

# SCIENTIFIC HORIZONS

Journal homepage: <https://sciencehorizon.com.ua>  
*Scientific Horizons*, 26(6), 110-120



UDC 332.13

DOI: 10.48077/scihor6.2023.110

## Analysis of the economic efficiency of growing pigs for meat and its improvement

**Ermir Shahini\***

Lecturer

Aleksandër Moisiu University of Durrës  
2001, 14 Currila Str., Durres, Albania  
<https://orcid.org/0000-0002-0083-1029>

**Mykola Misiuk**

Doctor of Economic Sciences, Professor  
Higher Educational Institution "Podillia State University"  
32316, 12 Shevchenko Str., Kamianets-Podilskyi, Ukraine  
<https://orcid.org/0000-0003-2903-7715>

**Maryna Zakhodym**

Candidate of Economic Sciences, Associate Professor  
Higher Educational Institution "Podillia State University"  
32316, 12 Shevchenko Str., Kamianets-Podilskyi, Ukraine  
<https://orcid.org/0000-0003-0010-8006>

**Valentyna Borkovska**

Candidate of Economic Sciences, Associate Professor  
Higher Educational Institution "Podillia State University"  
32316, 12 Shevchenko Str., Kamianets-Podilskyi, Ukraine  
<https://orcid.org/0000-0002-2983-2973>

**Nonna Koval**

Candidate of Economic Sciences, Associate Professor  
Higher Educational Institution "Podillia State University"  
32316, 12 Shevchenko Str., Kamianets-Podilskyi, Ukraine  
<https://orcid.org/0000-0002-1882-381X>

### Article's History:

Received: 30.03.2023

Revised: 27.05.2023

Accepted: 10.06.2023

**Abstract.** Agriculture has always played a vital role in Ukraine, which is primarily due to the geographical features of the location. Currently, the agricultural sector is the basis of the country's international specialisation. Thus, finding opportunities to improve this sector efficiency is still relevant. Therefore, the purpose of the study was to find ways to increase efficiency during activities in one of the agriculture branches, namely livestock breeding, within the framework of raising pigs. The main methods during work were analysis, deduction, modelling, forecasting, etc. During the study, a detailed review of the

### Suggested Citation:

Shahini, E., Misiuk, M., Zakhodym, M., Borkovska, V., & Koval, N. (2023). Analysis of the economic efficiency of growing pigs for meat and its improvement. *Scientific Horizons*, 26(6), 110-120. doi: 10.48077/scihor6.2023.110



Copyright © The Author(s). This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (<https://creativecommons.org/licenses/by/4.0/>)

\*Corresponding author

considering possibilities of the efficiency improvement of raising pigs was conducted. They were conventionally divided into two categories: connected with management processes and directly caring for animals. Thus, the author concludes that by using some methods of raising animals, a better quality of meat can be achieved, and therefore receive higher profits from its sale. During the study, possibilities connected with diet regulation, animals living conditions (temperature, enclosures, etc.), genetics and some others were directly considered. As for management tips, they are also analysed and provided by the authors: in particular, it was determined that cost reduction plays a huge role in such enterprises. In addition, the work considers the features of these enterprises work in terms of environmental safety and mentions the state role in the industry development

**Keywords:** agriculture; Ukraine economy; entrepreneurship; management; livestock breeding

## INTRODUCTION

Agriculture plays a key role in the development of any country (Praburaj, 2018; Till, 2022). This opinion is now held by most researchers in the world (Mundlak *et al.*, 2004), but it was not always so. Thus, in the 20<sup>th</sup> century, it was believed that the agricultural sector had a passive role, the essence of which was the redistribution of labour and part of investments (Lewis, 1954). This led to a certain neglect of the industry, which could cause huge losses in the long-term. The main reason for the agriculture importance is that it plays an important role for the economy and in terms of strategic security: being able to grow its own resources at least to meet most of the domestic population needs, the country can be protected from external price fluctuations of agricultural products, supply restrictions, etc. (Steven & Wiebe, 2021). This is very important, especially in the realities of ongoing globalisation (Nugroho *et al.*, 2021; Assaoui & Fabian, 2021).

Now, the agricultural sector is one of the principal areas of activity in Ukraine (Dmytriieva & Sviatets, 2021). There are many reasons for this: a significant role in the country's international trade in agricultural products (Kholoshyn *et al.*, 2021), a large share of the sector in the country's GDP (Kaminskyi *et al.*, 2021), a significant role in job creation etc. Therefore, creating the most favourable conditions for enterprises in this industry stays relevant. Crop production is widespread in Ukraine, considering the placement of chernozem soils on its territory (Pozniak, 2019). Nevertheless, livestock breeding also stays a critical component of development within the framework of Ukrainian agriculture. In addition, it is currently becoming even more relevant, considering the crisis phenomena that began to appear in the pig farming in Ukraine after the full-scale invasion of russia (reduction of livestock, decrease in the competitiveness of local enterprises, increase in pork imports, etc.) (Maksym *et al.*, 2022). Thus, it is still important to assess the economic efficiency of raising different types of animals. In this work, the assessment was conducted for pigs.

A substantial number of scientists were engaged in the study of the productivity improving of livestock breeding. S. Millet *et al.* (2018) assessed the efficiency of raising pigs (namely, their protein absorption),

considering the managing features by some processes connected with animal care. In the work, the authors mention the role of proper fattening, selection, and castration. However, attention is not paid to other essential elements that are also present during the management of a pig-raising farm. V. Maksym *et al.* (2022) conducted a study on the assessment of the current state of pig farming in Ukraine (sharp changes in which occurred primarily due to the beginning of the full-scale invasion of russia) and the possibility of increasing the efficiency of pig farming. Attention should be also paid to the works that evaluated the cultivation industries in different countries. Thus, G. Wang *et al.* (2021) conducted a study within China. Scientists clearly indicated the main threats facing meat producers and provided advice for minimising them in the future. In addition, the work of A.K. Ruckli *et al.* (2021) should be noted, who assessed the features of pig farms in terms of their negative impact on the environment.

Thus, the purpose of the work was to assess the possibilities for increasing the efficiency of pig raising. This can make it possible to increase the incomes of farmers all over the world (including in Ukraine), and therefore to increase the strength of the country in the face of external crises and create more added value.

