

WOJCIECH JÓZWIAK  
Institute of Agricultural and Food Economics  
– National Research Institute  
Warsaw

DOI: 10.5604/00441600.1218188

## NATURAL AND CLIMATE THREATS FOR FARMS OF NATURAL PERSONS AGAINST THEIR INCOME SITUATION

### Abstract

*The paper contains an analysis of the condition of the national farms owned by natural persons, it draws attention to the characteristics of major new problems that they start to encounter in the current EU financial perspective (2014-2020) or that they will face in the next perspective. Finally, the paper suggests how to tackle these problems.*

**Keywords:** individual farms, farms of natural persons, farm income, climate change, droughts, agricultural droughts.

### Introduction

The halfway point of the agricultural policy implementation in the current financial perspective (2014-2020) draws near and works on its assessment are ongoing. In two years, at the latest, works on the formulation of the Common Agricultural Policy for the next EU financial perspective will be intensified. Hence, the time has come to present the threats and hopes for the domestic agriculture concerning the year 2021 and next years. In Germany, a discussion on similar issues has already been launched (Isermeyer, 2014).

The paper includes an analysis of the income situation of the national farms owned by natural persons, next it draws attention to the natural and climate problems threatening them in the current EU financial perspective (2014-2020) and most likely also in the next. It also points to initial proposals for tackling these problems.

### **Methodological notes**

Analysis of the situation of national farms will be presented primarily on the basis of the results of the partial census of farms of 2013 (*Charakterystyka...*, 2014, pp. 358-371), because the census covered all national farms pursuing agricultural activity and having at least 1 ha of utilised agricultural area (UAA), also those with the size of 4 SO<sup>1</sup>, which are not covered by the Polish FADN monitoring. The 2013 census presented a rare chance to take a closer look at the smallest farms and it needs to be kept in mind that they constitute ca. 48% of the number of farms of natural persons in Poland.

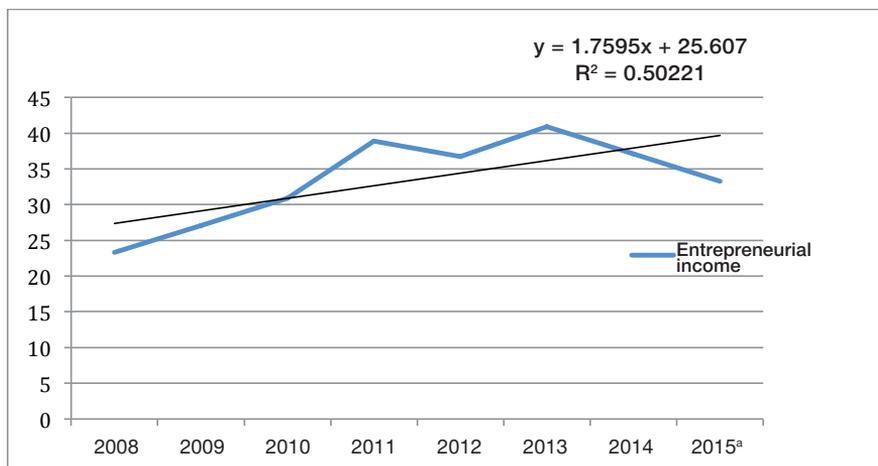
However, the 2013 census provided limited information on incomes of farm owners and their families, since they referred only to their structure. Thus, estimations covered farm incomes and quotients of the incomes, and labour inputs of agricultural producers and their family members. These estimates were made based on the 2013 results of the Polish FADN monitoring.

Numbers characterising the farm income and income on own labour at a farm covering one year require a comment. It was additionally established (Figure 1) that the so-called entrepreneurial income, calculated country-wide under economic accounts for agriculture (*Rachunki Ekonomiczne dla Rolnictwa*, RER), was in 2013 clearly higher than the income set as eight-year trends (2008-2015). Assessments formulated based on an analysis of income level estimates described in this paper, can thus be too optimistic to be generalised for other years. Although they have only secondary significance as regards the assessments made based on the 2013 census, conclusions formulated on their basis in this paper should be treated as preliminary.

The 2013 census results fail to include information on farms not conducting agricultural activity and those which conduct such activity, but whose UAA does not exceed 1 ha (*Charakterystyka...*, 2014, p. 17). They also do not include numerical data on farm income and own labour inputs of farmers and their family members incurred on the executed production. The latter values were estimated using numbers taken from the Polish FADN monitoring (Table 1).

---

<sup>1</sup> The SO measure is used to determine the economic size of farms. It is the production value calculated with the use of the method of indices. Indices are different regional five-year average prices obtained from sales of respective products in the area of a farm, omitting: VAT, tax on goods and direct payments. The SO measure is the sum of products of individual crop areas, number of livestock units according to their species, age groups and/or use groups and used indices.



