



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search  
<http://ageconsearch.umn.edu>  
[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

## REKRUTACJA TRWA - ZAPISZ SIĘ NA STUDIA!

TOWAROZNAWSTWO



BEZPIECZENSTWO  
WEWNĘTRZNE



PIELĘGNIARSTWO



ROLNICTWO



BUDOWNICTWO



PEDAGOGIKA



**STUDIUM W ŁOMŻY!!!**

[www.wsa.edu.pl](http://www.wsa.edu.pl)

**WSA**  
WYŻSZA SZKOŁA AGROBIZNESU  
W ŁOMŻY

CHALLENGES IN THE MILK MARKET (INVESTMENTS, DISRUPTIONS, LOGISTICS, COMPETITIVENESS, PRICES, AND POLICY)

Collective work, edited by  
Piotr Bórawski  
Andrzej Parzonko  
Ireneusz Żuchowski

## CHALLENGES IN THE MILK MARKET (INVESTMENTS, DISRUPTIONS, LOGISTICS, COMPETITIVENESS, PRICES, AND POLICY)

Wydawnictwo Ostrołęckiego  
Towarzystwa Naukowego  
im. Adama Chętnika  
w Ostrołęce 2021

ISBN 978-83-62775-45-3



**Challenges in the milk market  
(investments, disruptions, logistics,  
competitiveness, prices, and policy)**

Scientific editors:

Piotr Bórawski, Andrzej Parzonko, Ireneusz Żuchowski

Wydawnictwo Ostrołęckiego Towarzystwa Naukowego im. Adama Chętnika  
Ostrołęka 2021

Recenzenci – Reviewers  
TOMASZ ROKICKI  
BARTOSZ MICKIEWICZ

ISBN 978-83-62775-45-3

The monograph was written by the project funded by the National Science Centre in Poland allocated on the project OPUS 15, number of the project: 2018/29/B/HS4/00392.

© Copyright by Wydawnictwo Ostrołęckiego Towarzystwa Naukowego  
im. Adama Chętnika  
Ostrołęka 2021

180 publikacja Ostrołęckiego Towarzystwa Naukowego im. Adama Chętnika

Wydawnictwo Ostrołęckiego Towarzystwa Naukowego im. Adama Chętnika  
07-410 Ostrołęka, ul. Traugutta 9A  
tel. 29 764-59-80  
[www.otn.ostroleka.pl/ct-menu-item-15](http://www.otn.ostroleka.pl/ct-menu-item-15)  
e-mail: [otn.ostroleka@o2.pl](mailto:otn.ostroleka@o2.pl)

---

Skład: Ewa K. Czetwertyńska  
Druk: Drukarnia Kamil Borkowski, Łomża

---

## EXOGENOUS FACTORS IN THE MODERNIZATION OF DAIRY FARMS<sup>9</sup>

*Beata Kalinowska*

University of Warmia and Mazury in Olsztyn, Poland

*Piotr Bórawski*

University of Warmia and Mazury in Olsztyn, Poland

*Lisa Holden*

Pennsylvania State University, USA

### 12.1. Introduction

Supporting agriculture and rural development is an important part of both the state policy and the policy of the European Union. An important objective of the Common Agricultural Policy and Rural Development is the modernization of the agricultural sector, including the modernization of agricultural holdings. In the sphere of economic and social policy, modernization is associated with restructuring and investments (Czyżewski et al. 2008; Wasilewska 2009).

Modernization is a symbol of the entire catalog of various types of social changes, where society moves along a certain scale of progress

---

<sup>9</sup> This paper was funded by the project financed by the National Science Center (NCN) in Poland, Project OPUS 15, Project No.:2018/29/B/HS4/00392.

and achieves higher and higher levels of development. Modernization takes place in all historical periods, and an example of modernization is the departure of man from caves and the erection of the first shelters, replacement of carts with cars or replacement of typewriters with computers (Sztompka 2005).

