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SCIENTIFIC INFORMATION

The problem of complexity in economics on the example of the agricultural sector

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Abstract: The main aim of the article is recognition of the issues of complexity in economics with the particular emphasis on agriculture, as well as indication of resulting implications for this sector. Complexity in economic theory is in general perceived from the perspective of external effects, while the problem may also have other connotations: as the so-called fallacy of composition, or the phenomenon of entropy. The problem of complexity indicates the need for further reflection on the holistic perception of economic processes. This is particularly evident in the case of agriculture, when the evaluation based mainly on microeconomic approach from the perspective of the effect/cost relationship loses sight of the environmental, social, and cultural context. Focus should also be put on the entropy approach, which takes into account the openness of socio-economic systems and the limitations of resources, including the environment. Both the operating practice of agriculture together with the institutional surrounding, and agricultural economics are more advanced in the area of solving the problems of complexity on the practical and theoretical grounds, but there are still many issues that require solutions, particularly quantification of externalities. The work is theoretical in nature and a heuristic approach was applied in the considerations.

Key words: agriculture, complexity, fallacy of composition, entropy

Developmental processes of the contemporary world are becoming more and more complex due to, inter alia, globalization of the world economy. For this reason, the explanation of economic phenomena is a difficult task and necessitates a search for new theories or integration of the existing ones. The aim of this article is to recognize the complexity in economics, with a particular emphasis on agriculture, together with an indication of the resulting implications for this sector. The choice of this sector is not accidental. It comes from the fact that agriculture, due to the economic, environmental, and social context, requires a multidisciplinary approach. It teaches humility toward the complexity of sector analysis. Moreover, such evaluations may also include the so-called added value to economic theory, as an example of an integrated approach to the analysis of economic issues Wilkin (2009a). The main hypothesis of this paper is that agriculture, being a complex system in which there exists a connection of the economic, social, and environmental functions, requires interdisciplinary analytical approaches in order to evaluate the processes that occur in it. One may even come to the conclusion that some kind of cognitive eclecticism is in this case a more appropriate way of performing such an analysis.

The issues discussed in this article are important because of the problems of the relationship between the spheres of micro-, macroeconomics, and environment; in particular, the assessment of agriculture from the perspective of this optics. The issues are also topical from the methodical point of view. Accepting simplifications, which are often the case here, particularly within the mainstream economics, which relates to the stance that what is good for a single economic entity is also beneficial to society as a whole, may lead to a fragmented evaluation of the phenomena of economic processes[1]. Whereas the practical aspect of this issue comes down to activity planning in the sphere of economic and social processes coordination at the local, national, and global level or a better understanding of economic processes.

[1]In this context the concept of "invisible hand" of A.Smith (1981) is often invoked.

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The problem of complexity may have different connotations. First of all, as a so-called fallacy of composition – an erroneous transfer of dependences true on one level of analysis (e.g. microeconomic) to another level (e.g. macro, global). The resulting consequences are the costs incurred as well as the over-valuation of some activities and the undervaluation of others, often beyond the operation range of the market mechanism (free resources) what is also connected with market failures Popławski (2013). Complexity can also be understood from the perspective of economic systems being considered a complex adaptive system Gell-Mann (1994), where there are complicated relationships between the elements of these systems. It is often equated with the phenomenon of entropy, i.e. the measure of disorder, in other words, the complication of business processes. The work is theoretical in nature and a heuristic approach was applied in the considerations. The analysis includes references mainly to the EU and Poland.

FALLACY OF COMPOSITION

The statement that "*a whole cannot be regarded as a sum of the parts*" can indicate the essence of fallacy of composition. What applies to an individual does not work for the whole system. It is due to the lack of the partial optima coordination, permanent changes in economic and social systems, taking external effects into account in to narrow a range, as well as the synergies associated with the mutual relations between the components of the given systems. In this case, the sum of the partial optima (e.g. micro- and macroeconomic, environmental) is not equivalent to a global optimum (Czyżewski 2007). The conflict between the economic, social and environmental objectives leads to the primacy of the former, due to their valuation by the market. Only a mechanism institutionalized by standards and organizations enables an approximation of these objectives (Berkes et al. 2003). In economy we are generally dealing with collective processes (network economy) which are the result of the actions of many business entities. Therefore, it would be an oversimplification to reduce the total to the sum of the components in the evaluation of economic processes. This is especially true in the transition of analysis from the micro to macroeconomic level.