<sup>a</sup> Estimate values.

Fig. 1. Total entrepreneurial income in 2008-2015 in PLN billion.

Source: findings of J. Buks made based on economic accounts for agriculture (RER) performed by the Institute of Agricultural and Food Economics – National Research Institute and own calculations.

Table 1

*Selected characteristics of different size farms of natural persons in 2013*

| Measures and indices                          | Size of farms in SO <sup>a</sup> |      |       |       |             |
|---|----------------------------------|------|-------|-------|-------------|
|   | 0-4 <sup>b</sup>                 | 4-15 | 15-25 | 25-50 | 50 and more |
| Farm size in SO (EUR thousand)                | 4.0                              | 10.9 | 19.8  | 36.4  | 107.1       |
| Farm income (PLN thousand per farm)           | 7.5                              | 14.7 | 28.1  | 57.4  | 172.7       |
| Depreciation value (PLN thousand per farm)    | 6.0                              | 10.7 | 16.6  | 26.2  | 60.3        |
| Share of hired work in total labour input (%) | 14.0                             | 17.0 | 20.6  | 26.9  | 45.3        |
| Cost of hired labour (PLN per hour)           | 9.0                              | 8.9  | 8.7   | 8.5   | 10.1        |

<sup>a</sup> Production value calculated as per standard and expressed in EUR thousand.

<sup>b</sup> Estimates made based on extrapolation of figures given in subsequent table columns.

Source: calculated by M. Zieliński based on the results of the Polish FADN monitoring and own estimates.

- It was assumed that the average farm income, set on the basis of the results of the Polish FADN monitoring according to the value set in SO, corresponds to the average income of similarly selected groups of farms presented in the results of the partial 2013 census. Income for group size of 0-4 SO was set only for the farms with the size of 4 SO, based on the extrapolation of the figures given in Table 1, which refer to the subsequent size groups. Hence, the results of the 2013 census lack numbers characterising average farm sizes in size classes expressed in SO. Apart from that, the income of farms of 50 SO and more was not determined because of the limited comparability of the size of farms from this group monitored under the Polish FADN and those given in the results of the 2013 partial census (Abramczuk et al., 2015, p. 165).
- Depreciation amounts of fixed assets and own labour inputs were set using identical principles, as above.
- Estimated net farm income, increased by depreciation amounts, provided information on their gross income.
- Estimated own labour inputs (FWU) are the product of total labour inputs expressed in AWU and the fixed index of the share of own labour input in the total labour input. The index of own labour share in the total labour inputs was calculated as a difference of the total labour inputs taken as 100% and the percentage share of hired labour therein.
- Own labour input at a farm per full-time employee (FWU) amounts annually to 2120 hours.
- Net income calculated per own labour input unit stands for the “payment for” the labour, in case when the farm carries out simple replacement of assets. Whereas gross income per own labour unit, informs on the “payment for” own labour, when the farm assets used up in the process are not replaced, causing fast depreciation of assets.
- Net and gross income per labour unit at the conducted farm was compared to the average rate of remuneration for hired workers in agriculture and the parity rate (average national pay rate per hired labour), which in 2013 was at PLN 13.79 per 1 hour (Augustyńska-Grzymek, 2014, p. 20).
- Net income per own labour unit of the owned farm higher than the parity payments means a return, which constitutes the payment for equity invested in the farm. The return rate, i.e. its relation to equity value, was not estimated, though.
- Definitions of other used measures and indices can be found in the study (*Charakterystyka...*, 2014, pp. 18-19, 21-22 and 27-34).

### **Income situation of different size farms**

Starting from 1990, the national farms underwent a metamorphosis manifested in the change of legal and ownership structure, and size and commitment

structure of the factors of production. Most of the land previously owned by legal persons was transferred to farms of natural persons, known also as individual farms. In their framework the process of separation of developing or rather competitive farms took place, since their results withstand comparison to the results of farms of the other EU countries, also those from countries of the so-called old EU (EU-15), and Germany and Denmark.

Figures in Table 2 show that in 2013 farms of natural persons had ca. 91% of the total area of UAA in the country and employed 98% of the total number of people working in agriculture per full-time employee.

Table 2

*Ownership structure of Polish agriculture (as on 2013)*

| Measures and indices                      | Total national values | including farms       |                     |
|---|-----------------------|-----------------------|---------------------|
|   |                       | of natural persons    | other <sup>a</sup>  |
| Number of farms (thousand)                | 1394.6                | 1391.1                | 3.5                 |
| Share (%)                                 | 100.0                 | 99.7                  | 0.3                 |
| Utilised agricultural area (thousand ha)  | 14 609.2              | 13 265.8 <sup>c</sup> | 1343.4 <sup>c</sup> |
| Share (%)                                 | 100.0                 | 90.8                  | 9.2                 |
| Employment <sup>b</sup> (thousand people) | 1937.1                | 1897.7 <sup>c</sup>   | 39.4 <sup>c</sup>   |
| Share (%)                                 | 100.0                 | 98.0                  | 2.0                 |

<sup>a</sup> Farms: state-owned companies, higher education institutions, research institutes, collectives, production cooperatives and other legal persons.

