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**THE ROLE OF FARMERS' QUALIFICATIONS AND KNOWLEDGE
IN THE STRUCTURAL CHANGES OF POLISH AGRICULTURE
РОЛЯТА НА КВАЛИФИКАЦИИТЕ И ЗНАНИЯТА НА ЗЕМЕДЕЛСКИТЕ
СТОПАНИ В СТРУКТУРНИТЕ ПРОМЕНИ НА ПОЛСКОТО ЗЕМЕДЕЛИЕ**

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Abstract

Polish agriculture undergoes a structural transformation. The factors contributing to the economic changes in farms are varied. The paper tries to determine the role of qualifications and knowledge in this process. The article consists of two parts. The first one presents the significance of farmers' social characteristics for the development of agricultural holdings. Using data from the research carried out by the Institute of Agricultural and Food Economics – National Research Institute (IAFE-NRI) on the sample of over three thousand units, a positive and statistically significant impact of farmers' qualifications and knowledge on the process of investing in farms has been observed. The second part of the study describes and evaluates the system of shaping human capital in Polish agriculture, including agricultural education system as well as selected instruments of the agricultural policy.

Key words: structural changes, agriculture, knowledge, qualifications, farm.

INTRODUCTION

Polish agriculture undergoes a structural transformation. These process is reflected in the decrease of number of individual farms¹, especially those with a small area of agricultural land and limited economic potential. At the same time, the category of professional and large farms aiming at strengthening their position in agribusiness is developing². This does not change the fact that the structure of Polish agriculture is still considered ineffective. It refers mostly to the level of land and capital concentration [Karwat-Woźniak, 2011; Poczta, 2012]. This is why an attention to the need for further transformations is being brought. Economic changes are indispensable not only for the maintenance and improvement of agricultural producers' competitiveness, but also for the development of rural areas. There is a series of conditions for the transformation of Polish agriculture. For instance, a general economic prosperity, modernisation of means agricultural production, modification of the legal aspects of running a business and a proper

agricultural policy are of great importance. However, in the process of economic transformations, apart from significant exogenous factors, the significance of specific characteristics and attitudes of people employed in agricultural production, especially the qualities and actions of farm managers should be considered. Unstable market environment requires farmers to take an active approach, expressed not only in their adaptation to changes, but also in taking preventive actions [Balmann et al., 2006]. The competition rules naturally favour enterprises that aim at reducing the cost of production and delivering sufficient amount of products on time. Nevertheless, in some market segments an increase in demand for high quality products, produced in environmentally friendly or socially responsible way is observed. The common purpose of specific management strategies, both those based on low prices and high quality, is maintenance on the market and gain competitive advantage. An efficient realisation of such scenarios should be facilitated by intangible resources in the form of high agricultural qualifications and knowledge. Adequate know-how or skills can help optimise the use of production factors, obtain new resources or undertake a business cooperation. Nonetheless, a barrier in initiating expansive ventures, directed at achieving a satisfactory level of income, is often a deficit of fixed capital, restricting the opportunity to contact other actors of the food chain and access the sources of external financing.

¹ A farm (individual farm) is defined as a farm with an area of at least 1 ha of agricultural land, which is utilised by a natural person. In public statistics this definition has changed since 2010. ² According to public statistics, between 2002 and 2010 the number of individual farms decreased by 393 thousand (i.e. by 20%). Most of the liquidated farms were units of a relatively small area (up to 5 ha of agricultural land), whose number was reduced by 25%, whereas the number of units with the area amounted to at least 30 ha of agricultural land increased by 26%.

The influence of knowledge and skills of farmers on structural changes in the agricultural industry may be complex and unequivocal (fig. 1). Currently, on agricultural markets, characterised by intensive competition, one of the conditions for the process of farm modernisation is acquiring a great amount of knowledge and expertise. The process of modernising production facilities supported by suitable competences should translate into a change in the structure of the industry when it comes to production and technology use. In this context, the lack of sufficient level of qualifications constitutes a barrier to the implementation of investments. The diverse role of education and knowledge in general structural transformation results from the relation of these factors to the process of disorganisation of the economy. An increase of the share of services and industry sector in the global production contributes to the concentration of production and capital in agriculture, which triggers an outflow of employees from this sector to relatively more productive branches. In such situations, the high level of education and competences of farm managers, especially in non-agricultural disciplines, may lead to resigning from agricultural activity and seeking employment in other sectors.