The previous theoretical references to the fallacy of composition can be found in the works of M. Kalecki and J. Keynes. Based on their experience and research of the global crisis caused by the Second World War, they postulated a need for the coordination of business processes by using the fiscal policy instruments in order to reduce the negative economic phenomena (Kalecki 1962; Keynes 2007). They were repeatedly criticized for the lack of a microeconomic basis of their theory. However, paradoxically, their models built on a large level of aggregation, from the "top", seem to a large extent to limit the fallacy of composition. This results from the fact that in this way the synergy effects, or otherwise defined as emergence, associated with the inter-linkages between the economic system components, are not completely disregarded (Jakimowicz 2009).

Other well-known example of the fallacy of composition is the theorem of Garrett Hardin's "tragedy of the commons pasture" (Hardin 1968). He indicates that agricultural producers seek to maximize their income by using the common pasture and increasing intensity of its use, and thus increase the herd and grazing time. This action is rational for the producer. However, if such behaviour becomes a rule for all producers, it would lead to a tragedy for all of them, due to the of pastures and the impossibility of further use. As indicated by E. Ostrom, the Nobel Prize winner in economics in 2009, thanks to the mutual management of resources one can obtain a satisfactory level of efficiency, thus avoiding the fulfilment of the theorem of G. Hardin. In this case, the rules relating to the use of pastures are needed in order to allow the maximization of social welfare. Hence, through caring for the rationality of fragments of the economic processes, an overall order of the whole community or the global rationality cannot be guaranteed (Pajestka 1990). In a complex, the world rationality is shaped by the interactions between the individuals and the environment (Colander 2000a). In this context, there appears the problem of the global goods (e.g. the Amazon rainforest) and their exploitation and protection, which goes beyond the scope of this article.

The factor that dynamites the discrepancies between the sphere of micro-, macroeconomic and environment, and thus increases the fallacy of composition, is globalization. The current primacy of microeconomic efficiency being the driving force behind the development of many entities, especially those of the international scope, turns out to be an overly expensive path of development from the social point of view. Transferring the costs of environmental degradation and unemployment onto the society raises

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a question regarding the criteria for the evaluation of business processes. In the case of agriculture, the over-valuation of microeconomic efficiency, from the perspective of maximization of the production effect in relation to expenditures, may also lead to the fallacy of composition. The point is that these phenomena may be accompanied by negative external effects, like the degradation of the environment, which affects the loss of social welfare. Therefore, there exists a need for coordination at the national and international level to neutralize the globalization costs and the resulting fallacy of composition. A positive example in this regard is the common agricultural policy (CAP) of the EU, where the rules of sustainable development and environmental protection are implemented, while the global competition is limited, with an increase in the flow of production factors between the member states of the EU (Czyżewski 2007).

ENTROPY AND ITS CONNOTATIONS IN ECONOMICS

Issues relating to the complexity are reflected in the phenomenon of entropy. What does it mean? Entropy is a measure of disorder. This concept has been used in physics in the connection with the progress of research on the processes of thermodynamics. In this sense, it is understood as a possibility of processing power in one direction: from the useful energy to useless energy, or from the concentrated state to the dispersed state (Rifkin and Howard 2008). At later points in time, it was also used in the cybernetics, information theory, economics, and statistics (Roeske-Słomka 2011). An increase in advancement of the links between economic units makes the economic and social systems to increase entropy (Tarajkowski 2008), and thus the complexity of the systems. Relationships between the components of complex systems, which include economy, especially the agricultural sector, determine its existence, and at the same time disappear when the system is deconstructed. This is due to the synergy effects (or antagonistic interaction) (Hron and Macak 2013). Such sources can be found in the dynamic interactions between entities.

