



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

*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.*

TOMASZ WOJEWODZIC*, WOJCIECH SROKA*, JAROSŁAW MIKOŁAJCZYK**

*University of Agriculture in Krakow, Poland, **State Higher Vocational School in Tarnow, Poland

DYNAMICS AND VARIABILITY IN INCOME FROM FARMING IN FARMS OPERATING IN METROPOLITAN AREAS IN POLAND¹

Key words: income, metropolitan areas, farms

ABSTRACT. The aim of the paper was to indicate differences in income from agricultural activity earned by farm owners located in different zones under the influence of a big city. The study covered entities from six voivodships: Lower Silesia, Lubelskie, Lesser Poland, Masovia, Pomerania and Greater Poland. The database of the Polish FADN system was the source of data presented in the analysis. The outer and inner metropolitan zone have been distinguished as well as the group of objects located outside metropolitan areas. For the distinguished groups, a comparative analysis was carried out. Research pinpointed that in the inner metropolitan area zone, there was evidently a considerably higher income from a farm on one unit of own work and the estimate rate of wage for an hour of hired work. The average value of these categories was diminishing in subsequent zones along with moving away from the core of metropolitan areas. Apart from that, in all the three researched groups of farms, the average rate of wage of own work was higher than the rate of wage of hired work. This means that farm owners also take wages from management and the incurred economy risk. The height of these wages is subjected to considerable fluctuation that result from e.g., observed economic fluctuations in agriculture.

INTRODUCTION

Increasing globalisation has a significant impact on processes occurring in agriculture. The development of not only international corporations taking control of global agricultural and food markets, but also large multiples competing for domination in retail trail can be observed. What is also of significant importance for processes occurring in agriculture is the rise of mega-cities and the expansion of metropolitan areas. These processes are confirmed by empirical studies that cover Poland [Zegar 2018]. Cities create the demand for food products stimulating the development of agriculture, but on the other hand, they push agricultural production from suburban areas, absorbing both the land and labour force “sucked” from closed farms. This paper attempts to answer the question: Does the location of farms relative to the metropolitan area core impact the level of remuneration for work of those working in agriculture?

¹ Research funded by the National Science Centre, Poland No. 2016/21/D/HS4/00264.

MATERIAL AND METHODS

The way of defining metropolitan areas (MA) in the literature or Polish law has still not been unified [Grochowska 2016]. This creates a kind of terminological mess, but, at the same time, gives huge freedom in terms of interpreting this concept. For the purpose of achieving the research aims formulated in the project, the definition of MA presented by the Ministry for Regional Development in 2011 was adopted [Polish Monitor, 2012.252]. According to this definition, MA is the area of a large city (over 300 thousand inhabitants) and its functionally connected immediate environment established in the National Spatial Management Concept 2030 [Resolution No 239, Polish Monitor, 2012].

The aim of the paper was to indicate differences in income from agricultural activity earned by farm owners located in different zones of the influence of a big city. The research includes six voivodships: Lower Silesia, Lublin, Lesser Poland, Mazovia, Pomerania and Greater Poland. These voivodships were chosen to illustrate a huge diversification of both natural and economic conditions in Poland.

Based on planning documents (spatial management plans and studies), the following zones were distinguished in each of the regions [Sroka et al. 2018]:

- MA inner zone (municipalities directly bordering the core),
- MA outer zone (the remaining municipalities of MA),
- part of a province outside the metropolitan area (outside MA). Two research hypotheses were verified during the research.
- H_1 : the proximity of a large city has a positive impact on the amount of remuneration for own labour on a farm,
- H_2 : the remuneration for own labour on farms located in the vicinity of metropolitan area cores is higher than the remuneration for hired labour used in such economic entities.

The source material used in the analyses was numerical data obtained from the database of the Polish FADN system. Of 3,508 farms participating in the system over an uninterrupted period between 2004 and 2016, 1,854 entities operating within the provinces analysed were selected. 46 entities of this population operated in the MA inner zone, and 143 entities operated in the MA outer zone. For the distinguished groups, a comparative analysis was conducted.

