p-ISSN 0044-1600
e-ISSN 2392-3458

Problems of Agricultural Economics

www.zer.waw.pl

3(340) 2014, 45-64

Translation from Polish

ALEKSANDER GRZELAK
University of Economics
Poznań

EVALUATION OF THE REPRODUCTION PROCESSES OF ASSETS ON FARMS ENGAGED IN AGRICULTURAL ACCOUNTANCY (FADN)

Abstract

The main aim of this paper is to identify the processes of reproduction of fixedassets of farms in Poland leading agricultural accountancy of the FADN system. The time range of the analysis refers to the period 2004-2011 and is based on a sample of farms engaged in agricultural accounting of the FADN system. In the analyzed period (2004-2011) narrow reproduction processes were dominant in the analyzed group of farms. In the period of eco-nomic recovery in agriculture studied farms actively reproducing the productive assets, then the greater their share reached extended reproduction. There are significantdifferences in the process of reproduction due to the production profile,and above all the economic size of surveyed farms. One has noticed that the farms specialized in milk production modernization processes ensure almost the whole examined period extended reproduction, there has been an increase in investment. On the other hand, in non-specialist units we had to deal with a clear decapitalization of assets. Tested farms of economic size of 50-500 thousand euro values of standard production usually recorded the extended reproduction, while those below 25 thousand narrow one.

Keywords: reproduction processes, agricultural accountancy, market conditions.

Preface

The prerequisite for functioning of the economy, including agriculture, is the continuity of the production process. Production considered in terms of an

* The project was financed from the National Centre of Science funds, granted on the basis of the decision No DEC-2011/03/B/HS4/01174.

unceasingly repeated process is defined as reproduction (Górski et al. 1970). The rate of agricultural production is determined by changes in the resources of the factors of production and vice versa. Consequently, reproduction relates both to the agricultural production itself and to the associated resources of the factors of production, and that is why the term reproduction may be also applied to the land, labour and capital factor. In the case of the land factor reproduction means the process of renewal (enrichment) of the nutritive and biological values of the soil, hence the need to provide it with natural and mineral fertilizers, application of proper agricultural procedures to reduce soil erosion. Reproduction of the labour factor in turn is associated with demographic processes, hence generation replacement, qualifications and education, the ergonomic conditions of agricultural production. The capital participates to a considerable extent in the reproduction of the labour factor through providing better living conditions for the farmer family, and their work on the farm. Reproduction of the capital relates both to the fixed assets, i.e. those that are utilized gradually, and to the current assets which are used up in a single production process. Reproduction of the current assets takes place via purchase or self-supply, whereas the fixed assets are reproduced by capital expenditure (Grabowski, 1991).

The article is focused on reproduction of the fixed assets in agricultural holdings due to their major importance to the farm development processes. The fixed assets which participate in numerous consecutive production cycles, are utilized gradually, and a part of their value, corresponding to the value of wear and tear, is added to the value of the newly produced goods (product). The accounting effect of this gradual wear and tear of the fixed assets and the transfer of their value onto the new products (services) is in form of depreciation (Górski et al. 1970). It is a cost, but not an expenditure and is a "tax shield" of sorts for the business entities. That is why the depreciation of fixed assets is the cheapest source for investment funding (Iwin J., Niedzielski, 2002). It may also be regarded as an instrument for amassing funds required for simple reproduction of fixed assets possessed in the given business entity. However, this does not yet mean automatic renewal or reproduction of the fixed assets engaged in the process of production and hence the occurrence of any, simple at least, reproduction. They depend on investments, which are transformed into resources via the management process. This is how accumulation of capital takes place. The capital is funded from income, savings or external funding sources (credit, means under the EU CAP support programs).

The key objective of the article is the identification of processes of the reproduction of fixed assets in agricultural holdings in Poland which keep the FADN agricultural accountancy. Also the following research questions were formulated:

– What are the trends occurring in the reproduction processes in the group of the studied agricultural holdings?
– What are the diversities between different groups of farms within the scope of the phenomena studied?

The implementation of the major objective of the article and answers to the research questions posed will allow verification of the hypothesis: in the group of studied agricultural holdings there is a domination (in terms of universality) of the processes of narrowed reproduction over the extended one. The temporal scope of the analyses includes the period of 2004-2011 and is based on a sample of agricultural holdings which keep the FADN system agricultural accountancy.

Methodology of research

The article used the results of agricultural holdings which keep accountancy in accordance with the FADN system principles (*Standard results*... 2012). It is noticeable that these data are of a micro-economic nature and relate to arithmetical averages from an typical farm in a specific group of farms. They are featured by diversity, high level of detail and availability for use for comparisons from a dynamic perspective. The studied results, relating to an average agricultural holding under the FADN system, the situation of which is a resultant of behaviours of many agricultural producers, take on the features of regularity, simultaneously reducing the randomness (Sobczyński, 2011). Although the results of the agricultural accountancy system include merely a part of agricultural holdings (those more economically viable), they are approximately reliable (though not representative) for commercial farms in Poland, particularly in the case of determination of the trends in the studied phenomena. The surveys did not include farms with legal personality.

The analyses were focused on evaluation of the processes of reproduction in agricultural holdings which were analysed based on the reproduction indicator mainly (i.e. gross investments excluding the land purchase balance to depreciation). The fixed asset renewal indicator and the rate of investment were also used (see Table 2). Estimation of the studied indicators was done with the use of the "Standard results". Furthermore, they were complemented with data from the Individual Report of agricultural holdings in cases of investments identified in detail.

Evaluations were carried out for groups of farms in breakdown by the type of farm production (according to TF8 typology) and the economic size (according to ES6). According to the new method of determination of the economic size of farms, which has been applied since 2010, the study used a farm breakdown classification unified for the whole period with the parameters of the SO "2004" standard production. The studied set of farms was reduced due to outlying or atypical observations[1].

[1] In the first case the aim was to eliminate objects (farms) outlying in terms of the reproduction indicator (gross investments/depreciation). For this reason those farms were deemed outlying where the values of this indicator exceed twice the standard deviation from the average, set for the studied group (both upwards and downwards). In practice this meant exclusion of a part of farms from the studied population, where these values differed considerably (that was particularly the case of upwards deviations) from the mean values, which interfered with the results of analyses concerning in their majority the average values. The atypical observations meant those farms where the value of current assets was 0.

