Sustainable pig production - evaluation of different scenarios


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Introduction

The goal of pig production is to produce pig meat to as low cost as possible, as the industry in large is based on short time profit. However, consumers and society show a growing interest in production methods and quality of products (Öborn et al., 2002; Kanis et al., 2003) as well as the negative environmental effects of animal production. Therefore the question of sustainability in pig production needs to be taken into consideration. The aim of this study was to present three future pig production systems based on the different sustainability goals of FOOD21 and evaluate these from economic and environmental aspects.

Material and methods

Scenario methodology was used. We developed a step-wise method where one sustainability goal at the time is optimised. Thereafter, goal conflicts between different sustainability goals are identified. Finally were the sustainability goals grouped into scenarios (Sonesson et al., 2003). Three goal scenarios were identified (A) Animal welfare and natural behaviour of the animals, (B) Low impact on the environment and efficient use of natural resources, including energy, and (C) Product quality and safety. The qualitative descriptions of three future systems are one of the products of the scenario work. The scenarios were parameterised to allow economic and environmental evaluation. The parameterisation was based on the scenario descriptions and included diet formulation, production level, fertilizers, energy use etc. Economy was evaluated based on cost of production per kg pig meat. This included cost for feed, buildings, labour and sundry in piglet and slaughter pig production divided by kg meat produced. The environmental impact of the scenarios was analysed with Life Cycle Assessment (LCA), using the same dataset as in the economic evaluation.

Results

The scenario work resulted in the following descriptions.

Goal scenario A, Focus on Animal welfare and natural behavior of the animals. In this scenario, production is integrated. Sows are kept outdoors in summer and indoors at winter. Slaughter pigs are kept in a veranda system. Diluted diets were used for satiety. Groups are kept intact and slaughtered in batches, based on age. Ley for the pigs is included in the crop rotation together with protein feed crops such as rapeseed and peas, and cereals. Low doses of N fertilizers are applied to decrease the risk for fungi attacks on the crops and thereby decrease the need for pesticides to guarantee crop quality.

Goal scenario B, Focus on Low impact on the environment and efficient use of natural resources. In this scenario, the production form is specialized. All pigs are kept indoors. The buildings are ‘closed’ to control the emissions from manure. Synthetic amino acids and enzymes (phytase) are used to increase the feed efficiency. Phase feeding is practiced. The sexes are raised separately to different slaughter weights. The crop rotation is designed to meet the feed demand with locally produced crops and crop rotation is set up to utilize the positive effects of rotation on nutrients, weed and pest reduction. Catch crops and a high proportion of winter crops are grown in order to prevent nutrient losses.

Goal scenario C, Focus on Product quality and safety. In this scenario, the whole production chain from animal to retailer is integrated. Production is indoors with specialized production. The buildings have a well-controlled environment including ventilation, temperature, feed
distribution etc to achieve a certified production. All male slaughter pigs are castrated. Health is well monitored and preventive medical treatment are used. The time of slaughter is based on individual weight. The feed production uses precision farming in order to obtain high and consistent crop quality. Cereals dominate crop rotation as imported soy meal is used as protein feed.

Economic and environmental evaluation. The production costs per kg meat produced were highest for the animal welfare scenario, whereas there were similar costs for the environmental-friendly scenario and the product quality scenario. For all three scenarios, buildings, feed and labor were the largest components of the total cost. According to the LCA the environmental-friendly scenario has the lowest energy consumption, global warming potential, land use, and surplus nutrients calculated per kg meat produced. The product quality scenario has the highest energy consumption, global warming potential, pesticide use, and surplus nutrients, whereas the animal welfare scenario is intermediate, except for highest land use. The surplus N and the use of pesticides are significantly higher in the product quality scenario compared to the other two scenarios.

Discussion
The use of this method resulted in three different scenarios. Each of them had one aspect of sustainability in focus, but in conflict with the others goals. The ranking between the different aspects of sustainability may differ between different people and over time.

Today, there is an increased production cost taking animal welfare into account as in the animal welfare scenario. This is due to increased feed intake and higher building costs. The future profit of consumers’ confidence in pig production with high animal welfare is however not included. The environmental scenario and the product quality scenario have similar economic costs per kg meat produced. The environmental evaluation on the other hand, shows differences in all measures to the advantage of the environmental friendly scenario. This is the result of several choices made in both feeding and crop management, such as more efficient utilization of nitrogen. The product quality scenario has high emissions due to the poor crop rotation. Mainly cereals are grown as the protein feed is imported soy meal. This scenario resembles today’s production, where raw materials for pig feed often are grown in regions or countries other than where pig production takes place (Jongbloed and Lenis,1998).

Acceptance of production systems by the society is fundamental for the survival of pig production. Kanis et al. (2003) conclude that even though the prime interest of consumers is low prices on pork, there is a growing concern of food safety of pork, animal welfare and environmental pollution etc, which needs to be address.

How to evaluate different aspects of sustainability is mainly a political question, and legislation and political decisions can easily change the ranking of the scenarios. But these decisions should be based on knowledge. Scenario studies like this one is a useful tool in the search of new knowledge, as a compliment to traditional scientific studies.

References