Another meaning of modernization is related to the transformations in the political, social, cultural and mental spheres that continued in the West from the 16th to the 20th centuries. The result of these transformations was the development of capitalism, democracy, industry, urbanization, bureaucracy, rationalization, or the spread of individualism and motivation to achieve results, as well as the glorification of reason and science. In this context, modernization meant taking actions aimed at bringing modernity, reaching a specific, historically located institutional and organizational syndrome, which refers to the evolution of society from traditional and pre-technical to a modern society equipped with machine technologies. Modernization at that time was also characterized by secular and rational attitudes with a diverse social structure (O'Connell 1976).

Another meaning of the word modernization is used to express the actions taken by poorly developed and backward societies to match the world's most developed countries that coexisted with them in the same historical period (Wasilewska 2009).

The aim of this research was to assess the factors shaping investment in dairy farms. Particular attention has been focused on:

- Assessment of barriers to investment activity,
- Learning about investment plans.

We collected the data from a group of 383 dairy farms which made investments. The surveyed participants is divided into four groups depending on the size of the investment (PLN thousand):

- less than 300 thousand PLN – 151 farms,
- 300,1-600 thousand PLN – 104 farms,
- 600,1-900 thousand PLN – 52 farms,
- greater than 900 thousand PLN – 76 farms.

Purposeful selection was used in the research. The basis for qualifying the farm for the study was the investment made in 2007-2019 and the farmer's willingness to participate in the study.

## **12.2. The importance of modernization in the development of agriculture**

Modernization means "modernizing enterprises by introducing new technologies, equipment and devices, means of transport, or modern work organization." (<https://encyklopedia.pwn.pl/haslo/modernizacja;3942539.html>; 02/03/2020, 17:00).

According to the Economic and Agricultural Encyclopedia (1984), modernization of agriculture is a process of improving the existing fixed means of production, aimed at optimizing production processes by increasing the efficiency of human resources, while reducing their burden, and by increasing production efficiency and improving the quality of production, as well as by reduction of production costs.

Often the term modernization is associated with the term restructuring (Kusz 2018), but according to Woś (1999), these words are not identical in meaning. Modernization of farms is the replacement of the old production resource with a new one, which in turn results in better production quality and higher labor productivity, improving the efficiency of farming. On the other hand, restructuring is a change in the internal structure of an economic entity. In an agricultural holding, restructuring includes a change in the structure of production resources (which should be understood as a change in both the relationship between production factors and a change in ownership relations between individual production factors), and a change in the production structure and management method, as well as changes in the location of the farm in the market structure.

According to Klepacki (2005), restructuring means changes in the company's potential, changes in production technology and organization, or changes in relation to the environment, as well as changes in management and organizational structures designed to adapt the enterprise and organization to the requirements of the market economy.

Wójcicki (1997) also defines the modernization process and the restructuring process separately. The author believes that the

modernization of farms is carried out by introducing new techniques and work organization to the farm. This should be equated with the introduction of new technologies for obtaining agricultural raw materials and food products, taking into account the rational use of owned and acquired fixed assets. Restructuring, in turn, according to the author, is the changes taking place in the production structure and agrarian structure of farms and agricultural enterprises, including changes in employment in rural areas and agriculture.

According to Kusz (2018), both the modernization process and the restructuring process have a positive effects on increasing the competitive position of a farm. According to the author, changes resulting from the modernization process may translate into a change in the organization of a farm, and this in turn leads to the restructuring of the economic entity. The restructuring process often requires modernization of the production resources held. Therefore, the modernization and restructuring processes may simultaneously take place on the farm.

Modernization is aimed at adapting enterprises and entire economies to the current challenges that arise in their environment. These are constant, dynamic changes, allowing for participation in the benefits resulting from development. Entities in which the modernization process does not take place are marginalized (Zieliński 2014).

According to Zieliński (2014), in order for agriculture and rural areas to progress, the modernization process should be continuous. The creation and application of new technologies in agriculture is an important element that distinguishes modern agriculture from traditional agriculture.

There have been positive changes in agriculture in many developed countries. The introduction of new techniques and production technologies has led to an increase in the level of production and an improvement in the quality of manufactured products, as well as a decrease in the demand for human labor and improvement of working conditions. Another beneficial effect of progress in agriculture was less negative impact of agricultural production on the natural environment and reduced economic risk (Kim and Chavas 2003).

