STUDY REGARDING THE REDUCE OF THE FAT QUANTITIES IN SWINE CARCASES THROUGH CONTROL METHODS OF TECHNOLOGICAL FACTORS

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Abstract: *The production systems that can reduce the amount of fat in carcasses refer to the improvement of the welfare conditions of fattened pigs and the rigorous control of nutrition according to the type of meat preferred by consumers from the swine market. In order to ensure the proper conditions for fattening pigs to perform regardless of the exploitation system, they must be provided with adequate shelters for maintenance and feed suitable for the intended purpose, sufficient amounts of water and reliable technologies that can adapt on the fly to market requirements. The research carried out in the conditions of our country, highlights different systems of fattening pigs, each system presupposing to obtain a certain type of meat, a certain type of fattening farm, production expenses, production price, investment efforts, productive indicators and different economic outcomes.*

Keywords: *swine, reducing, methods, factors*

INTRODUCTION

Raising and capitalization of swine for meat production has many advantages [7,9,13]:

- pigs bring profit quickly to the farm due to the short interval between generations: a sow sown at eight months, ensures pigs ready for slaughtering six months after farrowing;
- pigs convert feed into meat more efficiently, about 2.7-3.2 kg of feed per 1 kg of live weight, compared to other species:

a. cattle approximately 8.0 kg of feed for 1 kg of live weight;

b. sheep, 5-6.0 kg of feed for 1 kg of live weight;

- pigs excel in high slaughter yields of usable carcass (65.9-87.8% compared to other animals that produce red meat (55.0-67.6% in cattle, 47.0-57.6% in sheep;
- pigs require very little labor in intensive industrial exploitation, thanks to the mechanization of feeding, watering, and manure removal;
- extensively exploited pigs require little investment for buildings and equipment;
- pigs can convert some industrial waste and by-products into meat;
- pigs are an excellent source of meat that can also be processed in individual households, due to the ease of superior processing and the preservation of meat qualities;
- pigs are prolific: they typically produce 23.2-37.8 piglets per year depending on the intensity of use of breeding sows and the age of piglets at weaning.

There are hundreds of different pure breeds of domestic swine (Sus scrofa domesticus) available around the world, but in fact, a pure breed is a type of pig that has a given set of biological and physical characteristics [1,5,8,11]. Some breeds have been developed according to the needs of farmers and are called cross breeds, hybrid breeds or improved breeds but pig breeders have developed many breeds in step with modern agriculture over time with certain shapes, sizes, colors or temperaments [2,4,10]. Crossbreeds usually have parents from two or more different breeds. On the other hand, purebred pigs are bred from parents of the same breed [3,6,12,15] Most of the pig breeds we know today are believed to be descended from the Eurasian wild boar (Sus scrofa) [14].

MATERIAL AND METHOD

Due to the high demand for meat on regional and local market, swine farms must have the ability to quickly adapt to the needs and consumption preferences of consumers. Integrated farms can only meet these demands if they have implemented production management and have systems of efficient exploitation that pretend it to these requirements. As part of this scientific approach, using the analysis methods specific to each exploitation system, the following was analyzed:

- each exploitation system of pigs for meat with its advantages and disadvantages for finding solutions that improve exploitation and make farms competitive through the products offered for sale;
- the type of meat that can be obtained depending on the endowments of the farm and its ability to adapt to the demands of the pork market;
- the response of the biological material to the welfare conditions offered, regarding the quality of the meat.

The analysis of different meat production systems with a certain percentage of fat in the carcass was the aim of the studies undertaken in different types of stable and mixed farms, the research objectives aimed at:

- the quality of the meat obtained depending on the exploitation system;
- control of technological feed factors to increase the efficiency of exploitation for meat of swine;
- the role of balancing rations on the amount of fat in carcasses.