The paper determines the role of qualifications and knowledge in the structural transformation of agriculture in Poland. The mentioned factors have been recognised as elements contributing to this changes. The study consists of two parts. The first part depicts the level and significance of farmers' qualifications and knowledge for economic change processes on farms. The second part describes and evaluates the system shaping human capital in Polish agriculture, including agricultural education system and selected instruments of the agricultural policy.

MATERIALS AND METHODS

For the purposes of the study two sources of data have been used. The first one constituted results of the surveys carried out by IAFE-NRI in 76 villages located across Poland. The information gathered as a result of this research was comprehensive and concerned both the features of the villages (location, level of the development of social and technological infrastructure, description of the local labour market) and socio-economic characteristics of all families living there. The information from the IAFE-NRI field surveys concerned farming families, particularly agricultural holdings managers, as well as the production resources were used. The features of farmers referred to both the type of formal

qualifications (i.e. level of general and agricultural education) and the quality of their knowledge³. The gathered statistical material was focused on three wave of surveys, i.e. years 2011, 2005 and 2000, when the size of the samples was 3331, 3705 and 3927 units respectively.

The description and evaluation of agricultural knowledge and education system in Poland was based primarily on the available public statistics and the reports of the CAP implementation. A relevant information on other resources were used as well.

As has already been mentioned, the structural changes in the sample were noted indirectly. The processes of modernisation and increase in production resources⁴ that took place in the studied farms between 2005 and 2011 were claimed favourable to these changes. The factors contributing to structural changes were: (1) production potential of a farm at the starting point, i.e. in 2005 and (2) the level of farm managers' qualification and knowledge. The former determinants included the following economic features of the agricultural holdings: area of agricultural land (in ha), number of livestock (in SD), level of machinery and technical equipment⁵ and the state of the buildings⁶. In turn the latter concerned the level of general and vocational education (formal qualifications) and knowledge (acquired through contacts with agricultural advisors and professional websites).

The models of economic changes in the farms were estimated exclusively for a part of the sample, i.e. for the units that were studied both in 2005 and 2011 (n=2690). These changes were expressed in the form of binominal logit model of qualitative variable [Long, 1997; Gruszczyński, 2002]. The overall form of the model analysed in the research can be written as:

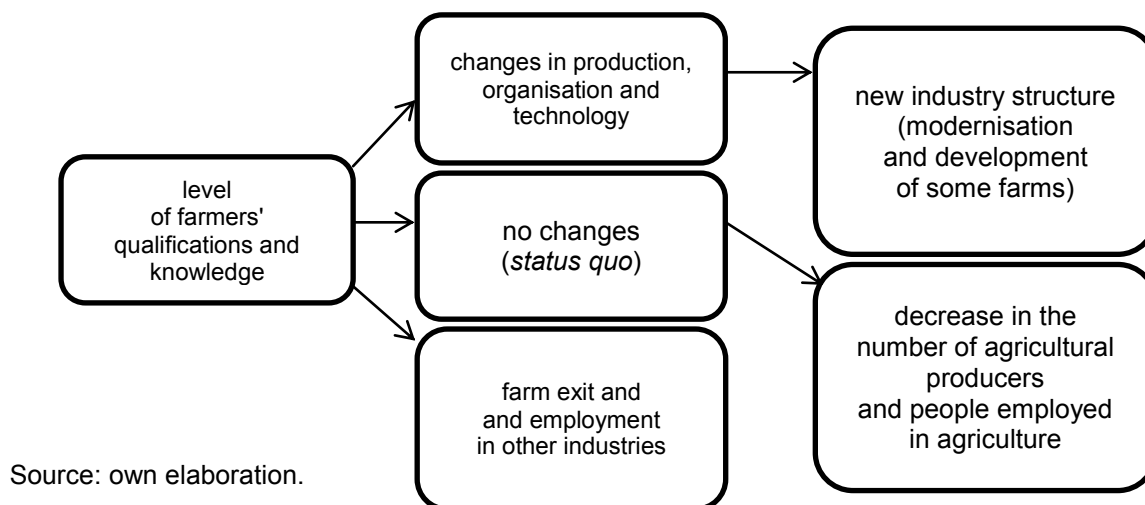
$$P(z_t = 1) = F(\beta_0 + \beta_1 M_{t-1} + \beta_2 UR_{t-1} + \beta_3 LU_{t-1} + \beta_4 B_{t-1} + \beta_5 QK_t)$$

³ The measure of respondents knowledge was indirect and based on their use of agricultural extension services as well as computers and the Internet in running their businesses.

