ANNALS OF THE POLISH ASSOCIATION
OF AGRICULTURAL AND AGRIBUSINESS ECONOMISTS

Received: 03.06.2021
Acceptance: 23.06.2021
Published: 29.06.2021
JEL codes: Q10, Q14

Annals PAAAE • 2021 • Vol. XXIII • No. (2)

DOI: 10.5604/01.3001.0015.0029

ŁUKASZ ŁUNIEWSKI, BARBARA GOŁĘBIEWSKA

Warsaw University of Life Sciences – SGGW, Poland

SOURCES OF FINANCING AGRICULTURAL ACTIVITIES IN DAIRY FARMS WITH DIFFERENT SCALES OF COW REARING

Key words: farm, milk production, financing agricultural activity, self-financing, investment expenditure

ABSTRACT. The aim of the research was to evaluate the sources of financing agricultural activities in farms specialized in milk production. The subject of research was a group of family farms located in the Podlaskie and Mazowieckie voivodeships (provinces). The criterion for farm division was the number of cows in the basic herd. There was also an assessment of the most important factors conducive to the development of dairy farms. To do so, the opinions of dairy farmers were used, and their views in this regard were expressed on a five-point Likert scale. The research was conducted on a sample of 100 farms in 2021. The interpretation of the results was made in relation to the criterion adopted in the division of farms into quartiles. It was found that the main source of financing activities in dairy farms was own funds. The highest share of farms using commercial loans was in the group of farms with the largest number of cows. With an increase in the number of cows in a herd, the area of farms increased, which is understandable due to the need to produce roughage. The most important factors influencing the development possibilities of agricultural holdings were the uninterrupted collection of raw material and a stable milk purchase price, which guaranteed the farmers' financial liquidity.

INTRODUCTION

The proper selection of sources of financing for farm operations is one of the key elements to start and continue farming. An agricultural producer, like any market operator, must meet monetary obligations. As reported by Omobolaji Omobitan, Aditya R. Khanal and Ummey Honey [2019], farm business financing is not only important to meet long-term agricultural needs but also to meet current needs such as the purchase of new high-yielding crop varieties, the payment of hired labor, the implementation of new technology, productivity improvement, etc. It is expected that all these financing applications will consequently help and improve the productivity and profitability of small farms/agricultural enterprises. Bernice Mwihaki Kiragu [2015] recognizes that agricultural finance is the financing of activities from production to market, whereby she relates it to

financial services ranging from short, medium and long-term loans to leasing, crop and livestock insurance, covering the entire agricultural value chain – raw material supply, production and distribution, wholesale, processing and marketing.

The basic division of sources of financing activities includes personal and non-farm resources. It has long been indicated that self-financing has been the primary source of financing development activities in the agricultural sector [Marcysiak, Marcysiak 2009, Zawadzka et al. 2014, Felczak 2015, Baraniak 2017, Franc-Dąbrowska el al. 2018]. This is perhaps related to the fact that this way of financing provides financial security and stability (self-financing is less risky) [Franc-Dąbrowska 2008, Mądra-Sawicka 2016, Omobitan et al. 2019]. Farmers' reluctance to go into debt or credit constraints have also been pointed out [Petrick 2003, Zinych, Odening 2009].

Different results are presented by Nigel Key [2000] and also by Pratap Birthal and his team [2017] for farms in Punjab, indicating that commercial bank financing is limited and associated with larger, wealthier farms. Credit, as an important source of financing in agriculture, is pointed out by Pavel Ciaian, Jan Falkowski and d`Artis Kancs [2012]. The authors point to the fact that there are delays between the operating cycle in agriculture and the need to make current operating expenditures, where credit can be helpful.

