Impact of the use of exotic compared to local pig breeds on socio-economic development and biodiversity in Vietnam

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Abstract

Vietnam owns a wide variety of local pig breeds. The present pig population has been strongly influenced by an influx of exotic pig breeds. This study describes Vietnamese local breeds, their origin and distribution, and assesses the influx of exotic pig breeds to Vietnam. Data were collected through literature reviews and key person interviews, within a global study on status, impacts, and trends from the exchange of breeding animals, implemented by the Institute of Animal Production in the Tropics and Subtropics, University of Hohenheim, commissioned by BMZ/GTZ, and supported by FAO. The Vietnamese pig population developed under the influence of migration, trade, and colonisation from neighbouring China, Laos and Cambodia. In the 20th century, the Vietnamese government promoted higher yielding local breeds, the Mong Cai prevailed as major sow line. Composite genotypes evolved through uncontrolled crossbreeding and scientific research. Exotic pigs have been introduced from the US and Europe since the 1920s. Throughout the 20th century, gene flow was driven by French colonial rulers, American armed forces, the socialist government, and since the liberalisation (1986) through commercial breeding companies and developmental projects. Decentralisation of the breeding system together with a developed AI network supported the spread of exotic pigs especially at smallholder level. Crossbreeding with exotic breeds and use of exotic breeds as sow and boar lines caused a severe decrease of indigenous breeds. Local breeds produce in low-input systems, fulfilling multiple functions for smallholder households. They yield lower performances than exotics, but require lower production inputs, and have favourable adaptation traits. Vietnamese breeds are genetically distinct from European breeds and show a greater genetic heterogeneity. Local breeds are a source of promising alleles of unpredictable economic value. Results show that gene flow has been a net influx of exotic pigs to Vietnam, accelerating in the last decades.

Key words: Vietnam, gene flow, biodiversity, local pig breeds, smallholder production

1 Introduction

Vietnam owns a wide variety of local pig breeds, being long time the basis of pig production. In recent decades, local breeds have been replaced by or crossbred with imported high-yielding breeds to increase performances, leading to a severe decrease in the number of local breeds (Vietnamese Country Report, 2003). In 2002, one quarter of 23 millions Vietnamese pigs were locals, predominating in uplands, rural and remote areas. Local breeds survive and produce on farm-grown feeds and by-products and withstand hardships. They have multiple functions for smallholder households, as they supply income, animal protein and manure, have saving and insurance functions, and sustain social commitments and social networks (Vietnamese Country Report, 2003). Vietnamese breeds are genetically distant to and more heterogeneous than European breeds, have a higher number of alleles per gene locus, wider ranges of allelic sizes, and are genetically more heterogeneous than European breeds (Thuy, 2004). Their extinction would mean a considerable loss for Vietnam’s biodiversity; genes of potential use for future breeding programs would be eliminated; and the food security and economy of smallholders might be put at risk. However, the disappearance of local breeds might also indicate that exotic breeds better fulfil farmers’ demands. This study describes origin and distribution of Vietnamese local breeds; assesses the influx of exotic

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breeds into Vietnam, and discusses the impact of the use of exotic pigs on socio-economic development and biodiversity in Vietnam.

2 Research methods

Data were collected between 10/2004 and 2/2005 through literature reviews and key person interviews, within a global study on status, impacts, and trends from the exchange of breeding animals, implemented by the Institute of Animal Production in the Tropics and Subtropics, University of Hohenheim, commissioned by BMZ/ GTZ, and supported by FAO (Huyen et al., 2005).

3 Results and discussion

3.1 Formation and distribution of local breeds

Vietnamese breeds can be put into two broad categories. The potbellied, higher-yielding breeds (I, Mong Cai, Lang Hong) in the delta areas of North Vietnam (NV) originated from a century-long, systematic breeding process. The unimproved breeds (Muong Khuong, Meo/ Ban/ H’mong, Thai Binh, Tap Na, Tong Con, Ha Bac, Son Vi, Co, Soc, Tuy Hoa, Tau Pha, Nghia Binh, Quang Tri Mini pig, Ba Tri) were shaped by less purposeful and systematic breeding measures of the hill tribes and ethnic minorities of North, Central and South Vietnam (SV) (Molenat and Thong, 1991; Ly, 1999; Lemke et al., 2000; FAO/DAD-IS, 2004; Thuy, 2004). It is assumed that the influx of pigs from neighbouring Laos, Cambodia and China in the context of occupancy, migration and trade has influenced the development of Vietnamese local breeds.