<sup>b</sup> As per full-time employees (2120 of working hours per year).

<sup>c</sup> Estimated sizes.

Source: own conclusions drawn up based on the study (*Charakterystyka...*, 2014).

Numbers of farms of natural persons differing by size expressed in SO<sup>2</sup> changed in 2010-2013 (Table 3). The number of the smallest farms (with the size of up to 4 SO) significantly decreased. The phenomenon was nothing major, but it was in line with the trend noted for many years in Poland and other countries as a result of a set of different reasons. These reasons also had impact on a drop in the number of farms with the size of 4-15 SO.

The data from Table 3 inform both on the growth in the number of farms with size of 25 SO and more, which of course has its own reasons. The number of farms with the size of 15-25 SO stayed at almost the same level in the analysed three-year period. In this case, the reasons for restricting the number of small farms had the same degree of impact as the reasons influencing the growth in the number of larger farms.

<sup>2</sup> Production size calculated in a standard manner and expressed in EUR thousand. The average EUR exchange rate in the National Bank of Poland in 2013 amounted to PLN 4.1975, i.e. 1 SO equalled PLN 4197.5 (*Rocznik...*, 2014, p. 621).

Table 3

*Changes in the number of farms of natural persons<sup>a</sup> differing by size in 2010-2013*

| Farm size in SO | Number of farms in thousands<br>per year |        | Change in the number<br>of farms |                   |
|-----------------|--|--------|----------------------------------|-------------------|
|                 | 2010                                     | 2013   | in thousands                     | in percentages    |
| Up to 4         | 758.2                                    | 657.5  | -100.7                           | -13.3             |
| 4-15            | 467.1                                    | 442.9  | -24.2                            | -5.1              |
| 15-25           | 111.9                                    | 112.1  | 0.2                              | 0.2               |
| 25-50           | 93.2                                     | 107.1  | 13.9                             | 14.9              |
| 50 and more     | 49.8                                     | 71.5   | 21.7                             | 43.6              |
| Total/average   | 1480.2                                   | 1391.1 | -89.1                            | -6.0 <sup>b</sup> |

<sup>a</sup> The Table was developed considering changes in the number of farms caused by a correction in the definition of a farm in 2013.

<sup>b</sup> Weighted average.

Source: own conclusions drawn up based on the study (*Charakterystyka...*, 2012, pp. 384-385 and *Charakterystyka...*, 2014, pp. 75-76 and 358-359).

The more important reasons, which could influence the changes in the number of different size farms owned by natural persons, were indicated below. Numbers in Table 4 give grounds for such assessment.

- In 2013, the share of farms with the size of up to 4 SO was the largest, namely amounting to ca. 48% of the total. These farms were characterised by the smallest UAA, the lowest share of farm managers with agricultural education and very labour-intensive production. Employment per area unit was nearly two times higher than the national average and by nearly 27% higher than in the next size group. Despite direct payments, only 10-11% of owner families obtained over half of their total income from farms. Approximately 60% of families earned income from off-farm gainful employment, and nearly 37% benefited from pensions. Among all of the analysed farm groups the highest share belonged to families earning income on non-agricultural activities. Off-farm gainful employment and non-agricultural activity limited interest in animal production, which largely requires constant supervision.

Relatively large share in the characterised group of farms of families earning income on pensions suggests traditional multigenerational families.

Farms of up to 4 SO reached the lowest income among all of the analysed groups – in those with the size of 4 SO, according to estimates it amounted to PLN 4.3 per hour of own labour input of a farm owner and his/her family. This was much less (by 52.2 pp) than the pay rate of a hired worker in agriculture

and corresponded to the level of 31.2% of the parity rate. If, however, a farm failed to invest then the gross income (farm income increased by depreciation amount) per hour of own labour input amounted to ca. PLN 7.8, i.e. 86.7% of the pay rate of a hired worker in agriculture and 56.6% of the parity rate. But over time the other farm management method lead to total depreciation of fixed assets. For example, 54-55% of the farms did not have their own mechanical pulling power in 2013<sup>3</sup>. A more in-depth analysis of the situation is in the study of Wojewodzic (2010, pp. 63-66). But even under such conditions, production could be continued by incurring own labour inputs with the use of simple tools, inputs of purchased current assets and own assets (seeds, straw and/or manure for ploughing in, fodder for livestock, etc.) and benefiting from production services.