Reproduction processes in agriculture – selected issues

Reproduction may be considered both from the macro- and micro-economic perspective. The first relates to the trends with respect to changes in the GDP and initially dominated in the sphere of interests of economists, particularly the Marxist ones (Marks, 1955; Marks and Engels, 1981) in form of the so-called Marxist reproduction schemes. The micro-economic approach is focused on analysis of the value of property (fixed assets) vs. investments and depreciation.

We distinguish narrowed, simple and extended reproduction. The first of them concerns a situation in which the fixed assets are diminished in real terms, because investments cannot reproduce the value of wear and tear of the fixed assets (in other words – when the amount of annual capital expenditure on reproduction of the fixed assets is lower than the level of annual depreciation allowance). The simple reproduction is characterised by the value of the fixed assets maintained at a steady level. The extended reproduction[2] is observed when the value of the fixed assets grows every year, which means the positive accumulation of capital. Moreover, it should be underlined that the extended reproduction in agriculture is associated with the phenomenon of land rent (the surplus of income over the remuneration for a farmer's work and his/her family members' and the opportunity cost of equity engaged in the production, excluding land), which are discounted in the price of land (Czyżewski,2012).

The productive potential of agriculture determines the position of this sector in economy, its competitiveness, social role in labour distribution. Increased capital expenditure allocated to purchase of machines and equipment for production, renewal and construction of structures dedicated to production or introduction of new technologies is a precondition, though insufficient, to modernization in agriculture. What is more, one should not only indicate to the quantitative aspect here, both with respect to investments and to changes in the fixed asset level. The growing importance in economic processes is being assigned to qualitative aspects of investments, since they are associated with opportunities to increase the effectiveness of management and improvement of the ergonomics of labour and reduction of noxiousness to the environment.

Taking into account the fact that agriculture belongs to complex systems, the sole evaluation of the processes of reproduction of the fixed assets in agriculture, without reference to the social and environmental aspects, curbs the research perspective. It is also necessary to take into account the effect of synergy within the area of interaction between the economic-production sphere and the socio-environmental one (Zwolak, 2007). In a situation when considerable labour resources are engaged in agriculture, as the case is in Poland, development of technical support of labour is difficult. On the other hand, due to the raw material-based nature of this sector and hence a considerable distance (in eco-

[2] From the macro-economic perspective this may be determined as economic growth.

nomic terms) to the final recipients, the market signals are late in reaching the agricultural holdings and this is the reason why the adjustment of the productive potential and therefore the fixed asset structure takes place with some inertia and is of a long-term nature. A conflict also occurs between the differentiation with respect to relatively greater flexibility of demand for food products and the flexibility of agricultural production, which is the reason why the fixed assets in agriculture respond to the market needs with delay (Piotrowicz, 2002). This phenomenon is enhanced by the relatively frequent changes in the economic situation in agriculture and by its large amplitudes. It is, therefore, necessary for agricultural development to provide stable functioning conditions (Woś, 2000). Investment processes and the reproduction of fixed assets associated with them also result from psychological factors, referring to the agricultural producers' prediction of the future economic situation.

Difficult conditions in which the fixed assets are used in agriculture, particularly agricultural machines (contact with the soil, impact of the atmospheric conditions), as well as the seasonality of agricultural production and the periods of intensive, often excessive use cause their non-linear wear and tear which, during some periods, may exceed the value of depreciation. Moreover, the equipment is highly dedicated, hence the selling opportunities are limited and the relatively high capital-intensity of production make reproduction of these means in real terms fairly difficult. Additionally, the considerable degree of wear and tear of fixed assets in agriculture in Poland[3] indicates to the fact that they are often used for periods exceeding their complete depreciation and the effective standards, particularly in smaller farms, the same situation also concerns buildings and structures. This phenomenon hampers the processes of reproduction.

Fixed assets participate in profit (income) generation, at the same time maximization of the agricultural producer usefulness function increases the pressure on boosting the processes of reproduction. Thus the process of elimination of less efficient techniques and structures and their replacement with more productive or environment-friendly ones, which is the basis of modernization of agriculture (Zwolak, 2007). It should be noted, however, that in the case of the smaller farms, based on family labour, the range of the process is limited due to adaptable servomechanism which comes to the farmer decision-making eliminating or compensating inconvenient changes in external management conditions (Czyżewski, 1986). This consists in regulating the level of farmer family members' consumption by substitution of natural consumption and the revenues from the sales of agricultural produce and primarily in lowering the remuneration for their labour in the revenues obtained in economic downturn conditions. Consequently, these farms may operate for years in the situation of the so-called "negative" income, narrowed reproduction and decapitalisation of fixed assets (Czyżewski, 1995).

[3] According to aggregated data by the CSO the degree of wear and tear of the fixed assets in 2011 was 76.8%.

The processes of reproduction in an agricultural holding based on their own labour resources depend on the situation of the household, i.e. the generation replacement, satisfying consumption, accumulated savings or external sources of income. On the other hand, there is also feedback. Where equity dominates in funding the operation of a farm there is a specific contradiction (at least in the short-term perspective) between the allocation of generated income to accumulation or consumption. Consumption is a priority in a farmer household, only when that is satisfied investments are considered. However, in the long-term this contradiction is not that pronounced because the dynamics of the processes of reproduction is decisive to the volume of resources, income and therefore the level of consumption (Grabowski, 1991), which particularly refers to market-oriented farms. The sole scale of reproduction processes is associated not only with the level of income and its generating factors (prices, costs of production) but also with the willingness to invest.

The processes of reproduction allow the implementation of the productive function of agricultural farms, but also they provide for maintaining the hygienic (e.g. in the case of dairy farms), environmental or biological (fruit and vegetable production) standards, which are associated with dedicated fixed assets. The agricultural holding development depends not only on reproduction of the production fixed assets but also on investments which allow modernization of the farm (Sobczyński, 2011) or its adjustment to animal welfare and environmental requirements[4].

