the Thai Nguyen region. And also, it describes the process of processing pork meat with chili sauce and frozen pork meat. Our study will present a feeding mechanism for wild pigs under semi-wild breeding conditions in the Thai Nguyen ecological environment. Asia, including Vietnam, has a good environment for feeding wild pigs and establishing pig farming. Our study has indicated researches and publications are needed for supporting exporting wild pigs and pork.

Keywords: pork meat processing; preservation; frozen pork; farming; wild boar.

Practical Application: Prenst work can help for improve safety of production and utilization os pork, specially in Asiatic region. Also will help for pork processing in term of efficacy of production units.

1 Introduction

In Vietnam, the wild pig is found in most of the forest areas of the provinces, especially the northern mountainous areas and along with the Truong Son Mountain range. Taming and raising them to become a pet is completely new in Vietnam. In Thailand and China, wild boars have also been domesticated and crossed with native pigs to become livestock in the breeding system for 12-18 years (Wilson, 2007).

The study to determine the nutritional requirements for meat-type pigs has been carried out regularly and continuously. Although the nutritional requirements for fattening pigs were studied the earliest, and there are quite a few studies on this issue, but because the breed is increasingly improved with a higher lean percentage, the nutritional requirements are also high. Research results often focus on the following content: Research results on reasonable protein and energy levels; Research results on the addition of protein and amino acid ratios from different feed sources for pig breeds as well different for commercial crossbred pigs (Jiang et al., 2011; Schiavon et al., 2018). This is the basis for balancing diets with reasonable protein and energy levels for wild boar and hybrid wild boar (Razmaitė & Švirmickas, 2012). Le Dinh Phung and Ha Thi Nguyet in 2011 studied wild behavior of Thai wild boar with birth weight 0.37 kg/head, weaning weight at 120 days reaching 13.83 kg/head, and the main ratio was banana stem, water spinach, water hyacinth, and 0.3 kg of rice bran is added/time for growing pigs (Pham et al., 2014). Thom & Huy (2021) also studied the biological characteristics of wild boars in Thailand and Vietnam, but the nutritional requirements for this breed have not been studied.

Moreover, When the EU-Vietnam Free Trade Agreement (EVFTA) takes effect, the EU commits to eliminate 85.6% of tariff lines for Vietnamese goods, equivalent to 70.3% of the total export value of Vietnam to the EU.

Currently, only over 42% of Vietnam's export value to the EU enjoys the 0% tax rate under the General Regulation on Preferential Tariffs (GSP).

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Within seven years from the effective date of the EVFTA, the EU commits to eliminate 99.2% of tariff lines, equivalent to 99.7% of Vietnam's total export value to the EU.

1.1 Research questions

Question 1: What are the results of wild pork processing? What are factors affect the quality of wild pork and pigs?

Question 2: What are appropriate crude protein and energy levels for F2 wild pigs? Additional research materials on nutritional feed for pigs.

Question 3: What are experiences from Asian countries?

1.2 Literature review

Thanapongtharm et al. (2016) stated that pig production intensified significantly during the last decade, with many economic, epidemiological, and environmental implications in Thailand. Also, detailed geographical analysis of the different production systems will be used to spatially inform planning decisions for pig farming, accounting for the specific health, environmental and economic implications of the different pig production systems.

Besides, Poligne et al. (2001) mentioned Boucane´ is a traditional meat product from Re´union that is obtained by salting, drying, and hot smoking pork belly. One-step unit operations give rise to a stable product with remarkable color and flavor qualities. Smoking the product directly over embers, however, leads to benzopyrene contamination. Mass transfers (salt gain, water loss) stabilize the end product, which has a 28.5% water content and 5.6% salt content. Lipid oxidation and Maillard reactions are the main mechanisms involved in the boucane´ production process.

Thom & Huy (2021), when studying the effect of the same level of protein on the nitrogen digestion in the small intestine of pigs, it was found that, in the diet, there are different types of feeds. In different diets, the content of nitrogen forms in the intestinal chyme is different. This directly affects the ability to absorb and use nitrogen in the digestive tract. Therefore, it requires the study of different protein levels on the basis of stabilizing the content of some essential amino acids as well as the change in the ratio and content of amino acids on the same protein level were established on the same type of diet to eliminate errors caused by differences in diets.