⁴ The economic transformations in farms involved the following activities: purchase of agricultural land, purchase of livestock, purchase of machinery and technical equipment, purchase of equipment for livestock buildings, construction, refurbishment and modernisation of farm buildings as well as implementation of specialist agricultural investments.

⁵ The level of the equipment of the surveyed farms concerned four types of machines and technical equipment: means of transport, machines for fertilising, crop protection, sowing, planting and harvest. The relevant variable assumed three variants: high, medium and low equipment level.

⁶ The study included livestock buildings, barns, garages, sheds and specialist buildings. The variable that characterised their condition included three variants: high, medium and low.



Source: own elaboration.

Fig. 1. Significance of qualifications and knowledge in structural changes in agriculture

where: z_t – economic changes in a farm (investments in the years 2005-2011); M_{t-1} – high level of machinery and technical equipment in 2005; UR_{t-1} – area of agricultural land in 2005; LU_{t-1} – number of livestock in 2005; B_{t-1} – poor technical condition of farm buildings in 2005; QK_t – high level of knowledge and qualification in 2005 and 2011⁷.

Four separate models of changes in farms were estimated. Each time different explanatory variables associated with a high level of qualification and knowledge of the farmers were taken into consideration, i.e.:

- higher level of general education,
- completed agricultural education,
- constant or temporary cooperation with an agricultural advisor,
- using a computer and the Internet in agricultural activity.

The study uses the following methods: description and statistical data analysis (including a logit model with dichotomous explanatory variable).

RESULTS AND DISCUSSION

Changes in the level of farmers' qualifications and knowledge

According to the IAFE-NRI survey, the overall level of qualification and knowledge of the farmers in Poland was low. However, in the years 2000-2011 its improvement was noticed (fig. 2). The share of farm managers with higher general education increased by 4 p.p. (i.e. from 3% to 7%) and with secondary

⁷ The calculations covered only the characteristics of people and farms that belonged both to the sample from 2005 and 2011.

education by 12 p.p. (from 16% to 28%). Within the analysed time period, the share of managers with primary education decreased significantly. In 2011, it was accounted for 20%, whereas just eleven years earlier – 36% of total farmers (drop by 16 p.p.). At the same time, the category of persons with vocational education was relatively stable and comprised a little less than a half of the respondents (45-46%). The observed improvement in the farmers' level of general education should be associated with generational changes. Part of the farms were handed down to younger successors. Both these categories were characterised by different levels of educational background and, in the majority of cases, less educated older people transferred their assets to better educated successors⁸.

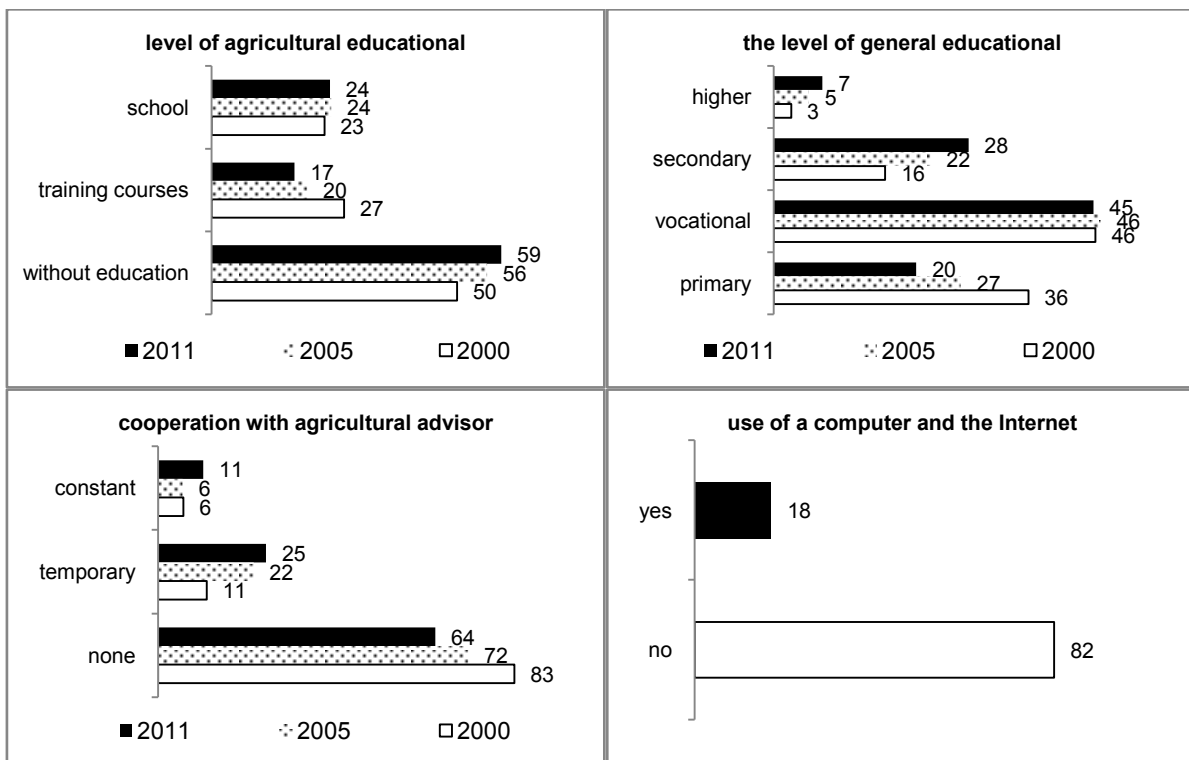
In the last decades, there has been a greater tendency among rural population to study non-agricultural disciplines. Many people from farming families decided to educate in general secondary schools and universities. Such choices resulted from the growing educational aspirations as well as reluctance towards working on farms with low economic potential. As a consequence of generational changes, the outflow of farmers with a completed agricultural training courses (which was