One can agree with the statement that nature has a constant tendency to change order into disorder, while increasing the degree of disorder (Georgescu-Roegen 1971). Therefore, it becomes necessary to use the economic policy instruments to extend the range of order. In the case of agriculture, order is carried out in the EU countries by the use the instruments of the Common Agricultural Policy. When the analysed process does not compensate for the environmental damage, the short period of validity of products or needs realized according to the criterion of microeconomic efficiency leads to the over-exploitation of environmental goods due to lack of their valuation in the economic calculation. The pressure to gain a competitive advantage makes companies not care about the common good or the resources of future generations (Czyżewski 2007). This problem also draws J. Rifkin and T. Howard's (2008) attention, who stress the need for a change to a paradigm which takes into account the limitation of resources, including the natural ones. According to them, this new opinion approximately corresponds to the "law of entropy". What is also important is the fact that the global economy is growing due to the constant pressure to increase its competitiveness, while the global ecosystem is fixed in terms of capacity to supply energy and raw materials (Zegar 2012). Therefore, what indirectly results from the law of entropy is the fact that it is necessary to change the paradigm in economics from that promoting economic growth to that taking development into consideration, including environmental restrictions.

The experience of the global economic crisis and the increase in the complexity of business processes connected with it make the critique of mainstream economics more and more noticeable. This includes, inter alia, the micro-foundations of macroeconomics (Colander 2000; Wojtyna 2008) or the theories related to the efficiency of markets. Although a faster development of research mathematization can be seen in the mainstream economics, if compared to the incorporation of achievements of other sciences (especially social), there is a tendency to open economy to the achievements of other disciplines (Wilkin 2009a). A notable example may be the development of the so-called economics of complexity (Arthur 1994). Its interdisciplinary nature, the rejection of the single market equilibrium, the abandoning of the extended formalism, the "humble" attitude towards the complexity of economic systems could constitute an attractive alternative in economic research (Beinhocker 2006). The weakness may be the lack of a methodology developed at a satisfactory level (Grzelak 2010). These tendencies in some extent coincide with the so-called entropy approach, which emphasizes that the current economic theory is based on the wrong paradigm. Economy cannot be treated as a closed and autonomic system, which does not

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integrate with others. This results from the interrelationships that take place at the interface between economy, environment and society.

In the case of agriculture, it can be concluded that the degree of entropy is high. This is mainly because of the strong dependence of the agricultural producers' economic situation: the dependence on agro-meteorological conditions, its significant atomization, and a notable increase of the energy consumption of this sector, also in connection with the processes of the production concentration. This could be particularly evident in agriculture if the Glansdorff-Prigogine's principle is accepted (Glansdorff and Prigogine 1971), which assumes that the socio-economic development is based on trying to reduce entropy. The inclusion of this sector to the EU CAP instruments helped to reduce the growth of entropy. This concerns, in particular, the creation of an institutional system that provides a greater stability of functioning and organizing of the sector (Czyżewski 2007). On the other hand, in the context of the stronger links of agriculture with the market environment and a wider range of the integration of prices between food markets in the world as well as turbulence in global markets (including financial markets) visibly influence the sector by negatively affecting its stability. Thus, there occur changes in the interaction between agriculture and environment. These relationships have become more diverse despite the weaker importance of agriculture in the economy regarding its contribution to creating the GDP. This, in turn, results from its importance in meeting the human needs, not only in terms of food consumption, but also creation of public goods (landscape, environment, culture).

The dominance of economization of socio-economic processes leads to agriculture being underestimated in many cases. This mainly concerns the creation of public goods. As a result, agriculture 'suffers' from the problem of a limited capacity to increase land productivity (Capra 1982). With the existing barriers of substitution of production factors, an increase in the productivity of land is accompanied by an increase in entropy, which comes at high energy intensity. Whereas in the traditional agriculture energy came from internal sources, the progress has started a rapid increase in the demand for energy, which largely came from the external sources (Czaja 1997), which negatively affected the agriculture-environment relationship.