According to Runowski (2018), a distinction is made between progress in many areas, such as: progress in the biological area, which is

associated with the improvement of desired traits in plants and animals (including those obtained through genetic modification) and progress in the technical area, which mainly concerns changes in means of production and methods of obtaining them. Technical progress should be understood in the technical and production sense, which includes energy progress, mechanical progress, engineering and construction progress, engineering and water progress, and IT (Intelligent Technologies) progress. The author also mentions progress in the technological area, which is associated with new methods of production and new production technologies, progress in the organizational area, associated with changes in the organization of a farm and production organization, and progress in the socio-economic area, the scope of which includes social relations, agricultural system, etc.

The effect of progress in agriculture is the reduction of unit production costs and an increase in production potential (Reisch and Zeddes 1995).

According to Sroka (2010), it is very difficult to identify the role of a single factor in the development of agriculture, because all factors synergistically affect development and are related to each other. The level of agricultural development is the result of the influence of many factors in various directions (Klusek 2003).

According to Kusz (2018), the process of modernization of agriculture, including farms producing cow's milk, is influenced by many factors that can be divided into: exogenous (external) and endogenous (internal) factors. According to the author, exogenous (external) factors affect either directly or indirectly the changes taking place in agriculture. They can be divided into several groups, which are: demographic factors, environmental factors, socio-cultural factors, economic factors, technological factors, institutional factors, and the globalization process. Exogenous factors can also be divided into those that affect the demand and supply of food products. Market factors influencing demand are more important in causing changes in agriculture than those influencing supply. From the point of view of achieving positive changes in agriculture, it is advantageous to have balance.

### **12.3. Exogenous and endogenous factors of agricultural modernization**

All investment activities carried out by farmers depend on the range of external – exogenous and internal – endogenous factors (Kusz and Gędek 2015). The exogenous factors determining the investment activity of farmers include:

- Demand for manufactured raw materials;
- Consumer preferences;
- Projected and current price levels of goods and services;
- Supply conditions, in particular the level of costs incurred, availability of factors of production, labor resources, materials and raw materials, machinery and equipment;
- Current and expected economic situation by farmers;
- Situation in a given sector of the economy;
- Geographic conditions;
- Demographic and social conditions;
- Resources in the national economy;
- System solutions (financial, economic, institutional);
- Economic policy, especially agricultural policy;
- Fiscal policy;
- Monetary policy;
- System of investment reliefs and subsidies;
- Level of inflation which determines the costs of obtaining capital;
- Level of interest rates;
- Functioning organizations or financial institutions;
- Degree of openness of the economy to international connections;
- Legal regulations;
- Barriers to international trade;
- Requirements for environmental protection or animal welfare;
- Demands from environmental groups;
- Other factors, such as rapid technical progress (Kusz et al. 2012).

Kołodziejczyk (2008) also points out that the modernization of farms is influenced by many external (exogenous) and internal

(endogenous) factors. The author includes among the exogenous factors: "eg. state policy, the Common Agricultural Policy and other institutions closely related to the functioning of farms and the condition of material and intellectual infrastructure", while the endogenous factors were identified by factors originating from within the farm itself like land, human and capital resources.

The endogenous (internal) factors of agricultural modernization relate mainly to the production potential. Internal factors mentioned most often in the literature are: human capital, the level of obtained income and financial situation, organizational culture or attitude to the farm of the farmer's family, relationship between production factors and their resources, applied production technologies and the degree of connection with the environment in the case of legal persons with hired labor (Kusz 2018).

The endogenous investment factors include:

- Productive potential (size, mobility, productivity and profitability of own resources);
- Degree of consumption of fixed assets;
- Economic and financial situation of farms;
- Adaptation of the enterprise to high volatility of the environment;
- Organization and management system;
- Scale of modern manufacturing techniques used;
- Knowledge of the farm managers;
- Age of the farm managers;
- Other (own predispositions) (Kasprzak-Czelej 2013).

Poland's accession to the EU forced dairy farms to adapt to many requirements for the production of cow's milk with high quality parameters. The quality requirements for good raw cow's milk resulted from the consumer's demand for high-quality dairy products and a very strong competition on the milk market (Salamończyk et al. 2013).