⁸ Disproportions in the level of formal qualifications resulted from different socio-economic conditions and role of education. In the times of full employment and planned economy the level of education did not significantly affect the social distribution of resources. This changed along with the economic transition. The every-day and professional life started to depend more on the quality and type of vocational qualifications, because they determined the employment opportunity.

popular in the past) was accompanied by an influx of people without any vocational qualifications to work in agriculture. Between 2000 and 2011, the share of farm managers without agricultural education increased by 10 p.p. from 50% to 60%, whereas the percentage of managers who have completed training courses decreased by the same amount, i.e. from 27% to 17% (fig. 2). This does not mean, however, that amongst new managers were not people with agricultural education, but this group was relatively small. In their case, the choice of education useful in running agricultural activities, mostly at the vocational and secondary level, should be linked with their willingness to work in agribusiness sector, as well as with the perspective of taking over the farms with a significant economic potential in the future.

Updating the information as well as use of professional assistance are necessary due to constant market changes and transformation of legal and organisational conditions. However, the data indicates that the majority of farmers did not use advisory services provided by specialised institutions (mainly

public and private advisory bodies). Nonetheless, it needs to be emphasised that in the years 2000-2011 the group of the respondents who did not use these services has significantly decreased (fig. 2). In 2000, farm managers who did not use advisory services accounted for over four fifths of the whole sample, whereas eleven years later their share decreased to two thirds of total number of respondents. It should be stressed that the observed increase in the use of agricultural extension services resulted not only from the need to acquire knowledge necessary to compete on the agricultural market, but also was triggered by the willingness to familiarise with the CAP regulations. The agricultural policy mechanisms introduced into the national system implied the need to comply with further administrative requirements, but also constituted an opportunity to gain additional funds. Acquiring those funds (e.g. direct payments, second pillar instruments) was a matter of new information or skills as well as receiving professional help. This especially concerned procedures for applying for support and settling accounts. A special assistance



*The results apply to all farm managers from the samples in a given year. Due to the lack of appropriate data the information on the use of a computer and the Internet was based exclusively on 2011 survey. Source: IAFE-NRI surveys 2000, 2005, 2011.

Fig. 2. The level of knowledge and qualifications of farm managers in Poland (in %)



in this type of activity was offered by agricultural advisory organisations, whose clients were both users of market-oriented, economically strong farms as well as people who owned small units, for whom agricultural activity was only a complementary source of income.

The ongoing advancement in agriculture means a wider spread of information technology. This is expressed in the use of specialist or general software, which allows farmers to reduce workload and improve farm management. The Internet has also begun to play an important role in running a business in agriculture. For agricultural producers it is a useful tool for linking with suppliers, purchasers and public institutions. The Internet also constitutes a rich source of agricultural knowledge and a platform for experience exchange (electronic issues of specialised press, professional portals, public administration websites) [Janc, 2013]. It follows from the study that the mentioned technology was not widely used by the respondents. In 2011 only one fifth of the farmers declared that they used a computer and the Internet (fig. 2). These were mostly young men who ran market-oriented farms with high scale of commercial production. In such cases, the mentioned technology was used in their everyday work. In the group of people who owned small farms with poor market connections, the use of computers and the Internet in agriculture was relatively rare. It is worth to mention that poor digital competences and insufficient development of broadband connections infrastructure still constituted a serious barrier in the use of the Internet by rural population.