## MATERIALS AND METHODS

During the study of the economic efficiency increasing analysis of pigs raising for meat, the author assessed the general industry state in Ukraine. For this, some data were used on the number of pigs in the country by year, slaughtered animals, and pork exports in general. To assess the possibilities and methods of the efficiency increasing of pig raising, data from various scientific sources were used. The existing methodology was assessed for its efficiency, after which the conclusions were made of which of them is the most effective, how they can be used in a single system, and how it will help in terms of pigs raising for meat.

As part of the study, the author used some statistical data sources. Among them, the official website of the State Statistics Service of Ukraine should be noted, the data of which made it possible to consider in more detail some inbuilt tendencies connected with the pig farming

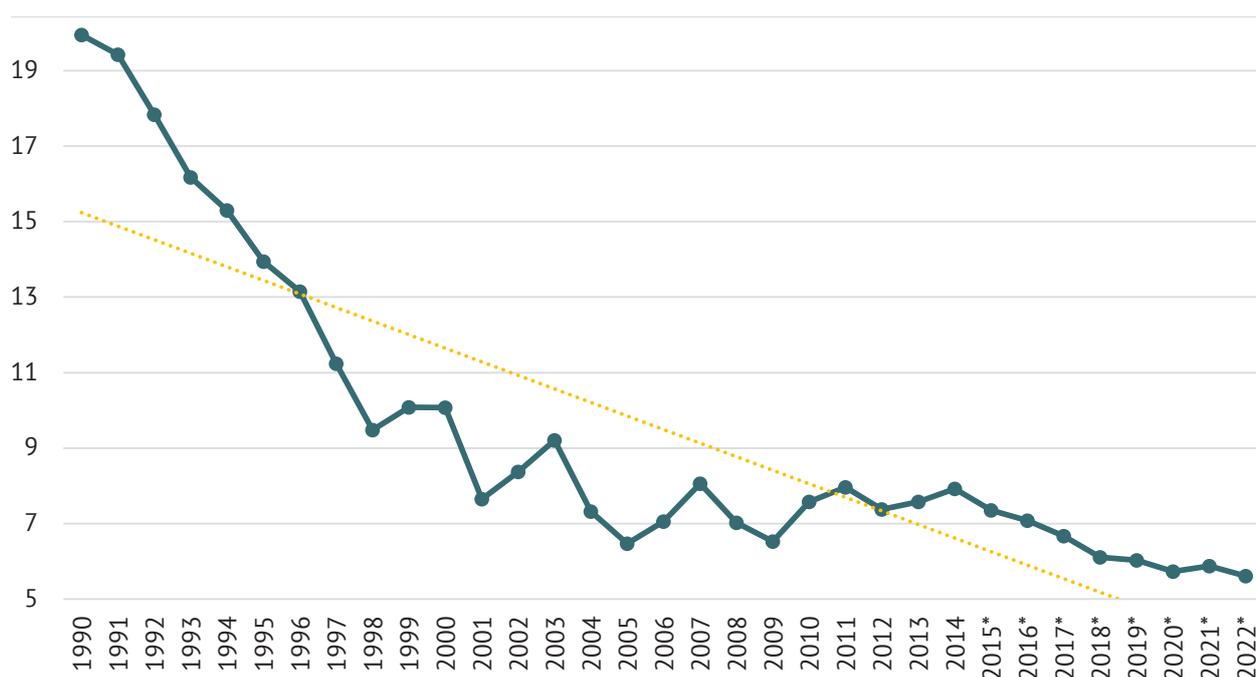
development in the country (the number of raised and slaughtered animal units, etc.) (Ukrstat Agriculture, 2023), as well as statistical data from International Trade Centre, namely the TradeMap platform (2023). These data made it possible to assess the situation in terms of international trade in pig meat by the country. In addition, the author used some data from the Ukrainian legal and regulatory framework, namely the Law of Ukraine "On State Support of Agriculture of Ukraine" (2004).

During the study, the author used an analytical approach. It made it possible to conduct an analysis of a substantial number of various sources and to identify patterns in pig farming, as well as to find opportunities to improve the efficiency of this process. A quantitative approach was also used, because the statistical data describing the functioning features of the pig farming in Ukraine were also used during the work. In addition, the author used a considerable number of scientific study methods. The main among them can be considered the analysis considering the information volumes that had to be processed during the work. In addition, the historical study method was used, which made it possible to assess the functioning features of pig farming

in Ukraine and some other countries (China, Nigeria, etc.), their features of conducting business. Statistical study methods were also used in the work, which were used to process quantitative data; at the same time, the graphical method made it possible to depict all of them in an understandable form. The deduction method was used to assess the general state of pig farming in Ukraine, considering the known data on individual indicators that characterise it. Modelling also became important, which was used in assessing the impact of the advice provided in the work to increase the economic efficiency of pig farming. For more qualitative conclusions about the future state of such farms, forecasting was used. The comparison made it possible to assess various methods of assessing the efficiency improvement of pig raising and to make conclusions about which of them should really be used.

## RESULTS

To begin with, authors will consider some data about the pig farming development in Ukraine. Thus, Figure 1 below shows information about the number of pigs in the country from 1990 to 2022.



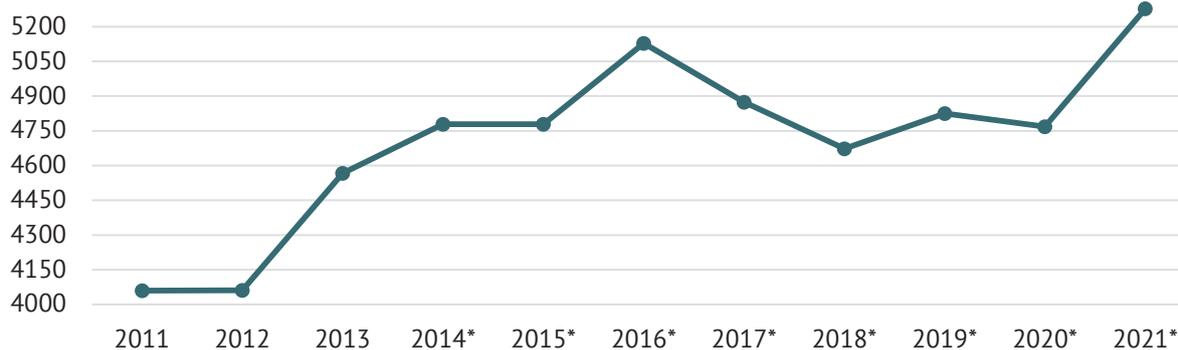
**Figure 1.** Number of pigs in Ukraine from 1990 to 2022, million animal units

**Note:** The data are provided without considering the temporarily occupied territory of the Autonomous Republic of Crimea, the city of Sevastopol and part of the temporarily occupied territories in the Donetsk and Luhansk regions.