3.2 Formation and distribution of composite breeds

The composite breeds Ba Xuyen and Thuoc Nhieu have been developed in the Mekong delta from mating between local sows and exotic boars (Craonnais, Berkshire, Yorkshire) between the 1920s and 1950s (Doanh et al., 1985). The White Phu Khan originated from the South Central Coast as crossbred between Yorkshire boars and local sows (Duyet and Duong, 1996). The National Institute for Animal Husbandry Hanoi (NIAH) created in 1981 the DBI-81 (Soviet Large White x local I) and BSI-81 (Berkshire x local I), to combine the higher lean meat ratio of the exotic with the higher robustness of the local breed (Doanh and Thong, 1985). The Mong Cai underwent a breeding and selection process at the state breeding farms (Doanh et al., 1985), and has been widely distributed throughout Vietnam, mainly as sow line (Thien, 2002). Improved Mong Cai that are currently kept in Vietnam, can be distinguished from the indigenous MC of the area of origin, mainly in terms of a larger frame and higher performance.

3.3 Introduction of high performance breeds and crossbreds

The introduction of exotic pigs to Vietnam in the 20th century was influenced by the political situation. In general, imports of exotic breeds to Vietnam included Craonnais, Berkshire, Landrace, Large White/Yorkshire, Duroc and Pietrain. In the 1920s to 1950s, when Vietnam was still French colony, imports came from France, the US, and Japan. From 1945 onwards (end of World War II, foundation of the Socialist Republic of Vietnam), North and South Vietnam (NV, SV) followed different development paths. In the 1960s and 1970s, a pig production industry developed in SV with strong support by the US, to provide the army with meat. In NV, AI was introduced into pig production in 1958 (Thien, 2002). The AI network was probably strongly backed by the system of cooperative farms. Imports to NV came from the SU, China, and Cuba. Imported breeds adapted to Vietnamese environmental conditions, but in comparison to parent stock in the countries of origin, their performance declined by 20 to 30%, and the mortality increased (Doanh, 1985).

The American war ended 1973, the country was united in 1975. Within Vietnam, gene flows of Mong Cai from NV to the central part and SV (“Mongcai-isation”, 1970 – 1989), and of Duroc from SV to NV were observed. After 1975, exotic breeds were systematically imported to Central Vietnam (Duyet and Duong, 1996). After 1975, state breeding centres were established also in SV. Yet, the breeding system of SV developed differently than in NV, with the import of French pigs (1975 – 1986), and selection and cross-breeding programs for Yorkshire, Thuoc Nhieu, and Landrace (Thong et al., 1996). The distribution of exotics and crossbreds and the replacement of local breeds caused the implementation of a Vietnamese conservation program in 1989, including conservation of the I pig (NIAH, 1997). After the political and economic renovation (1986), numerous national development programs started to distribute higher-yielding pig breeds to farmers (Duy et al., 2001). From 1990 to 2000, the Lean Meat Program aimed to increase the lean meat proportion in the Vietnamese pig herd. NGOs, GOs, commercial companies and breeders’ organisations started to introduce higher-yielding exotic breeds to Vietnam and at farm level (Lich and Tuyen, 2001).
From 1986 to 1991, the Vietnamese pig herd grew by 3% and the live weight output by 28%, from 1991 to 1999, by 28% and 84%, respectively (General statistical Office Vietnam, 2000). Improved management and the strong promotion of higher-yielding breeds had a strong positive effect on the Vietnamese pork production.