However, most of the farms showed a lower production value than those with the size of 4 SO, thus they brought lower income than those given above and this forced owners' families to seek for other sources of income. Lack of livestock production in these farms hindered balancing of organic fertilisers, which had a negative impact on the water capacity (retention capacity) of soils and its possibilities as regards absorption of minerals. Soil fertility in such case dropped, which additionally reduced income. This resulted in resignation from continuing agricultural production for the benefit of conducting the so-called agricultural activity consisting in keeping farms ready for production in order to be able to use direct payments and to allocate thus saved time resources to off-farm earning. In some cases, low level of income was the reason for total resignation from running a farm.

- The second group of farms, whose number also fell in 2010-2013, was characterised by the size of 4-15 SO. They obtained more favourable economic effects than those analysed above because of larger UAA, greater labour inputs and higher share of farm managers with formal vocational education. Apart from this, nearly 63% of these farms pursued livestock production, specialised and under mixed production<sup>4</sup>. Table 5 shows that farms of 4-15 SO reached, in 2013, the average net income in the amount of PLN 5.2 per 1 hour of own labour input; hence, by 34.9 pp less than the rate of hired worker and amounting to 42.1% of parity rate. But if farms failed to invest in replacement of fixed assets, than the gross income per one hour of own labour input amounted to PLN 9.1, i.e. slightly more than the pay rate for a hired worker, in the amount of 66.0% of the parity rate.

Therefore, average income per labour input unit slightly exceeded those obtained by farms of 4 SO and this could be the reason for the fact that 40.0% (more by ca. 29 pp than for the farms of the former group) of these families earned

<sup>3</sup> Own calculations based on the figures from the study (*Charakterystyka...*, 2014, pp. 368-369).

<sup>4</sup> Own calculations based on the figures from the study (*Charakterystyka...*, 2014, pp. 358-359).

over half of their income from the conducted farm. These were, most probably, farms of a size closer to the upper limit of the group. The source of income of the owners of smaller farms was mainly off-farm gainful employment and pensions.

Slightly lower share of families living on pensions than for farms of up to 4 SO is also an evidence of the inclination to live in traditional multigenerational families.

Lack of investments replacing the fixed assets worn in the production process lead – just like in the case of farms of up to 4 SO – to depreciation of the owned fixed production assets. Consequently, production fixed assets disappeared completely, except for land, of course, i.e. as in the case of farms of up to 4 SO. For example, 35-38% of the farms did not have their own mechanical pulling power in 2013<sup>5</sup>. But it was still possible to continue production with the use of own labour inputs, and own and purchased inputs of current assets and by buying production services. In some situations, unsatisfactory income also became the reason for resignation from agricultural production.

- In 2010-2013, the number of farms of natural persons of 15-25 SO, as already mentioned, continued almost at the same level.

The characterised farms differed from those from the former group under several respects. They had at their disposal larger by ca. 84% UAA and ca. 2/3 of their managers (more by 15.9 pp than in the former group) had agricultural education. Employment expressed in the number of full-time employees was, apart from that, higher by ca. 50% and two-times higher was the share of farms specialising in livestock production and mixed production.

The share of farm owners earning income from pensions was lower, though, than in the previously analysed group (by ca. 9 pp).

Table 5 shows that in 2013 the average annual net income of a farm of 15-25 SO per 1 hour of own labour input amounted to PLN 9.3, i.e. by 6.9 pp more than the rate of a hired worker but by 32.6 pp less than the parity rate. Full replacement of fixed assets used in the production process reduced the standard of living of farm owners' families in the analysed group, of course, if the income from other sources failed to compensate for the difference.

However, the characterised farms made it possible to earn income from own labour at the parity level of payment for labour, even if they did not have non-agricultural income sources. To this end, it was enough to implement the tactics of small depreciation of fixed assets (buildings, machinery, fixed plantations, etc.) and carry out average annual replacement of the equivalence of ca. 92% of its total value.

---

<sup>5</sup> Own calculations based on the figures taken from the source as above, pp. 368-369.