**Source:** created by the author based on data from the State Statistics Service of Ukraine (Ukrstat Agriculture, 2023)

As it can be seen from Figure 1, the number of pigs in Ukraine has a gradual downward tendency: the decline was most active until 2000, after which it slowed down; however, it accelerated again after 2014. All

this indicates on the existing problems in the industry. However, it is interesting to note that the pig slaughter data, shown in Figure 2 below, provides evidence of something different.



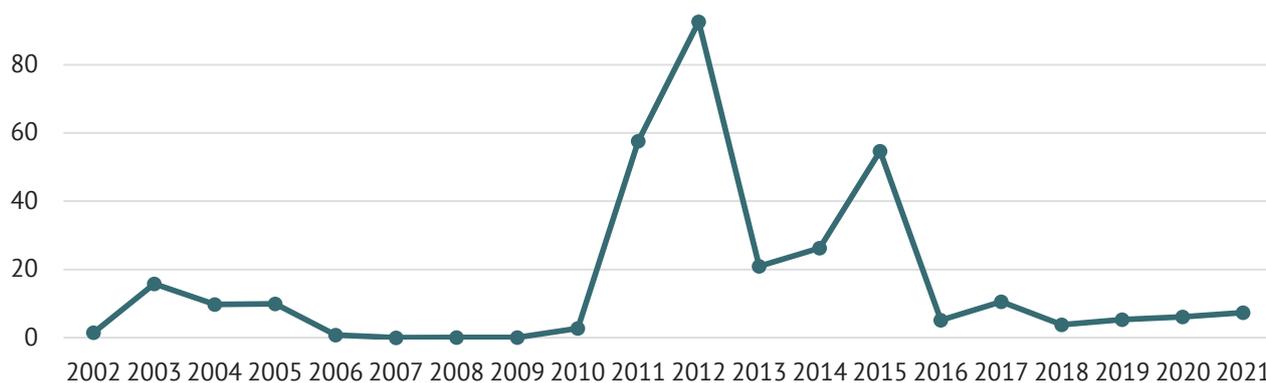
**Figure 2.** The number of pigs slaughtered in Ukraine in 2011-2021, thousand animal units

**Note:** The data are provided without considering the temporarily occupied territory of the Autonomous Republic of Crimea, the city of Sevastopol and part of the temporarily occupied territories in the Donetsk and Luhansk regions

**Source:** created by the author based on data from the State Statistics Service of Ukraine (Ukrstat Agriculture, 2023)

As Figure 2 shows, the number of animal units for slaughter in Ukraine is increasing every year on average, while the number of pigs being raised is decreasing. It is possible to calculate the difference between the data on the number of pigs in the country in general and the

number of animals slaughtered in 2011-2021: this figure drops sharply from 3.9 thousand to only 0.6 thousand animal units. This may indicate a gradual increase in the agriculture efficiency. Figure 3 shows data on this product export.



**Figure 3.** Pig meat export by Ukraine in 2002-2021, million dollars

**Source:** created by the author based on data from the State Statistics Service of Ukraine (Ukrstat Agriculture, 2023)

As it can be seen from Figure 3, the pig meat trade in Ukraine is quite unstable and can vary greatly from year to year. Thus, the average values for all this time reached the level of up to 10 million dollars, however, in some years they reached 20-95 million dollars. As of 2021, Ukraine's meat exports have been gradually increasing since 2018. Data for 2022 is not currently available, but it can be assumed that it will be

significantly lower than in 2021 due to the full-scale invasion of russia and the significant export capacity of Ukraine. Thus, it can be concluded that pig farming in the country is gradually declining, which can relate to Ukraine's greater direction towards trade in plant sector products. There are quite a few indicators that can be used to assess the economic efficiency of pig farming. In general, they can be described as shown in Table 1.

**Table 1.** The list of indicators of economic efficiency of an enterprise

Seq. No.	Factor class	Factor name
1	Costs	Fodder
2		Fuel and lubricant oil
3		The rest of the material costs
4		For labour payment

Table 1, Continued

Seq. No.	Factor class	Factor name
5		Social contributions
6	Costs	Amortisation
7		Services payment to third-party organisation
8		Other general production costs
9		Fodder conversion
10		Sale price
11		Production of products per 1 average annual animal unit
12	Other	Fodder cost
13		Marketability level
14		Maturity level
15		Average annual livestock at an enterprise

**Source:** created by the author based on data from the work of V. Maksym *et al.* (2022)

As Table 1 shows, 15 indicators of the economic efficiency of pig farming can be identified. Over 50% of them (8/15) are in a certain way connected with the expenditure side of the enterprise organisation, while others can be of the most diverse nature: price, livestock volumes, production efficiency, etc. Thus, a particularly vital component of increasing the economic efficiency of pig farming is the costs minimisation.

It should be noted that the efficiency of pig raising can vary depending on the company size that wants to start a business. Thus, in most countries of the world, producers of agricultural products can be divided into two groups: small (small farmers and SMEs) and large (certainly, medium-sized enterprises can be distinguished, but they will have characteristics of both small and large, therefore, it is more important to consider these two groups) (Havlicek *et al.*, 2020). They have unique features within the production processes, which affect the price and market relations. Thus, production processes in large pig farms resemble those typical of industry: they are precise, efficient, and narrowly focused. Thus, animals raised by such producers have a competitive advantage in the market. In turn, small farmers have less favourable conditions, they often do not specialise in one production and are forced to subsidise their own production with the help of external resources (although some modern studies come to the opinion that small farms can show a better result than large ones, in developing countries, but this statement needs a separate discussion (Delvaux *et al.*, 2020; Aragon *et al.*, 2022). Thus, given their competitive advantages and large production volumes, large producers have the opportunity to influence the price, which reduces the number of small enterprises and leads to the actual agriculture monopolisation, which negatively affects its further development. However, it should be noted that how efficient production on the farm will be depends also on a farmer's capabilities.

