

GUIDANCE MEMO

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An Analysis of Value-Chains and Market Development to Support the Smaller-Scale Production of Pork by Ethnic Minority Women in the Northern Mountainous Region of Vietnam

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ABSTRACT:

The Northern Mountainous Region (NMR) of Vietnam is one of the poorest regions of the country, and is largely populated by socially- and economically-marginalized ethnic minorities. Women in these communities tend to produce most of the heritage breeds of pork on smaller-scale. The pigs are often raised free-range and are able to root in forests and harvested paddies. Income from this production brings alternative sources of revenue outside of the more dominant cultivation of tea and rice.

This guidance memo first explores how the growing industrial pork production chain greatly affects these producers and their communities. It argues that preserving the smaller-scale producers offers benefits attributed to the maintenance of genetic diversity and indigenous knowledge systems of management, as well as increased standards of animal welfare.

Second, this guidance memo argues that smaller-scale producers need strengthened linkages between them and more urban restaurants and consumers, reduced production costs through the expanded use of available resources (e.g., feed), support capacity building through training on simple forms of e-marketing, and creative new ways to add value to their products and distinguish their production with more urban consumers. In the case of NMR, the collective action of small producers was also found to fill value chain gaps and produce new opportunities for participants.

Finally, this guidance memo concludes with an exploration of how African Swine Fever is devastating pork production of every scale in the north of the country, and how this impacts the sustainable future of smaller-scale pig farming.

1. Introduction

The Northern Mountainous Region (NMR) of Vietnam is an area largely populated by socially- and economically-marginalized ethnic minorities. While Vietnam is one of the most vulnerable countries in the world to climate change, it is in this NMR where this vulnerability is especially pronounced and visible. Many people

here suffer from the direct effects brought by drought, soil erosion, landslides, flooding, and rapidly changing climatic conditions. The impacts of climate variability in this region—as manifested through the longer periods and more frequent occurrences of droughts, flooding, and cold spells—have significantly made the local communities more vulnerable to these natural hazards. The annual

occurrences of typhoons, storms, and landslides during the rainy season and drought during the dry season constantly threaten the NMR. The rural communities here are also prone to multiple interacting socioeconomic stresses, including food insecurity, rising inequality, poor infrastructure, limited access to government services, and environmental degradation. Climate change compounds these existing stresses, thereby increasing the vulnerability of these local communities.

To this, recent and devastating effects of African swine fever (ASF), and the mass culling of pigs across the entire north of the country, has added considerable social, economic, environmental, and even emotional stressors to already fragile and precarious livelihoods. In many communities, pigs were raised by women in smaller-scale production systems, who are now rendered even more vulnerable and further marginalized by the loss of income, social standing, and agency. It is within this highly complex period of transitions (and against the evolving backdrop of rapid changes occurring across the entire Vietnamese economy more generally), that our research team sought to explore, challenge, redefine, refine, and even complicate our understandings of the sustainable production of pork. Drawing on our collective experiences of multiple years working with ethnic minority (EM) communities in sustainable food

production, and amended with new field work in, for example, villages in provinces in both Bac Kan in the northeast and Lao Cai in the northwest, this guidance memo is composed along the following themes:

- a). How are industrial-scale operations affecting smaller-scale producers in negative ways?**
- b). How does the support of smaller-scale farmers contribute to halting the spread of industrially-produced meat?**
- c). How can higher animal welfare practices be promoted?**
- d). How can the maintenance of more economically, socially, environmentally, and ethically sustainable forms of production in marginalized communities be supported?**

It is important to note that our team approached nearly every field site in periods of considerable transition. ASF has devastated communities across the NMR, and left smaller-scale pig farmers sad, scared, and in real positions of social, economic, environmental, and emotional vulnerability. It would not be overly dramatic to say the NMR is in crisis. While not the original intention of the study, our research team was forced to contend with the effects of the disease in how research was conceptualized and operationalized. Due to the importance of ASF in how it conditions every one of the guidance memo themes above, compiled with its

tremendous importance to sustainability among smaller-scale pig producers in low- and middle-income countries across Asia, we have also included the following theme:

e) How is ASF affecting, altering, and even dictating the trajectories of everything positive we have uncovered in the themes above?