In Poland, farms specializing in the production of cow's milk have undergone a wide range of restructuring and modernization processes, which can be divided into three periods. The first period is 1990-1995; the second period is 1995-2003; and the beginning of the third period started in 2004. In the years 1990-1995, farms producing cow's milk

underwent an adaptation process to the conditions of the market economy. During 1995-2003, dairy farms adapted to the requirements related to Poland's integration with the European Union and to the requirements related to the liberalization of world trade, the range of agricultural and agricultural products, and food products resulting from the end of the GATT Uruguay Round. Starting with Poland's accession to the European Union in 2004, a continuous process of adaptation to the changing market conditions, resulting from integration with the European Union, changes in the Common Agricultural Policy and ever stronger competition on the community and world markets began (Seremak-Bulge et al. 2015). As the author points out, the Polish dairy industry in the mid-1990s was one of the most fragmented in Europe. During this period, there were on average 2.6 cows in the herd. Almost 70% of farms had 1-2 cows, which constituted 37.5% of the national population. Milk produced at that time significantly differed from the European Union standards in terms of hygienic quality. For example, in 1998 only 15% of purchased milk met the criteria of the "Extra" class ("Extra" class is the content of up to 100,000 microorganisms and no more than 400,000 somatic cells in 1 ml of milk according to EU hygiene standards).

Dairies in Poland implemented a pricing policy focused on producing high-quality milk. The need to adapt to the hygiene and veterinary standards of the European Union before Poland's accession to the European Union was one of the factors accelerating the process of concentrating raw milk supply in larger farms and improving milk quality. Along with the rapid process of concentrating the milk marketed in larger farms, production efficiency and technological progress also improved.

The need to improve milk quality and production led to the creation of groups of large and medium-sized farms creating a good raw material base for the dairy industry. In 2013, compared to 2004, milk production increased by 6.6% (to 12.6 billion kg) nationally, due to an increase in milk yield per cow of almost 27% (to 5244 kg), despite a decrease in the number of cows by 15.4% and a decrease in the number of farms by almost 56%. In Poland, the number of suppliers in 2014 was 137 thousand, which was 56% lower than in 2004. The average annual volume of milk delivered from a farm was 73 tons and was almost three times higher than in 2004. In 2014, 10.6 million tons of raw milk were

supplied to the dairy industry, an amount that was 68% higher than in 1995.

Investments were an important factor having a positive impact on the increase in milk production and concentration of farms. Price policies were of secondary importance. In the first period of economic transformation, farms did not have adequate capital resources for the modernization of the raw material base.

Dairy cooperatives assisted farmers in purchasing supplies and equipment for breeding cows and cooling milk by granting loans repaid with milk deliveries (Smoleński and Seremak-Bulge 1994).

In addition, national budget funds were targeted for modernization of farms producing milk under the "Sectoral Restructuring and Modernization of Dairy BR / 01" and "Sectoral Dairy Program BR / 15". From the "Industry Dairy Restructuring and Modernization Program BR / 01", farms specializing in the production of cow's milk could obtain support for investments in 1994-2000, and from the "Industry Dairy Program BR / 15" in 2000-2007. In December 1997, the European Union introduced an embargo on dairy products from Poland due to the fact that raw milk did not meet the hygienic and veterinary standards. The embargo on products and the prospect of integration with the EU accelerated activities of the dairy sector to improve milk quality, and the state administration also made improving milk quality a priority. In 1998, the "extra" class was introduced to assess the quality of raw milk, which corresponded to EU veterinary standards. In order to support the process of obtaining the largest possible amount of high-quality raw milk in Poland, a surcharge was introduced to the purchase price of "extra" class milk. The amount of subsidies to raw milk in the "extra" class in 2002-2003 amounted to PLN 542 million. In farms specializing in the production of cow's milk, thanks to the implemented aid programs, significant modernization progress was made, which resulted in the share of milk in the "extra" class at the level of 70% in 2002, and in 2003 at the level of 81.4% (Seremak-Bulge et al. 2015).

