PROSPECTS OF PIGS PRODUCTION IN POLAND IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT

Elżbieta Szymańska
Warsaw University of Life Sciences, Warsaw, Poland

The research was aimed at defining the perspective of the production of porkers in Poland in the context of sustainable development. The analysis was based on data from 100 farms specialising in the production of porkers located in different parts of the country. The research included the stocking density of pigs per 100 ha UAA, the level of investment in the farms and benefiting from agri-environment payments. The first coefficient informs about the amount of natural fertilizers on the utilized agricultural area, the second one shows the costs paid by farms to increase the productive capital and the third one marks taking measures to protect natural environment. In the data analysis descriptive statistics and correlation analysis have been used. The studies indicate that the process of pig breeding concentration is progressing. The number of pig farms drops but at the same time an average scale of production is growing. Farms with a large scale and intensive production negatively affect natural environment to a bigger extent. In order to enhance further farm development some farmers pursue investments in building, machine or buying land. Farms with a smaller scale of production take more actions to protect the environment.

Keywords: durable development, pig farms, investments

Introduction

The concept of a "sustainable (balanced) development" sets the current direction of socio-economic development all over the world. Its creation was inspired by a fast economic growth occurring continuously in the second half of the 20th century and leading to a more intensive exploitation and reduction of the accessible natural resources. In general, the concept of a sustainable development implies that all human action on Earth should be: viable, ecologically safe and socially accepted (Majewski, 2008). According to the model put forth by Adamowicz and Dresler (2006) the approach should increase the quality of life of present and future generations through integration and cultivating appropriate proportions between the five basic dimensions: economic, ecological, social, institutional and spatial. Only the integration of environmental, economic and social policies can meet the challenges of sustainable development. It involves reconsidering the natural resources as limited economic resources and such use of natural capital that enables the conservation of the ecosystems' functioning in a long-term perspective.

The concept of sustainable development also involves the issues of agriculture and rural development. One of objectives of the agriculture described as sustainable is such use of earth's resources which does not destroy their natural sources but can provide for the basic needs of the next generations of producers and consumers (Smagacz, 2000). For a farmer a sustainable agriculture means a systematic growth of his farm and enhanced production which allows for the increased prosperity, the renewal of technical equipment, the improvement of the productivity and social security. Therefore, it concerns such management policies that ensure the concurrent execution of production, economic, ecological, ethical and social objectives (Runowski, 2000).

The increasing globalisation and the growth of the global competitiveness enhanced the development of the industrial agriculture which is characterised by intense specialisation, concentration in production, mechanisation and high intensity. As a consequence, that agriculture affects negatively the natural environment, poses a threat to biodiversity and to people and animal health, leads to the overproduction of food, and at the same time causes the drop of prices and farmers' incomes (Kuś, 2005). The essential part of agriculture are pig farms characterised by large-scale production. High concentration of pigs is a serious threat to the environment through the emissions of gas and dust from the inventory buildings and because of animal droppings, especially the slurry, which when poorly handled, pollutes waters and soil, constituting a risk to people and animals.

Material and Methods

The research was aimed at defining the perspective of the production of porkers in Poland in the context of sustainable development. The reference books and the data from the Central Statistical Office of Poland provided for the source of information. The basis of analysis were the data from 100 farms specialising in the production of porkers. The data were collected in the interviewer questionnaire completed in 2011. In those farms the ratio of pigs in the sales value was more than 60.0% and the production volume included the maintenance of 50 and more sows and/or the production of 1000 and more finishers annually. The analysed units were located in different parts of the country, mostly in the regions of the biggest concentration of pig farming in Poland. The research considers the rate of pigs per 100 ha of utilized agricultural area, the fact of benefiting from the agri-environment payments and the level of investments in the farms. The first indicator informs about the amount of natural fertilisers that burden the utilized agricultural area (UAA) with regard to the land's absorption capacity as the excess of nutrients may induce the crops change and degrade the natural environment. It has been adopted in the Nitrates Directive that the admissible stocking density in the countries of European Union must not exceed 1.8 – 2.0 LU/ha UAA, which corresponds with the annual production of nitrogen in their droppings at the level of 170 kg/ha UAA (Dyrektywa, 12/12/1991). At present this density is 4 times larger than the Polish mean value.