There are also attempts to use the entropy approach to evaluate the sustainability of agriculture (Asgharipour and Kocheki 2005). From this perspective, a better use of energy inputs, including the limitation in the use of fertilizers, leads to an improvement in the field of sustainable development of agriculture. At the same time, according to the research carried out in Northern Germany, various types of plants reach different values of the overproduction of entropy (Steinborn and Svirezhev 2000), which directly affects the processes of agriculture (environmental) sustainability and indicates that there exists the need to diversify agricultural production from this perspective. It cannot be disregarded that, provided the valuation process in agriculture is supplemented with the issue of energy flow together with indication of its balance (Georgescu-Roegen 1971), or the energy theory of value (Czaja 1997), then it could be proven that farms with less intensive production are more effective than it results from the existing analysis from the perspective of the effect/outlay relationship. For example, an American study (Patzek 2008) shows that an intensive production of maize, in contrast to organic production, generates a considerable entropy. The effects of these processes are the degradation of soil, water, and atmosphere.

THE IMPLICATIONS OF THE COMPLEXITY ISSUE IN AGRICULTURE

In the evaluation of the developmental processes of agriculture, a traditional neoclassical approach, based on the mechanistic view of the world (Bisaga et al. 2010) and describing farms from the perspective of costs and income function, is insufficient. It results, among others, from the realization of the economic, social, and environmental functions, which leads to the appearance of external effects. Thus agriculture has the properties of the emergent system[2]. The existing pressure to increase food production in view of the forecasted increase of world population to nine billion in 2050 (Agriculture and Climate ... 2010) stimulates the growth of the capital means of production in agriculture, use of efficient technology and concentration of production. The development of farms meeting these requirements is effective from the microeconomic point of view. On the other

[2]The system in which there are difficulties with the description and analysis of the feature of the irreducible to the properties of elements that make it up.

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hand, in the economic calculation conducted by these entities, the costs of the environmental degradation resulting from the excessive fertilizer use, livestock density, and monocultures are not included. There also appear social costs associated with the ousting of family farms with a lower scale of production from the market, which, in turn, creates structural unemployment. From the economic theory point of view, this is not something extraordinary. However, the problem is that in the agricultural sector due to the low mobility of productive resources, and the low reproduction capability of production factors, the right of the marginal revenue equalization of production factors works to a limited extent. That is why the weaker entities, due to the lack of alternatives in terms of market activity, may continue to operate in the market at the low efficiency of production factors applied and the depreciation of assets (Makinen et al. 2009). In addition, there are environmental limitations when it comes to increase the efficiency of the primary production factor, which is the land.

Complexity in agriculture is also associated with a complex system of the mutual feedback and dependencies occurring at the level of the farm itself, as well as on the point of contact with its surroundings. That is why the current market impulses are for farms only one of the elements of the control variables (Kulawik 2008). Others, in turn, relate to the conditions of existence of the farm family, changes in the profitability prospects, and the instruments of agricultural support. Furthermore, what is also notable is the issue of inseparability in agriculture, which is closely linked with the issue of complexity. On the one hand, this regards the interdependencies in the production of agricultural products (the dependence between the livestock and crop production – feed), and on the other, linking the production, social, and cultural function in an agricultural farm. Moreover, in the case of the food economy, we have also to deal, in the context of complexity, with non-harmonizing subsystems due to the much higher degree of market concentration in the agricultural environment (the sphere of supply and food processing). It manifests in differences in the microeconomic efficiency, the scale of production, and it leads to the perturbation in the development of agriculture. These phenomena require that the evaluation of the functioning of this sector should be interdisciplinary, taking into account the economic, environmental and social contexts. The latter was particularly evident in the case of the labour market situation in Poland in the 90's. Agriculture and rural areas, by absorbing the negative social effects of economic transformation (the transition of the economy from the planned to market economy) and maintaining the increased labour resources in the form of hidden unemployment[3], fulfilled the role of a catalyst in the labour market. It made it more difficult to increase the agricultural income and inhibited the structural changes in agriculture. Thus, we can speak of the fallacy of composition, that is, the inadequacy of assessments at the microeconomic (low efficiency) and macroeconomic level (providing jobs and limiting spending in the social sphere of the state).