Dariusz Kusz [2008] stated that the main source of investment financing in agricultural holdings were investments obtained from European Union funds, which may result from the fact that this source of financing is burdened with low cost and financial risk. Only after that, own funds were used, then credits and loans. Studying the issues of financing innovation in the agro-industrial complex, Zoya Babaeva [2018] reports that the enterprise's own funds are still among the most common sources of financing agricultural production. However, agriculture today needs more financial support and protection compared to other sectors of the economy. Elżbieta J. Szymańska and Mariusz Dziwulski [2014], studying the sources of investment financing in dairy farms with different scales of cow rearing found that the increase in the scale of cow rearing caused changes in the financing structure. Smaller farms financed investments to a greater extent using loans (mainly preferential loans) and subsidies, while in farms with a larger scale of production, the importance of own funds and commercial loans was higher. On the other hand, Arkadiusz Sadowski and team [2021] report that aid funds for investments were mainly used by farms larger in area. Sanne Klerx [2015] in her research found that the most used source of financing in the agricultural sector in Europe was debt financing.

Ewa Kołoszycz [2017], analysing investment expenditures within own resources in farms specializing in milk production, found that smaller farms can afford them to a limited extent, only development farms can realize investments. Similar results were obtained by the team of Imre Fertő [2021], studying dairy farms of Baltic and Central European countries – Estonia, Hungary and Slovenia. The researchers found that only in farms with large financial resources was there a possibility to finance investments.

MATERIAL AND METHODS

The aim of the research was to evaluate the types of sources of financing agricultural activities in dairy farms, depending on the scale of production, which was measured by the number of cows in the herd. Complementary to this research was an evaluation of the most important factors favourable for the development of farms, where the Likert scale was used.

The subject of the research was a group of family agricultural farms characterized by location in the area of the Podlaskie and Mazowieckie provinces. The study conducted in May 2021 involved 100 farms distributed practically in all districts of the analysed provinces. The selection of the research sample was related to the milk outlet place. The largest number of farms cooperated with Mlekovita Group and SM Mlekpol. The sample of farms covered by research is not a representative sample for dairy farms disposing milk to these units, however the obtained results may indicate some regularities in economic characteristics in dairy farms of potential development. The number of cows in the basic herd in a holding was used as the method of grouping. The number of cows in a herd can be considered a measure of the scale of milk production, therefore it was assumed that such a method of grouping will make it possible to determine what the development possibilities in farms with different numbers of cows in a herd are.

Research was carried out by means of a diagnostic survey. Questionnaires were made available to agricultural producers through the Facebook platform, using modern forms of communication. The chosen method of distributing the questionnaire was effective, especially considering the large dispersion of the research sample and the current restrictions caused by the COVID19 pandemic, which significantly reduced direct human contact.

The results were interpreted with respect to the assumptions made in dividing the households into quartiles. Clustering results are presented for both marginal quartiles, viz: I quartile, i.e. 25% of farms with the smallest number of cows, and the upper quartile, i.e. 25% of farms with the largest number of cows, but also for the two middle groups, separated by quartile II (median). Thus, four equidistant groups were separated:

A – 25% of the holdings in the study sample with the lowest number of cows in the main herd (bottom quartile),
B – 25% of holdings in group II (above I quartile but below II),
C – 25% of the holdings in the group between II and III quartiles,
D – 25% of holdings with the highest number of cows (upper quartile).

The division was made according to data for 2021 (research was conducted in April and May 2021), while information collected from respondents covered the years 2013-2020.

RESEARCH RESULTS

The studied groups of farms were differentiated in terms of average farmland area and milk yield (Table 1). The area of farms increased with an increase in the number of cows in the herd, which is understandable because of the need to produce roughage, which is the basis of modern TMR (Total Mixed Ration) feeding, especially in highly developed farms with high cow density. This is confirmed by the research of Renata Włodarczyk and Mindaugas Budvytis [2011], who found that herd size is very important for the application of modern systems of feeding or the implementation of other scientific achievements in animal production (animal maintenance and milk extraction techniques).