The second indicator covers the expenditures on increasing the productive capital that permits farm development. In Józwiak and Kagan's

opinion (2008) taking investment measures by farmers indicates their commercial activities, farm modernisation and the increase in the production scale. Production investments determinate the development opportunities of farms. They imply that a farmer increases the resources of fixed assets or improves their quality, which is supposed to contribute to the growth of the farm potential in the future. The research considers the investments in buildings and structures, plant and machinery and the purchase of the land used for cultivating. The third indicator shows that measures are taken to integrate environmental protection with the agricultural development in such a way that the adverse effects of agriculture can be minimised and its positive effect enhanced. Therefore, it indicates environmentally friendly farming. In the data analysis descriptive statistics and correlation analysis have been used.

Results and Discussion

Breeding pigs influences all natural environment resources like water, soil and air, but also biodiversity of species and the tourist and recreational landscape values. This is due to the specific characteristics of this animal species, to the systems of their maintenance but also to the problems concerning utilisation or handling of pigs' droppings. It is estimated that 60.0 – 80.0% of nitrogen compounds and phosphorus taken by pigs is not used and discharges in the environment in solid, liquid or gaseous form pollute the soil, water and air (Gołaś and Kozera, 2008).

Most problems in the use of animals are due to ammonia which is emitted together with the animal urine and during the storage of manure and slurry. The ammonia emission is accelerated by a high amount of protein in the forage, by high temperature and droppings gathering in pens. Another chemical compound that evolves in the pigsty is hydrogen sulphide which results from fermentation in the animal faeces. This gas is highly toxic and especially dangerous for little piglets. Breeding pigs is also the emission source of methane, nitric oxide and carbon dioxide. These gases are classified as greenhouse gases as they gather in the atmosphere resulting in the climate warming. Methane and carbon dioxide are particularly difficult to control as they are odourless and colourless (Szymańska, 2009). High heavy-metal content in the manure, especially of zinc and copper, which constitute the concentrated feed additive, is a decisive factor influencing the quality of soil around pig farms that use organic fertilizers. Dissolution of compounds containing phosphor, a forage component, leads to emission of another environmentally harmful gas – cadmium. The organisms of pigs absorb only 5.0 – 15.0% of these compounds contained in forages. The rest is passed on to the soil with the solid faeces, and having penetrated the plant tissues constitutes a threat to people and animal health.

Breeding pigs also involves a specific odour which increases with a big concentration of pigs. Furthermore, the production of porkers is often accompanied with noise and dustiness. Another key issue is the presence of antibiotics and other medicinal products in the animal droppings. Their use (often in excessive amounts) contributes to contamination of water and soil with pharmaceutics and to the creation of dangerous, antibiotic-resistant strains of micro-organisms which penetrate into the environment.

The adverse effects of the pig breeding on the environment are increased due to the intensification and concentration of production. Scale effect related activities lead to more economic benefits and at the same time deteriorate the parameters of different elements of the environment. In this respect, considerable changes can be met in Polish agriculture. According to the General Agricultural Census, in 2002 pigs were held in 760 600 farms (Użytkowanie, 2003). An average stocking density of this species totalled 110.2 pigs per 100 ha UAA. The structure of farms according to the scale of pig breeding was considerably fragmented. In 52.8% farms a few pigs were held, and in 19.2% there were a dozen of these animals. Only in 28.0% farms the scale of pig breeding was more than 20 pigs.

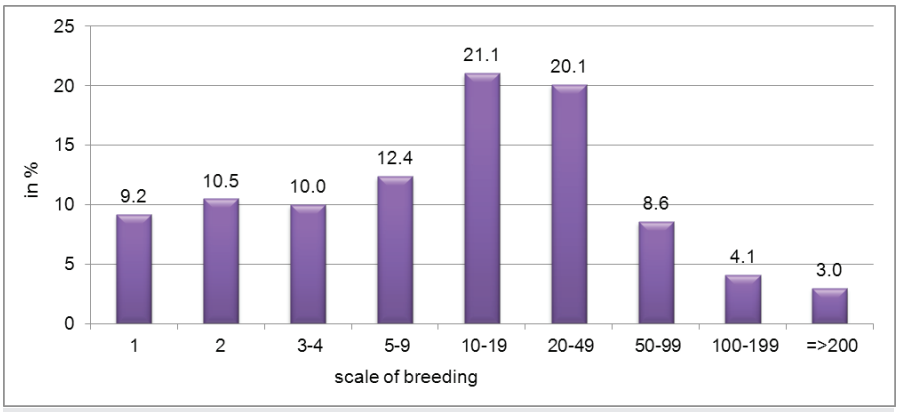

Figure 1 The share of farms with different scale of pig breeding in Poland in 2011
Source: own calculations based on CSO data

In June 2011 the pig inventory numbered around 13 500 000 pigs which constituted 87.0 of the species per 100 ha UAA. More than 359 000 individual farms were active in the production of porkers, of which 42.1% held only a few pigs (Fig. 1). Nearly the same percentage share concerned the farms (41.1%) with the herds of 10 to 49 pigs. More than 100 pigs were to be found in 7.1% of farms (Użytkowanie..., 2011). It can be claimed from these data that in spite of the increasing concentration of pig herds in Poland, breeding this species is still very diffused. Small-scale production farms have scarce adverse effects on the natural environment due to vast opportunities to maintain sustainability of agricultural production.