The first stage of the analysis used a simple measure of assessing the efficiency of own (unpaid) labour input in farms, which was based on the category of agricultural income (1).

$$E_{OL} = \frac{FFI}{T_{NSP}} \quad [\text{PLN/h}] \quad (1)$$

where: E_{OL} – efficiency of the use of own labour, FFI – Family Farm Income, T_{NSP} – time of non-salaried persons' own labour (mainly family members) as part of operations of a farm.

Farm income is a sum of remunerations of land, labour and capital input owned by a farming family and engaged in the farm's production activity and remuneration for the economic risk incurred by the farmer (2).

$$FFI = I_{LL} + I_C + R_{OL} + R \quad (2)$$

where: FFI – Family Farm Income, I_{LL} – income from land (land rent), I_C – income from capital employed, R_{OL} – remuneration for own labour, R – remuneration for management and incurred economic risk.

Describing the economic efficiency of work on a farm only using the category of farm income should be considered too simplified. Therefore, an attempt was made to estimate the remuneration of own labour by deducting remuneration for land and capital used in production processes from farm income. Remuneration for management and incurred economic risk was also excluded, assuming that, for reasons of simplification, it can be treated as a component of the remuneration for labour. This approach seems appropriate also due to the fact that it is difficult to physically separate the working time that a farmer devotes to practical work from the time he/she devotes to conceptual work on the farm. Taking into account these simplifications, the remuneration for a farmer and his/her family's own labour can be estimated using the following formula (3).

$$R_{OL} = FFI - I_{LL} - I_C \quad (3)$$

where: R_{OL} – remuneration for own labour, FFI – Family Farm Income, I_{LL} – income from land (land rent), I_C – income from capital employed.

Estimating the amount of land rent due to farmers causes a lot of problems in the case of aggregated data on the resources of used land. It was assumed herein that remuneration for 1 ha of a farmer's own land in different groups of farms corresponds to ground rent paid for 1 ha of leased land.

Calculations of opportunity costs of capital usually use interest rates that can be achieved when investing in risk-free financial instruments, e.g. interest rates on securities issued by the state (52-week t-bills issued by the Ministry of Finances) [Bieniasz et al. 2010, Satoła, Wojewodzic 2011] or interest rates on deposits [Franc-Dąbrowska, Kobus 2012, Wilczyński 2013]. In this analysis, in the absence of full data on the return rate on investment in t-bills for the entire period of the analysis, values of the reference rate of the National Bank of Poland were used for estimating the remuneration of capital. In order to calculate the hourly rate of remuneration of own labour, total own labour remunerations (P_w) were divided by unpaid labour input expressed in hours.

The paper also attempts to compare the remuneration for unpaid labour on a farm (the farmer and his/her family's own labour) and remuneration for paid labour (employed persons). In order to estimate the hourly rate of external labour, the average cost of remuneration for external labour in a given group of farms was divided by average external labour input.

RESEARCH FINDINGS

The pace and direction of changes in metropolitan areas depend, among other things, on the availability of labour force and space. This leads to a natural conflict between the city and rural areas, with the latter often becoming the main supplier of necessary resources. Whether agriculture frees its resources depends on whether farms are able to generate an income, which is impacted by numerous environmental, organisational and economic factors. The level of agricultural income is determined by the amount of possessed resources of production factors, their interrelation, the owner’s organisational efficiency and by exogenous factors beyond the control of farmers, such as prices of agricultural products and means of production and the government’s agricultural policy [Prus 2010]. As a result, the economic results of farms, and consequently the amount of remuneration for their owners’ work are subject to cyclical fluctuations (Figure 1).