Overall, this memo prioritizes the following:

A) Production and Supply

In low- or middle-income countries where industrial food animal production is expanding, what production operations exist that successfully employ sustainable practices and/or have higher animal welfare standards? What factors enable their success, and how can these producers be supported?

B) Key Actors: Small Local Producers and Communities; Women

What are the ways small-scale livestock farmers in the developing world have improved and/or could improve productivity and hence their livelihoods without moving to industrial livestock production? How can one analyze and quantify the productivity enhancement?

Finally, the suggestions of this guidance memo are based on actual examples uncovered during fieldwork. This study sought out and identified situations where alternative pork production

chains were working, and teased out elements in their success. Note that many categories in the following sections overlap.

2. The negative effects of industrial-scale operations on smaller-scale pork farmers

Across the country, rapid urbanization, economic advances, and rising incomes have provided further choices in diet for the average Vietnamese person. As a result, the consumption of protein from animal sources, and in particular from pork, has risen exponentially. Consumers prefer leaner cuts and tend to purchase meat fresh rather than frozen. While smaller-scale farmers once supplied the majority of pork in the country, recent years have seen the rapid rise of larger-scale producers to match this growing demand. Such producers use hybrid breeds in more intense systems, import feed, and often situate their production in rural communities. Industrially-produced pork is raised largely for export and domestic supermarkets.

In the NMR, on the other end of the scale of production, EM women tend to produce most of the local or heritage breeds of pork on smaller-scale. Indeed, pork production at this level offers substantial opportunities for poorer communities to improve income and generate family

employment. The pigs are often raised free-range and many are able to root and rut in forests and harvested paddies. Overall, these smaller-scale systems tend to be low-input, with feed grown or gathered locally, often by the producer. Indigenous knowledge (IK), that is, the systems of understanding that provide many NMR ethnic minority communities with more sustainable ways of reducing risk, are often incorporated in management and decision making. Pigs are considered as a form of capital investment, consumed in the family as food, supply manure for crops, and may be given as gifts during celebrations. Income from this production brings farmers and their families alternative sources of revenue outside of the more dominant cultivation of tea and rice. The meat from pigs raised in this manner is typically sold in local fresh markets.

Indeed, from one perspective these contrasting production types do not appear to be in competition. However, *this study determined that the industrial pork production chain greatly affected smaller-scale producers in unimagined ways.* First, the availability of access to export markets tends to be fickle and dependent on more overarching and geographically distant political agendas. When foreign markets no longer demanded this pork (as was the case with export to China in 2017), producers then try to recuperate their investments by flooding local Vietnamese markets with their unsold product. In turn, this greatly reduces

the price of pork across distribution outlets regardless of production method or pork breed. Local women invested in smaller-scale production targeting fresh markets were found to be unable to compete on price and commonly lost their investments. During interviews, these women expressed a desire to consistently maintain or even slightly increase their production to improve the income of their families, but feared these turbulent price fluctuations.

This study also found a number of previous small-holder farmers who were converting or had converted to larger-scale pig farming, and a more general rise of industrial or corporate pork production in rural and peri-urban communities. Overall, these transitions tend to take local ethnic minority farmers and bring them into situations where they become heavily dependent on external inputs (e.g., piglets, feed, and medicine). This positions them (and the communities they support) unfavorably and considerably more vulnerable to changes in the market, the price of inputs, and changes in climate.

Furthermore, *the rise of pork produced in a more industrial fashion at the village or household level has resulted in an erosion of IK.* To this, as operations in scale increase, animal welfare practices tend to decline. The value of an individual pig to a family (and hence its corresponding treatment, living conditions, and level of care) is higher than that at larger operations whose

practices are based more on calculated and demanding profit margins.

While the manure from pig production on most scales in the NMR is used for crop and fish production (and lesser so biogas), the rise in industrial pork is placing strains on rural environments. Larger-scale producers, and the attributed larger quantities of waste they are producing, were found to be increasing risk human and animal health. Respondents in communities near such operations also expressed genuine welfare concerns.