The optimal number of cows per 1 ha for environmental reasons should not exceed the limit of 1.5 LU per ha. If this limit is exceeded, further development and intensification of livestock production are not advisable [Duer et al. 2004]. This coefficient varies from group to group, as it depends on many nuances. One of them is the condition of obtaining the optimal yield of plants intended for roughage or complete fodder. It depends, among other things, on the appropriate soil class, proper water and air conditions, and correctly selected agrotechnology. In the studied groups, the highest number of cows per 1 ha UAA was in group D and amounted to 1.12 cows per 1 ha UAA. None of the studied groups exceeded the upper limit of 1.5 LU per 1 ha UAA. The system of keeping animals and the method of cattle feeding are also important, because grazing cows requires much more grassland than the traditional tethering system without grazing. In Poland, the optimal stocking density per 1 ha of pasture is, on average, 1 to 2 cows with calves. Even on very high-yielding grasslands, 2 LU/ha should not be exceeded, primarily to protect water and the environment. However, it is advisable to harvest the excess green fodder on such grasslands for hay or hay-silage [Duer et al. 2004]. Taking into account the above mentioned norms and the pledged results (Table 1), a relationship can be observed where group D, with the highest number of cows, has, at the same time, the lowest average value of grassland per 1 cow, i.e. 0.32 ha. On the other hand, group B is characterized by the largest area of 0.53 ha per 1 cow.

Taking the discussed standards and collected data into account, it can be concluded that only in groups B and C was the number of dairy cows at an optimal level, because it did not exceed the upper limit of 2 LU per 1 ha of grassland. The proportion of grassland was differentiated in individual groups. In group A the average area of grassland was 8.24 ha, which constituted approximately 28% of total UAA in the discussed group. In group B, on the other hand, the share of grassland area was 16.5 ha, i.e. 43.8% of the farm's UAA. Results for farms in group C were on a lower level. Grassland constituted, on average, 33.7% of all UAA. Similarly, in group D the share of grassland was 35.2% of total UAA. The situation was also differentiated in terms of the cow keeping system. Free grazing was used to the greatest extent in farms with a smaller number of cows.

Table 1. Selected characteristics of farms with a diversified number of cows

Specification	Holdings with cow number (divided into 4 equal groups)			
	A	B	C	D
Average size of farms [ha]	29.6	37.7	66.6	111.7
Average area of grasslands [ha]	8.24	16.5	22.42	39.34
Number of cows per 1 ha of UAA	0.61	0.82	0.65	1.12
Number of dairy cows (average)	18	31	43	125
Number of cows per 1 ha of grassland	2.18	1.88	1.92	3.18
Average annual milk yield [kg/head]	7,540	7,780	8,260	9,540
Share of farms with efficiency [%]				
Less than 6 [thousand kg]	12	0	4	4
6-8 [thousand kg]	56	72	40	20
Over 8 [thousand kg]	32	28	56	76
Share of farms according to cattle housing system*				
Tethered	42.9	51.7	25.8	26.9
Free-stall	0.0	0.0	12.9	50.0
Free-stall and tethered	46.4	37.9	45.2	19.2
Free grazing (spring - autumn)	10.7	10.3	16.1	3.8

* The results do not add up to 100 as more than one answer was possible

Source: own study

A clear relationship between herd size and average annual milk yield per cow can also be observed. The higher the herd size, the higher the milk yield. In the group with the largest herd size, it was over 26% higher than in the group of farms with a smaller herd size.

The results of the analysis showed that the main sources of financing agricultural activities, indicated by the respondents referred to personal funds, obtained from the sale of products (Figure 1). The respondents had the possibility to choose several answers at the same time, therefore the results do not add up to 100. The vast majority of farmers in all examined groups indicated that the main source of financing was funds obtained from the sales of milk and beef livestock. In the next place, the respondents mentioned the income from sales of other products, but the bigger the size of herd, the lower their share was. It is understandable that the importance of other activities decreases with higher specialization.