The mechanism of dependence between the process of reproduction and its efficiency is a problem particularly essential in the analysis of reproduction. There are at least two aspects it may be considered in. The first one relates to changes in productivity (of capital, in particular) and transformation of investment activities into effects, most often relating to production and income, but also to the environment (the cross-compliance principle). If the investments are not well focused there will be no development effects (Woś, 2000). These issues, in the context of changes in the productivity of production factors were considered in the studies by Grabowski (1991). Also in analyses by (Baryschrikov et al. 2011), but referring to agriculture in Russia, the importance of state budget aid to reproduction processes was noted. It allows boosting the processes of reproduction, launching the multiplier effects and modernization of agriculture. The second aspect of reproduction efficiency relates to rational use of fixed assets within the given production scale. More than once the purchase of a tractor or a combine-harvester by a smaller farm may not be economically justified and may hamper optimal use of the resources already possessed and generate relatively high costs, and even overinvestment in this area of activities. The situation may change if the purchase

[4] Due to the aggregation of data, in the further part of this study investments were not split into those allocated to reproduction, adjustment or development, as it was assumed that all of them affect the dynamics of processes of the reproduction of fixed assets.

is supported by public aid (e.g. under the measure Modernization of agricultural holdings RDP 2007-2013). Then decisions of this type are rational at the level of the producer himself, because of the attractive opportunity to increase his production resources, though they do not change the fact that in macro-economic terms the efficiency of reproduction processes is small.

The effects of reproduction are largely stimulated by the economic conditions in agriculture. They affect the profitability of production and thus the ability to accumulate. It should be noted here that the processes of reproduction should be considered taking into account the economic conditions cycle. The thing is, the cycle itself to some extent verifies the correctness of investments, structural transformations and only identification of investing activities over the whole cycle presents a complete picture of the situation with respect to the studied processes. In such terms narrowed reproduction, when the economic conditions are less favourable, needs not be evaluated unambiguously negatively if investments compensate in excess the wear and tear of the fixed assets when the economic conditions improve.

One of the challenges faced currently by agriculture in Poland consists in the adjustment of production potential and technologies to the cost (price) competitiveness and simultaneous observance of relatively high environmental standards. That is why reproduction should, on the one hand allow modernization of the production resources, protecting the production processes (in terms of continuity) and on the other – it should ensure reduction of noxiousness to the environment. To achieve this, the institutional mechanism should be applied, as is the case of the EU CAP, according to which obtaining of payments depends on meeting the environment welfare requirements (e.g. cross-compliance, agri-environmental payments). This affects the evolution of the approach to the processes of reproduction in agriculture. Insomuch as earlier they were considered an element of development of the fixed assets which are directly associated with the production functions, after the accession to the EU their role in modelling the non-productive functions of agriculture is increasingly appreciated.

Market conditions of the reproduction processes in agricultural holdings

Integration with the EU was an essential incentive for development in agriculture. This mainly resulted from the inclusion of the Polish agriculture into the CAP instruments, which meant noticeable growth in budgetary support in this sector and improvement of price relations. The share of budget expenditure on agriculture grew considerably after integration with the EU, thus fostering the improvement of the conditions of operation of this sector (Czyżewski and Matuszczak, 2011). In 2007-2009 this share grew almost threefold to stabilize in 2010-2011 at the level of over 4 percent of the total budgetary expenditure

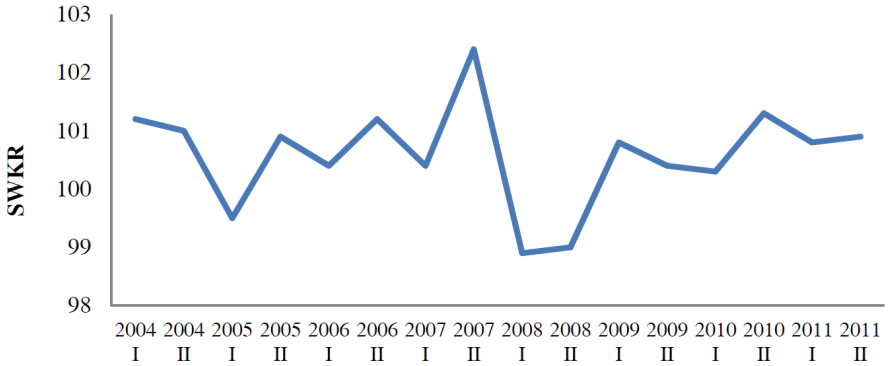
(without the KRUS funds)[5]. In 2011 these funds dropped by 7.5 percent in real terms as compared with the previous year (Czyżewski and Matuszczak, 2012). The impact of the budgetary policy on the development of agriculture grew essentially, thus generating favourable conditions for such development.

The dynamics of real growth in capital expenditure in the economy and in agriculture was also high during the studied period (2004-2011) – in total by 96 and 95 percent respectively. This particularly concerned the first years of Poland's membership in the EU (2004-2007), when aggregated investments in agriculture grew by 62 percent. This was mainly associated with favourable conditions for agricultural production, and was reflected in the improvement of price relations and growth in agricultural production. It should be noted that the year 2007 was exceptionally beneficial for agriculture – as confirmed both by production growth (+5.9%), and improvement of price relations (price scissors indicator 107.2 %).

A slump in market conditions for agriculture in 2008 caused a clear deceleration of investing processes in this sector in 2008-2009 (in total a drop by 7%). In 2010-2011 the dynamics of investments in agriculture grew again in connection with an economic boom in this sector.

The favourable economic conditions in the economy and in agriculture in 2004-2007 (excluding the end of the first half of 2005 in the case of agriculture, see Fig. 1), were also caused by abandoned investments in the previous years and primarily the opportunity provided to farmers in form of support to investing activities and direct payments. In 2008 there was the deterioration of the economic situation in agriculture as a result of the global economic crisis, then the improvement in 2009-2010 (Seremak-Bulge, 2004-2011). In 2011 a slight deterioration of conditions was observed, though the synthetic indicator of economic conditions in agriculture disclosed positive values (Fig. 1), and the price scissors indicator was 108.3 in 2011. Concluding, we might, simplifying somewhat, distinguish two sub-periods in agriculture in the studied period (2004--2011): the first one – the first years after integration with the EU (2004-2007) and the second one – from the year of the slump in economy (i.e. as of 2008).