The analysed farms were characterised by a relatively large-scale production as for Poland, namely between 22.7 to 2100.9 tons of porkers a year. This variability was due to different types of farming. A closed breeding cycle was used in 63.0% of farms. It consisted in keeping livestock and the final products were finishers. On the other hand, in one fourth of the analysed farms the open breeding cycle was found, consisting in buying piglets or weaners and thus raising finishers. As much as 12.0% of farms were characterised by a mixed breeding cycle. In larger scale farms stocking density of pigs per area unit was bigger. It was explained by the fact that pig farming is to a lower extent related to the land than breeding ruminant animals. As the producers of porkers use purchased forage to feed their animals, they do not have to be active in the production of plants. In the analysed group of farms the utilized agricultural area was from 7.5 to 793.6 ha. In large-scale production farms an average area of UAA was larger, too.

In regard to the possessed resources of the earth, stocking density of pigs was between 0.2 to 105.4 LU per 1 ha UAA. As for 37.0% of farms, it complied with the requirements of the Nitrates Directive, and with regard to the rest of units it did not satisfy the adopted standards. In the group characterised by the smallest production volume stocking density was on average 1.6 LU per ha

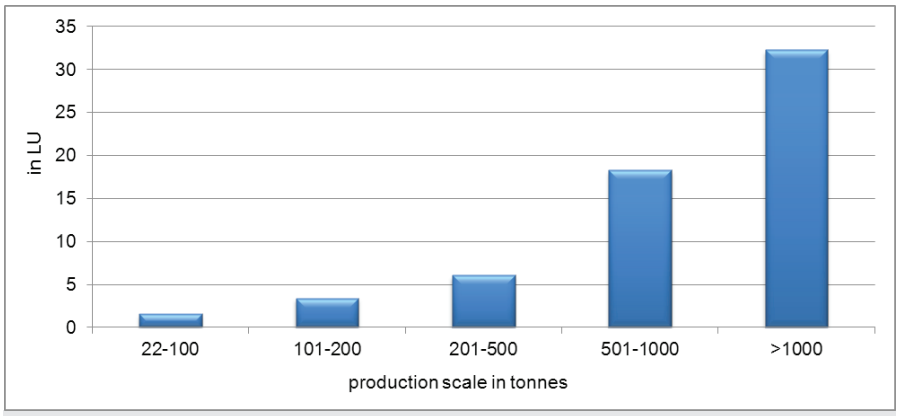

Figure 2 Stocking density of pigs per 100 ha of utilized agriculture area in farms with different scale of production
Source: own research

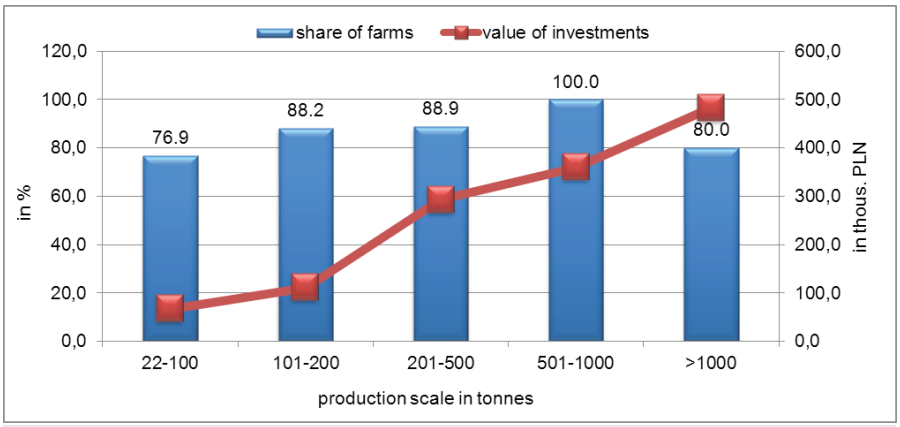

Figure 3 The share of producers investing in fixed assets on farms with different scale of production
Source: own research

of UAA (Fig. 2). In the second group it was more than twice that big. In the farms with the larger production scale its mean value was 32.3 LU per ha of UAA. A statistically vital relationship occurred between the scale of production of porkers and stocking density. The correlation coefficient between these variables amounted to 0.64.