Thus, education and level of a manager's knowledge (especially in the agricultural industry) strongly affects the efficiency of raising of any species plants or animal species. Thus, especially in developing countries, it is farmers fault for existing inefficiencies in their enterprises and could increase their income level by an average of 3% without involving innovative technologies (Umeh *et al.*, 2015).

The diet chosen by a farmer plays a special role in raising pigs, which is already a part of increasing efficiency by optimising animal care. If possible, feeding should be adapted for each animal individually (Soleimani & Gilbert, 2021). In other words, the diet choice should be determined based on the genetic line features of certain breeds of pigs; this makes it impossible to offer a universal option of diets. It is also important how much food the animals will consume during the raising and in the last development stages. Thus, reducing the food amount from the ad libitum level (that is, when animals can eat as much as they want) by 25% leads to a decrease in weight gain by 27-35% (Lebret, 2008). Sometimes, this feature can be used skilfully. For example, to regulate the amount of fat and meat in a pig after slaughter (because fat begins to be actively deposited at an older age).

Some manipulation of the future pigs' weight can be done using the compensatory growth response, that is, a physiological phenomenon that accelerates the final growth rate, which is achieved by initial food restriction and subsequent ad libitum feeding (Campbell, 1983; Menegat *et al.*, 2020). The animal's response to such feeding strategy can vary depending on when it is introduced and the feeding restriction duration: for example, if restriction begins between 28 and 90 days of age, a response can be expected at slaughter after approximately 140 days (Therkidsen *et al.*, 2002). In addition, this feeding strategy can improve muscle protein absorption, which will improve pig tenderness,

especially in females (Kristensen *et al.*, 2004); this strategy leads to an increase in adipose tissue in pigs and the growth of internal organs. It is possible to change some meats quality and in the case of pigs feeding ad libitum. This is made by changing animals' diet. Thus, in the case of decreasing the amount of proteins or lysine in the diet, but with the provision of a sufficient energy amount, the softness and juiciness of the meat in pigs improves, but in this case the growth rate decreases (Lebret, 2008). At the same time, if pigs are limited in terms of obtaining amino acids for some time before slaughter, then the volume of adipose tissue can be increased.

It is also important to consider how housing conditions (amounts of free space, temperature, etc.) can affect the carcass quality after slaughter. Thus, air temperature affects the energy requirements and growth performance of pigs: they grow if pigs are kept in colder conditions and vice versa. Thus, the best temperature (thermoneutral zone) was established, which is determined within the framework of 22-28 degrees Celsius (Renaudeau *et al.*, 2008; Gourdine *et al.*, 2021). Decreasing the temperature to 17-22°C can lead to an increase in the growth rate of pigs due to greater voluntary feed consumption (Lebret, 2008; Schmitt *et al.*, 2021). Even the amount of free space provided to animals has a certain influence. Thus, if 0.76 m<sup>2</sup> was allocated per pig, the growth rates of pigs were comparatively lower than in the case when the area increased to 3.5 m<sup>2</sup> (Beattie *et al.*, 2000).

It is interesting to compare the pigs raising under the conditions of organic farming, that is, under active enclosure and receiving their established organic diet (which consists of at least 90% organic feed ingredients per the European Union (EU) Directive) (Lebret, 2008). In addition, the use of synthetic amino acids, antibiotics, growth stimulants and products with GMO (genetically modified organisms) is prohibited in organic raising. In fact, the study results in this case can vary. As it was shown in the works of some scientists (Hansen *et al.*, 2006), pigs raised in organic conditions had a lower daily gain and an increased content of lean meat in the carcass compared to other studied groups. At the same time, other scientists conclude that it is not too important whether the animals are fed organic or chemical food: the conditions of their keeping play a much greater role (Millet *et al.*, 2005).

Another key component that should be monitored is the conversion of plant protein to animal protein, which decreases under conditions of active nitrogen release with pus (Millet *et al.*, 2018). In general, there are three strategies connected with increasing nitrogen efficiency: genetic selection, castration, and selection of optimal animal weight. Nevertheless, the fact that selecting genes (through gradual selection) that would increase the efficiency of proteins absorption is rather questionable. Even in the 20<sup>th</sup> century, J. Hammond (1947) assumed that any selection of such genes would only lead to an increase in the protein energy efficiency.

However, more modern studies show that such an effect can still be achieved (Moehn *et al.*, 2004; Sarria *et al.*, 2021). The next way to improve the efficiency of plant protein conversion is castration (Tomasevic *et al.*, 2020; Weiler *et al.*, 2021). Studies show that for males, castration does lead to better protein absorption (Moehn *et al.*, 2004). Regarding the last point, that is, the weight loss efficiency for better protein absorption is not clear. Thus, for a long time, scientists could not conclude about whether such an effect is present at all: some studies indicate its presence (Shirali *et al.*, 2012), while others did not notice it at all (Aymerich *et al.*, 2020). In general, scientists concluded that the animal weight at the end of the feeding process should be within certain limits, which are about 115.2 kg for fat breeds, and 96.6 kg for lean breeds (Morel & Wood, 2005). Thus, the use of all the abovementioned methods will be able to significantly increase the efficiency of meat production on pig farms. Nevertheless, it should be remembered that some indicators can be individually distinguished for individual breeds or differ due to external conditions. Therefore, it is important to check all these methods in practice.

## DISCUSSION

Within the framework of their study, V. Maksym *et al.* (2022) assessed the efficiency of pig production at agricultural enterprises in Ukraine. In general, scientists come to the conclusion that there are only a few effective directions for increasing the profitability of meat production, these are: costs optimisation and sales policy improvement (reduction of all costs types due to the use and involvement of material and technical, and labour resources), finding new high-quality sales markets, the development of a full-cycle vertically diversified form of production organisation (with the help of the use of self-grown fodder of the grain group for animal feeding and the use of own capacities for their further processing). Optimising products should become especially important in the realities of high electricity prices caused by Russia's invasion of Ukraine. It is also should be mentioned that the scientists built a rather complex model for assessing the economic efficiency of pig raising, which used 15 indicators. This made it possible to assess the possibilities and efficiency of growing this animal type in different regions of Ukraine. Note that some of these methods were also mentioned by the author in the abovementioned work. They are really efficient in terms of increasing the efficiency of the economic and management component of the process.