The average value of income generated in the farm groups analysed showed an upward trend. The income recorded a similar pace of changes. There was also a visible impact of location. Farms situated closer to the metropolitan area core obtained a higher agricultural income per hour of a farmer and his/her family’s own labour, but this category was subject to higher fluctuations ($R^2 = 0.5822$).

Due to the methodological solutions adopted in this study, the estimated alternative income from own capital (without land) declined, as it was linked with the reference rate of the National Bank of Poland, which was corrected by the Monetary Policy Council from 6.5% in 2004 to 1.5% in 2016. At the same time, the analysed period saw an increase in ground rent for land used for agricultural purposes. In the early period after Poland’s integration with EU structures, the fastest increase in ground rent costs was observed on the outskirts of metropolitan areas. While, in 2004, the average ground rent in farms located in the outer zone of metropolitan areas was PLN 162 per ha of AA, in 2008 it stood, on average, at over

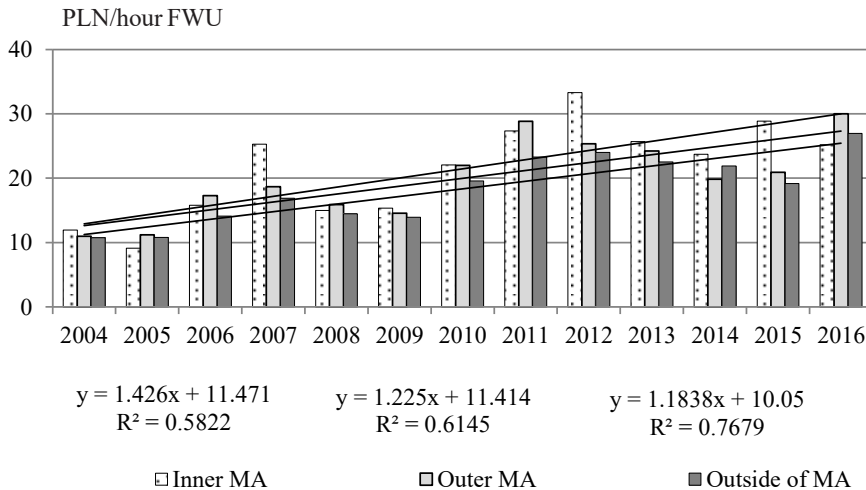


Figure 1. Average income from a farm
 Source: calculations based on FADN data

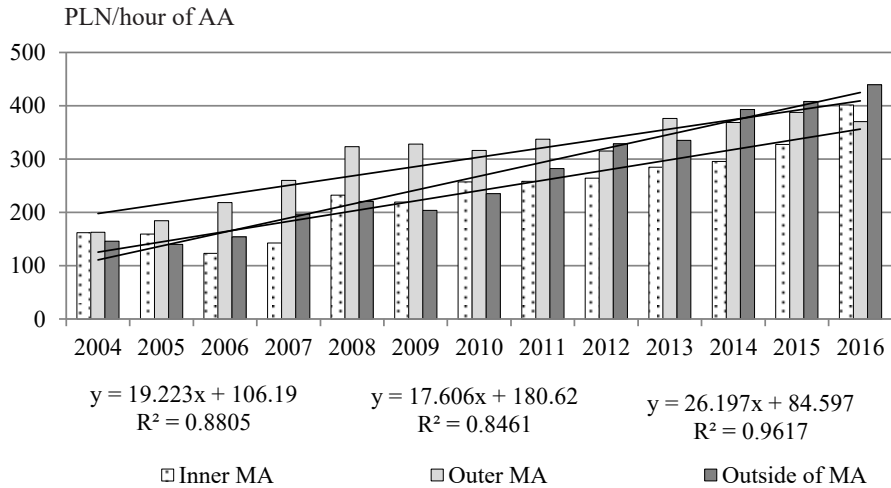


Figure 2. Average value of ground rent
Source: calculations based on FADN data

PLN 323 per ha, but increased much more slowly in the following years. This is an indirect indication of relatively fierce competition among farmers for land freed in poorly performing entities. The linear trend for this group of farms over the whole analysed period was described by the equation $y = 17.606x + 180.62$ ($R^2 = 0.8461$). The biggest increase in rent costs was observed in farms located outside metropolitan areas, where the average rent grew from PLN 146 per ha to almost PLN 440 per ha of AA ($y = 26.197x + 84.597$; $R^2 = 0.9617$). High values of the coefficient of determination R^2 show a good fit of presented linear trends.

