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Tailoring slaughter weight of indigenous Vietnamese Ban pigs for the requirements of urban high-end niche markets

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ABSTRACT

Slaughtered at heavy live weights, carcasses of the autochthonous Vietnamese Ban pig breed are not marketable on the highly remunerative niche markets of the urban Red River Delta. Therefore, Ban pigs are traded often at just 10 to 15 kg to avoid excessive fat accumulation. However, already, a moderate increase of slaughter weights might lead to rising profits for smallholder farmers in the uplands. Thus, this research aimed at investigating the effect of increasing live weight on the carcass composition and meat quality of indigenous Ban pigs qualifying for commerce on high-end markets. Fifty-six castrated male Ban fatteners with body weights ranging from 6.5 to 29.3 kg were collected from smallholder farmers applying a feeding system based on banana pseudostem (*Musa* spp.) and slaughtered by local slaughterers according to common practice. The carcass quality of 51 animals and, additionally, meat quality parameters of the loin and ham of 56 animals were assessed. For the evaluation of increased live weights on commodity prices, two pricing systems based on actual market prices for Ban fatteners in Son La town and Hanoi were suggested. Carcass fat depots did not significantly increase when body weights were raised from 12 to approximately 20 kg, and the distribution of primal cuts and the meat quality of the loin and ham were relatively stable. Thus, the currently applied slaughter weights for purebred Ban pigs appear to be suboptimal, and a moderate increase of slaughter weights to approximately 20 kg is feasible and could result in monetary benefits. In this context, the role of small-scale slaughterers for value chain upgrading is discussed. In conclusion, increasingly formalized value chains for traditional pork products could provide the potential to not only contribute to rural development in the Southeast Asian Massif, but also to the conservation of animal genetic resources of a highly valuable eco-cultural region.

1. Introduction

Pork consumers in Vietnam and other Southeast Asian countries increasingly opt for low-fat pork, and substitute cooking lard with vegetable oil, resulting in a rapidly growing commodity market for lean pork [1,2]. In northern Vietnam, this market is predominantly accessed by small-scale producers embedded in a favorable socioeconomic framework. In order to cope with the increased demands and requirements imposed by competitive commodity markets, they shifted to, over the years, crossbreeding with modern pig lines and increased slaughter weights [3]. Consequently, the yearly output per head of the Vietnamese pig sector continuously rose [4], and, additionally, lean meat yield improved. In contrast, ethnic minority smallholders in the remote uplands of northwestern Vietnam are barely connected to markets, and practice subsistence-oriented extensive pig husbandry with slow-growing autochthonous breeds [5]. For these smallholders, niche markets could provide a viable alternative to the commodity market. Indeed, the Food and Agriculture Organization of the United Nations proposed niche markets as a chance for poor livestock keepers to increase their incomes [6]. But, while researchers have analyzed niche pork markets in Europe [7], particularly those for Iberian pork, and the United States [8,9], such research within developing countries is lacking. For remote smallholders in northern Vietnam, access to nice pork markets could serve as an additional source of income to crop production, and reduce their dependency on world market prices when selling their cash crops [10].

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In northern Vietnam, affluent urban consumers in particular show an increasing interest in meat from indigenous pig breeds fed on 'natural' diets [11,12], indicating that value chains for specialty pork could be extended to urban markets. Smallholders could even exhibit some competitive advantages in supplying niche markets: firstly, remote smallholders keep native pig breeds and, secondly, they apply traditional feeding strategies. Both of these attributes are particularly appreciated by consumers. In the upland region of northwestern Vietnam, smallholders keep the indigenous Ban (synonymous with Meo and Hmong) breed. Under extensive conditions, this pig breed is characterized by a low reproductive performance (7.2 piglets born litter^{-1}) and growth rate (65 g daily gain until an age of 180 days) [13]. Target markets for Ban pork could be represented by specialty restaurants or 'green' food shops, an organic-like market segment in Hanoi and its surroundings [14].

Linking rural smallholders embedded in a community-based pig breeding program to these remunerative markets by a specialty food supply chain has been proposed as a sustainable rural development concept in northwestern Vietnam [15,16], and could be transferred to other regions of the Southeast Asian Massif where similar conditions prevail, for instance, to the highlands of Laos [17] or southwest China [18,19]. Phuong et al. [20] showed that restaurant owners in the lowlands of northern Vietnam paid more for pure Ban pork compared to pork from crossbred pigs and exotic purebreds. Additionally, it was found that live weight significantly contributed to price differentiation among purebred Ban hogs. Ban pigs with a live weight lower than 12 kg were priced 4–17% higher by restaurant owners compared to pigs with an average weight of more than 18 kg, which was assumed to be attributable to the increasing fat content of heavier and older pigs [20]. The urban high-end retail sector also puts emphasis on low fat contents of the carcass and, therefore, demands pigs with particularly low live weights [14]. According to Mathias et al. [21], understanding and maintaining product quality is crucial in order to demand premium prices in niche markets, whereas not being able to adhere to quality requirements can result in market failure. To our knowledge, data on the carcass quality of pigs slaughtered at low body weights is extremely rare, although products of this type are wide spread (e.g., suckling pigs in Europe, lechón in Latin America and the Philippines, local piglets in Southeast Asia and China). Low weight pigs are often consumed on special occasions, such as private or public festivities (e.g., New Year, harvest festivals) and/or religious celebrations. It should be noted that hogs vary in their genetic origin and therefore reach their market weight at different ages. In China, Southeast Asia and the Philippines, local pigs are the usual preference [18,20], whereas in Europe, fast growing crossbreds are slaughtered at a low age to produce suckling pigs. In either case, benchmark data on the carcass configuration of slaughter hogs is required in order to allow for coordination of the value chain, particularly if market acceptability is strongly dependent on carcass quality.