[5] It should be noted that in 2010 a change took place in the functioning of the agricultural budget, as the Bank Gospodarstwa Krajowego (BGK) took over management of the European fund budget, established on 1.01.2010. Till 2010 expenditure on agriculture, rural development and the agricultural markets included the amount of the loan for CAP pre-funding, and that increased the total amount of expenditure on the three items. Since 2010 isolation of this amount under BGK makes direct comparison of expenditure on various items before 2010 impossible. The actual expenditure on those items, together with the voivodes' budgets and the target reserves, with account taken of the funds taken over by BGK were higher in real terms in 2010 by 28.8 percent as compared with the previous year (Czyżewski and Matuszczak, 2012).



I – means the SWKR value as at the end of the first half-year of the given year (June);II – SWKR at the end of the second half-year of the given year (December).

Fig. 1. Synthetic indicator of economic conditions in agriculture (SWKR) in 2004-2011.

Source: own study based on: (Seremak-Bulge, 2004-2011).

Results of surveys

In the studied group of agricultural holdings extended reproduction for an average farm was noted only in 2006-2007 (table 1). In 2004 and 2011 it was near the simple reproduction of assets. In the remaining years the needs to reproduce the assets in the studied farms were not satisfied, although the results of 2010 should not be evaluated unambiguously negatively. It is noticeable that the values of the reproduction indicator corresponded with the economic conditions in agriculture (Fig. 1), hence we dealt with a sort of cyclicity of this indicator. Only when the economy was clearly booming the investments exceeded the reproduction needs in agricultural holdings. In the first sub-period (2004-2007) the reproduction indicator grew in total by 38 percent in an average agricultural holding, whereas in the consecutive one (2008-2011) it dropped by 41 percent, which shows that throughout the studied period there was a moderate prevalence of narrowed reproduction processes. In the second sub-period, due to some saturation with investments in agricultural holdings and the ensuing growth in the value of assets, it was more difficult to obtain extended reproduction. It is also noticeable that during the sub-period in which the higher reproduction indicator was observed also the indebtedness indicator was relatively higher. This means that the use of external funding sources facilitates reproduction and modernization of assets in agricultural holdings[6].

Similar trends were observed in the case of the fixed asset renewal indicator (excluding land). It shows that on the average, the complete renewal of the fixed assets lasted about 14 years, which should be assessed positively. However,

[6] Similar conclusions result from surveys by the team led by Józwiak (2009).

it should be kept in mind that in the years preceding Poland's accession to the EU agriculture was largely underinvested and the fact that these data concern relatively economically stronger agricultural holdings. It should be noted also that investments primarily in machines and agricultural equipment prevail which shows, that the fixed asset potential in agriculture changes in the "mechanized" direction. This resulted from the farmers' current needs and from the direction of use of investment support after the accession to the EU (mainly purchase of farm machines, equipment and tools for agricultural production). Predominance of this type of investments meant less risk and easier way to obtain and settle investment capital from the EU funds for purchase of machines and equipment (Poczta and Czubak, 2007). On the other hand, there are cases of considerable negligence with respect to investing in buildings and structures, which is also connected with the downward trend in pig rearing and abandonment of animal production on smaller farms. In the studied group of agricultural holdings the investments in buildings amounted merely to 3 percent (2011) of the value of all investments, which shows considerable degree of decapitalisation of those fixed assets and serious need of modernization in this area.

Reproduction processes in agricultural holdings depend on agricultural income from which investments are financed. Other surveys done in agricultural holdings in the EU which were included into the FADN system, with the size over 16 ESU show that reproduction processes are intensified with growing income (Kusz et al. 2013). In agriculture, and particularly in Poland, investments are most often funded from the farmer's own resources, i.e. the income earned (Czekaj, 2011) or savings. A relatively stable relation of investments in fixed assets to agricultural income (the rate of investment) was observed. The highest relations of the studied indicator were achieved by agricultural holdings in the first year of EU membership, and that was connected with the former underinvestment and a relatively low level of farmer incomes. It was observed that in the situation of relatively high income (2010-2011) the rate of investment was reduced, most probably because of the relatively lower willingness to invest. It was also observed that growth in income earned by 1 full-time employee also fosters improvement of the reproduction indicator. Furthermore, it was noted in the case of the share of total costs in the value of production that if it did not exceed 60 percent it was accompanied by extended or simple reproduction processes. This may mean that both the conditions of profitability of agricultural production and the efficiency of production determine the range of processes of reproduction of assets. Subsidies, and direct payments in particular, play an essential role in generation of income and the reproduction processes. They provide some sort of stabiliser of farm development, supporting these processes during the period of worse economic conditions in agriculture at a level which would be impossible to achieve without the support (Bezat-Jarzębowska et al. 2013).

Table 1

Reproduction measures versus the selected economic data from agricultural holdings (in 2004-2011) which kept the FADN agricultural accountancy (for an average farm)

Specification	2004 N=11595	2005 N=11248	2006 N=11383	2007 N=11786	2008 N=11971	2009 N=11824	2010 N=10548	2011 N=10520
Reproduction indicator[a]	1.03	0.88	1.20	1.27	0.78	0.84	0.93	0.97
Fixed assets renew. indicator[b]	0.07	0.05	0.08	0.08	0.05	0.06	0.07	0.07
Rate of investments[c]	0.39	0.33	0.34	0.35	0.33	0.34	0.29	0.28
Profitability of labour[d]	27.15	27.03	31.56	36.40	28.38	29.72	43.53	49.18
Income[e]	58.03	56.76	68.26	78.64	60.12	63.21	89.38	100.97
Share of subs.bal. in income[f]	0.27	0.57	0.42	0.37	0.56	0.61	0.53	0.44
Cost indicator[g]	0.60	0.63	0.60	0.59	0.70	0.65	0.61	0.59
Debt indicator[h]	0.13	0.13	0.14	0.15	0.13	0.11	0.12	0.13

[a] Fixed assets reproduction indicator = investments (land purchase excluded)/depreciation.
[b] Fixed assets renewal indicator = investments (land purchase excluded)/value of fixed assets (land excluded).
[c] Rate of investment = investments (without land)/farmer family income.
[d] Profitability of labour (in thousand PLN) = income from the family agricultural holding/number of full--time employees in the agricultural holding.
[e] Income from the family agricultural holding (in thousand PLN).
[f] The share of subsidy and tax balance in the income = sum of the balance of payments and taxes on operating and investing activities/ income from the family agricultural holding.
[g] Relative cost level indicator = total cost/value of production.
[h] Debt indicator = total liabilities/total assets.