Table 4

*Characteristics of farms of natural persons different by size expressed in SO (as on 2013)*

| Measures and indices  | Total or average national values | including farm size (SO) of |       |       |       |             |
|---|----------------------------------|-----------------------------|-------|-------|-------|-------------|
|   |                                  | up to 4                     | 4-15  | 15-25 | 25-50 | 50 and more |
| Number of farms (thousand) <sup>a</sup>                           | 1425.3                           | 685.9                       | 445.3 | 112.8 | 108.0 | 73.3        |
| Share (%)   | 100.0                            | 48.1                        | 31.3  | 7.9   | 7.6   | 5.1         |
| UAA of a farm (ha per farm)                                       | 9.3                              | 2.8                         | 7.6   | 14.0  | 23.7  | 55.4        |
| Employment per full-time employees of a farm                      | 1.3                              | 0.9                         | 1.4   | 1.8   | 2.1   | 2.6         |
| Share of farm managers with agricultural education (%)            | 47.7                             | 30.8                        | 51.7  | 67.6  | 73.5  | 77.7        |
| Share of farms (%):   |                                  |                             |       |       |       |             |
| • with specialist production:                                     |                                  |                             |       |       |       |             |
| - plant   | 55.5                             | 72.3                        | 44.4  | 34.4  | 22.2  | 21.3        |
| - livestock   | 13.8                             | 5.7                         | 12.6  | 24.8  | 30.2  | 30.5        |
| • with mixed production (%)                                       | 30.7                             | 22.0                        | 43.0  | 40.8  | 47.6  | 48.3        |
| Share of farm owners with income:                                 |                                  |                             |       |       |       |             |
| • from agricultural activities exceeding half of the total income | 34.9                             | 10.6                        | 40.0  | 75.2  | 75.3  | 92.4        |
| • from <sup>b</sup> :   |                                  |                             |       |       |       |             |
| - non-agricultural activity                                       | 15.2                             | 17.4                        | 14.3  | 11.9  | 10.2  | 12.2        |
| - gainful employment  | 49.8                             | 59.9                        | 54.2  | 27.4  | 16.3  | 11.2        |
| - pensions  | 30.9                             | 36.7                        | 30.6  | 21.4  | 17.0  | 12.7        |

<sup>a</sup> Figures in this line differ from those given in Table 3. This is because the former Table gives the farms selected by another definition to obtain comparability with the number of farms in 2010.

<sup>b</sup> The share does not add up to 100%.

Source: as in Table 2 and own estimates made with the use of a part of results of the Polish FADN monitoring.

But some part of farms in the analysed group invested to a degree ensuring extended replacement of fixed assets (Józwiak, 2016, p. 70), which increased production and as a result the income derived from the owned farm. At the same time, it moved to the next farm size group of different characteristics. At the basis of gathered data it is not possible, however, to – even hypothetically – state which features decided on the fact to the greatest extent.

Table 5

*Estimated average net and gross income per one hour of own labour input on farms of natural persons differed by production size and assessment of the income (as on 2013)*

| Measures and indices   | Farm size in SO      |       |       |       |
|--|----------------------|-------|-------|-------|
|  | up to 4 <sup>a</sup> | 4-15  | 15-25 | 25-50 |
| Income in PLN per one hour of own labour input:                          |                      |       |       |       |
| - net income   | 4.3                  | 5.2   | 5.8   | 9.3   |
| - gross income   | 7.8                  | 9.1   | 9.8   | 14.7  |
| Net income in PLN per one hour of own labour input in relation (%) to:   |                      |       |       |       |
| - agricultural worker rate   | 47.8                 | 65.1  | 109.4 | 207.1 |
| - parity rate  | 31.2                 | 42.1  | 67.4  | 127.6 |
| Gross income in PLN per one hour of own labour input in relation (%) to: |                      |       |       |       |
| - agricultural worker rate   | 86.7                 | 102.2 | 172.9 | 302.3 |
| - parity rate  | 56.6                 | 66.0  | 106.6 | 186.4 |

<sup>a</sup> Numbers put in the column refer only to farms of 4 SO. They were determined based on extrapolation of numbers given in the next columns of the Table.

Source: own estimates made with the use of results of the Polish FADN monitoring compared in Table 1.

The presented analysis explains probably the most important reason for a very high (by ca. 35 pp higher than in the previously analysed group) share of families of farm owners with income from agricultural production exceeding half of their total income. Other sources of income of farms with the size of 15-25 SO were of rather marginal significance in the situation.

- The number of farms in the fourth of the analysed groups, with the size of 25-50 SO, increased in 2010-2013. The main characteristics of the farms are – at the background of the former group – greater by 69% UAA, higher by ca. 17% employment (partly caused by a growth in employed hired workers), higher by ca. 14 pp share of farms with livestock production (specialist or conducted under mixed production) and higher by ca. 6 pp share of farms run by managers having agricultural education. As a result, ca. 75% of such farm owners and their families earned over half of their income from agricultural production.

Table 5 shows that payment for unit own labour input for farms of the group was at a higher level than the parity rate by 27.6 pp. Upon taking up an assumption that the payment equalled parity rate, it was determined that these farms achieved the average return in the amount of PLN 22.6 thousand, which constituted the payment for equity invested in the owned farm. Along with the depreciation amount this amounted to ca. PLN 48.8 thousand. From other research (Józwiak, 2016a, pp. 70-77), it follows that in 2010-2012 farms of similar size intended their free funds for investment financing.