An interesting study on pig raising in Nigeria was conducted by J.C. Umeh *et al.* (2015). This country as a whole is quite special in terms of the economy management, taking into account the geographical conditions of its location. Scientists note that in Nigeria there are inefficiencies in the way farmers manage at enterprises. Therefore, they describe the following tips for improving the efficiency of pig farmers (primarily in terms of

state regulation): optimising the use of available resources; encouraging farmers to join together to share knowledge, technology and practices; the policy of improving credit opportunities for entrepreneurs; encouraging studies in the agriculture industry and creating consultation services for such enterprises. Notably, as mentioned above in the author's study, similar methods of influence should be relevant in Ukraine as well, as one of the most promising opportunities for increasing the activities efficiency in the agricultural sector, including pig raising, is the improvement of scientific potential. Studies on the state of this industry in China was conducted by G. Wang *et al.* (2021). Scientists write that there is certain inefficiency in the country connected with the low return on costs of most enterprises in the country's agrarian sector. G. Wang *et al.* (2021) note that production at the capacity limit could reduce the production cost for different farmers from 21% to 47%, which is a large amount. The second thing the authors pay attention to is the use of the latest technologies, which will, among other things, be aimed at reducing farm waste. According to them, it can also improve production efficiency. The main advice provided by G. Wang *et al.* (2021) are the following: firstly, farmers should actively adapt to the rapid changes in the environment and quickly switch to organic fuels, waste-free production, etc.; secondly, entrepreneurs should pay more attention to the existing territorial advantages they have to improve the competitive situation in the market; thirdly, to more actively study modern world trends within the framework of technological development, quickly involve the latest technologies in production; fourth, to use financial instruments to protect oneself from external shocks (pandemics, world crises, etc.). It should be noted that these approaches are also quite applicable in the realities of Ukraine, however, their use will be more relevant in the future, when enterprises will find an opportunity to overcome more urgent problems connected with insufficient funding, insufficient efficiency of growing technologies, etc.

B. Lebret (2008) in his study sufficiently shows a large number of components that affect the business efficiency and are primarily connected with the features of animal raising. He describes feeding systems, raising, pig care features, etc. In general, the main conclusion from their study is that optimisation and quality use of animal care processes (which was also described by the abovementioned authors in the work) can significantly increase the efficiency of pig raising and will allow entrepreneurs to receive significantly higher incomes in the future. Unfortunately, they are often available primarily to large enterprises, while the possibilities of small farms, whose role in the economy is also high, are extremely limited. In the framework of the abovementioned study, the author notes that large companies do have comparative advantages in conducting activities in agriculture; nevertheless, the increase in the SMEs

number should remain a vital component of national policy due to certain benefits they bring (higher mobility, adaptation possibility, job creation, etc.).

Recently, the problems of sustainable development are becoming more and more relevant, which is why ensuring compliance with its principles and purposes is important for any company, including farms (Kalinowska *et al.*, 2022; Herger, 2020), because it is one of the most important components for achieving the country's sustainable development purposes (Laurett *et al.*, 2021). As noted by T. Soleimani & H. Gilbert (2021), the main methods for reducing the influence of pig farms on the external environment are the preparation of appropriate rations in accordance with the genetic line requirements, as well as ensuring their ecological optimisation. In turn, G. Samarin *et al.* (2021) study the features of the EU countries attitude to this problem. They write that the European Union already has an active program of ecologically clean agriculture, which includes several strategic areas, namely: protection of livestock and people from harmful microorganisms; development of ecological production of products; development and improvement of equipment for waste disposal and cleaning of livestock breeding emissions; development of regulatory documents on environmental protection and reduction of product losses during transportation. According to scientists, the spread of such principles is particularly important for the future agriculture development as a whole. A.K. Ruckli *et al.* (2021) in turn assessed how successful modern pig farms have been in terms of ensuring sustainable development in terms of "green" energy production. Based on their study, it can be concluded that on most farms (even in highly developed countries) there are still needs to improve the performance of environmental sustainability. Moreover, they show that improving farm and field management is crucial to simultaneously reduce the environmental influence and promote biodiversity of pig farming, at least in European realities.

Thus, it can be concluded that pig farming in Ukraine is currently in a long-term stagnation, which only worsened with the beginning of a full-scale invasion. However, to solve the existing problems, there are many tools that can be used both by the entrepreneurs themselves and by the state. From a farmer's point of view, a lot of advice has been given above on efficiency improving of managing such an enterprise: from improving some management components to making some changes in animals' diet. Nevertheless, it should be noted that the state also has certain influence levers. They can be found in the Law of Ukraine "On State Support of Agriculture of Ukraine" (2004), which clearly describes the possibilities of state support for the country's agriculture. Among them, the following can be distinguished: providing financial support, reducing the loans price, compensating leasing payments, opening access to all the necessary information for conducting

business, etc. As it was shown above in the study, because the most critical component of the efficiency of pig farming business management is the reduction of the expenditure part, therefore, it can be assumed that the financial support methods are the most effective for this industry. Thus, ensuring their more active implementation could also have a positive impact on Ukrainian pig farming in the long-term.

## CONCLUSIONS

Thus, within the framework of this work, an analysis of the economic efficiency of pig farming was conducted, as well as ways to increase it. All methods described in the study were divided into two types: those connected with the change of the management features of the enterprise, and those connected with the approach change to animal care. It was shown that the most vital role in efficiency increasing of the company's management is played by the reduction of the expendable part, as it makes it possible to significantly increase the competitiveness of products compared to other manufacturers. In addition, the attention should be paid to pricing, conducting a marketing campaign, production rates, etc. In addition, a key role is often played by the of education level of managers at enterprises, which indicates the need for their constant self-improvement need.