In order to stay on the market and to ensure further development of farms, 86.0% of farmers invested in fixed assets in 2010. Most investments involved the purchase of machines. This fixed assets inventory was increased by 3/4 of farmers. Half of the respondents invested available money in buildings and structures and 18.0% of producers increased the area of their farms.

The proportion of farms that carried out investments in particular groups varied (Fig. 3). In the smallest-scale farms more than 3/4 of farmers invested their cash money in buildings and machines. In the fourth group, where the annual production of porkers was from 501 to 1000 kg, all farms increased the fixed asset inventory. In the remaining groups the proportion of investing farms was from 80.0 to 88.9%. In the large-scale production farms the amount of investments was bigger. In the first group an average sum of money spent on investments was 67 100 PLN and in the last group it was 483 400 PLN. The correlation coefficient between the scale of production and the amount of investments amounted to an average level and was 0.48

Some farmers from the analysed group of farms implemented the measures for the environmental protection as part of the RDP (Rural Development Programme) packages. It has been implied by the amount of agri-environment payments benefited by 34.0% of the producers of porkers. A larger proportion of farms with the agri-environment payments has been found within the small-scale farms' group. The smallest percentage of farmers implementing measures for environmental protection has been quoted in the group producing from 501 to 1000 tons of porkers per year (Fig. 4).

The average value of agri-environment payment was 35 600 PLN. However, the payment differential between the farms was very high. Farmers received annually from 1 400 PLN to 372 600 PLN. A high differential in the level of payment is also indicated by the value of the standard deviation. The highest agri-environment payments were found in the largest-scale farms. However, no statistically significant difference has been observed between the production scale and the level of agri-environment payments.

Furthermore, all farmers in the analysed group of farms benefited from direct payments by virtue of their utilized agricultural area ownership and 63.0% of the producers of porkers received compensation for the less-favoured areas (LFA).

The cross-compliance principle also necessitates the concern for the environment in the pig farms. It means combining the amount of direct payments and those benefited from the measures under the Rural Development Programme for the years 2007 – 2013 (RDP 2007 – 2013) included in axis II i.e. agri-environment payments, LFA payments for

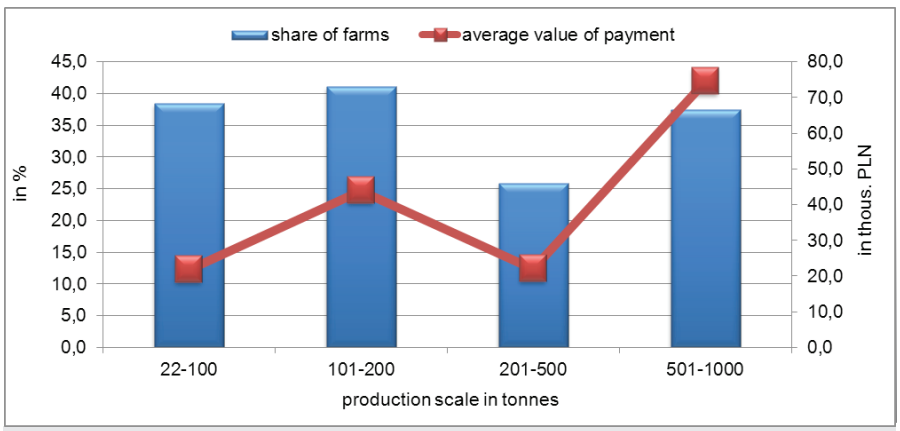

Figure 4 Share of farmers receiving agri-environmental payments and the average value of payments in farms with different scale of production
Source: own research

farming in the mountain areas and in other less-favoured areas and for the afforestation of agricultural land with meeting defined requirements by those who benefit. The requirements in question include:

- protecting environment from pollutions resulting from the farming activities,
- production of agricultural products without a threat to the health of people, animals and plants,
- providing for animals' well-being.
- land farming with no impairment to their quality (Minimalne..., 2010).

In Poland, the cross-compliance requirements are implemented gradually. The requirements to identify and register the animals and those to protect natural environment are applied from the 1st January 2009. In 2011, there were implemented the requirements regarding public health, and animal and plant health. Those concerning the animals' well-being will be applied from 2013. In the case of non-compliance, direct payments will be reduced in proportion to the scale of infringements.