Simultaneously, a quickly rising trend is that urban Vietnamese consumers are shopping more at supermarkets rather than in fresh markets. Pork and products processed from pork in these supermarkets are supplied exclusively by the larger-scale producers. An additional influence of the rise of larger-scale production is the development of more complex value chains that demand greater and more regular quantities of pork that additionally can be certified to industrial food safety schemes. This rise in larger supermarkets in more urban settings also has the potential to threaten the popularity of local fresh markets, a key POS location for smaller-scale producers. Furthermore, smaller-scale producers, with a lack of supply and inability to pay for certifications, are unable to participate in these new value chains. This puts the women involved in the smaller-scale production of pork in increasingly

vulnerable positions. As explained in Section 5 however, it is just this niche that may offer considerable opportunities for smaller-scale producers.

With the rise in industrial-scale pork production, many local and heritage breeds of pork are in decline. There is pressure from extension to adapt the hybrid breeds. This reduces the food security status of smaller-scale farmers, and possibly also forces them into capital intensive off-farm markets for imported feed and veterinary medical supplies. To this, it also results in a deterioration in IK. The decline of local and heritage breeds is something of considerable concern after the culling of animals due to ASF (See Section 6). Finally, and as will be treated in considerably more detail in Section 5, the smaller-scale production of hybrid breeds homogenizes the larger- and smaller-scale value chains, situating smaller-scale producers in more direct competition with those larger. Preserving the smaller-scale producers not only offers benefits attributed to the maintenance of genetic diversity and IK systems of management, and increased standards of animal welfare, but also offers the potential for producers to create unique opportunities to distinguish their production with more urban consumers.

Overall however, this combination trends have resulted in a further reduction of self-sufficiency,

environmental quality, and sustainability in ethnic minority villages. As will be discussed in Section 6, ASF is also more likely to originate in larger-scale production operations with considerable and devastating repercussions to neighboring smaller-scale producers.

3. Supporting smaller-scale producers to halt the spread of industrially-produced meat

Overall, the suggestions of this guidance memo are based on actual examples uncovered during fieldwork. This study sought to identify examples where alternative pork production chains were working, and then tease out elements in their success. Two case studies were used to help provide these examples, the first being a start-up women's cooperative in Bao Nhai commune in Lao Cai province.

Perhaps of no surprise, many successful smaller-scale pig farmers operating in alternative value chains typically received some level of training by NGOs (often funded or operationalized by international organizations). *One interesting finding is that **training in pig breeding** was noted by women smaller-scale farmers as being of vital importance to the economic sustainability of their operations.* Raising one's own sows reduced the input costs of purchasing piglets, which permitted

some level of expansion and/or capital accumulation. Women were also able to provide sows and piglets to other local smaller-scale producers, further contributing to the diversity of their operations, their income sources, and even the more general sustainability of their community.

*One of the most significant findings contributing to the success of smaller-scale pork producers was the management of a **linked side business** in the production of alcohol produced from grains.* Many female pork producers earned as much as one-fifth of their income in the sales of alcohol. Rice grown by the family in local paddies was fermented, and the dregs of that fermentation was then used to supplement feed for pigs (and hence save additional money). Importantly, whereas the market value for rice alone is low at only \$0.40/kg, when made into alcohol however, 15 kg of rice produces 17 liters of wine which is valued at \$0.60/liter. The combined production system then contributes to stronger earning potential.

It was mentioned previously that in 2017, the market for pork was undercut by larger-scale domestic producers flooding local markets with their unsold products. One woman in Bao Nhai commune used this opportunity to acquire the supply of inputs needed to begin sausage production (and beneficially also economically support other smaller-scale producers in her community). Meat was purchased from producers by

a village cooperative group of women who value added their pork by producing sausages and then linking their production with sales via contracts in the local school systems.

The 60 members each keep 3-5 pigs at home (with many also producing alcohol). The cooperative supported its female members through the sharing of information on breeding, market opportunities, and providing outlets for pork sales. Respondents mentioned that by participating in this cooperative, they felt more confident, better able to make decisions, and proud to earn additional income to support the health and welfare of their families. The cooperative also organizes group learning activities, provides credit and lending services, and members contribute to a collective fund to create opportunities for poorer women in their community to begin pork production. Such collective action has also allowed for the construction of more hygienic facilities and a better awareness of breeding and disease prevention techniques. Members are thinking of the future, with many expressing an interest in passing on their operations to their children.