Determinants of investment processes in farms: significance of knowledge and qualifications among managers

The conducted analysis documented that in the years 2000-2011 there was an improvement in the level of qualifications and knowledge among farm managers. This mostly referred to the level of general education and acquisition of specialist information provided by agricultural advisory entities. Moreover, according to the data, these factors contributed significantly to the increase and modernisation of fixed production assets of farms. It follows from research that between 2005 and 2011 agricultural qualifications and knowledge positively and significantly influenced the implementation of agricultural investments. Among all analysed farmers' characteristics the agricultural knowledge acquired with the use of ICT and as a result of cooperation

with agricultural advisors had the strongest influence on the development of fixed assets. For a manager who broadens their knowledge with the use of the mentioned methods, the likelihood of introducing of investment on a farm was increased twice, *ceteris paribus*. Formal qualifications of the managers influenced changes in the agricultural production assets less significantly. Agricultural education increased the likelihood of implementing an investment venture by 61%, *ceteris paribus*. On the other hand, the impact of high level of farmers' general education was statistically insignificant. It should be mentioned that apart from the farmers' characteristics in the activation of economic transformations on farms, other microeconomic determinants also played an important role. These factors concerned the size and condition of the production resources. The likelihood of investment activities was relatively higher for farms with greater livestock⁹, area of land¹⁰ or a high level of machinery and technical equipment¹¹. At the same time, the likelihood of an increase in agricultural assets was negatively influenced by a poor condition of farm buildings¹².

Polish education and qualification system for farmers

The analysis indicates that the process of agricultural investments was influenced by the level qualifications and knowledge of farm managers. For this reason, the positive economic transformations in the group of farms are related to the organisation and the quality of the Agriculture Knowledge and Information System (AKIS). The Polish AKIS is comprised of a number of entities [Kania et al., 2011].

The most important elements of this systems are: agricultural education institutions (at secondary and higher level), agricultural advisory bodies and institutions responsible for agricultural policy and rural development. From the beginning of the market transition in Poland, AKIS underwent deep changes that resulted both from economic changes (restructuring of the farming industry), political and administrative reforms (decentralisation) as well as the process of European integration.

⁹ One head more in the livestock meant a 5% higher likelihood of agricultural investment implementation, *ceteris paribus*.

¹⁰ A 1 ha larger area of land meant a 3-4% higher chance of completing an investment in fixed production assets, *ceteris paribus*.

¹¹ The high level of machinery and technical equipment always resulted in an increase in the likelihood of an investment by 74-87%, *ceteris paribus*.

¹² Poor condition of farm buildings decreased chances of implementing agricultural investments by 43-45%, *ceteris paribus*.

Table 1. Logit estimations* for the variable: investments in farms in the years 2005-2011