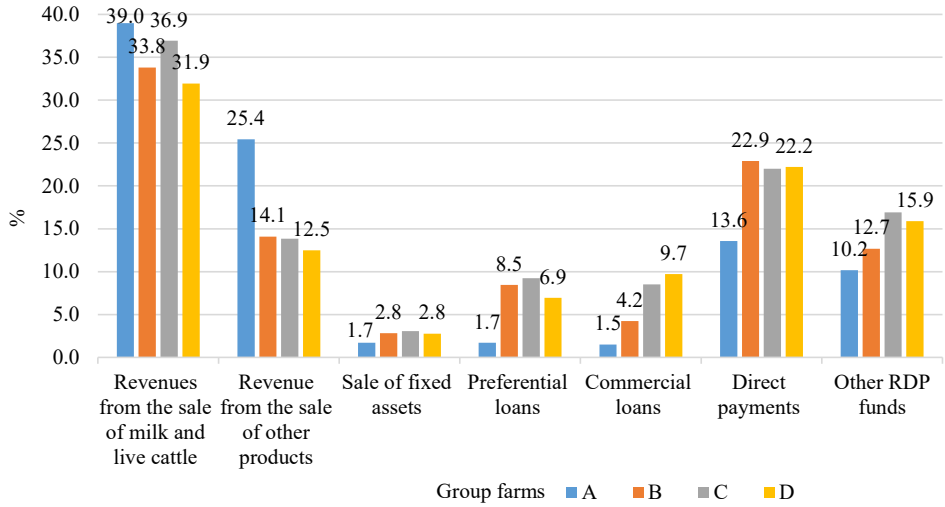

Figure 1. Sources of financing of the surveyed farms
Source: own study

Direct payments also played a large role and were also indicated as a source of financing of great importance. The least used source of financing activities were loans, both preferential and commercial. In particular groups, their share varied, but it did not exceed 9%. This probably resulted from current needs and investment plans. Only in the group of farms with the highest number of cows was the use of commercial loans almost 10%.

In the case of financing investment activities, land purchase was indicated as being implemented to a great extent in about 24-28% of the farms. The highest number of responses referred to no such investment (Table 2). However, this could have been due to the inability of purchasing land due to low supply.

On the other hand, investments in the purchase of agricultural machinery and equipment were realized to a great extent. In the surveyed groups, more than 60% of respondents (only in the group with the lowest number of cows more than 50%) indicated a high importance of this kind of investments. Responses to expenditure on construction, renovation or modernization were more varied. Producers indicated, to varying degrees, that investments were made or not made. When buying heifers, on the other hand, in all surveyed groups, most respondents indicated a lack of such investments, but with an increase in the number of cows in the herd, the number of such answers decreased, while the degree of realization of such investments increased. This indicates that in smaller farms, herd replacement is more often done with the use of animals from own breeding.

In the survey, respondents were asked for their opinion on which farm development factor they considered most important (Figure 2).

Table 2. The goals of investment expenses in surveyed agricultural holdings

Implementation of expenditure on investments	Realisation of investments in group holdings			
	A	B	C	D
Land purchase [%]				
Lack	72	56	48	36
Slightly	4	4	8	16
Moderately	0	16	16	20
Mostly	24	24	28	28
Construction, renovation or modernization [%]				
Lack	20	24	36	24
Slightly	32	28	12	16
Moderately	12	24	20	16
Mostly	36	24	32	44
Purchase of agricultural machinery and equipment [%]				
Lack	12	4	8	4
Slightly	16	8	16	12
Moderately	20	12	8	20
Mostly	52	76	68	64
Purchase of heifers [%]				
Lack	76	68	44	42
Slightly	16	8	24	16
Moderately	4	16	12	10
Mostly	4	8	20	32

Source: own study

The greatest positive influence, according to the respondents on the development of farms in discussed years, had, first of all, uninterrupted receipt of raw material, which limited fluctuations in the preservation of financial liquidity. Also subsidies and favourable, stable prices for milk sales were of great importance. Only a few percent of farmers in particular groups had a different opinion.