Such collaboration provides agency to these smaller-scale producers, and expands options for economic and socially sustainable smaller-scale pork production. Community members and local institutions who support their sausage production are happy with the relationships they are forging, and how

it strengthens their communities, which means they are less likely to seek pork from larger-scale producers. The pigs raised under these conditions also live a better life more suited to their natural habits and behaviors, and the children at local schools enjoy higher quality and more nutritious locally-produced meats. Importantly, the cooperative has not overextended. That is, its operations have been further enhanced with a sustained and target market, of a scale and scope that these small-producers can continue to reliably supply.

Mrs. Phuong is a smaller-scale producer and founding member in this collective. She cultivates 5 acres of rice, of which 2 are for family consumption, and 3 provide the raw materials necessary to make rice alcohol. She keeps 2-3 pigs at a time. See Figures 1-4.

There is, however, a late and tragic caveat to this story. Mirroring conditions across the NMR, the commune is currently in the middle of an ongoing ASF outbreak.

Respondents are very worried that they will lose all of their investments. Some have spoken of trying to raise chickens to replace pork for sausages, but found the process more complicated as chickens have more bones that are difficult to filter. Considerably more detail will be provided on ASF in Section 6.

4. Promoting higher animal welfare practices

This section draws heavily from a case study conducted in Lung Khau Nhin commune, Muong Khuong district in Lao Cai province. Muong Khuong has reputation for producing high quality local pork and a breed by the same name, “Mường Khương”, is one of the most famous in Vietnam. Lung Khau Nhin is a very difficult to reach upland commune of Muong Khuong district, over 12 kilometers from the district center. Its population of around 3,000 people includes 7 ethnic minority groups (i.e., mostly Nung and Hmong) who live in 12 villages. These communities are largely dependent on the food they produce, and percentage of people living below the poverty rate approaches 80%. The commune grows 400 ha of maize and 100 ha of rice. Difficult and rocky terrain and regular problems with drought and cold result in the near impossibility of raising most larger breeds of livestock. As such, local and heritage black pigs provide the main source of animal protein.

In 2011, an international NGO began a project in the commune to improve the lives of ethnic minority women by finding ways to connect them to larger markets. 150 local pigs were given to farmers, of which 129 pigs were sows. Local participants

consider the project a success. Farmers were able to learn new skills, attend training courses on topics such as household economics and business skills for women. Women learned how to breed sows and raise indigenous breeds of pork for local fresh markets. According to the chairperson of the local women’s union, this has allowed many women to lift their families out of poverty and accumulate some wealth.

Mrs. Leng Thi Hai, for example, is a 41-year-old ethnic minority woman. She is also illiterate. In 2013, she joined the project and was provided with 1 sow and 1 boar, from which she began producing 8-10 piglets twice a year. She finds working with heritage breeds easy, due to the lower investments required and the breeds being more tolerant to local environmental conditions such as cold.

As with the example in Section 3, Mrs. Hai supplements her income with the production of alcohol, in her case from corn. She buys some corn from nearby farmers, with some going to feed the pigs and the rest to ferment for alcohol. Approximately one-seventh of her income is derived from selling alcohol, with the remainder largely from selling pork (or live sows and piglets to other women). She is extremely happy with her progress, as her first daughter is attending a university in Hanoi, and second and third daughters are enrolled in local high schools. The majority of this, she

adds proudly, is funded by her production of pork. She has also been able to add technology to her operations, such as a new thresher.

As with many in her community, Mrs. Hai does not want to raise hybrid pigs. Part of this relates to production practices, and part of this relates to the preferred flavor profiles and marbling content of the meat. Mrs. Hai treats the specific illnesses of her pigs with medicines and herbal treatments she can forage from nearby forests (i.e., IK). In winter, she warms the food she provides her pigs to insure they remain comfortable and healthy. Although she believes that local pigs are more cold hardy than imported ones, she also feels they thrive better under more optimal and personal care. Her pigs are also fed with corn she grows herself. Previously this corn was sold at low prices in the market, but now she has added considerable value. In effect, she does not need to buy expensive feed, pay for medicine, or even purchase her own piglets. Corn not used as pork feed is turned into alcohol, further adding to her income. Of course, the manure from the 8-9 pigs she regularly keeps is returned to fertilize her corn fields. See Figures 5-9.