According to Nga et al. (2014): Wild boar, the whole body is covered with short hairs, similar to bamboo roots, usually dark brown in color. The head and body length of an adult pig is about 90 - 180 cm, and the tail length is about 30 cm; the height of the shoulder is about 55 - 110 cm. Herds of wild boar can travel together on long journeys to new settlements but do not migrate. Wild boars are more active at night, at dusk, and at dawn. When the pigs mature, they will leave the herd and live independently around 50-350 kg, with some domesticated pigs up to 450 kg. Males are usually larger than females. Wild pigs have four pairs of fangs and six pairs of breasts.

Then, Keenan (2016) stated Pork ranks first among all meat sources and accounted for approximately 40% of global meat consumption. Significant changes in pork have occurred over relatively few generations. From a nutritional standpoint, pork is an excellent source of B vitamins and minerals that are highly bioavailable. In pigs, dietary fats are incorporated into tissue lipids largely unaltered, and therefore, pork is typically more unsaturated (healthier) than beef and lamb. As a result, feeding strategies to further improve the fatty acid (i.e., CLA and vitamin E) composition of pork have been the focus of considerable research.

While Bui Thi Thom et al. (2021b) mentioned wild pork processing in Vietnam, yield and quality of wild pork mentioned (Thom et al., 2021f). Also Bui Thi Thom, Dinh Tran Ngoc Huy (Thom & Dinh, 2021) specified pork meat criteria export to Europe.

Lander et al. (2020) pointed Pigs have played a central role in the subsistence and culture of China for millennia. The close relationship between pigs and people began when humans gradually domesticated wild pigs over 8,000 years ago. While pigs initially foraged around settlements, population growth led people to pen their pigs, which made them household trash processors and fertilizer producers.

Thom et al. (2021c) emphasizes sustainable value chain in wild pig development in the North of the nation, as well as the participation of people (Thom et al., 2021a). And Lan et al. (2021b) mentioned feeding mechanism of pigs during EVFTA and also, competition to China and Thailand (Lan et al., 2021a).

However, there are also Malaysian wild boars in the South, which Mr. Chau Xuan Vu (Phu Quoi commune, Long Ho, Vinh Long) imported dozens of pigs from Malaysia in 2006.

2 Methodology

A wide range of statistics and data was used to make analyses and propose solutions. Experiences in Vietnam food processing were also mentioned. Besides, the Authors mainly use quantitative and qualitative methods, including synthesis, inductive and explanatory methods.

3 Main Result

3.1 Overview

Table 1

3.2 Food issues for feeding wild pigs

The feeding process of wild pigs is as follows (Olesen et al., 2018; Sevilla et al., 2020):

The process of raising commercial wild boar at wild pig farm:

After three months of age from the date of birth, Wild boars must be moved from the concentrated farming area to the wild farming area. The wild farming area must be large, the water source must be clean, and the disinfection system must be good.

Table 1. Classification of wild pigs breeds in the world (World Bank, 2007).