Source: FADN system data base in Poland for 2004-2011.

Table 2

Breakdown of agricultural holdings (in %) (in 2004-2011) which keep FADN agricultural accountancy by the value of reproduction indicator[a]

Groups of farms by reprod. indicator	2004	2005	2006	2007	2008	2009	2010	2011
A	73	65	57	56	68	66	64	62
B	7	9	9	7	9	9	9	8
C	2	3	4	3	3	2	3	3
D	3	4	6	5	4	5	5	6
E	14	19	24	26	10	16	19	21

[a] Reproduction indicator = investments (land excluded)/depreciation; reproduction indicator: 0.5 and less – a; 0.5-0.9> – b; 0.9-1.1> – c; 1.1-1.5> – d; 1.5> – e.

Source: FADN system data base in Poland for 2004-2011.

During the evaluation of the processes of reproduction of assets the farms of the studied sample were split by the value of the reproduction indicator (Table 2). 5 groups were distinguished. The first one, below 0.5, is characteristic to farms in which asset decapitalisation is evident. The second group concerns farms in which there actually is narrowed reproduction but they have a chance to achieve at least simple reproduction. This depends on the conditions of profitability of agricultural production and the aid instruments under the EU CAP. The consecutive group includes farms where reproduction oscillates around simple reproduction of assets. Group 4 consists of farms with extended reproduction, probably based on profitability of production and the scale of production. Group 5 consists of agricultural holdings with very high dynamics of the processes of reproduction and the advanced modernization of the assets.

It should be emphasized that the studied group of farms usually achieved more favourable economic and production conditions both as compared with total average farms in Poland and as compared with average results of farms participating in the Polish FADN[7].

The largest share of farms was recorded in extreme groups, the smallest in the central one. This may indicate to a polarized development of farms within the studied sample, with outstanding domination of farms with very low reproduction indicator. These, as a rule, are the units with very limited investing activity. These results may also show the relatively small range of extended reproduction processes in agriculture in Poland, if the share of farms with narrowed reproduction in a group of the relatively economically stronger farms (as compared with those average in the country) usually exceeded 70 percent. The relatively large share of farms with very high reproduction shows in turn that in the existing market conditions after accession to the EU a part of farms actively took the opportunity to modernize and hence reproduce their assets. It was also noted that improvement of the economic situation in agriculture stimulated growth in the share of agricultural holdings which achieved a higher level of reproduction. The particular attention should be paid to deterioration of economic conditions between 2007 and 2008, which resulted in a clear change in the breakdown of farms by the reproduction indicator in individual groups.

In the case of evaluation of reproduction by production types of farms, the most advantageous situation in the studied population was achieved by dairy farms. Almost all of them recorded extended reproduction in the studied period (Table 3). This shows the high investing activity in this group of entities. They actively took the opportunity to modernize their production potential with the

[7] The group of farms participating in the Polish FADN amounted to, for example, in 2011 – 738 thousand, vs. 10.5 thousand in the studied sample (farms which kept the FADN system accountancy after elimination of outlying and atypical units). The area of agricultural land in farms of the first group accounted for 55 percent of the size of farms from the second of the specified groups, whereas the value of production and the amount of income accounted for 48 and 42 percent respectively.

use of i.a. the following measures: "Young farmer", "Investments in an agricultural holding" (SOP 2004-2006) or "Modernization of agricultural holdings" (RDP 2007-2013). These investments mainly concerned the purchase of equipment for milking, cooling and storage of milk, upgrading buildings to higher phytosanitary standards, introduction of new silage preserving technologies. Generally, during the studied period the milk production remained at a similar level with an upward trend in the milk yield and downward trend in the cow headage (*Rynek mleka*... 2012). The least advantageous situation in reproduction of assets occurred in farms with diversified activity, where narrowed reproduction prevailed. This means permanent decapitalisation of assets in this group of agricultural holdings. These farms usually have a small area and the scale of production does not generate sufficient equity for investing purposes (Augustyńska-Grzymek and Skarżyńska, 2011). These phenomena are a consequence (and, later on also the reason) of relatively lower income in smaller entities. This may also be associated in smaller farms with greater preference for consumption than pro-investment activities, due to smaller scale of production and the absolute level of income. However, their future should not be considered solely in the production terms.

In the case of farms specializing in field crops a relatively high activity in asset reproduction was observed. It is noticeable that in the situation of favourable price conditions in the cereal market they achieved the extended reproduction and narrowed reproduction when the conditions were less favourable. The good conditions for achieving satisfactory level of profitability and support in form of direct payments were important to development of this group. They neutralized the effects of deterioration of profitability of production. These farms increased their land resources in the first place then invested in production assets, i.e. the purchase of combine-harvesters, tractors, spraying machines (Kagan, 2011).

In farms specializing in rearing of granivorous livestock the reproduction of assets underwent significant changes, associated with the so-called pig cycle. This means that when profitability of this production in the market improves, investing processes are activated. At the same time these farms (also horticultural ones) are relatively more vulnerable to market pressure hence the lower importance of subsidies and their stabilizing effect on income and the reproduction processes. In the context of the recent experience in Poland with the African swine fever and the associated embargo on the sale of meat it may be stated that meat production is burdened with considerable risk which affects the changeability of the economic situation of agricultural holdings and the reproduction processes.

Table 3

Reproduction indicatorsa in agricultural holdings (in 2004-2011) which keep the FADN agricultural accountancy by production types (for an average farm in a given group)

Description[b]	2004	2005	2006	2007	2008	2009	2010	2011
1	0.91	0.81	1.04	1.25	0.82	0.90	1.02	0.98
2	0.87	0.78	1.37	1.88	0.64	0.61	0.65	0.81
4	1.09	0.77	1.03	1.06	0.81	0.72	0.73	0.88
5	1.04	1.58	1.93	1.89	1.09	0.96	1.02	1.14
6	0.79	0.84	1.23	1.69	0.71	0.75	0.79	1.05
7	0.61	0.85	1.30	1.12	0.64	0.94	0.97	0.83
8	0.58	0.72	1.01	1.02	0.61	0.73	0.72	0.78

[a] Reproduction indicator = investments (land excluded)/depreciation; [b] 1 – field crops; 2 – horticultural crops; 4 – permanent crops; 5 – dairy cows; 6 – herbivorous animals; 7 – granivorous animals; 8 – mixed.
Source: FADN system data base in Poland for 2004-2011.