The value of rent impacts the economic result of farms that lease land, but also constitutes, along with the estimated cost of own capital, an important element of the opportunity cost of own means of production, decreasing the estimated remuneration of own labour.

Both farm income and remuneration of farming families are subject to cyclical fluctuations, caused by a highly volatile economic environment. Due to volatile economic conditions, farms are increasingly affected by changes occurring in their micro and macro environment. In the globalised economy, price fluctuations on global markets impact domestic markets, and consequently the economic results of commercial farms in Poland [Płonka 2017].

Considerably higher hourly rates for own labour were recorded by entities operating in metropolitan areas (Figure 3). Significantly larger gaps in estimated rates of labour remuneration were recorded in good economic times, while in bad economic times the average value of rates was much more unified.

Average rates of remuneration of paid workers increased systematically. The pace of increase was similar for all groups analysed, as shown by the functions of linear trends (MA inner zone: $y = 0.4847x + 4.7429$; $R^2 = 0.9414$ MA outer zone: $y = 0.4718x + 5.1315$; $R^2 = 0.8181$, farms located outside MA: $y = 0.4782x + 5.0329$; $R^2 = 0.9687$). Moreover, the analyses showed that over almost the entire period of analysis, the rates of remuneration earned by farmers for work on their own farms, although subject to significant fluctuations,

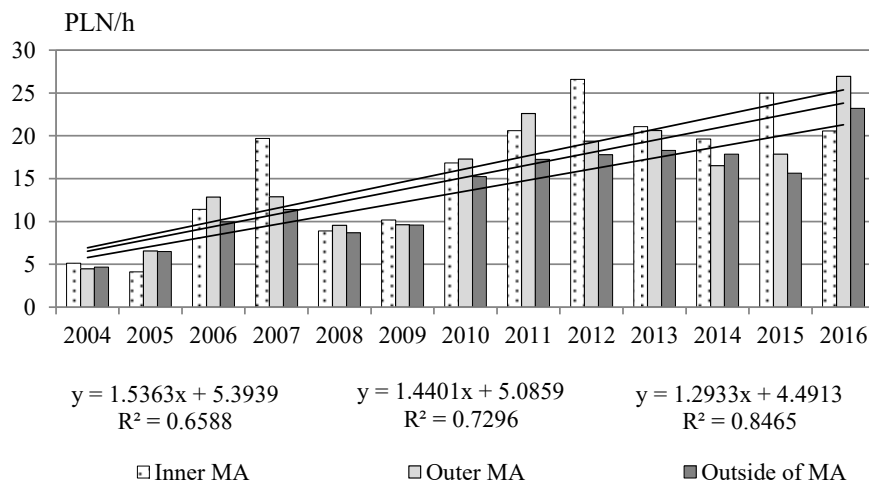


Figure 3. Estimated remuneration of the farmer and his/her family's own labour in commercial farms
Source: calculations based on FADN data

Table 1. Remuneration of work in commercial farms

Specification	Remuneration of work [PLN/h]						
	2004	2006	2008	2010	2012	2014	2016
MA inner zone							
Own labour	4.7	11.0	8.3	16.3	25.9	19.0	20.1
Hired labour	5.3	5.6	7.6	9.1	9.2	10.0	11.0
MA outer zone							
Own labour	4.0	12.3	8.8	16.3	18.1	14.9	25.6
Hired labour	5.6	5.6	6.9	10.2	9.7	10.1	10.3
Outside of MA							
Own labour	4.3	9.6	8.1	14.6	17.0	17.1	22.3
Hired labour	5.8	5.9	7.7	8.7	9.6	10.1	11.3

Source: calculations based on FADN data

were higher than the rates received by paid workers. In 2016, they were almost twice as high (Table 1). This means that, on average, not only physical work of the farmer and his/her family but also management and economic risk, not included thus far in the study, was paid in the farm groups analysed.