On this grounds it may be concluded that farms of 50 and more SO reached even higher amount of return thus calculated. Result of other research by Józwiak (2014, pp. 64-77) confirm the observation.

### **Major naturale and climate problems facing farms and initial suggestions on their tackling**

From the beginning of the current century, Europe notes intensified emergence of extreme weather phenomena: floods, hurricanes, large-area droughts (Kundzewicz et al., 2006, pp. 169-170). In Poland, droughts are especially vexing and the phenomenon has already been noted in the interwar period when the issue of “steppe formation in the area of Wielkopolska” was first discussed and described.

According to Przybylak (2006, p. 43) and Strakel (2006, pp. 10-12), in the 20<sup>th</sup> century the average air temperature in Poland grew by ca. 1°C, and starting from 1960s the number of sunny days increased. Both these factors accelerate rainwater evaporation, thus contributing to droughts mainly in the plant growing periods, whose effects are the most worrying on poor quality soils. Approximately 35% of UAA in Poland has soils formed on sand and gravel. Their water saturation is enough for plants for ca. 2.5 weeks and then, in case of no precipitation, there comes the so-called agricultural draught, because crops start to suffer from soil water shortage.

The effects of droughts were assessed based on a research of 1716 farms with poor quality soils (soil valuation index  $\leq 0.7$ ) in 2006-2013 (Józwiak et al., 2016, p. 49). Some part of them operated in gminas (municipalities), where drought took place at least seven times in the last eight years. Income of these farms was by 25.3% lower than at farms situated in other gminas. Negative effects of droughts are thus evident, but unfortunately the binding payment scheme fails to offset the damages.

According to Kędziora (2005, pp. 77-87), ca. 39% of the country area (nearly the entire Polish Lowland [*Niż Polski*]) was characterised by lower precipitation than the other areas and evaporation of ca. 80% of rainwater. The case is even worse for a part of the Lowland covering the following voivodeships: Wielkopolskie, Kujawsko-Pomorskie, Lubuskie, Dolnośląskie and Łódzkie. In these areas over 85% of rainwater evaporates (it is one of the worst indices in Europe), thus only, at most, 15% of water is used in the area for economic and municipal needs, and the rest of water supplies groundwater or unproductively runs-off into the sea.

Further unfavourable climate change will deteriorate the soil water balance and this will reduce the already meagre possibilities of crop irrigation. Therefore, it is necessary to draw up an act and ensure measures to counteract these phenomena. This refers to increased retention (holding and storing of the useless periodic run-off of surplus rainwater) which can be increased through:

- suitable fertilisation with organic fertilisers of soils used for agricultural purposes;
- reconstruction of old and erection of new water lifting or water storage facilities, such as: levees, gates, locks, weirs, ditches, channels, reservoirs, etc.<sup>6</sup>;
- ban on exploitation of peat;
- creation of as wide as possible internal polders around regulated rivers (rivers-channels) and flooding through culverts areas beyond embankments where human activity has ceased, etc.

Plant litter has a significant retention capacity. Hence, it is necessary to enforce a ban on felling of more than hundred years old forest stands in the lowland part of the country and trees in mountainous regions and foothills as well as to take up efforts to restore the natural forest stands for respective habitats.

Such a system – apart from large and possibly renovated dam reservoirs and river embankments – will ensure water during droughts and all at once will protect the country against floods. Of course, it should be created over several years.

Forest belts, cutting across large-area arable lands (e.g. with the surface of over 25 ha), are expedient since they reduce rainwater evaporation. It is also purposeful to use the so-called land improvement treatments in compacted soils, which will enable to recreate – to a greater extent than now – groundwater resources for economic purposes (Kędziora, 2005, pp. 95-96).

It is justified to introduce obligatory crop insurance against losses resulting from extreme weather events, not only droughts but also floods, hurricanes and hailstorms. Such insurance will reduce the insurance rate paid by the agricultural producers and lower the management risk.

### **Conclusions**

The paper includes an analysis of the income situation of the national farms owned by natural persons and a characteristics of the new problems linked to the progressing climate change, which they have to face in the current EU financial perspective (2014-2020) or which can occur in the next one. It also included initial proposals on how to solve these problems.

To analyse the condition of farms, the results of the 2013 partial census of farms were used, which covered, for instance, a sample of 200 thousand farms of natural persons. The census had two advantages: it provided the most up-to-date characteristics of farms, also of the smallest ones (with the size of up to 4 SO), thus those not covered by the Polish FADN monitoring.