## 12.4. Specialization of dairy farms

Starting in 2002, the process of modernization of dairy farms in Poland was implemented with the use of EU funds under the SAPARD programs, the Sectoral Operational Program (SOP) and the Rural Development Program (RDP). In the years 2004-2013, PLN 5 billion was allocated to investments in dairy farms under the RDP. More than PLN 24 billion was paid for investments related to adjustments to meet the European Union standards under RDP 2004-2006, of which 93% was paid for the construction of panels and slurry tanks, while PLN 26 billion was paid under RDP 2007-2013. Another PLN 24 billion. was intended for the purchase of equipment and machinery (Seremak-Bulge et al. 2015).

Currently in order for a dairy farm to be able to produce and sell cow's milk, the farm is obliged to comply with the legal provisions in national and EU regulations regarding sanitation and hygienic conditions, animal welfare and the environment.

In the area of sanitation and hygienic conditions required for the production of cow's milk, farms specializing in the production of cow's milk must meet the conditions of the Act of December 16, 2005 on animal products (Journal of Laws of 2006, No. 17, item 127, as amended), which directly refers, to Regulation (EC) No. 853/2004 of the European Parliament and of the Council of 29 April 2004 with specific hygiene rules for food of animal origin (Journal of Laws of the EU, L 139 of April 30, 2004, p. 55).

The animals owned by farms specializing in the production of cow's milk are also subject to the Act of August 21, 1997 for the protection of animals (Journal of Laws 1997, No. 111, item 724, as amended), which means that they must be kept on a farm in conditions not worse than those described in the Regulation of the Minister of Agriculture and Rural Development of 28 June 2010 on the minimum conditions for keeping farm animal species other than those for which protection standards have been defined in the European Union regulations (Journal of Laws 2010, 116, item 778, as amended) and the Ordinance of the Minister of Agriculture and Rural Development of February 15, 2010 on the requirements and procedures for keeping farm animal species for which

protection standards have been defined in European Union regulations (Journal U. 2010 No. 56 item 344 as amended).

In addition, livestock must be marked and registered in accordance with the Act of 2 April 2004 on the animal identification and registration system (Journal of Laws of 2004, No. 91, item 872, as amended).

In the entire process of producing high-quality milk on farms, animal nutrition is very important. Therefore, the farm requires the acquisition and storage of feed from its own farm and the use of feed for feeding animals produced in accordance with the requirements of the Act of 22 July 2006 on feed (Journal of Laws 2006 No. 144 item 1045 as amended), referring to the EU law contained in many legal acts, including in particular Regulation (EC) No. 1831/2003 of the European Parliament and the Council of 22 September 2003 with requirements for feed hygiene (OJ L 31 of 08.09.2003, p. 1).

The production of cow's milk on the farm is closely related to the rearing of youngstock and the maintenance of a herd of dairy cattle which results in the production of manure, a valuable fertilizer of natural origin used in crop production, which is the basic animal feed base (Czekała 2015).

On the one hand, natural fertilizers are highly valued in crop production, but if not used carefully, they can pose a threat to the environment. In addition to natural fertilizers, a number of chemicals may be used in crop production, including mineral fertilizers and various types of substances supporting the cultivation of plants, the use of which, if not properly used, may also have a negative impact on the condition of the natural environment (Walczak et al. 2012).

Therefore, farms specializing in milk production are obliged to store and use fertilizers, including those of natural origin, in accordance with the Act of July 10, 2007 on fertilization and fertilization (Journal of Laws of 2007, No. 147, item 1033, as amended) and the Act of 20 July 2017 Water Law (Journal of Laws of 2017, item 1566, as amended). The provisions of the Water Law Act additionally regulate the entire subject related to the use of surface and groundwater, their protection and management, which is also related to agricultural production carried out on farms specializing in the production of cow's milk. Rules and regulations

that must be complied with for milk production and dairy farming are extensive.

## **12.5. Research results**

The owners of dairy farms identified barriers that hinder investment activity. The research showed that greatest barrier was the lack of necessary equity capital (Table 1). It should be noted that only in the group of farms whose investment value was in the range of 600.1-900 thousand indicated that the greatest barrier was the complicated procedures of applying for EU funding.