The least important factors influencing farm development in 2013-2019 were contracting agreements, membership in an agricultural producer group and agricultural insurance. In all three of these cases discussed, more than half of the respondents said these factors were not as important in the ability to expand agricultural production.

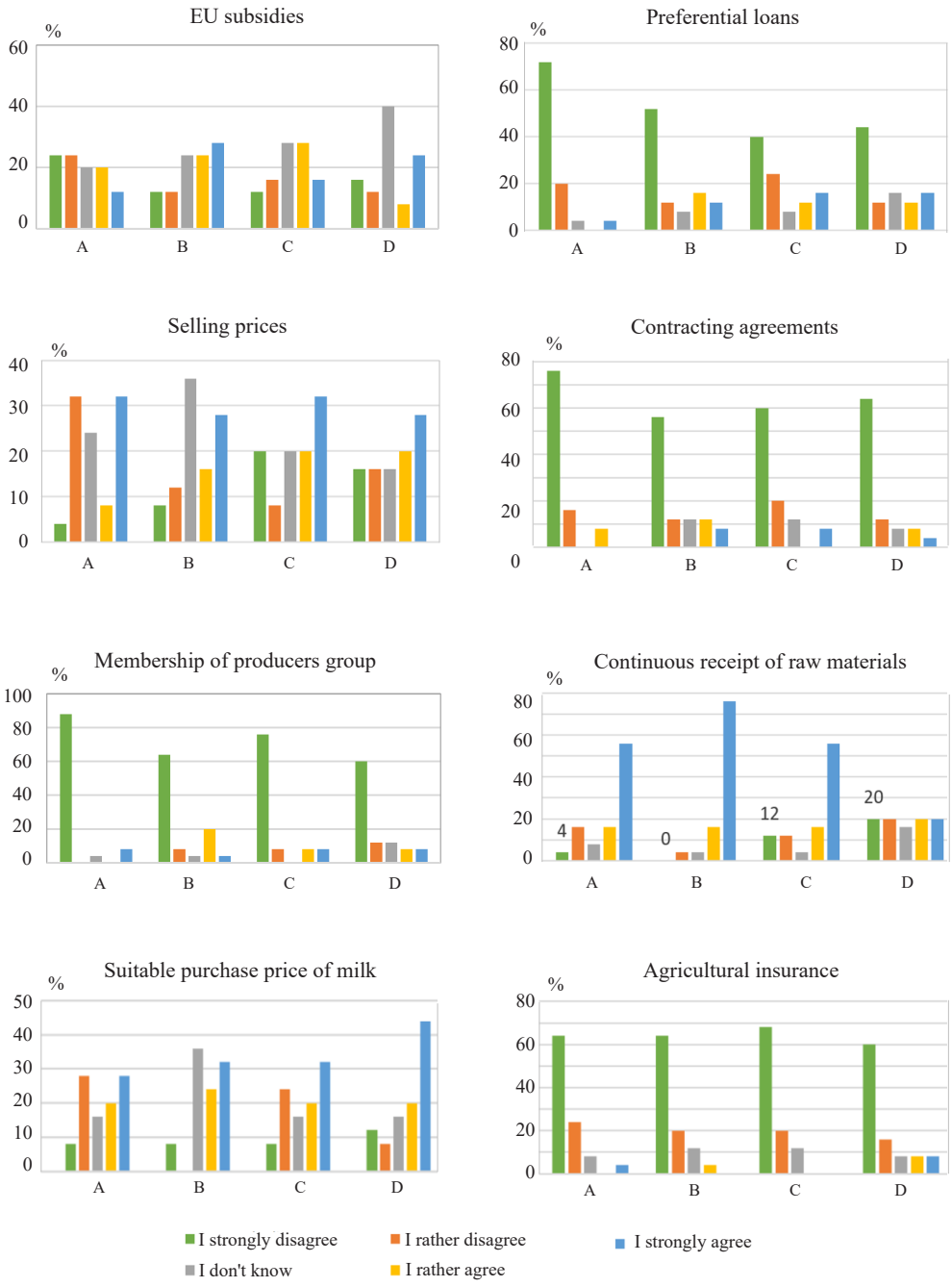

Figure 2. The most important factors facilitating farm development in 2013-2020 according to the respondents