Moreover, the 2013 census provided numerical data allowing for assessment of only the income structure of farm owner families. Thus, it was necessary to

---

<sup>6</sup> Information on facilities, structures and measures increasing water retention were taken from the paper of dr hab. Romuald Kosina from the Institute of Experimental Biology at the Wrocław University of 27.11.2015, which was filed in the secretariat of the Citizen Letters and Opinions Office in the Chancellery of the President of the Republic of Poland.

draw up additional data on farm incomes, and quotients of these incomes and labour inputs of agricultural producers and their family members at their farms. These estimates were made based on the 2013 results of the Polish FADN monitoring.

Figures characterising farm income and own labour income of a farm covering one year require a comment. It was additionally established that the so-called entrepreneurial incomes calculated on a country scale under the economic accounts for agriculture (RER) were in 2013 clearly higher than the income calculated based on an eight-year trend (2008-2015). Assessments made based on analyses of income level estimates included in the paper, can be thus too optimistic to be generalised for other years. Although they have only secondary significance as compared to the assessments made based on the results of the 2013 census, the conclusions made below should be treated as preliminary.

The share of farms from the two first of the analysed groups, with the size of up to 4 SO and 4-15 SO, amounted to 77.9% of the total number of farms of natural persons in the country in 2013 and the number in 2010-2013 dropped by 10.2%. The analysis showed that 77.8% of them ensured only additional funds used for keeping the standard of living. Over half of the farm owners and their family members derived income from off-farm gainful employment, carrying out non-agricultural activities and/or pensions.

It was estimated that unit net income from labour on a farm of up to 15 SO were lower by at least 1/3, even from the rates of hired workers in agriculture. Simple replacement of the held production assets significantly decreased the standard of living of the family members of such farms. Income from other sources and negative replacement of production assets rescued the situation, on the one hand, but, on the other, lead to depreciation of own assets.

Approximately 22% (nearly 281 thousand) of farm owner families of up to 15 SO earned over half of their total income on agricultural production, which ensured very low standard of living, if it was decided to replace the owned assets in a degree enabling its simple replacement. Resignation from this solution, made it possible to obtain income per labour input unit, which was slightly higher than the pay rate of an agricultural worker.

Families with income from pensions were probably multigenerational. Their large share in the analysed farms suggests traditional approach of this group of people to organisation of family life.

Number of farms of 15-25 SO continued in 2010-2013 at almost the same level. Farms were the main source of livelihood for little over 3/4 of owners of such farms and their families, and deriving income from other sources has a much smaller range than at farms of 15 SO.

The estimated annual averages for net income per 1 hour of own labour input were by ca. 9 pp higher than the pay rate of a hired worker, but by ca. 1/3 lower than the parity rate.

However, it was possible to obtain income from own labour at the owned farm at the parity level of payment for labour, if the tactics of small depreciation of fixed assets was used (buildings, machinery, fixed plantations, etc.). Whereas complete departure from replacement of production assets lead to a growth in the level of income per one hour of own labour input to the rate higher by ca. 7 pp than the parity rate.

Only farms of 25 SO and more ensured net income sufficient to “pay for” own labour at least at the parity level and to make investments enabling extended replacement of assets.

Effects of climate change became an important threat for farms of natural persons, manifested mainly in droughts occurring with great intensity at ca. 39% of the country area, especially for farms with soils of below the average quality. The current direct payment scheme fails to compensate for the losses of farms on that account, droughts in the area reduce the already low incomes obtained by smaller farms (of up to 15 SO) contributing to the growing rate of loss in their number. The effects of droughts affect also larger farms, so they take or will increasingly more often have to take their own efforts to increase water resources available to crops (use of balanced mineral fertilisation of fields, establishment of forest belts on open fields, use of land improvement treatments in compacted soils to reconstruct groundwater resources, etc.). However, this will not suffice and public funds will be needed for direct payments for farms conducting agricultural production on areas of the country where droughts happen especially often, or for reconstruction of neglected small retention facilities (gates on streams, water lifting facilities formerly used by watermills, etc.) and erection of new ones. Such enterprises, apart from collecting water for irrigation of crops, will also limit the scale and range of flood damages, without the need to focus on construction of large dams on rivers.

The risk of farming in increasingly more difficult natural conditions would be limited by obligatory, i.e. relatively cheap, insurance of crops against the effects of extreme weather events. It is also necessary to amend the act on land rent which will extend the rights of tenants. This would reduce the costs incurred by them on land purchases, which in turn would allow them to allocate the financial means saved in this manner on modernisation and extension of the size of production at farms.

The above-outlined procedures would make it possible to produce national raw materials for food production for domestic and export needs even if other farming conditions deteriorated (e.g. limited amount of the EU funds allocated to subsidies for farms).