It is difficult to unequivocally evaluate the situation of farms specializing in grazing livestock, in horticultural cultivations or in permanent crops in terms of reproduction of assets. In the first sub-period (2004-2007) we observed gradual improvement in the situation. In consequence, the extended reproduction was recorded in 2006 and 2007. In 2008-2009 as a result of deteriorated conditions narrowed reproduction was recorded and in the years that followed (2010-2011) reproduction of assets was featured by higher dynamics, though below the level of 2006-2007. In the first years of EU membership horticultural farms actively invested in under cover cultivations, whereas those specializing in permanent crops purchased fruit harvesters and cold storage facilities. Farms specializing in grazing livestock invested in animal race breed improvement. In this case it seems necessary to invest in irrigation systems (sprinkling machines) for permanent grasslands to improve the profitability of fodder production (Kagan, 2011).

Table 4

Reproduction indicatorsa of agricultural holdings (in 2004-2011) which keep the FADN agricultural accountancy by the economic size (SO) (for an average farm in a given group)

Specification[b]	2004	2005	2006	2007	2008	2009	2010	2011
1	0.40	0.24	0.32	0.38	0.27	0.25	0.26	0.28
2	0.57	0.59	0.83	0.78	0.52	0.50	0.44	0.60
3	0.83	0.95	1.27	1.35	0.74	0.80	0.81	0.86
4	1.01	1.10	1.65	1.59	0.97	1.06	1.11	1.14
5	1.06	1.13	1.63	1.94	0.94	1.15	1.30	1.03
6	0.88	0.78	1.24	1.17	0.79	0.89	0.91	0.92

[a] Reproduction indicator = investments (land excluded)/depreciation; [b] Economic size expressed as the standard production value (in thousands EUR): 1 – very small – 2-8; 2 – small – 8-25; 3 – moderately small – 25-50; 4 – moderately large – 50-100; 5 – large 100-500; 6 – very large >500.
Source: FADN system data base in Poland for 2004-2011.

Differences in the reproduction indicator level between the studied farms of different economic size (table 4) are larger as compared with the type of production breakdown. This may mean that the volume of production and its associated scale have a greater impact on reproduction of assets, though it should be kept in mind that investing activity, hence the reproduction of assets also depend on the agricultural producer's features and generation replacement (Leopold, 1995). These data show that changes in the Polish agriculture after accession to the EU lead to growing polarization.

Farms with standard production value of up to EUR 25 thousand throughout the studied period recorded narrowed reproduction, which indicates the decapitalisation of their assets. The functioning and future existence of such farms is possible due to the fact that their owners often gain income outside agriculture and furthermore, the degree of satisfaction of their consumption needs is usually rather low. These units usually lack their own funds for this purpose because of very low income, they also have very low creditworthiness (Augustyńska-Grzymek and Skarżyńska, 2011). It should be noted that because of low investing activity of such farms, they often use completely depreciated fixed assets. As a result, their actual dynamics of reproduction processes is still lower.

In smaller farms (though not necessarily the smallest) there are certain opportunities to improve the income situation through improvement of agricultural procedures (*Pomoc*... 2013). They can also try to run minor services, manufacturing or cooperate with other farmers, hold functions for the broadly understood rural welfare, maintenance of the settlement network, social viability and stability in rural areas. These farms also have some potential for increasing production (e.g. animal, fruit, high quality food products) also through local sale. This is fairly essential as it may concern many thousands of workplaces and living conditions for about a million rural inhabitants (Józwiak and Ziętara, 2013). However, it should not be expected that all these farms will find their place in the market. Some of them will withdraw from agricultural activity, seeking higher incomes in other fields of activities, so divestment processes will take place there (Wojewodzic, 2010). Low reproduction dynamics in these farms need not, after all be always evaluated negatively. An open question is whether these processes will be associated with the flow of resources (capital and land in particular) from these to other larger farms or highly specialized ones. Often such land is subject of status change for construction purposes[8]. This problem is differentiated across regions and purchase of small plots of land from smaller farms is often not attractive due to the relatively high unit costs of its cultivation and disadvantageous layout.

It is not easy to unequivocally evaluate the studied indicator in the case of agricultural holdings with standard production value of EUR 25-50 thousand. In 2006-2007 the extended reproduction was observed, in the remaining years

[8] This may be confirmed by the fall by 5 percent in the agricultural land area in Poland in 2004-2010.

the narrowed reproduction, although it did not differ much from the simple reproduction. Development of farms in this group depends mainly of the profitability of production, obtaining investment supporting means, the possibility to expand production scale and activation of non-agricultural forms of activity. However, one can hardly expect all of them, or a major part of this group to achieve at least the simple reproduction of assets.

In the case of the agricultural holdings with production volume of EUR 50-500 thousand the extended reproduction[9] is usually observed. One might suppose that their income fully provides for satisfaction of their consumption needs and also investment funding. They actively took the opportunity to modernize their production potential with the use of i.a. the following measures: "Young farmer", "Investments in an agricultural holding" (SOP 2004-2006) or "Modernization of agricultural holdings" (RDP 2007-2013). It is worthwhile to notice that the farms of this group recorded narrowed reproduction only at the time of severe slump in agriculture. This may mean that the managers of these agricultural holdings make investment decisions not from the viewpoint of the current situation but in a long-term perspective. These holdings may be defined as highly economically viable. The scope of further investment stimulating state support should be limited in this case, as most probably these entities have launched autonomous modernizing mechanisms and care should be taken to counteract the risk of transformation of this mechanism into a helix leading to overinvestment.