Source: own study

SUMMARY

The conducted research confirms and complements previous research conducted by other authors in the field of activity financing in farms, including farms focused on milk production. The sample selection for the research does not authorize generalisations of the results to the whole population of dairy farms in the country. However, the results of the research are a contribution to enrich the current knowledge on business financing in dairy farms. Changes that occur in the environment, as well as in the farms themselves, indicate that the current monitoring of the situation in agricultural farms (including dairy farms) is important and gives opportunity to assess current issues concerning the functioning and development of units.

The analysis of research results made it possible to formulate several concluding statements. It was found that the main source of activity financing in farms was private funds obtained from the sale of raw materials. Only in the group of farms with the largest number of cows was there a greater use of commercial loans. Therefore, it can be assumed that some of the farms with a larger scale of rearing based the financing of production activities on external sources of funding. However, in the case of smaller farms, mainly own resources were used.

In all surveyed groups, investment activities were implemented, mainly in machinery and equipment, as well as in repairs and the modernization of fixed assets. To a lesser extent, decisions were made with regard to the purchase of land or purchase of heifers to renew the herd. While the ability to purchase land may be limited by a lack of supply, it may be surprising that farms in all groups primarily restocked their herds in a closed cycle. This indicates that they are basing herd development on their own breeding material. This may be associated with the fact that, in the discussed group, the average annual milk yield was at a very high level, so there was no need to look for more efficient breeds.

The basic advantage of dairy cattle farming, in the opinion of farmers, was the uninterrupted collection of raw material and a relatively stable milk purchase price, which guaranteed farmers maintained financial liquidity. These variables were indicated as the most important factors of farm development. According to the respondents, subsidies also had a significant impact as a source of financing in farms, because they provided opportunities for the realization of investments contributing to a reduction of labour intensity and an increase of labour and production efficiency. Respondents overwhelmingly did not indicate preferential loans as a source of financing. It is likely that the stable price in the purchase of milk and the uninterrupted collection of raw material reduced the necessity to take liabilities in the form of credits.

The least important factors influencing farm development in 2013-2019 were contracting agreements, membership in an agricultural producer group and agricultural insurance. In all three cases discussed, more than half of the respondents confirmed that they strongly disagreed that the factors listed above had an impact on their farm development during the years studied.

BIBLIOGRAPHY

Babaeva Zoya Shapiulakhovna. 2018. An investigation into current issues in the financing of the innovative development of the agro-industrial complex. *Academy of Strategic Management Journal* 17 (4): 1-6.

Baraniak Marta. 2017. Działalność inwestycyjna gospodarstw rolnych w Polsce z uwzględnieniem finansowania własnego (Investment activity of Polish farms including own funds). *Annales Universitatis Mariae Curie-Skłodowska. Oeconomia* 51 (6): 21-30. DOI: 10.17951/h.2017.51.6.21.

Birthal Pratap S., Ramesh Chand, P.K. Joshi, Saxena Raka, Pallavi Rajkhowa, Tajuddin Khan, Arshad Khan, Khyali R. Chaudhary. 2017. Formal versus informal: Efficiency, inclusiveness and financing of dairy value chains in Indian Punjab. *Journal of Rural Studies* 54: 288-303. DOI: 10.1016/j.jrurstud.2017.06.009.

Ciaian Pavel, Jan Falkowski, Kancs d'Artis. 2012. Access to credit, factor allocation and farm productivity. *Agricultural Finance Review* 72 (1): 22-47.