**References**

- Augustyńska-Grzymek, I. (2014). Materiał i metodyka badań. In: I. Augustyńska-Grzymek (ed.), *Produkcja, koszty i dochody z wybranych produktów rolniczych w latach 2012-2013* (wyniki rachunku symulacyjnego). Warszawa: IERiGŻ-PIB.
- GUS (2012). *Charakterystyka gospodarstw rolnych. Powszechny Spis Rolny*. Warszawa.
- GUS (2014). *Charakterystyka gospodarstw rolnych*. Informacje i Opracowania Statystyczne, Warszawa.
- GUS (2014). *Rocznik statystyczny 2014*. Warszawa.
- Isermeyer, F. (2014). *Künftige Anforderungen an die Landwirtschaft- Schlussfolgerungen für die Agrarpolitik*. Thunen Working Paper 30, Johann Heinrich von Thunen-Institut, Bundesforschungsinstitut für ländliche Räume, Braunschweig: Wald und Fischerei.
- Józwiak, W. (2016). *Sprawozdanie z realizacji tematu statutowego nr IV Efektywność funkcjonowania podmiotów gospodarczych w rolnictwie*. Zagadnienia wybrane w 2015 roku, Zakład Ekonomiki Gospodarstw Rolnych IERiGŻ-PIB, maszynopis. Warszawa.
- Józwiak, W., Zieliński, M., Ziętara, W. (2016). Susze a sytuacja polskich gospodarstw rolnych osób fizycznych. *Zagadnienia Ekonomiki Rolnej*, nr 1(346), pp. 42-56.
- Kędziora, A. (2005). Przyrodnicze podstawy gospodarowania wodą w Polsce. In: L. Ryszkowski and A. Kędziora (ed.), *Ochrona środowiska w gospodarce przestrzennej*. Zakład Badań Środowiska Rolniczego i Leśnego PAN, Poznań.
- Kundzewicz, Z.W., Szwed, M., Radziejewski, M. (2006). Zmiany globalne i ekstremalne zjawiska hydrologiczne: powódzie i susze. In: M. Gutry-Korycka, A. Kędziora, L. Starkel, L. Ryszkowski (ed.), *Długookresowe przemiany krajobrazu Polski w wyniku zmian klimatu i użytkowania ziemi*. Komitet Narodowy IGBP do spraw Międzynarodowego Programu „Zmiany geosfery i biosfery” PAN i Zakład Badań Środowiska Rolniczego i Leśnego PAN, Poznań.
- Przybylak, R. (2006). Zmiany klimatu Polski w ostatnich stuleciach. In: M. Gutry-Korycka, A. Kędziora, L. Starkel, L. Ryszkowski (ed.), *Długookresowe przemiany krajobrazu Polski w wyniku zmian klimatu i użytkowania ziemi*. Komitet Narodowy IGBP do spraw Międzynarodowego Programu „Zmiany geosfery i biosfery” PAN i Zakład Badań Środowiska Rolniczego i Leśnego PAN, Poznań.
- Starkel, L. (2006). Klimat a człowiek w transformacji środowiska przyrodniczego Polski. In: M. Gutry-Korycka, A. Kędziora, L. Starkel, L. Ryszkowski (ed.), *Długookresowe przemiany krajobrazu Polski w wyniku zmian klimatu i użytkowania ziemi*. Komitet Narodowy IGBP do spraw Międzynarodowego Programu „Zmiany geosfery i biosfery” PAN i Zakład Badań Środowiska Rolniczego i Leśnego PAN, Poznań.
- Wojewodziec, T. (2010). Zjawiska schyłkowe w gospodarstwach osób fizycznych i prawnych na obszarze Karpat Polskich. In: W. Musiał, W. Sroka, T. Wojewodziec (ed.), *Sytuacja ekonomiczna gospodarstw z terenów górskich i podgórskich*. Program Wieloletni 2005-2009, no. 185, Warszawa: IERiGŻ-PIB.

WOJCIECH JÓZWIAK

Instytut Ekonomiki Rolnictwa i Gospodarki Żywnościowej

– Państwowy Instytut Badawczy

Warszawa

## ZAGROŻENIA PRZYRODNICZO-KLIMATYCZNE DLA GOSPODARSTW ROLNYCH OSÓB FIZYCZNYCH NA TLE ICH SYTUACJI DOCHODOWEJ

### Abstrakt

*Artykuł zawiera analizę stanu krajowych gospodarstw rolnych w posiadaniu osób fizycznych, zwraca uwagę na charakterystykę ważniejszych nowych problemów, które zaczynają one napotykać w bieżącej unijnej perspektywie finansowej (lata 2014-2020) lub napotkają w następnej, a w części końcowej wskazuje wstępne propozycje sposobów ich rozwiązania.*

**Słowa kluczowe:** gospodarstwa indywidualne, gospodarstwa osób fizycznych, dochody gospodarstw, zmiany klimatu, susze, susze rolnicze.

*Accepted for print: 12.09.2016.*