3.4 The pig breeding system and its stakeholders

The actual Vietnamese pig breeding system has a pyramidal structure. Organisational units are state farms (under government administration) and provincial farms (under the People’s Committee of the province). Most breeding centres are involved in several levels of the breeding pyramid; and lack of funding has required them to engage additionally in production of fattening stock. However, the emphasis on short term commercial gain is at the expense of a long-term national vision of livestock improvement. Mass organisations and national development projects play a role in the distribution of pigs to farmers. The AI network strongly supports the distribution of exotic germplasm at village level. The activities of the Vietnamese pig breeding system are not centrally coordinated (ASPS, 2002). After 1986, foreign GOs and NGOs, commercial importers, and breeding associations became major driving forces in the gene flow of higher-yielding breeds to Vietnam, but their actions are not centrally coordinated, and information on them is lacking (Huyen et al., 2005).

3.5 Suitability of different breeds for different environmental conditions

Local breeds are appreciated by farmers for their favourable adaptation characteristics. However, ecological and economic conditions are changing, and animals adapted to production systems that no longer exist might be replaced by those better suited to the new, especially more market-oriented systems. Local breeds yield lower performances than exotic pigs. For example, the average daily gain was 65 g/day for Ban pigs under extensive and 120 g/day for Mong Cai under semi-intensive conditions (Lemke et al., forthcoming, a), 291 g/day for LW x MC (Loc et al., 1996) and 587 g/day for Landrace under improved conditions (Thien et al., 1995). Higher performances of exotics or crossbreds have so far been mainly recorded under improved keeping conditions. Lemke et al. (forthcoming, b) evaluated semi-intensive pig production with higher-yielding Mong Cai, opposed to extensive production with local Ban pigs. Semi-intensive production with MC yielded a higher output but required a higher input; while extensive production with Ban pigs yielded a lower output at a lower input. The resulting net benefit\(^1\) per household per year did not differ statistically between production systems and breeds.

3.6 Impact of the introduction of exotic pig breeds on biodiversity

The influx of exotic pigs to Vietnam and spread within the country and the onesided promotion of local Mong Cai caused the stepwise replacement of other local breeds. The share of the latter in the sow population of NV decreased from 72% in 1994 (Thien et al., 1996) to 45% in 1997 (NIAH, 1997). In 2002, only 26% of the Vietnamese pig herd were local pigs. Today, of 14 Vietnamese breeds, Ba Xuyen, Thuoc Nhieu, Quang Tri, Ban and H’mong are in vulnerable state, I and Lang Hong in critical state, and Phu Khanh, Co and Son Vi face extinction (Vietnamese Country Report, 2003). In reaction, the National Program on Conservation of the Vietnamese Animal Genetic Resources was founded in 1989, but covered only selected pig breeds. The long-term sustainability of those programs is questionable, as they are based on very small animal numbers and depend heavily on government subsidies (Lemke et al., 2000). Genetic diversity supports livestock’s adaptation ability. Vietnamese breeds have particular distribution areas and represent a large natural gene pool. Their genetic peculiarities and distinctiveness compared to European pig breeds has been shown (Thuy, 2004). Vietnamese breeds harbour alleles, which might be significant for future genetic improvement and of unpredictable economic value.

4 Conclusions

The access to information on the gene flow to and within Vietnam is limited due to the decentralised nature of the breeding system and the restricted information policy of its stakeholders. The net gene flow in the past decades has been a net inflow of exotic, higher-yielding breeds to Vietnam. Driving forces were commercial interests (before 1945/after 1986), policies of the socialist government (1945 till present), and foreign GOs and NGOs (after 1986). The introduction of exotic pigs was and is strongly supported by inherent structures of the pig breeding system as well as political structures. The influx of exotic breeds had a strong positive impact on the national pork production, but at the same time strongly replaced the

\[^1\text{net benefit}=(\text{revenue from sold pigs}+\text{non-market value of production})–(\text{variable costs}+\text{feed opportunity costs})\]
local pig breeds. However, local breeds might be competitive under low-input conditions, and their replacement might endanger the livelihoods of smallholders in low-input systems depending on those breeds. National decisions on the use and conservation of local breeds need to be based on scientific proofs of the value of specific traits, and market-backed valuations of products. Further research is required concerning the characterisation of breeds, performance evaluation, genetics of special traits, breeding organisation and marketing.

5 References