Farmers also reported barriers of high interest rates on loans and lengthy procedures for obtaining approval for investments. This barrier particularly affects farms suffering from lack on necessary capital to conduct the investment. The loans and credits are too expensive for many farmers and their difficult economic situation limits the use of credits.

Another strict barrier to the investment processes in dairy farms are the complicated procedures for applying for EU funds. This barrier particularly affects farmers who are not able to fill in all necessary documents.

Polish dairy farmers are also afraid of agricultural policy and its uncertainty. The common agricultural policy of the European Union places particular emphasis on the development of agriculture and rural areas. So farmers should not be afraid and take advantage of the opportunities it creates.

Polish dairy farms have lower profitability compared to other farmers from EU member states. These differences result from a smaller scale of production, greater fragmentation of dairy farms, lower milk yield of cows and worse development prospects.

Dairy farmers in Poland have also difficulties in achieving good advice. The development of dairy farms requires constant contacts between farmers and advisers who offer various types of advice, e.g. investment, agricultural, technological and others. Obtaining such aid requires constant cooperation with advisers who help farmers in developing their farms.

Table 1. Barriers to investment activity depending on the amount of financial support (%)

Barrier	Investment [thousand PLN]			
	Less than 300	300,1-600	600,1-900	Greater than 900
No necessary equity capital	64,90	67,31	63,46	64,47
Difficulties in obtaining loans	41,06	38,46	36,54	26,31
High interest rates on loans	56,95	67,31	63,46	61,84
Lengthy procedures for obtaining approval for an investment	58,94	68,30	63,46	72,37
Complicated procedures for applying for EU funds	62,91	62,50	73,08	59,21
Lack of advice and practical models	31,79	26,92	15,38	22,37
Information system not functioning satisfactorily	30,46	43,27	30,77	39,47
Too much risk of failure	41,06	56,73	40,38	44,74
Low production profitability	45,69	54,81	34,62	60,53
Uncertainty about agricultural policy	57,62	69,23	57,69	59,21

Source: data from own research

The owners of dairy farms had investment plans (Table 2). The purchase of land was the most common investment across all groups of dairy farms. In many regions of Poland, farmers have problems with purchasing land because of its shortages. In Poland, the land is very often passed down from generation to generation in families. Moreover, farmers are reluctant to sell land, seeing it as an investment of capital. The sale of land from the resources of the National Agricultural Support Center is decreasing year by year, which is the amount of the dwindling land resources.

On farms where the investment value was in the range of 300.1-600 and 600.1-900 thousand PLN, the construction of livestock buildings was the next highest investment, whereas. By investing in buildings, farmers improve the hygienic conditions of animals and their welfare, and install milking machines and devices for storing and cooling milk. In addition, modern barns are equipped with sewage systems to store the slurry, which protects the natural environment.

In farms with the lowest and the highest value of investments, the purchase of a tractor and equipment was the next highest investment. Investments of this kind are very beneficial because they enable the

introduction of more mechanization in the economy. Thanks to these investments, dairy farm owners become more independent in field work and hire less workforce, which is becoming more and more difficult in the Polish countryside.

Table 2. Further investment plans of the surveyed farmers depending on the amount of financial support (%)

Investment plans purchases	Investment value [thousand PLN]			
	Less than 300	300,1-600	600,1-900	Greater than 900
Land	47,02	49,04	61,54	68,42
House building / apartment	17,22	13,46	19,23	23,68
Livestock buildings – cowshed, juniper, calf, other	28,48	33,65	36,54	34,21
Construction of farm buildings	14,57	20,19	23,08	21,05
Tractor/equipment	31,12	29,81	36,54	44,74
Devices	18,54	15,38	21,11	21,05
Car	14,57	14,42	11,54	17,11

Source: data from own research

## 12.6. Summary and conclusion

The development of dairy farms is closely linked to the investment process. The investment activity of dairy farmers depends on many different factors and is limited by barriers. Our research demonstrate that the most important barrier to the investment process is the complicated procedures of applying for the EU funds. Such barrier is the effect of complicated procedures of filling documents, realization the investment process and refunding money. Polish farmers have to carry out the investment and after that they can apply for money refunding. They can only claim a refund of 50% of the investment costs.