However, studies by Jarosław Mikołajczyk and Wojciech Sroka [2018], for the year 2016, indicate that, in very small and small farms, the economic rates of remuneration of the external labour force were higher than the farming income per family work unit. This questions the rationality of the continuation of agricultural activity by smaller entities.

The almost four-fold increase in remuneration of own labour observed in commercial farms between 2004 and 2016 confirms positive changes occurring in agriculture. We can only hope that it will result in the continued transformation of the agrarian structure and contribute to increased interest among young people in running farms.

SUMMARY

Both the research hypotheses were positively verified in the paper. In the inner zones of metropolitan areas, both farm income per family work unit and the estimated rate of remuneration per hour of paid labour were markedly higher. The average value of these categories decreased, as the distance from MA cores increased. An opposite trend was observed with the average value of ground rent, which increased faster in farms operating outside metropolitan areas.

The calculations confirm that in all three farm groups analysed, the average rate of remuneration of own labour was higher than the rate of remuneration of hired labour used in such economic entities. This should be considered a positive phenomenon, showing that owners of such entities also obtain remuneration for management and incurred economic risk. However, the level of such remuneration is subject to significant fluctuations resulting, among other things, from economic cycles observed in agriculture. The economic situation in Polish agriculture has been highly changeable over the last twenty five years. The alternating good and bad economic times, or times of high and low economic activity, have shaped present-day agriculture, determining its condition, competitiveness and possibilities of development.

BIBLIOGRAPHY

- Bieniasz Anna, Zbigniew Gołaś, Mikołaj Parzonka. 2010. Strategie płynności finansowej i ich efektywność w przemyśle (The strategies of financial liquidity and their efficiency in industry). *Ekonomika i Organizacja Przedsiębiorstwa* 4: 38-46.
- Franc-Dąbrowska Justyna, Paweł Kobus. 2012. Koszt kapitału własnego – dylematy wyceny. (Equity capital cost – the dilemmas of Appraisal). *Zagadnienia Ekonomiki Rolnej* 1 (330): 77-89.
- Grochowska Anna. 2016. *Konflikty przestrzenne w planowaniu przestrzennym obszarów metropolitalnych na przykładzie Wrocławskiego Obszaru Metropolitalnego* (Spatial conflicts in spatial planning of metropolitan areas on the example of the Wrocław Metropolitan Area). Wrocław: Instytut Geografii i Rozwoju Regionalnego, Uniwersytet Wrocławski.
- Mikołajczyk Jarosław, Wojciech Sroka. 2018. Wynagrodzenia najemnej siły roboczej w gospodarstwach rolniczych polskiego FADN według wielkości ekonomicznej w latach 2010-2016 (Wages of hired labor in farms of Polish FADN according to the economicsize in the years 2010-2016). *Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu* XX (2): 138-144.
- Płonka Aleksandra. 2017. Farm owners' interventions during economic crisis (Działania interwencyjne właścicieli gospodarstw rolnych w okresie kryzysu gospodarczego). *Acta Scientiarum Polonorum. Oeconomia* 16 (3): 53-61.
- Prus Piotr. 2010. *Funkcjonowanie indywidualnych gospodarstw rolniczych według zasad zrównoważonego rozwoju* (Individual farms functioning according to sustainable development principles). Bydgoszcz: Wydawnictwa Uczelniane UTP w Bydgoszczy.
- Resolution No 239 of the Council of Ministers of 13 December 2011 on approving the National Spatial management Concept 2030. Polish Monitor, 2012. 252.