Order	Pig Breed name	Distribution place
1	*Sus scrofa* Affimis	India, Sri Lanka
2	*Sus scrofa* Anolamanensis	Tunisia, Algeria, Maroc
3	*Sus scrofa* Andamanensis	Andaman Island - India
4	*Sus scrofa* Attila	Hungary; Iran-Ukraine; Russia; central Belarus
5	*Sus scrofa* Baeticus	Balear; southern Spain; Northern Morocco
6	*Sus scrofa* Barbarus	North Africa, Tunisia, Algeria, Morocco
7	*Sus scrofa* Castilianus	Northern Spain
8	*Sus scrofa* Chirodontus	China
9	*Sus scrofa* Coreanus	North Korea
10	*Sus scerofa* Cristatus	Southern Himalayas, Nepal, India, Thailand, Romania
11	*Sus scrofa* Davidi	Southern Himalayas, Iran, Pakistan, Romania, Northwest India
12	*Sus scrofa* Falzfeini	Poland
13	*Sus scrofa* Ferus	Northern Europe
14	*Sus scrofa* Floresianus	Flores Island - Indonesia
15	*Sus scrofa* Jubatus	Malaysia
16	*Sus scrofa* Leucomystax	China
17	*Sus scrofa* Libycus	Turkey; Palestine; Yogoslavia; Uzebekistan; Kazakstan
18	*Sus scrofa* Majoli	Central Italy
19	*Sus scrofa* Mandehuricus	China
20	*Sus scrofa* Mediterrancus	Spain
21	*Sus scrofa* Meridionalis	Audalousie; Sardaigue; Cose
22	*Sus scrofa* Moupinensis	South China Coast and South Vietnam
23	*Sus scrofa* Nicobaricus	Nicobar Island - India
24	*Sus scrofa* Nigripes	Central Asia; coastal Caspian; Afghanistan; Mongolia; China;
25	*Sus scrofa* Papuensis	Guinea
26	*Sus scrofa* Raddeanus	Mongolia
27	*Sus scrofa* Reiseki	Yogoslavie; Albania; Grice; Hungary
28	*Sus scrofa* Riukinanus	Rycon Island - Japan
29	*Sus scrofa* Sardous	Cadague; Corse
30	*Sus scrofa* Serofa	Spanish island; Northern Italy; Virtue; France; Benelux; Denmark; Poland, Czech Republic; Slovakia; Albania
31	*Sus scrofa* Sennaarensis	Sudan
32	*Sus scrofa* Sibiricus	Munkinok; Sayan; Môngcổ; Siberia; Transbaikalia
33	*Sus scrofa* Sukvianus	China
34	*Sus scrofa* Taivanus	Taiwan
35	*Sus scrofa* Ussusicus	Russia; Corsica; China
36	*Sus scrofa* Vittatus	Indonesia; Malaysia; Bali; Po Cang Island

- From the day the wild boar is born until the date of sale, absolutely do not use industrial feeds, stimulants, high doses of antibiotics.

- The main food is green vegetables, accounting for 70%, starchy foods such as corn bran, wheat bran, and earthworm powder.

Note: To ensure a clean, firm, and delicious wild boar meat in the process of raising the farm, feed more worms, herbs and use herbal medicine to cure diseases.

3.3 Factors that affect the quality of wild pork and pigs

Protein digestion and influencing factors (Ramkisson et al., 2020; Rangel et al., 2016):

First, the protein will be broken down by the protease enzyme system in the stomach and small intestine of the pig into amino acids. Next, these amino acids will be absorbed by the blood to the liver and body organs to participate in the synthesis of proteins with specific characteristics of the organs, especially the synthesis of muscle proteins and the formation of proteins into lean meat products of growing pigs (Yang & Liao, 2019). The closer the dietary amino acid supply is to the pig's requirements, and the less nitrogen is excreted in the feces and urine, and the higher the protein utilization efficiency (Wang & Fuller, 1989). However, in order to improve the digestibility and utilization of protein and amino acids in the diet, it is necessary to have a clear understanding of the factors affecting protein and amino acid digestion in pigs.

3.4 Effects of breed and genetics

The ability to digest and utilize feed in general and protein depends on the genetic nature of the species, breed, and individual (Wu & Bazer, 2019). In fat-oriented pigs, the digestibility and utilization of protein are lower than in lean pigs (Geels, 2009; Noblet & Perez, 1993). This is reflected in the ability to secrete protein-digesting enzymes in pancreatic juice, intestinal juice, and in fact, the formation of a metabolic, genetic pattern suitable for the nature of the food and the feeding regime (Noblet & Perez, 1993). In the foreign pig breeds selected for lean specialization, a metabolic pattern adapted to a high percentage of protein in the diet has been formed to have raw materials for cumulative protein synthesis to increase lean body weight (Gan et al., 2019). In terms of biochemical nature, it is the ability to enhance the secretion and activity of proteolytic enzymes in the pancreatic juice to be able to break down the high levels of enhanced protein in the feed for the needs of weight gain. According to Corring & Saucier (1972) experimented with feeding pigs with different protein levels, it was found that the secretion and the activity of the kimosine enzyme increased markedly.