RESULTS AND DISCUSSIONS

To improve the welfare conditions of fattened pigs according to the quantity and quality of meat demanded by the market, farms must be able to perfect their operating systems and operating conditions: maintenance system, feeding, watering and control of microclimate factors and to specialize its human resource to meet these demands. Swine meat is obtained in several production systems with their advantages and disadvantages as follows:

- the stable maintenance of pigs for fattening, involves the increase of investments with technology and their maintenance in shelters with controlled microclimate and the mechanization of the main technical operations, feeding, watering, evacuation of manure.

Within this exploitation system, large herds can be concentrated, the nutrition system can be controlled to obtain a certain type of meat: for consumption or for meat products. This stall fattening system has the disadvantage that failure to ensure a technological factor can lead to the appearance of metabolic or respiratory diseases, which increase the fattening period and increase operating expenses, not being able to supply the market with the amount of meat or the type of meat required by the market. To reduce animal sensitivity, preserve animal health and their biosecurity, we recommend improving production indicators:

• ensuring the well-being of fat pigs through conditions that allow them to perform;

• the use for fattening of healthy hybrids with a high capacity to adapt to intensive exploitation;

• the control of the state of health through veterinary health management for disease prevention;

• farm biosecurity through buffer zones around farms.

- outdoor maintenance and shelters of fat pigs. In this system, a smaller number of fat pigs can be fattened, because the paddocks have the disadvantage that the animals come into contact with external conditions and if the system is not well managed, especially in winter and spring, drafts can cause the appearance of respiratory diseases and loss of production, because sick pigs no longer achieve the planned gains and consume more resources and the fattening period is longer.

The well-managed system has a multitude of advantages:

- animals are more robust due to the favorable influence of environmental factors;
- quality meat with good organoleptic characteristics can be obtained if concentrated fodder is replaced with green mass, especially alfalfa;
-good ration conversion indices and lower feed costs, but the duration of exploitation better combines the effects of green mass on ensuring the necessary mineral salts and vitamins;

An effective way to reduce the amount of fat from swine carcasses is to control the microclimate in shelters with effects on the accumulation of reserve fatty substances for the thermoregulation of vital functions under thermal stress conditions. The thermal environment from shelter is the result of the interaction of air temperature, humidity and air flow. These factors are, in turn, determined by a number of factors such as: the weight of the animals, the number of animals in the stalls, the degree of isolation of the shelter, the condition and the type of shelter.

The ideal air temperature for optimal production and lean meat depends on:

- the needs of fat pigs at a certain age;
- the method of ensuring and the degree of mechanization of ventilation;
- the type of floor in the speaker;
- how to administer water and feed;
- the quality of the fodder and the exploitation technology implemented;
- the type of meat desired to be obtained.

Fresh, clean air is essential to keep pigs healthy and vigorous. Cool and dry is far superior to hot and humid and a warm and humid space is the perfect environment for organisms that cause respiratory diseases to thrive and spread. The challenge for pig producers during cold weather is to keep the buildings properly warm for the pigs while preventing moist air from building up in the housing.

Ensuring a proper comfort zone and sufficient useful space per head of fattening pig is essential for meat production. The clean stall allows greater control over the thermal environment of the fattening pigs by providing a source of heat as well as a place for the pigs to protect themselves from air currents. In case of high temperatures, the pigs distance themselves from each other and if the discomfort persists the pen becomes wet due to the disorganization of the batch and the failure to keep the resting area clean.

Fat pigs have management systems for low and high temperatures, so we found that in the cold they have the following behavior:

-consumes food more often and in larger quantities for temperature regulation and not for weight gain. Although more feed energy is needed to maintain body temperature, growing pigs in concrete floor systems is severely affected by winter temperatures, with the exception of heated piglets and young pigs. It is known that piglets have less fat to insulate themselves from the cold and need in the first week of life temperatures of 30 degrees Celsius to survive instead fat pigs protected from air currents without warm microclimates achieve optimal production if fattening is well managed and carried out in shelters well insulated and with possibilities of air ventilation to regulate humidity.