Duer Irena, Mariusz Fotyma, Andrzej Madej (ed.). 2004. *Kodeks Dobrej Praktyki Rolniczej*. Wydanie III (Code of Good Agricultural Practice). Edition III. Warszawa: Ministerstwo Rolnictwa i Rozwoju Wsi, Ministerstwo Środowiska.

Felczak Tomasz. 2015. Źródła finansowania działalności indywidualnych gospodarstw rolniczych w opinii zarządzających (The sources of financing of agricultural activities according to their managers). *Zeszyty Naukowe Uniwersytetu Szczecińskiego. Finanse, Rynki Finansowe, Ubezpieczenia* 74 (2): 83-91.

Fertő Imre, Štefan Bojnec, József Fogarasi, Ants Hannes Viira. 2021. The investment behaviour of dairy farms in transition economies, *Baltic Journal of Economics* 21 (1): 60-84. DOI: 10.1080/1406099X.2021.1920754.

Franc-Dąbrowska Justyna. 2008. Ocena płynności finansowej przedsiębiorstw rolniczych (Assessment of agricultural companies' financial liquidity). *Zagadnienia Ekonomiki Rolnej* 1: 43-59.

Franc-Dąbrowska Justyna, Mądra-Sawicka Magdalena, Bereżnicka Joanna. 2018. Cost of agricultural business equity capital – a theoretical and empirical study for Poland. *Economies* 6 (3): 37. DOI: 10.3390/economies6030037.

Key Nigel. 2000. Avings, credit and the self-finance of crop production in Mexico. *Savings and Development* 24 (2): 161-175.

Kiragu Bernice Mwihakireg. 2015. *The relationship between agricultural financing and productivity of dairy farming in central Kenyaby: research project submitted in partial full filmentof the requirements of master of science in finance*. Nairobi: University of Nairobi, http://erepository.uonbi.ac.ke/bitstream/handle/11295/94742/, access: 11 June 2021.

Klerx Sanne. 2015. Alternative sources of finance in the agricultural sector. Wageningen: Wageningen University, https://edepot.wur.nl/349994.

Kołoszycz Ewa. 2017. Volatility of milk prices and the formation of the surplus on the self-financing of investments in dairy farms. *Problems of Agricultural Economics* 2 (351): 77-93.

Kusz Dariusz. 2008. Finansowanie działalności inwestycyjnej w wybranych gospodarstwach rolniczych Podkarpacia (Financing investment activities in selected farms of Podkarpacie Region). *Ekonomika i Organizacja Gospodarki Żywnościowej* 66: 63-72.

Marcysiak Adam, Agata Marcysiak. 2009. Źródła finansowania działalności bieżącej i inwestycyjnej gospodarstw rolnych (Sources of financing investments and operation in agricultural farms). *Zeszyty Naukowe SGGW w Warszawie. Problemy Rolnictwa Światowego* 9 (24): 119-127.

Mądra-Sawicka Magdalena. 2016. Samofinansowanie działalności w przedsiębiorstwach rolniczych (Self-financing in agriculture enterprises performance). *Finanse, Rynki Finansowe, Ubezpieczenia* 4 (82): 425-435. DOI: 10.18276/frfu.2016.4.82/1-36.

Omobolaji Omobitan, Khanal Aditya, Hone Ummey. 2019. *Examining capital constraints and financing sources: How do small farms meet their agricultural spending and expenses?* [In] Selected Paper prepared for presentation at the Southern Agricultural Economics Association (SAEA). Annual Meeting, February 2-5, 2019, Birmingham, Alabama. DOI: 10.22004/ag.econ.284282.

Petrick Martin. 2003. Empirical measurement of credit rationing in agriculture: a methodological survey. Discussion Paper No. 45. Halle (Saale): Institute of Agricultural Development in Central and Eastern Europe (IAMO), http://nbn-resolving.de/urn:nbn:de:gbv:3:2-23204.