Other important barrier to the investment id dairy farms is the lack of capital. This barrier particularly affects poorer farmers and those who have small-scale farms who cannot afford to carry out the investment on their own. They have to take loans and credits which are expensive.

The largest percentage of farmers indicated land purchase as the most important investment plan in the future. The largest percentage of farmers indicated land purchase as the most important investment plan

in the future. This plan may be difficult for many farmers to implement due to the lack of agricultural land for sale in their region. There is currently a hunger for land in Poland and many farmers, although they would like to expand their business and buy land, cannot do it.

Other investment plans are closely related to the production of milk, enlargement of the herd of animals or the purchase of new machinery and equipment for farms. It should be noted that these investments can be implemented on dairy farms and the barriers are rather small.

### References

1. Czekala W. (2015): Current situation and future trends on management of natural fertilizers in Poland. *Archiwum Gospodarki Odpadami i Ochrony Środowiska* ISSN 1733-4381, vol. 17, issue 1 (2015), 39-46. <https://encyklopedia.pwn.pl/haslo/modernizacja;3942539.html>.
2. *Encyklopedia ekonomiczno-rolnicza*. Państwowe Wydawnictwo Rolnicze i Leśne, Warszawa 1984, hasło: modernizacja gospodarstw.
3. Gałaj D. (1990): Tradycja i nowoczesność w rolach kobiet wiejskich. [W:] *Kobieta w kulturze i społeczeństwie*. Red. B. Jedynek, Wydawn. UMCS, Lublin 1990, 256-257.
4. Czyżewski B., Gospodarowicz M., Kołodziejczyk D., Lidke D., Matuszczak A., Wasilewska A., Wasilewski A. (2008): Rola instytucji w modernizacji gospodarstw rolnych. Warszawa, IERIGŻ PIB.
5. O'CONNEL J. (1976): *The concept of modernization* (w:) Black Cyril (red): *Comparative Modernization*, Free Press, New York
6. Klepacki B. (2005): Procesy przemian gospodarki polskiej lat 90., ze szczególnym uwzględnieniem rolnictwa. [W:] Red. Klepacki B., *Procesy przystosowawcze przedsiębiorstw agrobiznesu do gospodarki rynkowej*. Wydawn. Wieś Jutra, SGGW w Warszawie, Warszawa 2005.
7. Klusek T. (2003): Uwarunkowania i czynniki rozwoju gospodarstw rodzinnych w warunkach gospodarki rynkowej. *Roczniki Nauk Rolniczych*, Seria G, t. 90, z. 2, 175-184.
8. Kusz D. (2018): *Pomoc publiczna a proces modernizacji rolnictwa*. Oficyna Wydawnicza Politechniki Rzeszowskiej, Rzeszów, 2018, 135-197.
9. Salamończyk E., Guliński P., Senterkiewicz M. (2013): Wielkość dostaw, jakość i skład mleka surowego, skupowanego w latach 2006–2010 przez jeden z krajowych zakładów mleczarskich. *Wiadomości Zootechniczne*, R. LI (2013), 4, 37–42.