If we consider the possibilities of increasing efficiency in terms of animal care, special attention should

be paid to the feeding features. By providing a competent diet, the final animals weight can be increased. In addition, dietary restrictions can be applied. It allows manipulating the final volumes of meat and fat that will be in the pig carcass. In turn, the use of compensatory growth reaction (feeding reduction for a certain number of days before slaughter and subsequent diet according to the ad libitum method) makes it possible to increase the final weight of the carcass. The attention should be also paid to the conditions in which animals live: the amount of free space, enclosures, temperature, etc. In addition, the authors recommend adhering to such conditions of enterprises operation, within the framework of which they will fit into the framework of sustainable development, primarily by minimising the negative impact on the environment.

It is promising for further studies to conduct similar studies (on the efficiency assessment of raising a particular breed or species) in the realities of Ukraine. In addition, it is important to regularly conduct a general assessment of the agriculture state in Ukraine and to look for existing inefficiencies.

## ACKNOWLEDGEMENTS

None.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

## REFERENCES

- [1] Aragon, F.M., Restucci, D., & Rud, J.P. (2022). Are small farms really more productive than large farms? *Food Policy*, 106(2022), article number 102168. doi: [10.1016/j.foodpol.2021.102168](https://doi.org/10.1016/j.foodpol.2021.102168).
- [2] Assaoui, R., & Fabian, F. (2021). Globalization, economic development, and corruption: A cross-lagged contingency perspective. *Journal of International Business Policy*, 5(1), 1-28. doi: [10.1057/s42214-020-00091-5](https://doi.org/10.1057/s42214-020-00091-5).
- [3] Aymerich, P., Soldevila, C., Bonet, J., Gasa, J., Coma, J., & Solà-Oriol, D. (2020). Increasing dietary lysine impacts differently growth performance of growing pigs sorted by body weight. *Animals*, 10(6), article number 1032. doi: [10.3390/ani10061032](https://doi.org/10.3390/ani10061032).
- [4] Beattie, V.E., O'Connell, N.E., & Moss, B.W. (2000). Influence of environmental enrichment on the behaviour, performance and meat quality of domestic pigs. *Livestock Production Science*, 65(1-2), 71-79. doi: [10.1016/S0301-6226\(99\)00179-7](https://doi.org/10.1016/S0301-6226(99)00179-7).
- [5] Campbell, R.G. (1983). Effects of feeding level from 20 to 45 kg on the performance and carcass composition of pigs grown to 90 kg live weight. *Livestock Production Science*, 10(3), 265-272. doi: [10.1016/0301-6226\(83\)90061-1](https://doi.org/10.1016/0301-6226(83)90061-1).
- [6] Delvaux, P.A.G., Riesgo, L., & Paloma, S.G. (2020). Are small farms more performant than larger ones in developing countries? *Science Advances*, 6(41), article number eabb8235. doi: [10.1126/sciadv.abb8235](https://doi.org/10.1126/sciadv.abb8235).
- [7] Dmytriieva, V., & Sviatets, Y. (2021). Turning points in agriculture development in Ukraine: Results of analysis on the base of purified data. *Agricultural and Resource Economics: International Scientific E-Journal*, 7(1), 6-21. doi: [10.51599/are.2021.07.01.01](https://doi.org/10.51599/are.2021.07.01.01).
- [8] Gourdine, J.L., Rauw, W.M., Gilbert, H., & Pouillet, N. (2021). The genetics of thermoregulation in pigs: A review. *Frontiers in Veterinary Science*, 8, article number 770480. doi: [10.3389/fvets.2021.770480](https://doi.org/10.3389/fvets.2021.770480).
- [9] Hammond, J. (1947). Animal breeding in relation to nutrition and environmental conditions. *Biological Reviews*, 22(3), 195-213. doi: [10.1111/j.1469-185X.1947.tb00330.x](https://doi.org/10.1111/j.1469-185X.1947.tb00330.x).
- [10] Hansen, L.L., Claudi-Magnussen, C., Jensen, S.K., & Andersen, H.J. (2006). [Effect of organic pig production systems on performance and meat quality](https://doi.org/10.1016/j.science.2006.05.015). *ScienceDirect*, 74(2006), 605-615.
- [11] Havlicek, J., Domeova, L., Smutka, L., Rezbova, H., Severova, L., Subrt, T., Sredl, K., & Svoboda, R. (2020). Efficiency of pig production in the Czech Republic and in an international context. *Agriculture*, 10(12), article number 597. doi: [10.3390/agriculture10120597](https://doi.org/10.3390/agriculture10120597).
- [12] Herger, M. (2020). [What is the role of agriculture for sustainable development?](https://www.nadel.ch/en/what-is-the-role-of-agriculture-for-sustainable-development/) Zurich: NADEL Center for Development and Cooperation