variable	coefficient	std. error.	t stat	sig.	odds ratio
constant	-0.323	0.068	-4.746	0.000	-27.6
livestock (SD)	0.054	0.010	5.614	0.000	5.5
area of agricultural land (ha)	0.043	0.008	5.721	0.000	4.4
technical condition of farm buildings (poor)	-0.586	0.107	-5.493	0.000	-44.4
level of machinery and technical equipment (high)	0.598	0.145	4.122	0.000	82.0
higher general education	0.214	0.182	1.176	0.240	23.9
model summary: McFadden R ² = 0.113; corrected R ² = 0.109; Number of cases "correctly predicted" = 1819 (67.6%); f(beta'x) at mean of independent = 0.239 Likelihood ratio test: Chi-square (5) = 415.359					
variable	coefficient	std. error.	t stat	sig.	odds ratio
constant	-0.382	0.069	-5.532	0.000	-31.8
livestock (SD)	0.052	0.009	5.449	0.000	5.3
area of agricultural land (ha)	0.040	0.008	5.292	0.000	4.1
technical condition of farm buildings (poor)	-0.572	0.107	-5.345	0.000	-43.6
level of machinery and technical equipment (high)	0.558	0.146	3.821	0.000	74.7
agricultural education (yes)	0.474	0.104	4.566	0.000	60.6
model summary: McFadden R ² = 0.119; corrected R ² = 0.115; Number of cases "correctly predicted" = 1815 (67.5%); f(beta'x) at mean of independent = 0.239; Likelihood ratio test: Chi-square (5) = 435.119					
variable	coefficient	std. error.	t stat	sig.	odds ratio
constant	-0.480	0.069	-6.995	0.000	-38.1
livestock (SD)	0.045	0.009	4.801	0.000	4.6
area of agricultural land (ha)	0.026	0.007	3.587	0.000	2.6
technical condition of farm buildings (poor)	-0.595	0.109	-5.446	0.000	-44.9
level of machinery and technical equipment (high)	0.627	0.148	4.236	0.000	87.3
use of advisory services (yes)	1.073	0.099	10.830	0.000	192.7
model summary: McFadden R ² = 0.146; corrected R ² = 0.142; Number of cases "correctly predicted" = 1857 (69.0%); f(beta'x) at mean of independent = 0.239 Likelihood ratio test: Chi-square (5) = 536.515					
variable	coefficient	std. error.	t stat	sig.	odds ratio
constant	-0.373	0.068	-5.486	0.000	-31.1
livestock (SD)	0.052	0.010	5.346	0.000	5.4
area of agricultural land (ha)	0.033	0.007	4.415	0.000	3.4
technical condition of farm buildings (poor)	-0.556	0.108	-5.141	0.000	-42.7
level of machinery and technical equipment (high)	0.553	0.147	3.754	0.000	73.9
use of ICT	1.108	0.140	7.929	0.000	203.0
model summary: McFadden R ² = 0.185; corrected R ² = 0.178; Number of cases "correctly predicted" = 2380 (88.5%); f(beta'x) at mean of independent = 0.317; Likelihood ratio test: Chi-square (5) = 351.113.					

*The results refer to the same farms surveyed in 2005 and 2011 (n = 2690).

Source: IAFE-NRI surveys 2000, 2005, 2011.



The Polish agricultural education is constituted by a network of secondary schools and seven universities¹³. Secondary agricultural schools, consisting of 414 basic vocational schools and technical schools, which are mostly administered by local governments. A small number of units (45 schools of educational and regional significance) is supervised and supported by the Ministry of Agriculture and Rural Development (MARD). Due to a deep organisational decentralisation and decreasing interest of students the industry-based specificity of many agricultural schools has been fading away and does not constitute a cohesive system¹⁴. An additional problem is the lack of adaptation of the curricula to the needs of a rural labour market, lack of appropriate educational materials for schools and a small number of training courses [Kamiński, 2012]¹⁵.

Similar tendencies to those observed in secondary education can be seen in higher agricultural schools (universities). First of all, the number of their students is decreasing¹⁶. Additionally, the number of people with the education in agriculture disciplines is diminishing relatively the most¹⁷. This tendency should be contributed to the overall

demographic processes, reflected in the decrease in the total number of students as well as a drop in popularity of mentioned field of studies. Agricultural schools generally educate people without a suitable (introductory) agricultural secondary education. A vast majority of graduates of these schools do not work in the agro-food sector [Pietrzak, 2014; Wasilewski, 2012]. The problems of higher education institutions, also agricultural ones, include a low level of education triggered by education-boom and focus on low-cost disciplines (usually taught part-time), insufficient public financing and limited number of field work [Rudnicki, 2013].

Another element of the AKIS in Poland is agricultural advisory, which includes both public and private entities. The public advisory system is comprised of the Agricultural Advisory Centre (and its three divisions) supervised by the MARD and sixteen regional advisory centres (including numerous local units), which are self-governing legal entities¹⁸. The public advisory system is mainly financed by the state and, to a smaller extent, by commercial activity. The growing competition, commercialisation of advisory services and increasing requirements expressed by farmers led to a dynamic development of private advisory companies¹⁹. Apart from enterprises specialising in advisory activity, substantive support for farm managers is also provided by a growing number of enterprises producing the means agricultural production as well as food processing entities. In such situations advising usually constitutes an additional service that accompanies purchase or sale. The role of the public and private agricultural advisory grew significantly as a result of the accession of Poland to the EU. In an initial phase after the accession, advisory bodies acted on a massive scale, which was related to the provision of support to farmers applying for direct payments and other financial resources within the rural development policy²⁰. Subsequently, apart from support in acquiring subsidies, between 2007 and 2013, a significant field of activity of advisory entities

¹³ The National Centre for Agricultural Education (KCIR) in Brwinów estimates the number of agricultural secondary schools at 414. These include institutions that offer vocational education for which the relevant minister is the minister of agriculture and rural development, agricultural market and fishing. According to KCIR, in 2013 there were nine agricultural institutions of higher education in Poland. It is worth adding that specialisations connected with agricultural production are also taught in non-agricultural schools.