At high temperatures for fattening pigs, facilities are needed to ensure the microclimate from the shelters. High temperatures reduce the productive performance of fattening pigs not as losses through death but by reducing feed consumption and can disrupt the technological flow by extending the fattening period and obtaining carcasses with a lot of fat. We recommend in hot conditions to protect and avoid stress in fattening pigs:

- offering adequate quantities of fresh and clean drinking water for consumption at discretion;
- humidifying the walls of the shelters to regulate the humidity in the shelter;

- reducing the amount of waste water from the canals if the exploitation is done in boxes with a grid floor;

- decrease of the number of pigs per pen during the summer periods. This way of working reduces the number of pigs in the total air space of a shed and reduces the amount of heat generated by fat pigs;

-increasing the speed of air movement through the hall, for cooling the pigs.

Although fat pigs do not sweat, evaporative heat loss can lower body temperature and if stress cannot be avoided through these recommendations, cooling strategies must be optimized to improve the performance of human resources on the farm according to table 1.

Table 1.

Management measures to optimize heat stress in fattening pigs

High temperature in the shelter	
Fat pigs	**Human resource**
1. distance themselves from each other; 2. increase the contact surface with the concrete floor; 3. they get dirty and cool in the defecation area; 4. become agitated and aggressive; 5. consumes little feed; 6. shake at the water source;	1. increases the area per head of fattened pigs by reducing the number of animals in the pen; 2. moisten the walls of the box with water; 3. increase the speed and volume of air currents; 4. sprinkles the animals with water; 5. sprinkles the floor and walls of the hall with water; 6. a larger quantity is provided and the animals are thinned and the tank is cleaned
Low temperature in the shelter	
Fat pigs	**Human resource**
1. gather 2. lie down in the feeding area; 3. eat large amounts of feed; 4. the appearance of cold diseases	1. reduce drafts and close vents 2. distribute sawdust in the box; 3. provides additional heat; 4. the windows are insulated and the density in the shelter is increased;

Source: own processing

Control of nutrition. Maintaining pork quality is critical and feed quality influences meat quality and fat quality is a major component of pork quality. The quality of fats is defined from the perspective of physical and nutritional characteristics, but the major problems related to the quality of meat fats are: soft fats, unusual odors and the impact of the composition of pork fat on human health.

Soft fat is a major concern for pork processors because it can cause problems in meat processing:

- lower processing yields;

- low fat value affecting pork meat producers.

Soft fat oxidizes faster and acquires an unpleasant smell faster, being oily, a characteristic that is considered very undesirable by most consumers. The use in feed rations of vegetable oils and co-products, with a high level of vegetable oil, to ensure the energy level reduces the firmness of pork fat. At levels below 8.00% vegetable oils, pork quality is not affected but we recommend that fattening pigs be fed recipes that combine:

- corn with soybean meal to obtain lower amounts of fat in carcasses but of good quality in terms of fat firmness;

- using barley in rations to produce carcasses with very little fat and quality in terms of firmness and color.

The unusual odors are given by the fats used to balance the rations in energy, which oxidize in improper storage conditions for these reasons in order not to imprint unpleasant odors on the meat during the finishing period, fats must be excluded from feed rations. Oil and fish meal are very susceptible to go rancid and acquire unpleasant odors. The use of

moderate fats in rations leads to good performances regarding the quality of the carcasses obtained from fattened pigs and the amount of fat is reduced and the quality in terms of firmness as shown in table 2.

Table 2.