Other women in the village shared similar positive experiences with their local and smaller-scale production of pork. Most appreciated the reduction in overhead that resulted from feeding local pigs the locally grown corn or the dregs from alcohol production. *It should be pointed out that*

*our research team does fear **potential negative social and mental health implications** on the community from the rise in locally available **alcohol**, and feels research into other value-added products with similar attributed economic benefits (e.g., tofu) is necessary.*

Overall, women feel empowered in that they are saving money to build new houses and they have the power to invest in the future and the education of their children. Stated otherwise, when attention was paid to these rural women, and routes for economic independence provided, their motivation and self-confidence were increased. This contributed positive synergies directly to and increased the welfare of their communities, their families, and themselves. In turn, production in this way also promotes higher standards of animal welfare.

5. Supporting more sustainable forms of production in marginalized communities

If we temporarily ignore the recent devastation of ASF, smaller-scale pork production is economically, socially, and environmentally viable. *Pork produced from local pigs have a developing niche market. This is particularly the case among urban consumers, who are willing to **pay more** for these breeds than those pigs produced industrially.* Indeed, in the case of the NMR, local pigs provide the

preferred flavor profiles of pork across socio-economic groups. It is also however restrained by the limited quantities available (something now exasperated by the massive culling of all pigs brought by ASF).

One major area in need of strengthening is the linkages between smaller-scale producers and more urban restaurants and consumers. This study did find a number of value chains in operation useful in identifying specific places of potential support. In recent years, some restaurants in provincial towns (and larger urban centers) have begun to source directly from EM smaller-scale producers. Often these are specific restaurants that focus their branding on nostalgic or romantic notions of rural Vietnam (real or imagined). *Links between producers and these end markets were found to be strengthened by familial bonds, and/or based on ethnic ties, and/or simply the innovative work of a smaller cooperative on the village level looking to improve the lives of its members.* Women's organizations and politically-based cooperatives were found as examples in the case of the NMR.

Overall, these restaurants tend to specialize in "local pork" and offer specific and novel types of cuisine (e.g., pork steamed on stones in a clay pot). Such focus on the producers and their products offer opportunities for them to take pride in production. If smaller-scale producers were to switch to hybrid breeds of pork, as suggested by

many agricultural extension agents, they would lose the potential to tap into these burgeoning markets. Although logistically it is not an option for every smaller-scale producer to benefit from these alternative value chains, cooperatives do provide and could provide considerably more opportunities for collection, butchering, marketing, and distribution of local pork. This would help to overcome the difficulties of geography and poor infrastructure in the NMR.

Smaller-scale producers of local pork, especially on the village and commune levels, need additional training in how to best market their products. Support and capacity building programs (from government, NGOs, and universities) and improved access to information may help elevate market access gaps and diversify access to multiple marketable channels. Despite poor infrastructure in the region, nearly every rural resident has access to a cell phone. As such, *simple and free solutions include **teaching smaller-scale producers how to use Facebook to attract customers.*** In the case of Vietnam, many universities allocate small research funds for professors to use in outreach projects designed to alleviate poverty and better their communities. Training smaller-scale producers in these basic technologies would surely be applicable.

Furthermore, local extension needs to be trained to appreciate the social, economic, and environmental

benefits of raising heritage pork. Rather than simply being discounted, long-standing IK systems should be better incorporated into breed selection, production methods, and outreach training events. In the case of the NMR, train-the-trainer events are also necessary to educate extension personnel on the demands of the different systems of production, and ways of supporting the marketing requirements of smaller-scale producers.

This study has shown that considerably more research is needed in optimizing output and prices from processing. Creating specialty and highly value-added products based on local pork, including by smoking or drying of meats, remains in its infancy. Such methods would also permit the option of preserving meat during periods of extreme price fluctuation. Highly value-added end products and specialized menu items (e.g., pork steamed in clay pots) remain rare. Stated otherwise, *more work is required to further establish local pork as a **niche and value-added market***. Local production needs to be higher “valued” in the marketplace, command a higher price, and provide a level of competitive advantage to smaller- over larger-scale producers.