¹⁴ In most of the cases, students of receiving education in secondary agricultural schools did not have vocational plans based on their line of education [Domalewski, 2012].

¹⁵ As a result of the education system reform, starting from 2012 some types of secondary schools were closed down and obtaining vocational qualifications was possible in courses conducted by public and private educational institutions and centres for practical training and continuing education. The available information attests to a relatively large popularity of courses in agricultural vocations. In the academic year 2012/2013 from among over 24 thousand students, 12% chose agricultural production course (second when it comes to the number of participants) [GUS 2014]. The interest in obtaining vocational qualifications in this domain resulted mostly from the requirements for granting support within CAP, which in the case of some support instruments required having appropriate qualifications.

¹⁶ In the academic year 2013/2014 higher agricultural schools taught 76.1 thousand people, i.e. 11% less than in the year 2000/2001. The share of higher agricultural school students in the year 2000/2001 was 5.4% and in the year 2013/2014 this percentage was 4.9% [GUS 2014].

¹⁷ For example, between 2007 and 2011 it fell by 36% (from 8696 to 5601 students) [MNiSW 2013]. As a result, in the last few years (2010-2014) 1.3-1.5% of all students took up agricultural studies. According to the methodology of the Central Statistical Office of Poland (GUS), agricultural studies include: horticulture, farming, fishing, animal science, forestry and agricultural chemistry. Higher agricultural schools also teach non-agricultural disciplines.

¹⁸ Apart from regional agricultural advisory centres, advisory activity services are also provided by chambers of agriculture.

¹⁹ It is hard to determine a specific number of private advisory companies. In 2014 the MARD accredited 182 such companies, which employed the total of 366 employees.

²⁰ Between 2004 and 2006 1.6 million people received advisory services within the Sectoral Operational Programme (SOP) "Agriculture" (it is estimated that 1.2 million applications for payment were prepared with help from agricultural advisors), which significantly contributed to the absorption of EU financial resources allocated for rural development (including mainly direct payments) [Dudek, 2010].

was support in the implementation of the cross-compliance mechanism²¹. In the forthcoming years (2015-2020) these entities are said to be especially important in implementing innovations in agriculture as well as in greening policy. This does not change the fact that the fundamental task of these institutions is still the provision of individual services for farmers, concerning production technology, farm management or accounting.

The level of farmers' knowledge is also influenced by the agricultural policy. The start of special and complex measures in this matter resulted from the implementation of the CAP. This policy involves tools which are to adjust and strengthen the human potential in agriculture, mostly in the form of vocational training. In Poland, training for farmers and other people employed in agriculture was offered in 2004-2006 and RDP for 2007-2013. As a result of the former, 413 thousand people were trained in a number of fields (the most popular courses included the code of good agricultural practices, financial management of farms and property insurance in agriculture). On the other hand, training courses within RDP for 2007-2013 (over half of them concerned cross-compliance requirements) were attended by 209 thousand participants²². An important issue is the problem of the influence of the implemented forms of training on the increase in the knowledge of the participants, and subsequently, on running farms. The content of the curriculum was undoubtedly vital, as it was strictly related to the implemented agricultural policy. In many cases the knowledge of the participants was broadened. In this aspect the effect of the undergone projects was direct, as it was directly related to knowledge increase²³. However, the manner of providing

information in the form of one-time or two-day group meetings did not conduce to the knowledge increase and its better adaptation to individual needs.

DISCUSSION

The attempt at determining the role of know-ledge and qualifications for farmers within structural transformations in agriculture is limited for several reasons. The paper focuses only on a selected dimension of these changes, namely on transformations in microeconomic production fixed resources. These processes in agriculture are usually analysed with reference to the macro level, paying particular attention to the issues concerned with the size of this group, characteristics of production activities, the features of the involved workforce resources, legal and organisational forms, as well as the inter- and intra-sectoral links of individual actors [Boehlje 1992; Woś 2000]. The mentioned properties in the form of aggregated values are usually considered for a given time frame.

The analyses carried out in the paper are based on indirect methods of agricultural knowledge and qualification measurement. Such approach to the mentioned features is limited, because it is based on the respondents' statements. However, due to organisational or financial limits, questionnaires are commonly applied in the social sciences. It is worth emphasising that the questionnaire measurement tools do not enable the verification of actual knowledge and its application in practice.