10. Seremak-Bulge J. (2015): (Red.). Procesy modernizacyjne w sektorze mleczarskim. Red. Grochowska R., Ocena strat ponoszonych na poszczególnych etapach łańcucha mleczarskiego w Polsce. Wydawnictwo IERiGŻ-PIB, Warszawa 2015.
11. Kim K., Chavas J.P. (2003): Technological change and risk management: an application to the economics of corn production. *Agricultural Economics*, nr 29, 2003, 125--142.
12. Reisch E., Zeddies J. (1995): Wprowadzenie do ekonomiki i organizacji gospodarstw rolnych. Wydawnictwo Akademii Rolniczej w Poznaniu, Poznań 1995.
13. Runowski H. (1997): Postęp biologiczny w rolnictwie, wydawnictwo SGGW, Warszawa.
14. Smoleński Z., Seremak-Bulge J., (1994): Produkcja i rynek mleka w okresie przechodzenia do gospodarki rynkowej, IERiGŻ, Warszawa 1994.
15. Sroka W., Dacko M. (2010): Ocena czynników rozwoju przodujących gospodarstw rolniczych z wykorzystaniem metody drzew regresyjnych typu C&RT. *Zagadnienia Ekonomiki Rolnej*, nr 2, 2010, 100-112.
16. Sztompka P. (2005): Socjologia zmian społecznych. Wydawnictwo Znak. Kraków.
17. Walczak J., Krawczyk W., Szewczyk A., Mazur D., Pająk T., Radecki P. (2012): Oszacowanie wielkości produkcji oraz jednostkowej zawartości azotu nawozów naturalnych, powstałych w różnych systemach utrzymania zwierząt gospodarskich w Polsce. Instytut Zootechniki Państwowy Instytut Badawczy, 4-6.
18. Wasilewska A. (2009): Teoretyczne uwarunkowania procesu modernizacji gospodarstw rolniczych. *Zeszyty Naukowe SGGW w Warszawie, seria Ekonomika i Organizacja Gospodarki Żywnościowej*, nr 75, Warszawa 2009, 211-212.
19. Woś A. (1999): Instrumenty restrukturyzacji i modernizacji gospodarstw rolnych. Instytut Ekonomiki Rolnictwa i Gospodarki Żywnościowej, Warszawa 1999.
20. Wójcicki Z. (1997): Wpływ rozwoju mechanizacji na przemiany agrarne w polskim rolnictwie. [W:] Red. H. Runowski, *Przemiany strukturze agrarnej I zatrudnieniu rolniczym do końca XX wieku*. Wydawnictwo SGGW, Warszawa 1997.
21. Zieliński K. (2014): Procesy modernizacyjne rolnictwa. Wydawnictwo Difin, Warszawa 2014.
22. Ustawa z dnia 16 grudnia 2005 r. o produktach pochodzenia zwierzęcego (Dz.U. 2006 nr 17 poz. 127 z późn.zm.).
23. Ustawia z dnia 21 sierpnia 1997 r. o ochronie zwierząt (Dz.U. 1997 nr 111 poz. 724 z późn.zm).
24. Ustawa z dnia 2 kwietnia 2004 r. o systemie identyfikacji i rejestracji zwierząt (Dz.U. 2004 nr 91 poz. 872 z późn.zm.),
25. Ustawa z dnia 22 lipca 2006 r. o paszach (Dz. U. 2006 Nr 144 poz. 1045 z późn.zm.).
26. Ustawa z dnia 10 lipca 2007 r. o nawozach i nawożeniu (Dz. U. 2007 Nr 147 poz. 1033 z późn.zm.).

27. Ustawa z dnia 20 lipca 2017 r. Prawo wodne (Dz. U. 2017 poz. 1566 z późn.zm.).
28. Rozporządzenie Ministra Rolnictwa i Rozwoju Wsi z dnia 28 czerwca 2010 r. w sprawie minimalnych warunków utrzymywania gatunków zwierząt gospodarskich innych niż te, dla których normy ochrony zostały określone w przepisach Unii Europejskiej (Dz.U. 2010 nr 116 poz. 778 z późn.zm.).
29. Rozporządzenie Ministra Rolnictwa i Rozwoju Wsi z dnia 15 lutego 2010 r. w sprawie wymagań i sposobu postępowania przy utrzymywaniu gatunków zwierząt gospodarskich, dla których normy ochrony zostały określone w przepisach Unii Europejskiej (Dz.U. 2010 nr 56 poz. 344 z późn.zm.).
30. Rozporządzenie (WE) nr 853/2004 Parlamentu Europejskiego i Rady z dnia 29 kwietnia 2004 r. ustanawiającego szczególne przepisy dotyczące higieny w odniesieniu do żywności pochodzenia zwierzęcego (Dz. Urz. UE L 139 z 30.04.2004, str. 55).
31. Rozporządzenie (WE) nr 183/2005 Parlamentu Europejskiego i Rady z dnia 12 stycznia 2005 r. ustanawiającego wymagania dotyczące higieny pasz (Dz. Urz. UE L 35 z 08.02.2005, str. 1).