This study has also shown that production costs can be considerably reduced when locally grown rice, corn, cassava, foraging, and allowing pigs to free-range harvested cropland is used to supplement purchased feed. The use

of local crops is also considerably more environmentally sustainable and shelters smaller-scale producers from feed price fluctuations and the attributed risk.

That is, *this study suggests that more emphasis needs to be placed on the optimization of **locally sourced or produced input materials** used in pig feed to reduce the cost of production*. In the case of the NMR, what little has been done to this point this has largely been focused on the products unused in the fermentation of rice or corn alcohols.

Overall, small-scale producers are facing a flood of unsustainably produced and imported commercial pig feed. This is a situation becoming direr, as a result of oversupply in the face of culls related to ASF.

At the consumer level, *a better explanation of the rich diversity of local and heritage pork breeds and production styles is needed to further distinguish these products in the marketplace*. Despite a number of heritage breeds, little recognition of this diversity appears at the various POS. Furthermore, there are considerable opportunities to enhance the profile of smaller-scale pork in terms of food safety. The larger value chains developing in support of larger-scale producers are creating their own standards and safety certification schemes.

Tremendous opportunity exists for smaller-scale production standards that certify

not only the safety of the meat, but also center animal welfare and other ecological premises. Such standards would permit smaller-scale producers a window of opportunity to participate and even compete in the modern supermarkets increasingly taking market share with urban consumers across Vietnam.

6. African swine fever and the possible end of smaller-scale pig producers?

ASF is quickly rendering already highly vulnerable people (e.g., EM women) even more vulnerable. The death of sows and pigs results in a substantial loss of both income and food. Producers whose income is entirely derived from the production of pork are most affected. When pigs die or are culled, the family is left with no income, increasing debt, and little money to cover daily expenses. Women with younger children cannot easily seek off farm employment, and those who are over the age of 50 also find it difficult to find alternative jobs.

While government has promised compensation for animals culled, the pigs are undervalued and there are no real promises when or even if the money will arrive. To further confound the situation, this study found that in many cases, when money does arrive, it often complicates already difficult situations. To prevent the reoccurrence

and spread of ASF, those in areas affected are not permitted to purchase new sows for at least one year. As such, the financial compensation is spent elsewhere, on things essential to daily life including clothing and gasoline. This means that after a couple of years, the money is spent and there is nothing tangible in place to earn more. This study also found that in some cases, 6 months following an outbreak, villagers were trying to raise pork again. Finally, in still other cases, the compensation money was used to pay off bank debt, pay off debt for feed, and possibly even invest in a new pen for pigs (required following ASF). In these cases, villagers gambled and mentioned they expected government to have a vaccine in the near future.

Commonly expressed suggestions to replace 1 for 1 (chicken for pork) are over simplistic and do not match realities on the ground. Local pork producers in the communities in this study tended to be EM, and use IK in their production. This knowledge is specific to their pork production. Furthermore, the timing, markets, skills, and infrastructure required to raise chickens have no relation to pork. Finally, value-added products produced from pork (e.g., sausages), require a different array of technology and equipment when using chicken.

***African swine fever**, although it does not spread directly to humans, is also leading to a **human health crisis**.* Local villagers and smaller-scale producers

suffer from fear and anxiety, a change in diet, and a lack of appetite resulting from increased stress. Villages near affected sites face feelings of impending devastation and loss. Smaller-scale producers were found to watch their pigs all day for signs of disease, and many suffered from insomnia and panic attacks. Women who had previously enjoyed improved economic and social empowerment through the income their pigs provided them, now expressed feelings of guilt at not being able to further invest in their children's education.

Respondents explained how ASF differed from other forms of environmental disaster. If there were a large flood, for example, planted vegetables and grains would be lost. However, this loss would only be for one season and other crops could be used to compensate for the caloric and monetary lapse. Supportive social and extended family networks could also help fill the temporary void. This study found that ASF is considerably more threatening. Whole villages are being required to reshape economic livelihoods and outlooks. Respondents worry it is not temporary.