The proportion of fat in the rations of fattening pigs to obtain quality carcasses

Item	Category – fat pigs			
	Fattening 31.0-80.99kg		Finishing 81.0-106, kg	
	Proportion in ration (%)		In the first part of the finishing (%)	Last 21 days of finishing (%)
Fat of animal origin	0.0-8.0		0.0-4.0	-
Vegetable oil	0.0-4.5		0.0-2.0	0-1.0

Source: own processing

We believe that pork fat used in human food needs to be well managed due to the impact of its composition on human health. It is known that there is a close relationship between dietary composition and body fat in pigs, for these reasons it is relatively easy to manipulate the composition of pig fat by changing the type of fat fed into rations to adjust energy requirements. High levels of saturated fat are associated with cardiovascular disease for these reasons we believe that efforts should be made to increase the intake of "healthier" fats by manipulating feed recipes for fattening pigs as follows:

- omega-3 fatty acids with a beneficial effect on cardiovascular diseases, such as flax, flaxseed or flaxseed oil can increase the amount of omega-3 fatty acids in pig fat by using them to regulate the energy requirement of the feed used during the finishing period;
- the introduction of linseed into the rations below 12.5% improves the omega-3 fatty acid content of pork fat, without having a negative impact on the quality of the carcass and the fat in the carcasses regarding firmness and color.
- the use of green fodder and food scraps in the rations of traditional breeds, Mangalita and Bazna, is beneficial, because it contributes to obtaining quality carcasses with reduced amounts of fat, and the proportion of unsaturated fatty acids is high.

It is interesting to remember and compare the data obtained by us with those resulting from research carried out for this purpose in the world:

- the digestibility of amino acids and energy from feed tends to be lower than the digestibility of feeds such as corn and soybean meal;
- sows fed large amounts of forage can access feeders without becoming excessively fat. This simplifies feed management for the pregnant sow herd and can improve sow welfare;
- due to the high fiber content and the limited availability of energy and amino acids, feed should not be given at raised levels in lactating sows and fattening pigs in the first part of fattening;
- fat pigs from traditional breeds perform well on pasture if they receive a diet supplemented with concentrate feed. These pigs use more nutrients from the feed after an adaptation period of two months, but the digestibility of the feed increases with the maturity of the pig.

Food scraps used in the feed of fattening pigs. Although pigs fed with a diet of corn meal and soybeans achieve good gains, being omnivores they can feed on a wide range of

foods, performing valuable functions as recyclers of nutrients found in foods that are no longer suitable for human consumption.

Swine from traditional breeds exploited in the open air to supplement the pork shortage, use the nutrients from dry waste from bakeries, rejected fruits and vegetables. Processed foods such as candy, popcorn, potato chips, cereal, and pasta that do not meet specifications or are past a manufacturer's expiration date may also be included in the swine's diet. Table scraps and other food waste from restaurants, schools and other institutions can be included in the swine's diet. However, raw scraps should not be fed to pigs. If table scraps and food waste contain animal products, they may not be acceptable to some pork markets.

We believe that both marketing indications and regulations regarding the inclusion of human food waste in swine diets should be checked to ensure compliance with pig feeding standards.

CONCLUSIONS

The performance of fattened pigs shows the type of management implemented in the farm, housing, facilities, quality of biological material, nutrition, welfare, but for a good distribution of the obtained meat, it is necessary to perform marketing and reliable technologies, adapted to the demand, to deal with the consumption trends. In order to reduce the amount of fat in the carcasses and improve its quality, firmness and color, through the managerial measures undertaken, it is necessary to control the technological factors that determine the obtaining of meat and meat products with characteristics that satisfy the preferences of consumers of such products. Depending on the quantity and quality of marketable meat, farms must be able to perfect their technologies to ensure welfare and achieve performance according to the requirements, production systems of a type of meat and operating conditions by controlling microclimate factors and nutrition, because the quality of the feed, the ingredients incorporated in the recipes have major influences on the amount of meat obtained, the quality of the meat and of the fat from meat.