Conclusions

1. The studies indicate that the process of pig breeding concentration is progressing. The number of pig farms drops but at the same time an average scale of production is growing. This increase can be achieved through benefiting from the economies of scale like lowering individual costs of production and the supply of large lots of finishers on the market, for which a higher selling price can be obtained.

   The increase of production scale is forced as well by a growing competitiveness in the European pig market.
2. Large-scale production farms adversely affect the natural environment to a bigger extent due to droppings, gas emissions, noise and the dustiness of space. The stocking density of pigs in 63.0% of analysed farms was higher than the norm adopted in the EU countries, the later amounting to a maximum of 2 LU per 100 ha per UAA. Insufficient area of utilized agricultural area hindered appropriate use of livestock manure.
3. In order to enhance further pig farm development, some farmers pursue investments in building or extending the buildings and in buying machines and land. In 2010 the fixed asset inventory was increased by 86.0% farmers in the analysed group, in view of further development. Large-scale production farms were characterised by a higher amount of investments.
4. Reduction of negative impacts of farming on the natural environment is one of the primary objectives of the common agricultural policy. Agri-environmental measures are addressed to those farmers who want to contribute to the improvement of environmental quality and to preserving natural assets of the rural areas. By this virtue, 34% producers of porkers from the analysed group benefited from payments. However, application of agri-environmental measures was more frequent in small-scale production farms.

References

ADAMOWICZ, M. – DRESLER, E. 2006. Zrównoważony rozwój obszarów wiejskich na przykładzie wybranych gmin województwa lubelskiego. Zeszyty Naukowe Akademii Rolniczej we Wrocławiu, 2006, no. 540, p. 17 – 24.

DYREKTYWA RADY 91/676/EWG z dnia 12 grudnia 1991 r. dotycząca ochrony wód przed zanieczyszczeniami powodowanymi przez azotany pochodzenia rolniczego. Dz.U. L 375 z 31. 12. 1991.

GOŁAŚ, Z. – KOZERA, M. 2008. Ekologiczne konsekwencje koncentracji produkcji trzody chlewnej. In: Journal of Agribusiness and Rural Development, 2007, no. 1(7), p. 29 – 42.

JÓZWIAK, W. – KAGAN, A. 2008. Gospodarstwa towarowe a gospodarstwa wielkotowarowe. Roczniki Nauk Rolniczych, seria G., t. 95, z. 1, p. 22 – 30.

KUŚ, J. 2005. Ekologiczne podstawy integrowanej produkcji roślinnej. Materiały Szkoleniowe, IUNG Puławy, LODR Końskowola, 2005, p. 101 – 108.

MAJEWSKI, E. 2008. Trwały Rozwój i Trwałe Rolnictwo – teoria i praktyka gospodarstw rolniczych. Warszawa : Wydawnictwo SGGW.

MINIMALNE wymagania wzajemnej zgodności (cross-compliance) dla gospodarstw rolnych. Praca zbiorowa. Brwinów : Centrum doradztwa rolniczego w Brwinowie. 2010.

RUNOWSKI, H. 2000. Zrównoważony rozwój gospodarstw i przedsiębiorstw rolniczych. Zeszyty Naukowe SERiA, t. 2, z. 1, p. 94 – 102.

SMAGACZ, J. 2000. Rola zmianowania w rolnictwie zrównoważonym. Pamiętnik Puławski, z., vol. 120, 2000, no. 2, p. 411 – 414.

SZYMAŃSKA, E. 2009. Environmental protection in farms of various slaughter pigs' production scale. In: Quality in improvement of production and service processes. Edited by J. Lewandowski, M. Sekieta. Technical University of Lodz. Łódź, 2009, p. 167 – 176.

UŻYTKOWANIE gruntów, powierzchnia zasiewów i pogłowie zwierząt gospodarskich w 2011 roku. http://www.stat.gov.pl/gus/5840_787_PLK_HTML.htm [23.03.2012]

UŻYTKOWANIE gruntów, powierzchnia zasiewów i pogłowie zwierząt gospodarskich. Powszechny Spis Rolny 2002. GUS, Warszawa 2003.

The research study was funded with budgetary resources for education between 2010 and 2012 as research project no. N N112 156739

Contact address

Elżbieta Szymańska Ph.D., Warsaw University of Life Sciences, Faculty of Economic Sciences, Department of Economics and Organization of Enterprises, Nowoursynowska 166 ST, 02–787 Warsaw, Poland, tel. 4822/593 42 27 fax. 4822/593 42 29, e-mail: elzbieta_szymanska@sggw.pl