Potentially tainted pork has no market, and producers are not legally permitted to ship it anyway. This has resulted in an overall drop in price across the region for pork. Indeed, there has been a radical drop in prices up and down the entire production chain. Feed providers, with no buyers

of their products and hence no source of income, are also economically struggling. Furthermore, producers who have taken loans to pay for industrial feed have done so based on the collateral of their animals. With animals dead, many find themselves with tremendous debt and with no foreseeable means to pay back their loans.

In the vacuum that has been created, questions should be raised as to how much of the demand for pork will be filled with industrially-produced animals from abroad. A similar concern must be raised about the future sourcing of sows and piglets. As few are now available locally, they have to be brought in for production on any scale to resume. One finding of this study are the real concerns for the future of the genetic diversity in and even the future raising of heritage pigs on any scale in the NMR. The negative effects of this on EM people will be considerable.

According to respondents, local pigs are less vulnerable to ASF than their hybrid cousins. While it is uncertain if this is related to genetics, it almost certainly has something to do with the more compacted production facilities more typical in larger-scale production systems. The density of production matters. With these facilities operating in rural areas, sometimes near smaller-scale producers, everyone has been affected.

7. Conclusions

Overall, this study uncovered a number of positive trends in the smaller-scale production of pork in the Northern Mountainous Region of Vietnam. To reiterate, smaller-scale pork production is economically, socially, and environmentally viable.

This study also uncovered that the industrial pork production chain greatly affects smaller-scale producers and local communities in many ways. The rise in industrial pork is placing strains on rural environments, and pork produced in a more industrial fashion at the village or household level has resulted in an erosion of IK. Preserving the smaller-scale producers not only offers benefits attributed to the maintenance of genetic diversity and IK systems of management, as well as increased standards of animal welfare, but also offers the potential for producers to create unique opportunities to distinguish their production with more urban consumers.

Possible points of intervention are to strengthen the linkages between smaller-scale producers and more urban restaurants and consumers, reduce production costs through the encouragement of using of available resources (e.g., feed), support capacity building through training on simple

forms of e-marketing, and seeking new ways to add value for smaller-scale producers. In the case of NMR, the collective action of small producers was also found to fill value chain gaps and produce opportunities for participants.

Unfortunately, it is also important to clarify that the majority of these trends have been considerably altered following the recent effects of ASF. Indeed, rather than ending positively, this study predicts the following in the near future.

First, many local and heritage breeds of pig, those adapted to local conditions, may disappear. A considerable decline in the genetic diversity of local pig breeds is also predicted. This will have devastating effects on the EM communities that rely on them for food and income across the NMR.

Second, EM women will be particularly affected. With childrearing traditionally considered the role of the women in the family, and with few opportunities for off-farm labor or training, considerable economic and social strains will become greater.

Third, with the death of most pigs, one to two years following the epidemic a higher price for breeding pigs can be expected. This price will be more easily paid by those with larger access to investable capital. This is predicted to be those involved in larger, rather than smaller-scale production. Questions as to the future

of smaller-scale production are pressing.

Fourth, the ASF epidemic can return at any time. Local producers believe that a vaccine is forthcoming, and many have started to raise pigs again.

Fifth, with the lack of pigs in Vietnam, the country may be unable to supply the demand for pork through its domestic production. The price effect on

consumers and future smaller-scale producers remains uncertain. What is almost certain however, is that this void will likely be filled by imported and/or industrially-produced meat.

Overall, with the ever increasing stresses resulting from climate change, and exasperated by ASF, the people of the NMR will face a considerably more challenging future.

Figure 1: Mrs. Phuong (right) at home in Nam Chi Ngoai village, Bao Nhai commune.



Figures 2 and 3: Pork sausages produced by the cooperative. Notice in Figure 3 the QR code being used for product traceability.



Figure 4: A pig raised in smaller-scale production.



Figure 5: Mrs. Nung Thi Nga, chairperson of the women's union in Lung Khau Ninh. Standing second from the right, she is here with the family of Mrs. Leng Thi Hai.



Figures 6: Smaller-scale production of heritage breeds of pig.



Figure 7: Corn being dried in preparation for use in feed and fermentation.



Figure 8: The byproduct or dregs of the alcohol produced from corn is mixed with unused corn and sweet potato leaves to produce fodder for the pigs.



Figure 9: Mrs. Hai with new equipment purchased from raising local pigs.



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