- [13] Kalinowska, B., Borawski, P., Beldycka-Borawska, A., Klepacki, B., Perkowska, A., & Rokicki, T. (2022). Sustainable development of agriculture in member states of the European Union. *Sustainability*, 14(7), article number 4184. doi: [10.3390/su14074184](https://doi.org/10.3390/su14074184).
- [14] Kaminskyi, A.B., Nehrey, M.V., & Zomchak, L.M. (2021). COVID-19: Crisis or new opportunities time for the agricultural sector of Ukraine. *IOP Conference. Series: Earth and Environmental Science*, 628(2021), article number 012031. doi: [10.1088/1755-1315/628/1/012031](https://doi.org/10.1088/1755-1315/628/1/012031).
- [15] Kholoshyn, I., Mantulenko, S., Joyce, A.S., Sherick, D., Uvaliev, T., & Vedmitska, V. (2021). Geography of agricultural exports from Ukraine. *E3S Web of Conferences*, 280(3), article number 11009. doi: [10.1051/e3sconf/202128011009](https://doi.org/10.1051/e3sconf/202128011009).
- [16] Kristensen, L., Therkildsen, M., Aaslyng, M.D., Oksbjerg, N., & Ertbjerg, P. (2004). Compensatory growth improves meat tenderness in gilts but not in barrows. *Journal of Animal Science*, 82(12), 3617-3624. doi: [10.2527/2004.82123617x](https://doi.org/10.2527/2004.82123617x).
- [17] Laurett, R., Paco, A., & Mainardes, E.W. (2021). Sustainable development in agriculture and its antecedents, barriers and consequences – An exploratory study. *Sustainable Production and Consumption*, 27(6), 298-311. doi: [10.1016/j.spc.2020.10.032](https://doi.org/10.1016/j.spc.2020.10.032).
- [18] Law of Ukraine “On State Support of Agriculture of Ukraine”. (2004). Retrieved from <https://zakon.rada.gov.ua/laws/show/1877-15#Text>.
- [19] Leuret, B. (2008). Effects of feeding and rearing systems on growth, carcass composition and meat quality in pigs. *Animal*, 2(10), 1548-1558. doi: [10.1017/S1751731108002796](https://doi.org/10.1017/S1751731108002796).
- [20] Maksym, V., Chemeris, V., Dushka, V., Dadak, O., & Martyniuk, U. (2022). Modelling of the economic efficiency of pig breeding in agricultural enterprises. *Agricultural and Resource Economics: International Scientific E-Journal*, 8(3), 178-199. doi: [10.51599/are.2022.08.03.09](https://doi.org/10.51599/are.2022.08.03.09).
- [21] Menegat, M.B., Dritz, S.S., Tokach, M.D., Woodworth, J.C., DeRouchey, J.M., & Goodband, R.D. (2020). A review of compensatory growth following lysine restriction in grow-finish pigs. *Translational Animal Science*, 4(2), 531-547. doi: [10.1093/tas/txaa014](https://doi.org/10.1093/tas/txaa014).
- [22] Millet, S., Aluwe, M., Broeke, A.V.D., Leen, F., Boever, J.D., & Campeneere, S.D. (2018). Review: Pork production with maximal nitrogen efficiency. *Animal*, 12(5), 1060-1067. doi: [10.1017/S1751731117002610](https://doi.org/10.1017/S1751731117002610).
- [23] Millet, S., Raes, K., Van den Broeck, W., De Smet, S., & Janssens, G.P.J. (2005). Performance and meat quality of organically versus conventionally fed and housed pigs from weaning till slaughtering. *Meat Science*, 69(2), 335-341. doi: [10.1016/j.meatsci.2004.08.003](https://doi.org/10.1016/j.meatsci.2004.08.003).
- [24] Moehn, S., Ball, R.O., Fuller, M.F., Gillis, A.M., & Lange, C.F.M.D. (2004). Growth potential, but not body weight or moderate limitation of lysine intake, affects inevitable lysine catabolism in growing pigs. *Journal of Nutrition*, 134(9), 2287-2292. doi: [10.1093/jn/134.9.2287](https://doi.org/10.1093/jn/134.9.2287).
- [25] Morel, P., & Wood, G. (2005). Optimisation of nutrient use to maximise profitability and minimise nitrogen excretion in pig meat production systems. *Acta Horticultura*, 674(674), 269-275. doi: [10.17660/ActaHortic.2005.674.31](https://doi.org/10.17660/ActaHortic.2005.674.31).
- [26] Mundlak, Y., Larson, D., & Butzer, R. (2004). *Agriculture dynamics in Thailand, Indonesia and the Philippines*. *Australian Journal of Agricultural and Resource Economics*, 48(1), 95-126.
- [27] Nugroho, A.D., Bhagat, P.R., Magda, R., & Lakner, Z. (2021). The impacts of economic globalization on agricultural value added in developing countries. *PLoS One*, 16(11), article number e0260043. doi: [10.1371/journal.pone.0260043](https://doi.org/10.1371/journal.pone.0260043).
- [28] Pozniak, S. (2019). *Chernozems of Ukraine: Past, present and future perspectives*. *Soil Science Annual*, 70(3), 193-197.
- [29] Praburaj, L. (2018). *Role of agriculture in the economic development of a country – An overview*. *International Journal of Commerce*, 6(3), 25-30.
- [30] Renaudeau, D., Anais, C., Gourdine, J-L., & Kerdoncuff, M. (2008). Effect of temperature level on thermal acclimation in Large White growing pigs. *Animal*, 2(11), 1619-26. doi: [10.1017/S1751731108002814](https://doi.org/10.1017/S1751731108002814).
- [31] Ruckli, A.K., Dippel, S., Durec, N., Gebaska, M., Guy, J., Helmerichs, J., Leeb, C., Vermeer, H., & Hortenhuber, S. (2021). Environmental sustainability assessment of pig farms in selected European countries: Combining LCA and key performance indicators for biodiversity assessment. *Sustainability*, 13(20), article number 11230. doi: [10.3390/su132011230](https://doi.org/10.3390/su132011230).
- [32] Samarin, G., Vasilyev, A., Tikhomirov, D., Normov, D., Pavlov, A., Kokunova, I., Solovieva, M., & Dvoretckii, L. (2021). The environmental impact of pig farming. *KNE Life Science*, (2021), 932-941. doi: [10.18502/kl.v0i0.9031](https://doi.org/10.18502/kl.v0i0.9031).
- [33] Sarria, L., Balcells, J., De La Fuentea, G., Tora, M., Gomez-Arriueba, J., & Seradj, A.R. (2021). Evolution of viscera and muscle fractional protein synthesis rate in lean meat selected hybrids and castrated Duroc pigs fed under moderate crude protein restriction. *Animal*, 15(6), 100220. <https://doi.org/10.1016/j.animal.2021.100220>.
- [34] Schmitt, O., Reigner, S., Bailly, J., Ravon, L., Billon, Y., Gress, L., Bluy, L., Canario, L., Gilbert, H., Bonnet, A., & Liaubet, L. (2021). Thermoregulation at birth differs between piglets from two genetic lines divergent for residual feed intake. *Animal*, 15(1), article number 100069. doi: [10.1016/j.animal.2020.100069](https://doi.org/10.1016/j.animal.2020.100069).