The level of the reproduction indicator in the largest holdings, i.e. above EUR 500 thousand of standard production may be a little surprising. Primarily it is that the resources of the factors of production there are often leased (land lease[10], payment to hired labour, lease of assets), and that is associated with relatively high cost. In the case of holdings leased from ANR it is not possible to establish a fund of depreciation of the leased fixed assets (Nowak, 2008). Furthermore, validity of the lease of agricultural real estate is not guaranteed in terms of legal solutions, neither is the security of long-term management – this also discourages farmers from investing. That is why the reproduction indicator is lower than in both the neighbouring groups of economic size (Guzewicz et al. 2004). On the other hand it should be noted that in the case of large agricultural holdings the sole evaluation of the reproduction indicator, oscillating around simple reproduction should not be evaluated negatively in view of the considerable absolute value of the investment. These holdings achieve high (supra parity) income, they receive relatively high support via subsidies and they operate in terms of enhanced production risk.

[9] Similar results of surveys with respect to relationships between reproduction and the scale of production concerned the situation of agricultural holdings in Poland in the eighties of the 20th century (cf Grabowski, 1991).

[10] In this group of farms the share of lease in the total area of agricultural land used was particularly high and e.g. for 2011 it amounted to 70 per cent. In all the remaining groups this share did not generally exceed 40 percent.

Summary

The considerations presented in the article lead to the following conclusions:

1. During the studied period (2004-2011) narrowed reproduction processes prevailed in the studied group of agricultural holdings. This is not a positive phenomenon in the context of significant needs for modernization of agriculture in Poland, particularly in view of the fact that the results of the study concern the group of economically stronger farms. This proves decapitalisation of the fixed assets and insufficient accumulation of capital. However it would be a simplification to state that it is associated solely with adjustment of production potentials of agricultural holdings to the market conditions due to the over two decades of introducing the open market economy mechanisms. Following the accession to the EU a noticeable acceleration of investing took place in agriculture with the support under the CAP, however it mainly concerned the more viable farms and the needs in this respect are extensive. During the first sub-period (2004-2007), which may be identified with a short-term economic cycle in agriculture, the dynamics of the reproduction processes was high, whereas during the consecutive one (2008-2011) reduction in investing activities exceeded the former growth. This was also affected by the difficult situation in the labour market at that time, which limited the absorption of labour resources of rural population. Only in 2004 and 2006-2007 extended reproduction was observed. During those years also the share of farms achieving the extended reproduction was larger in the studied group.
2. The economic and production conditions have an essential role in shaping of the reproduction processes. During the period of better economic conditions in agriculture the studied agricultural holdings were more active in reproducing the production fixed assets, particularly during the first sub-period of Poland's membership in the EU, i.e. in 2004-2007. This was also associated with the high underinvestment and thus less favourable economic conditions in agriculture in 1998-2003. Only since 2004 did the situation improve noticeably as a result of increased share of budgetary expenditure on agriculture, following the inclusion of agriculture under the EU CAP instruments. Positive macro-economic trends occurring in the economy at that time also contributed to that.
3. An essential role in boosting the processes of reproduction is played by subsidies, particularly the direct payments, which play the role of a kind of stabilizer during the period of less favourable economic conditions, supporting the investment processes and counteracting weakening of the processes of reproduction of the fixed assets. Growth in the income earned by 1 full-time employee also fosters the improvement of the reproduction indicator. At the same time, reproduction of the fixed assets in the studied farms depends on the profitability of agricultural production with respect to the relations of costs and production, which depend, in turn, on the price scissors indicator.

4. There are considerable differences in the reproduction processes with respect to the production profile and primarily to the economic size in the group of studied farms. In dairy farms the modernization processes ensured the extended reproduction through almost the whole studied period, whereas on farms with many-sided production the decapitalisation of the fixed assets was evident. These phenomena resulted from inability of these farms to reach income allowing funding the development because of the small production scale and limited willingness to invest.
5. The studied farms with economic size of EUR 50-500 thousand of standard agricultural production value usually report extended reproduction, while those below EUR 25 thousand – narrowed reproduction. In the remaining groups of farms the situation is more complex. In the case of the largest agricultural holdings (above EUR 500 thousand), which often lease land and fixed assets, investing possibilities are often limited, due to the inability of establishing the depreciation fund from the leased property. That is why only in the period of very good economic conditions (i.e. 2006-2007) they recorded the extended reproduction, while in the remaining years it was narrowed or near simple.
6. The presented results of study, though not representative to the whole population of agricultural holdings in Poland, as they relate to more viable entities, and more market-oriented ones, show that smaller farms, often without any clear production type, record permanent narrowed reproduction, thus decapitalisation of their fixed assets. However, the future development of agriculture, and rural areas in particular, should not only be associated with farms highly specialized or primarily with large scale of production, although they play a growing role in the food market. Smaller farms11 account for about 85 percent of farms which are recognised in the food market12, which translates into a considerable range of engagement of production resources in them. Hence this issue has a social dimension and concerns such aspects as non-agricultural rural development or quantification of public goods generated by agriculture. State aid for these farms and boosting their investing processes is, therefore, in the public interest, particularly in view of the expected growth in food demand worldwide. This does not mean aid for all farms of this type but for those which have chances of economic viability. In the remaining cases it is recommended to include rural stakeholders into rural activation programmes, land consolidation to sustain the viability of rural areas. Therefore, the proposal to support small farms under RDP 2014-2020 should be assessed positively, particularly the following measures: "Small farm restructuring" and "Modernization of agricultural holdings", which give chances of increasing the population of economically viable holdings with at least the simple reproduction of their assets.

[11] Farms with economic size of EUR 2-25 thousand of standard agricultural production value.

[12] This refers to farms with the standard agricultural production value over EUR 2 thousand. These farms produce about 90 percent of the standard agricultural production value in Poland.

References

Augustyńska-Grzymek I., Skarżyńska A.: Stan i szanse rozwoju gospodarstw towarowych uznanych za słabe ekonomicznie. Zagadnienia Ekonomiki Rolnej, no. 1, 2011.

Baryschrikov N., Samygin D., Cherdantseva E.: Influence of the state support on conducting reproduction process in the agricultural organizations. Finance and Credit, no. 35(467), September 2011.