Sadowski Arkadiusz, Monika Wojcieszak-Zbierska, Patrycja Beba. 2021. Territorial differences in agricultural investments co-financed by the European Union in Poland. *Land Use Policy* 100: 104934. DOI: 10.1016/j.landusepol.2020.104934.

Szymańska Elżbieta Jadwiga, Mariusz Dziwulski. 2014. Poziom inwestycji i źródła ich finansowania w gospodarstwach mlecznych o różnej skali chowu krów (The level of investment and sources of their financing in dairy farms of different farming scale of cows). *Roczniki Naukowe SERiA* XVI (6): 476-480.

Włodarczyk Renata, Mindaugas Budvytis. 2011. Właściwe żywienie krów wysokowydajnych – jak w pełni wykorzystać ich potencjał produkcyjny (Proper feeding of high-yielding cows – how to fullfil their productive potential). *Życie Weterynaryjne* 86 (10): 771-776.

Zawadzka Danuta, Agnieszka Strzelecka, Ewa Szafraniec-Siluta. 2014. Ukierunkowanie produkcji gospodarstwa rolnego a zdolność do samofinansowania nakładów inwestycyjnych – ujęcie porównawcze (The type of farm's production and the ability to self-finance of investments – a comparative approach). *Zarządzanie i Finanse* 3 (1): 289-305.

Zinych Nataliya, Martin Odening. 2009. Capital market imperfections in economictransition: empirical evidence from Ukrainian agriculture, *Agricultural Economics* 40 (6): 677-689.

***

ŹRÓDŁA FINANSOWANIA DZIAŁALNOŚCI ROLNICZEJ W GOSPODARSTWACH MLECZNYCH O RÓŻNEJ SKALI CHOWU KRÓW

Słowa kluczowe: gospodarstwo rolnicze, produkcja mleka, finansowanie działalności rolniczej, samofinansowanie, wydatki inwestycyjne

ABSTRAKT

Celem badań była ocena źródeł finansowania działalności rolniczej w gospodarstwach wyspecjalizowanych w produkcji mleka. Podmiotem badań była grupa rodzinnych gospodarstw rolniczych zlokalizowanych na obszarze województwa podlaskiego oraz mazowieckiego. Kryterium podziału gospodarstw była liczba krów stada podstawowego. Dokonano także oceny najważniejszych czynników sprzyjających rozwojowi gospodarstw mlecznych, wykorzystano opinie producentów mleka, a ich poglądy w tym zakresie wyrażono w pięciostopniowej skali Likerta. Badania przeprowadzono na próbie 100 gospodarstw w 2021 roku. Interpretacji wyników dokonano w odniesieniu do przyjętego kryterium w podziale gospodarstw na kwartyle. Stwierdzono, że głównym źródłem finansowania działalności w gospodarstwach mlecznych były środki własne. Najwyższy udział gospodarstw korzystających z kredytów komercyjnych wystąpił w grupie gospodarstw o największej liczbie krów. Wraz ze wzrostem liczby krów w stadzie wzrastała powierzchnia gospodarstw, co jest zrozumiałe ze względu na konieczność produkcji pasz objętościowych. Do najważniejszych czynników wpływających na możliwości rozwojowe gospodarstw, badani producenci zaliczyli nieprzerwany odbiór surowca oraz stabilną cenę skupu mleka, które gwarantowały rolnikom zachowanie płynności finansowej.

AUTHORS

ŁUKASZ ŁUNIEWSKI, ENG

Warsaw University of Life Science (WULS)
Department of Economics and Enterprise Organization
166 Nowoursynowska St., 02-787 Warszawa, Poland
e-mail: lukasz_luniewski@sggw.edu.pl

BARBARA GOŁĘBIEWSKA, DR HAB. PROF. WULS

ORCID: 0000-0003-4073-5274
Warsaw University of Life Science (WULS)
Department of Economics and Enterprise Organization
166 Nowoursynowska St., 02-787 Warszawa, Poland
e-mail: barbara_golebiewska@sggw.edu.pl