Since then, the authors believe that there is an adaptation of enzymes in pancreatic juice to the change of nutrition in general and protein regime in particular. Markov et al. (2018) suggested that kimosine yeast responds to all changes in the protein composition of the feed to adapt to the increase in protein levels. Diet, the higher the protein content of the diet, the stronger the enzyme activity. Thereby, we can comment that the genetic selection process for pigs' lean body weight gain is associated with the change in yeast activity under compatible conditions to accommodate the increase in the fat content amount of protein in the diet.

Effects of feed processing and feeding techniques: In pigs, feed properties and nutritional composition affect digestive secretions, enzyme activity, digestive performance, and absorption

of protein and amino acids in the diet. Feeding conditions affect the number of digestive juices secreted and change the activity of digestive enzymes markedly. Keim et al. (1991), when studying the digestive enzyme secretion of pancreatic juice, it was found that protease activity depends on the intensity of secretion of pancreas and dietary composition. With diets that are well balanced in nutritional composition relative to the body weight and age of the pig, there is little variation in trypsin intake. According to the authors: Rivest et al. (2000), when studying the effect of the same level of protein on the nitrogen digestion in the small intestine of pigs, it was found that, in the diet, there are different types of feeds. In different diets, the content of nitrogen forms in the intestinal chyme is different. This directly affects the ability to absorb and use nitrogen in the digestive tract.

Effect of nutritional composition in the diet: Dietary composition from a modern point of view is the general balance in terms of quantity and quality of nutrients such as protein, amino acids, minerals, vitamins, starch flour, fat with an appropriate ratio to ensure high digestibility and feed efficiency, in which the appropriate protein ratio will contribute to feed costs, reduce costs and improve productivity. People are most often interested in the protein/Exchange energy (energy) relationship, amino acids/energy, and maximum fiber content in the balanced relationship between nutritional components. The nutritional balance in the diet was developed for pig subjects and incorporated into the eating standard.

3.5 Consumption of protein/kg increased weight of experimental pigs

Protein is an important nutritional component for the growth and development of piglets. Normally, food sources to supplement protein are usually of animal origin, such as milk powder, fish meal, but for economic reasons, most of them are derived from plants such as soybean meal and from grains (maize, rice, etc.). Protein consumption has a great influence on the economic efficiency of the diet. The results of monitoring protein consumption/kg weight gain of experimental pigs are presented in Table 2.

The results of Table 2 show that when increasing the level of protein in the diet has a good effect on the growth of pigs, pigs grow faster and consume less feed/kg weight gain. Specifically, when feeding F2 hybrid wild boar a diet with a protein level of 16% - 14%, the protein consumption/kg weight gain of 922.5 g protein decreased by 8.71% compared to the experimental batch. have a protein level of 17% - 15% (1010.5 g protein/kg weight gain); Protein consumption/kg weight gain in experimental group 3 (15-13% crude protein in the diet) was reduced by 10.33% compared to the experimental one diet (17-15% protein in the diet).

However, the actual monitoring shows that when reducing the percentage of protein in the diet to 15-13% (growth and fattening phase), experimental pigs 3 tend to have unsmooth hair and some skin diseases. The experimental pigs appeared to have diarrhea in the experimental batch with a protein ratio of 17-15%. When pigs get sick, the cost of veterinary drugs and labor increases. This is something to consider when balancing the protein ratio in the diet for F2 wild boars. The results in Table 3.6 show that protein expenditure/kg weight gain is also expressed (Figure 1).

In a diet with a high percentage of protein, the price will usually be higher. Therefore, for effective farmers, the balance of nutrition in the diet must reduce product costs; taking advantage of local raw materials to reduce costs is a concern today. To calculate the efficiency of F2 wild boar production, we calculated the cost/kg gain in weight, and the results are presented in Table 3.