In the case of the studied farms, the indicator of positive economic changes was the fact of implementation of agricultural investments. Neither the amount of the expenditures nor production and income effects of the described activities were taken into account. Nonetheless, considering the fact that Polish agriculture was dominated by semi-subsistence farms with small economic strength, often equipped with modest and outdated production resources, the actions aimed at its improvement or increase was considered positive and able to influence structural changes in the whole sample.

We also need to mention the complex role of qualifications and knowledge of managers in the initialisation and implementation of agricultural investments. The general and professional competences of farmers could foster different stages of these processes: planning, making purchase decisions, obtaining funds, implementing and settling. Subsequently, significant knowledge and qualifications undoubtedly optimised the use of new resources and technological means. However, apart from the farmers' characteristics, the previously accumulated physical capital was also significant

²¹ As a result of the so-called Fischler's reform, all Member States adopted the agricultural advisory system (FAS), whose task was to support the primary changes in the CAP. The system, managed by the MARC, began to function in Poland in 2009 and was implemented with the measure of RDP for 2007-2013 number 114. The instrument allowed farmers and forest owners to apply for a refund of most of the costs incurred on advisory aid within the scope of: cross-compliance, environmental protection, work safety, increase in profitability and competitiveness, support for restructuring, development and innovation. It results from the analysis of the available data, advisory services co-financed by the RDP enjoyed small interest among farmers and forest owners from the very beginning. Until the end of 2014, 42 thousand beneficiaries received financial aid for 162 thousand advisory services [Report for 2015].

²² Both within the SOP "Agriculture" and RDP for 2007-2013 the number of the trained participants was less than planned. In the first case, these operations covered half the people than planned, and in the latter – two thirds. In the case of RDP for 2007-2013 the information concern the state at the end of 2014 [Report for 2015].

²³ Most of the participants of the training declared that they had obtained necessary knowledge that met their expectations and was helpful in applying for public support [IBC Group 2008, Report for 2015].



for the described economic changes on farms. This capital was often gathered by the previous managers. In this context, observed in the study the insignificant influence of managers' higher general education on farm transformations means that this feature in relation to the implementation of agricultural investments did not differentiate the research sample. Higher education was also one of the characteristic of the respondents for whom farming activity did not constitute the main source of income. A relatively more important role for introducing changes on farms was played by professional competences acquired in agricultural schools and the current knowledge drawn from professional portals or advisory services.

CONCLUSIONS

The issue of structural changes holds a significant place in the economic analysis of Polish agriculture. The need to stimulate deep transformations within this sector has been argued for years. A necessity for different changes has been pointed out, from a decrease in the number of farms, through improvement of their production factors, to intensification of horizontal and vertical relations. The studies on mentioned aspects proves that there are structural transformations in agriculture. Nevertheless, their pace and scale are varied. The paper describes an issue of the role of qualifications and knowledge of farmers in these changes. According to the surveys the level of respondents' qualifications and knowledge was low, although it increased between 2000 and 2011. Most of the respondents did not have agricultural qualifications, did not use computers and the Internet in their work and did not cooperate with advisory institutions. Moreover, less than half of them completed basic vocational schools. On the other hand, only a small number of surveyed farmers had a high level of qualifications and knowledge. The analyses documented the fact that such characteristics had a positive and statistically significant impact on the investments in studied farms. The observed diversity in farmers' characteristics and in the frequency of actions aimed at increase and modernisation of production resources was economically driven and reflected the differences in family farm functions. The quantitative and qualitative improvement of agricultural production assets was linked with high level of managers' human capital, concerned especially those units which constituted the primary workplace and main source of income for their users. On the other hand, the shortage of professional qualifications and lack of interest in specialist information was noted particularly in the case of farms managed by persons employed outside

agriculture or those who lived off pensions. For this last group income from agricultural activity was often complementary or marginal. In these cases, the fixed assets were usually not increased or restructured and the degree of its consumption was considerable.

The paper also characterises the system of farmers' qualifications and knowledge formation. In Poland the institutions responsible for the implementation of this task were regarded as developed. These included mostly secondary schools and agricultural higher education institutions, agricultural policy and agricultural advisory units. It needs to be stated that the CAP affected the knowledge of Polish farmers. A significant role of the CAP in this respect is also foreseen for the years 2015-2020.

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