Thus, in order to develop a sustainably competitive marketing grid for specialty native pigs, slaughter weight in relation to carcass tissue composition is of high importance. Elevated slaughter weights could reduce transaction and processing costs per unit of output, which is essential for processors and retailers, and increase the yearly output of meat per sow, which is important for producers. Alterations in carcass composition, for instance, an increase in the amount of subcutaneous fat depots, are often the major limiting factor with regard to increasing slaughter weights in the commodity sector, a principle that also applies to the Ban specialty market. When slaughtered at live weights as commonly applied in rural areas, i.e. at 50 to 60 kg, carcasses of indigenous breeds are not marketable in niche markets, while a moderate increase in live weight at slaughter from, currently, a maximum of 15 kg to around 20 kg could be acceptable and lead to rising profits for stakeholders along the specialty pork value chain in northern Vietnam. Since meat quality is a specific attribute appreciated by consumers of traditional pork in Vietnam [12], potential variations in the palatability of fresh meat with increasing live weight are also of high interest.

Consequently, the aim of this research was to investigate the effect of increasing live weight on the composition of low weight indigenous Ban carcasses destined for urban high-end markets. One goal was to identify an optimal slaughter weight to produce carcasses with desired attributes as a basis for a marketing grid for vertical coordination between remote smallholder producers and the high-end retail sector. Therefore, Ban pigs were collected under varying environmental conditions in relation to available feed resources and the housing system (pen, enclosure, semi-scavenging) typical for the extensive smallholder pig husbandry system in northern Vietnam and slaughtered by small-scale slaughterers (a capacity of one to two pigs per day) by common practices. Additionally, this research investigated whether meat quality of indigenous Ban pork is affected by changes in live weight.

2. Material and methods

2.1. Animal selection

This study was carried out from October 2013 to February 2014 in Son La city (21° 19′37″ N, 103° 54′51″ E) and its surrounding districts. Son La province is a mountainous province in northwestern Vietnam bordering Laos in the south. In total, 56 purebred Ban pigs were selected from different litters, dams and farms. This selection procedure was aimed at drawing a sample representative for slaughter pigs as available on the market, i.e. offspring from unrelated animals raised and finished under environmental conditions varying in dependence of household resources. Data on the rearing environment of the pigs, including information on feeding, was collected by the use of a simple semi-structured questionnaire (n = 41). Slaughter pigs were castrated male pigs at an age of 5 to 7 months, assigned for marketing at a price premium to restaurants and the high-end food retail sector in the urbanized Red River Delta.

2.2. Slaughter and carcass quality measurements

Animals were slaughtered in Son La city according to common slaughtering practice, i.e. bleeding without prior stunning, by three slaughterers representing typical small-scale slaughter locations (a capacity of one to two pigs per day). To date, no larger abattoirs exist in Son La province. A maximum of four pigs per day was slaughtered on 19 slaughter days. Pigs were collected the day before slaughter and fasted for at least 12 h prior to slaughter. After bleeding, pigs were scalded by pouring hot water over the body and dehaired manually. Subsequent to evisceration, head, feet and leaf fat were removed. The hot carcass without viscera, head, feet and leaf fat was weighed and the hot dressing percentage calculated relative to the live weight of the fasted animal. The carcass was then split along the backbone and backfat thickness was recorded at the level of the last rib (BF1) and above *gluteus medius* (BF2). The carcass length was measured as the shortest distance from the first thoracic vertebra to the pubic symphysis. The loin eye area (LEA) was recorded on the cross-section of the loin between thoracic vertebras 13 and 14. Afterwards, the right carcass half was weighed and dissected, according to Nissen et al. [22], into the most valuable primal cuts (i.e. shoulder, loin and tenderloin, leg). Primal cut yields were expressed relative to the hot carcass weight. Primal cuts and the belly were then dissected further into the soft tissues (lean, fat, skin) and bone. The carcass components were weighed and tissue composition expressed relative to the hot carcass weight. Samples of the loin (*longissimus thoracis et lumborum*, LTL) and ham (*semimembranosus*, SM) were excised, and partly

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