- [35] Shirali, M., Doeschl-Wilson, A., Knap, P.W., Duthie, C., Kanis, E., Arendonk, J.A.M.V., & Roehe, R. (2012). Nitrogen excretion at different stages of growth and its association with production traits in growing pigs. *Journal of Animal Science*, 90(6), 1756-1765. doi: [10.2527/jas.2011-4547](https://doi.org/10.2527/jas.2011-4547).
- [36] Soleimani, T., & Gilbert, H. (2021). [An approach to achieve overall farm feed efficiency in pig production: environmental evaluation through individual life cycle assessment](#). *The International Journal of Life Cycle Assessment*, 26, 455-469.
- [37] Steven, D., & Wiebe, P.K. (2021). Strategic foresight for agriculture: Past ghosts, present challenges, and future opportunities. *Global Food Security*, 28, article number 100489. doi: [10.1016/j.gfs.2020.100489](https://doi.org/10.1016/j.gfs.2020.100489).
- [38] Therkildsen, M., Riis, B., & Karlsson, A. (2002). [Compensatory growth response in pigs, muscle protein turnover and meat texture: effects of restriction/realimentation period](#). *Animal Science*, 75, 367-377.
- [39] Till, E.R. (2022). *Agriculture for economic development in Africa evidence from Ethiopia*. Cham: Palgrave Macmillan. doi: [10.1007/978-3-031-07901-6](https://doi.org/10.1007/978-3-031-07901-6).
- [40] Tomasevic, I., Bahelka, I., Candek-Potokar, M., Citek, J., Djekic, I., Kusec, I. D., Getya, A., Guerrero, L., Iordachescu, G., Ivanova, S., Nakov, D., Sołowiej, B. G., Szabo, C., Tudoreanu, L., Weiler, U., & Font-i-Furnols, M. (2020). Attitudes and beliefs of Eastern European consumers towards piglet castration and meat from castrated pigs. *Meat Science*, 160, article number 107965. doi: [10.1016/j.meatsci.2019.107965](https://doi.org/10.1016/j.meatsci.2019.107965).
- [41] TradeMap. (2023). *List of importing markets for a product exported by Ukraine. Product: 0203 Meat of swine, fresh, chilled or frozen*. Retrieved from [https://www.trademap.org/Country\\_SelProductCountry\\_TS.aspx?nvpm=1%7c804%7c%7c%7c%7c0203%7c%7c%7c4%7c1%7c1%7c2%7c2%7c1%7c2%7c1%7c1%7c1](https://www.trademap.org/Country_SelProductCountry_TS.aspx?nvpm=1%7c804%7c%7c%7c%7c0203%7c%7c%7c4%7c1%7c1%7c2%7c2%7c1%7c2%7c1%7c1%7c1).
- [42] Ukrstat Agriculture. (2023). *Agriculture data*. Retrieved from <https://www.ukrstat.gov.ua/>.
- [43] Umeh, J.C., Ogbanje, C., & Adejo, M.A. (2015). Technical efficiency analysis of pig production: A sustainable animal protein augmentation for Nigerians. *Journal of Advanced Agricultural Technologies*, 2(1), 19-24. doi: [10.12720/joaat.2.1.19-24](https://doi.org/10.12720/joaat.2.1.19-24).
- [44] Wang, G., Zhao, C., Shen, Y., & Yin, N. (2021). Estimation of cost efficiency of fattening pigs, sows, and piglets using SFA approach analysis: Evidence from China. *Plos One*. doi: [10.1371/journal.pone.0261240](https://doi.org/10.1371/journal.pone.0261240).
- [45] Weiler, U., Font-i-Furnols, M., Tomasevic, I., & Bonneau, M. (2021). Alternatives to Piglet castration: From issues to solutions. *Animals*, 11(4), article number 1041. doi: [10.3390/ani11041041](https://doi.org/10.3390/ani11041041).

## Аналіз економічної ефективності м'ясного свинарства та шляхи її підвищення

**Ермір Шахіні**

Викладач

Дуррський університет імені Олександра Мойсіу  
2001, вул. Currila, 14, м. Дуррес, Албанія  
<https://orcid.org/0000-0002-0083-1029>

**Микола Васильович Місюк**

Доктор економічних наук, професор

Заклад вищої освіти «Подільський державний університет»  
32316, вул. Шевченка, 12, м. Кам'янець-Подільський, Україна  
<https://orcid.org/0000-0003-2903-7715>

**Марина Володимирівна Заходим**

Кандидат економічних наук, доцент

Заклад вищої освіти «Подільський державний університет»  
32316, вул. Шевченка, 12, м. Кам'янець-Подільський, Україна  
<https://orcid.org/0000-0003-0010-8006>

**Валентина Вікторівна Борковська**

Кандидат економічних наук, доцент

Заклад вищої освіти «Подільський державний університет»  
32316, вул. Шевченка, 12, м. Кам'янець-Подільський, Україна  
<https://orcid.org/0000-0002-2983-2973>

**Нонна Василівна Коваль**

Кандидат економічних наук, доцент

Заклад вищої освіти «Подільський державний університет»  
32316, вул. Шевченка, 12, м. Кам'янець-Подільський, Україна  
<https://orcid.org/0000-0002-1882-381X>

---

**Анотація.** Сільське господарство завжди відіграло важливу роль в Україні, що зумовлено насамперед географічними особливостями розташування. Нині аграрний сектор є основою міжнародної спеціалізації країни. Таким чином, пошук можливостей підвищення ефективності цього сектору залишається актуальним. Тому метою дослідження було знайти шляхи підвищення ефективності діяльності однієї з галузей сільського господарства, а саме тваринництва, в рамках вирощування свиней. Основними методами під час роботи були аналіз, дедукція, моделювання, прогнозування тощо. Під час дослідження було проведено досить детальний розгляд можливостей підвищення ефективності вирощування свиней. Їх умовно розділили на дві категорії: пов'язані з процесами управління та безпосередньо доглядають за тваринами. Таким чином, автор приходить до висновку, що за допомогою деяких способів вирощування тварин можна досягти кращої якості м'яса, а отже, отримати більший прибуток від його реалізації. Під час дослідження безпосередньо розглядалися можливості, пов'язані з регулюванням раціону, умовами утримання тварин (температура, вольєри тощо), генетикою та ін. Що стосується управлінських порад, то вони також проаналізовані та надані авторами: зокрема, визначено, що зниження витрат відіграє величезну роль на таких підприємствах. Крім того, в роботі розглянуто особливості роботи цих підприємств з точки зору екологічної безпеки та зазначено роль держави в розвитку галузі

**Ключові слова:** сільське господарство; економіка України; підприємництво; управління; тваринництво

---