Bezat-Jarzębowska A., Rembisz W., Sielska A.: Substytucyjność źródeł dochodu producenta rolnego. Wieś i Rolnictwo, no. 3, 2013.

Czekaj T.: Zachowania inwestycyjne polskich gospodarstw rolnych. Zagadnienia Ekonomiki Rolnej, no. 4, 2011.

Czyżewski A.: Dochody rolnicze a procesy reprodukcji w gospodarce chłopskiej w okresie Polski Ludowej. Ekonomista, no. 4-5, 1986.

Czyżewski A.: Makroekonomiczne uwarunkowania przedsiębiorczości w agrobiznesie [in:] Rozwój rolnictwa i agrobiznesu w skali lokalnej (red. A. Czyżewski). Wydawnictwo ODR w Sielinku, Poznań 1995.

Czyżewski A., Matuszczak A.: Krajowe i unijne finansowanie wydatków budżetowych w sektorze rolno-żywnościowym w latach 1996-2012. Journal of Agribusiness and Rural Development, no. 2, 2012.

Czyżewski A., Matuszczak A.: Wydatki w krajowym budżecie rolnym Polski na rzecz rozwoju lokalnego przed i po integracji z Unią Europejską (1997-2011). Journal of Agribusiness and Rural Development, no. 1, 2011.

Czyżewski B.: Renty ekonomiczne w gospodarce żywnościowej w Polsce. PWE, Warsaw 2012.

Górski J., Nasiłowski M., Sadowski Z., Sierpiński W.: Ekonomia polityczna. Wydawnictwo Książka i Wiedza, Warsaw 1970.

Grabowski S.: Procesy reprodukcji w gospodarstwach indywidualnych. PWRiL, Warsaw 1991.

Guzewicz W., Osuch D., Zdzieborska M.: Wyniki produkcyjno-ekonomiczne wielkoobszarowych gospodarstwa powstałych z majątku byłych pgr (lata 2000-2003 i zamierzenia na rok 2004). IERiGŻ, Warsaw 2004.

Iwin J., Niedzielski Z.: Rzeczowy majątek trwały, amortyzacja i inwestycje rzeczowe w finansach przedsiębiorstw. PWN, Warsaw 2002.

Józwiak W., Ziętara W.: Kierunki i zakres wsparcia inwestycji w polskich gospodarstwach rolnych w latach 2014-2020. Zagadnienia Ekonomiki Rolnej, no. 1, 2013.

Kagan A.: Efektywność produkcyjno-ekonomiczna przedsiębiorstw rolnych na tle procesów restrukturyzacyjnych ze szczególnym uwzględnieniem spółek, w których prawa z udziałów wykonuje Agencja. IERiGŻ-PIB, Warsaw 2011.

Kusz D., Gędek S., Ruda M.: Endogeniczne uwarunkowania działalności inwestycyjnej gospodarstw rolniczych w Unii Europejskiej. Roczniki Ekonomii Rolnictwa i Rozwoju Obszarów Wiejskich, t. 100, z.1, 2013.

Leopold A.: Polityka w stosunku do wsi i rolnictwa w okresie transformacji systemowej [in:] Wieś i rolnictwo w okresie transformacji systemowej (red. L. Klank). IRWiR, Warsaw 1995.

Marks K., Engels F.: Dzieła wybrane. Wydawnictwo Książka i Wiedza, Warsaw 1981.

Marks K.: Kapitał. T. II. Wydawnictwo Książka i Wiedza, Warsaw 1955.

Nowak P.: Reprodukcja majątku trwałego zasobu własności rolnej skarbu państwa (na przykładzie oddziału terenowego AWRSP w Poznaniu w latach 1995-2008). Journal of Agribusiness and Rural Development, no. 2, 2008.

Piotrowicz A.: Czynniki określające strukturę organizacyjną przedsiębiorstwa. Ekonomika i Organizacja Przedsiębiorstw, no. 3, 2002.

Pomoc dla małych gospodarstw rolnych w Polsce w nowej perspektywie finansowej 2014--2020. Ministerstwo Rolnictwa i Rozwoju Wsi (materiały informacyjne), Warsaw 2013.

Poczta W., Czubak W.: Bariery pozyskiwania środków UE na cele inwestycyjne przez gospodarstwa rolne [in:] Identyfikacja i ocena barier administracyjnych realizacji programów rozwoju obszarów wiejskich (red. M. Wigier). Seria Raporty Programu Wieloletniego 2005-2009, no. 66. IERiGŻ-PIB, Warsaw 2007.

Rynek mleka. Stan i perspektywy (red. J. Seremak-Bulge). IERiGŻ-PIB, Warsaw 2012.

Seremak-Bulge J.: Koniunktura w rolnictwie. Rynek Rolny, lata 2004-2011. IERiGŻ-PIB, Warsaw.

Sobczyński T.: Ocena możliwości rozwojowych gospodarstw rolniczych Unii Europejskiej na podstawie inwestycji netto w latach 1998-2008. Folia Pomeranae Universitatis Technologiae Stetinensis, Oeconomica, no. 291(65), 2011.

Sytuacja ekonomiczna, efektywność funkcjonowania i konkurencyjność polskich gospodarstwa rolnych osób fizycznych (red. W. Józwiak). Seria Raporty Programu Wieloletniego 2005-2009, no. 132. IERiGŻ-PIB, Warsaw 2009.

Wasilewska A.: Wyposażenie i efektywność środków trwałych w gospodarstwach indywidualnych o różnych typach produkcyjnych. Zeszyty Naukowe SGGW. Ekonomika i Organizacja Gospodarki Żywnościowej, no. 78, 2009.

Wojewodzic T.: Dywestycje w gospodarstwach rolnych – istota, definicja, podział. Wieś i Rolnictwo, no. 2, 2010.

Woś A.: Inwestycje i akumulacja w rolnictwie chłopskim w latach 1988-1998. IERiGŻ, Warsaw 2000.

Wyniki standardowe 2011 uzyskane przez gospodarstwa rolne uczestniczące w polskim FADN. IERiGŻ-PIB, Warsaw 2012.

Zwolak J.: Rola środków trwałych w rolnictwie polskim w latach 1990-2004. Wydawnictwo Akademii Rolniczej w Lublinie, Lublin 2007.

Accepted for print: 12.09.2014.