3.6 Feed cost/kg weight gain of experimental pigs

Calculating production costs is an important criterion for formulating diets to reduce investment costs and increase economic efficiency in livestock production.

Table 2. Protein consumption/kg weight gain of experimental pigs (g).

Order	Content	Lot TN1	Lot TN2	Lot TN3
1	Total pigs volum increase (kg)	540,64	540,11	532,38
2	Food consumption / kg increase	6,47	6,31	6,62
3	Protein consumed(g)	546 300	498 240	482 400
4	Tiêu tốn Pr / kg tăng KL	1010,5	922,5	906,1
6	*Comparison (%)*	*100*	*91,29*	*89,67*

Table 3. Feed cost/kg weight gain of experimental pigs (VND).

Order	Description	Lot TN1	Lot TN2	Lot TN3
1.	Total pigs volume increased (kg)	540,64	540,11	532,38
2.	Cost of food core	32.149.620	30.368.976	32.257.464
3.	Cost of green food	3.969.000	3.903.000	4.029.000
4.	Total food cost (VND)	36.118.620	34.271.976	36.286.464
5.	Food cost/kg increase	66.807,15	63.453,70	68.158,95
6.	*Comparison (%)*	*100*	*94,98*	*102,02*

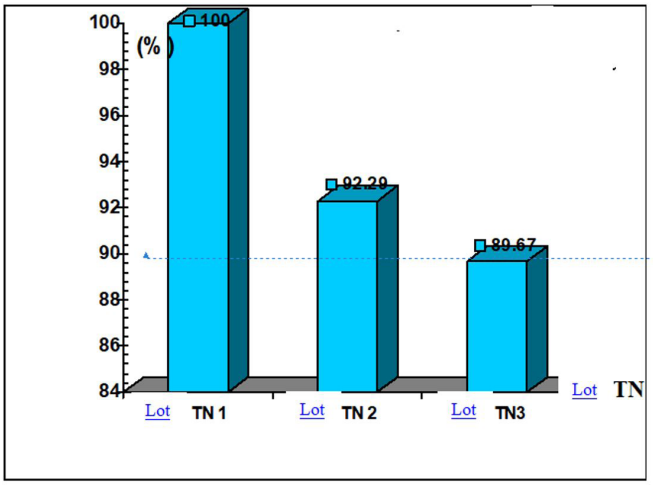

Figure 1. Protein consumption/kg in boar.

Feed cost/kg weight gain is a general economic indicator, evaluating economic efficiency in livestock production. Feed cost depends on many factors such as survival rate, growth ability, feed conversion capacity, feed conversion capacity, and feed cost.

The experiment also calculated the cost of feed (Table 3) to evaluate the efficiency of hybrid wild boar raising for meat.

From Table 3, we see, the cost for 1 kg of weight gain in experimental lot 2 is the lowest, 63453.70 VND, which is reduced by 3 353.5 VND/kg, equivalent to 5.02% compared to batch TN1 (66,807,15 VND). Meanwhile, plot TN3 only decreased by 2.57% compared to plot TN1. When reducing the 15 - 13% crude protein level, the cost increased by 2.02% (1,351.8 VND/kg) compared to the TN1 batch. This shows that the economic significance of choosing the appropriate level of protein in the diet will bring about economic efficiency.

The results of our study are relatively consistent with many other studies, which is mainly due to the high price of synthetic amino acids. However, these works have also suggested that the increased costs of using diets with a balance of amino acids with synthetic amino acids are offset by a reduction in environmental pollution.

3.7 A wild pork protection method

- Whether storing raw meat in the refrigerator or freezer in the refrigerator, it is necessary to wrap the meat carefully to maintain its freshness and protect the meat from infection with pathogenic bacteria.

Note: If you put meat in the freezer, cover the meat in several layers to prevent it from freezing too much, losing water, and changing color and flavor. When wrapping meat, pay attention to wrap it tightly to prevent air from entering so that the meat does not have many layers of ice clinging to it.