- Satoła Łukasz, Tomasz Wojewodzik. 2011. *Wykorzystanie kategorii dochodu rezydualnego w poszukiwaniu renty gruntowej* (The use of residual income category to seek for a land rent). *Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu* XIII (8): 249-257.
- Sroka Wojciech, Jarosław Mikołajczyk, Tomasz Wojewodzik, Bogusława Kwoczyńska. 2018. Agricultural land vs. urbanisation in chosen Polish metropolitan areas: a spatial analysis based on regression trees. *Sustainability* 10 (3): 837. DOI: 10.3390/su10030837.
- Wilczyński Artur. 2013. *Znaczenie kosztów alternatywnych w rachunku ekonomicznym gospodarstw rolnych* (The impact of opportunity costs on farms profitability). *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu* 305: 802-812.
- Zegar Józef Stanisław. 2018. *Przyszłość rolnictwa na terenach zurbanizowanych* (The future of agriculture in urbanized areas). *Zeszyty Naukowe Problemy Drobnych Gospodarstw Rolnych* 1: 107-126. DOI: 10.15576/PDGR/2018.1.107.

DYNAMIKA I ZRÓŻNICOWANIE DOCHODÓW Z DZIAŁALNOŚCI ROLNICZEJ W GOSPODARSTWACH FUNKCJONUJĄCYCH NA OBSZARACH METROPOLITALNYCH W POLSCE

Słowa kluczowe: dochody, obszary metropolitalne, gospodarstwa rolne

ABSTRAKT

Celem badań było wykazanie różnic w kształtowaniu się dochodów z działalności rolniczej uzyskiwanych przez właścicieli gospodarstw rolnych usytuowanych w różnych strefach oddziaływania dużych miast. Badaniami objęto gospodarstwa z sześciu województw: dolnośląskiego, lubelskiego, małopolskiego, mazowieckiego, pomorskiego oraz wielkopolskiego. Źródłem danych do analiz była baza polskiego FADN. Wyodrębniono wewnętrzną i zewnętrzną strefę metropolitalną oraz grupę obiektów leżących poza obszarami metropolitalnymi. Dla wyodrębnionych grup przeprowadzono analizę porównawczą. Badania wykazały, że w wewnętrznej strefie metropolitalnej na wyraźnie wyższym poziomie kształtowały się zarówno dochód z gospodarstwa rolnego na jedną jednostkę pracy własnej, jak i szacunkowa stawka wynagrodzenia za godzinę pracy najemnej. Średnia wartość tych kategorii zmniejszała się w kolejnych strefach wraz z oddalaniem się od rdzenia obszarów metropolitalnych. Ponadto, we wszystkich trzech badanych grupach gospodarstw średnia stawka wynagrodzenia pracy własnej była wyższa niż stawka wynagrodzenia pracy najemnej wykorzystywanej w tych jednostkach gospodarczych. To oznacza, że właściciele gospodarstw uzyskują również wynagrodzenie za zarządzanie i ponoszone ryzyko gospodarcze. Wysokość tych wynagrodzeń podlega jednak znacznym wahaniom, wynikającym m.in. z obserwowanych w rolnictwie cykli koniunkturalnych.

AUTHORS

TOMASZ WOJEWODZIC, DR HAB.

ORCID: 0000-0002-0817-4190

University of Agriculture in Krakow
Institute of Economics and Social Sciences
21 Mickiewicza Av., 31-120 Kraków, Poland

WOJCIECH SROKA, PHD

ORCID: 0000-0002-4255-3741

University of Agriculture in Krakow
Institute of Economics and Social Sciences
21 Mickiewicza Av., 31-120 Kraków, Poland

JAROSŁAW MIKOŁAJCZYK, PHD

ORCID: 0000-0001-6165-2529

State Higher Vocational School in Tarnow
Institute of Administration and Economics
8 Mickiewicza St., 33-100 Tarnów, Poland