Although the quantity and quality of fat from carcasses and meat is defined from the perspective of physical and nutritional characteristics, the major issues related to fat quality are given by the quantitative and qualitative diets administered to fattening pigs, the way in which feed is stored and the effects of consuming processed agro-food products on human health. For these reasons, the control of the nutrition of fat pigs must take into account the proportions of vegetable oils and animal fats used in swine feed to cover the energy level of feed rations, being a close relationship between dietary composition and body fat in pigs for this reason it is relatively easy to manipulate the composition of fat pork by changing the type of fat that is introduced into the rations to regulate the energy requirement and maintain the health of the consumers of such products.

REFERENCES

[1]. BLAIR L.A. și colab., 1984, Swine production and management, Agriculture Canada, Publication 1442

[2]. FEINER G., 2006, Meat Products Handbook: Practical Science and Technology. Sawston: Woodhead Publishing.

[3]. GADEKAR Y.P., SHARMA B.D., SHINDE A.K., MENDIRATTA S.K., 2015, Restructured Meat Products – Production, Processing and Marketing: A Review. The Indian Journal of Small Ruminants, 21(1), 1-12

[4]. GOGYN DAROTA, NOWICKI J., HERBUT P., 2019, Effects of Environmental Enrichment on Pig Welfare – A review. Animals, 9, 1-17

[5]. HEBER LOREDANA, PETROMAN CORNELIA, PETROMAN I., BĂLAN IOANA, MARIN DIANA, IVAŞCU GABRIELA, POPOVICI C., 2010, Pork and carcasses quality in swine exploited in family farms, Scientific Papers Animal Science and Biotechnologies 43(2), 406-408

[6]. HUI Y.H., NIP W.-K., ROGERS R.W., YOUNG O.A. (eds.), 2001, Meat Science and Applications. New York – Basel: Marcel Dekker

[7]. MARIN DIANA, PETROMAN CORNELIA, PETROMAN I., BĂLAN IOANA, TOADER COSMINA, CIOLAC RAMONA, HEBER LOREDANA, FURDUI I., 2010, Distribution of pig livestock by development region in Romania, Scientific Papers Animal Science and Biotechnology, 43(2), 416-419

[8]. QUINIOU N., RENAUDEAU D., DUBOIS S., NOBLET J., 2000, Influence of high ambient temperatures on food intake and feeding behaviour of multiparous sows, Animal Science 70, 471-479

[9]. PEDEN RACHEL S.E., TURNER S.P., BOYLE LAURA A., CAMERLINK IRENE, 2018, The Translation of Animal Welfare Research into Practice: The Case of Mixing Aggression between Pigs. Applied Animal Behaviour Science, 204, 1-9

[10]. PETROMAN CORNELIA, PETROMAN I., MARIN DIANA, GABRIS DELIA RAMONA, CIOLAC RAMONA, VĂDUVA LOREDANA, 2013, Consumption of food in quantitative in terms on average of origin, Scientific Papers Animal Science and Biotechnology 46(1), 382-384

[11]. RADHAKRISHNAN M., SASEENDRAN P. C., ANIL K. S., GEORGE S., USHA A.P., KANNAN A., MUHAMMAD ASLAM M.K., 2018, Analysis of Waste Management System Followed în Pig Farms în Kerala. Animal Science Reporter, 11(4), 1-10

[12]. REESE D.E., THALER R.C., BRUMM M.C., LEWIS A.J., MILLER P.S., LIBAL G.W., 2000, Swine Nutrition Guide. Lincoln, NE: University of Nebraska

[13]. SALAZAR LAURA, KOC H.L.,YANG C.H., LLONCH LOURDES, MANECA X., CAMERLINK IRENE, LLONCH P., 2018, Early Socialisation as a Strategy to Increase Piglets Social Skills in Intensive Farming Conditions, Applied Animal Behaviour Science, 206, 25-31

[14]. STOICA MARIA ANGELA, PETROMAN CORNELIA, PETROMAN I., 1998, Rezultate practice privind valorile unor indici de reproducție la scroafe, Editura Mirton, Timișoara

[15]. VALROS ANNA, HEINONEM MARI, 2015, Save the Pig Trail, Porcine Health Management, 1(2), 1-7