When storing meat in the refrigerator, it is necessary to keep the temperature in the refrigerator about 2 degrees Celsius; for the freezer compartment, the temperature should be approximately -25 degrees Celsius. For cooked meat (such as roast pork, boiled pork, smoked pork), if you want to store it, you should put it in small containers and close the lid.

- Do not place containers of cooked meat close to raw meat to prevent bacterial contamination. Freeze cooked cuts of meat if you want to keep them longer.

3.8 Steps making Stir-fried wild pork meat with chili sauce

Bought wild boar, shaved, washed, cut into thin but large pieces. Thinly sliced lemongrass; minced garlic onion. Marinate the meat with 2/3 of the lemongrass, garlic, and onion, three tablespoons oyster sauce, two tablespoons seasoning, mix well and marinate for 15 minutes.

Put the pan on the stove, add a little oyster sauce, lemongrass, and the remaining garlic and sauté until fragrant. Add the marinated wild boar and sauté over high heat until the meat is cooked and slightly browned. Add one teaspoon of fried satay.

The meat is almost golden; add the sweet peppers and stir-fry until the chili is cooked, then add the chopped scallions and stir quickly.

3.9 Experiences from Asian countries such as Thailand, China, etc.

In China: Wang et al. (2019) investigated the effect of market power on the food safety of the pork industry in China. Probit models with a two-step Heckman selection procedure are applied to identify the determinants of the likelihood and degree of food safety violations. Market power is found to reduce the likelihood of violation but not the degree of violation. Other factors such as traceability systems, adoption of risk control systems and industry standards, and the scale and scope of operations also impact food safety violations. Findings suggest that market power in China's pork industry provides incentives for firms to mitigate risk and improve food safety. However, firms may continue to have challenges in meeting food safety obligations when moving toward mega-size and product diversification. While Schneider & Sharma (2014) pointed that Processed and packaged meats are the fastest growing market segments, reflecting the increasing influence and operation of pork processors and the more general trend towards processed foods that can be shipped, stored, and sold with a longer shelf-life in super- and hypermarkets. Agribusiness firms control much of the production and sale of meat (and agricultural products more generally), often through production arrangements with commercial farmers and with financial support from the public and private investment. Smallholder farmers either opt-out of pig production in the context of increasing consolidation of the industry, become specialized hog producers or are transformed into waged, typically migrant, laborers; and consumers eat more pork than ever before, with wealthier eaters preferring industrially produced meat, which is viewed as more strictly regulated and safer.

In Thailand: Charoensook et al. (2013) analyzed context n of livestock production in Thailand, genetic diversity and evaluation, as well as management strategies for animal genetic resources focusing on pigs and cattle. Sustainable conservation of

Table 4. Results of evaluation of experimental pork quality.

Order	Content	Lot TN1	Lot TN2	Lot TN3
		$\bar{X} \pm m_{\bar{X}}$	$\bar{X} \pm m_{\bar{X}}$	$\bar{X} \pm m_{\bar{X}}$
1.	Meat color after surgery (Minolta L*) (brightnes)	48,02 ±1,11	47,95 ± 1,54	47,83 ± 1,36
2.	Meat toughness (kg/ cm^2)	4,85 ± 1,23	4,89 ± 1,56	4,95 ± 1,25
3.	pH of tenderloin right after surgery	6,8 ± 0,32	7,0 ± 0,12	7,1 ± 0,15
4.	tenderloin pH after 45 minutes	5,5 ± 0,21	5,3 ± 0,24	5,2 ± 0,26
5.	Cholesterol (mmol/L) blood	1,65 ± 1,23	2,15 ± 0,91	3,11 ± 1,89
6.	Triglycerid (mmol/L) blood	2,3 ± 1,34	2,8 ± 0,98	2,6 ± 1,12

indigenous livestock as a genetic resource and vital components within the agricultural biodiversity domain is a great challenge as well as an asset for the future development of livestock production in Thailand.

The growth rate (for wild boars that have been raised in Thailand and Vietnam) is slow (average is only about 0.15 - 0.3 kg/day). The physiological life span of wild boar lasts from 15 to 25 years.

4 Discussion

4.1 The Results of evaluating the quality of experimental pork

In addition, the experiment also assessed meat quality through a number of criteria presented in Table 4.

Table 4 shows: The color of tenderloin of wild boar in the experiment fluctuated the average value of color index Minilta L* (brightness) from 47.83; 47.95; 48.02 and has a bright red color. The results were similar between the experimental batches, but the batch with a high protein percentage tended to have a higher color value, but the difference was not significant. Research by Nguyen Thi et al. (2012) L* values are 43.08 – 46.88. Research by author Townsend (2017) for European wild boar forest has a L* value of 37.72 lower than our results. Meanwhile, according to Warriss & Brown (1995), Minolta L* value indicates the ability to accept the light color of meat and is usually in the range of 49-60.

The tenderness of pork loin tested between batches was similar 4.85 - 4.88 - 4.95 kg/cm2. Townsend (2017) showed that loin strength increased gradually as the crossbreeding rate with wild boar increased, in which pure Yorkshire pigs had a toughness of 4.51 kg/cm2, F1 hybrid pigs (wild boar x Landrace) 4.37 kg/cm2, and wild boar 6.49 kg/cm2. The muscle toughness of lợn wild boar in the study of Żochowska et al. (2005) is 5.2 kg/cm2, and Andersson-Eklund et al. (1998) is 4.8 kg/cm2.

4.2 Process to produce frozen wild pork as follows

When pigs are qualified for export, kg for meat. Before slaughter, pork is monitored with a strict process; from outside the barn, it is brought into a cool room, drinking RO water, listening to music, taking a cool bath to reach the best state for at least 10-12 hours.

The entire pre-processing process, such as fainting, removing secretions (extraction), shaving, nail removal, heart clearing, thin doors... are completely isolated from the ground and handled within 5 minutes.

After slaughter, pigs are brought into a cooling room with a temperature of -25 degrees Celsius for few minutes to lower the body temperature of the pigs.

After that, the pork is put into cool meat storage with a temperature of 0 degrees C to 4 degrees C for a period of 16 -24 hours to ensure the biochemical ripening process; at this time, the pork becomes cool pork.

Cool meat is brought out to be broken, preliminarily processed in the condition that the room temperature must be cooled, the body temperature should not exceed 7 degrees Celsius. After breaking into individual pieces, the meat is put into a deeper freezing room with an average temperature of -45 degrees Celsius for about 6-8 hours. Depending on the part of the pig, the freezing time is different. Finally, the meat is put into a storage room at -22 degrees Celsius.

5 Conclusion

Thom et al. (2021d) mentioned Habitat Based Feeding Practices in Wild pigs (Sus scrofa) in Thai Nguyen region, North of Vietnam.

Asia, including Vietnam, has a good environment for feeding wild pigs and establishing pig farming. Our study has indicated researches and publications are needed for supporting exporting wild pigs and pork. Besides, we also described the process of frozen pork meat and delicious pork processing method with food safety criteria.

5.1 Policy implications

- We would suggest that Ministries and government agencies will consider facilitating export markets for wild pork meat in the northern region of Vietnam, for instance, In Thai Nguyen city. Dinh et al. (2020) mentioned roles of banks in providing financing and also (Dinh et al., 2021).

- Dinh & Dinh (2010) stated governance mechanism need to be enhanced and mentioned also (Dinh, 2015).
- And bank system and agriculture banks can also support lending programs for agriculture and wild pig farming.

- Last but not least, For the experiment with an energy level of 3000-2900 kcal/kg of feed, with the corresponding protein

level of 16-14%, the growth rate increased to 4.31% (0.89 kg/head), and absolute growth increase by 5.59% (5.21 g/head/day); reduced feed consumption in which 4.71% concentrate and 5.97% green feed, and at the same time reduced feed cost by 4.74% compared to the experimental batch with the energy level of 2900-2800 kcal/kg food at the same age.

Evaluation of pork performance in Experiment 2 between the experiments showed no significant difference between the ratio of jaw hook, lean meat, sawing, and there was no statistical significance. It also does not affect the chemical composition of the meat.

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