The need to take into account many variables, often non-quantifiable, which are not the subject of market transactions, necessitates the use of heuristic, or deductive, references in agriculture. The main feature of external effects is that they are not subject to market transactions (Zegar 2010). This is also important from the point of view of estimating the potential losses borne by the entire society under the irrational use of environmental resources. The market mechanism usually leads to an excess of the negative external effects and the deficiency of the positive ones at the socially desirable level, as well as to the suboptimal allocation of these effects (Samuelson and Marks 1998). In turn, the agricultural producer may not have the motivation to increase them, while on the other hand the negative external effects may be limited (Zegar 2007). The external effects complicate the evaluation of the economic situation of entities, especially in agriculture, and they are the essential factors for determining the quality of life. Due to the lack of a market for these effects, there are difficulties with their valuation.

Currently there can be observed an increase of interest in research in the area of external effects in agriculture and its environment (Falkowski 2010). This regards primarily the identification and quantification of external effects, as well as the valuation of natural resources, landscape and culture. This is important in the construction of public support for

[3]This unemployment in Poland results from the lack of alternative job opportunities outside agriculture, as well as legislative conditions, i.e. lack of possibility to register as unemployed in the Employment Office if someone possesses more than 2 hectares of land, which also applies to members of the farm. The estimates of hidden unemployment in rural areas in Poland range from 700 thousand to 1.7 million people (2012).

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these effects. Although these studies are generally subjective in nature, often using the contingent valuation method, the hedonic or experimental (choice experiment) valuation, they shed a new light on the complexity of agriculture. Although each of these methods has its limitations and they are based mainly on indirect estimates, they are practical implications in the field of the research of instruments that can support this sector and rural areas, which would maximize the targets of social stakeholders. On the other hand, the lack of inclusion in the economic models of these effects may considerably overestimate some form of activity (e.g. the industrial farm of fattening of animals), and to underestimate others (family farms with mixed production profile), which may distort the evaluation in the societal perspective (Grzelak 2010). It is generally easier for family farms to connect the microeconomic efficiency with the social and environmental efficiency[4]. This is due to, among others, maintaining the viability of rural areas. In addition, due to the insufficient level of income from farming, these farms are stimulated to seek the off-farm sources of income, which contributes to the multifunctional development of rural areas.

At the microeconomic level the competitiveness criterion is determined by the equilibrium price, which generally does not take into account the external effects associated with these processes, including social costs. Moreover, these effects are not the criterion for the decision making by farmers (Zegar 2011). Therefore, it requires the institutionalization of activities (by standards or organizations) aimed to internalize these effects, as well as the identification of the non-market functions of agriculture (Wilkin 2009b). It concerns both stimuli: negative in the form of fees (e.g. environmental), fines, limits (e.g. restrictions in subsidy for the with very large-scale of production), taxes; and positive – favouring certain pro-environment behaviours, the implementation of the Code of Good Agricultural Practices, as well as the actions tending to including these elements into the economic calculation (Grzelak 2010).

Multifunctional agriculture, despite the fact that from the perspective of the microeconomic efficiency (ratio of effect/outlet) it may be relatively inefficient, when taking into account the effects associated with the creation of public goods and thus satisfying social needs, creates a relatively greater value for the socio-economic system. As indicated by some studies (Constanza et al. 1997), the value of environmental goods may even surpass the value of agriculture products and services valued by the market. Despite the maximization of the individual effects of agricultural producers in farms with a high intensity of production, the cost of this phenomenon, especially the imbalance of achieving the production and environmental targets, is borne by the society through, for example, the environmental degradation and the consumption of unhealthy foods[5]. On the other hand, so far the farmers, e.g. in the EU, incurred the costs for generating the negative external effects only to a small extent (Bortłomiuk 2006). Research (Krasowicz 2005; Wrzaszcz 2012) shows that particularly the a farms specializing in the production of milk which use agricultural land – pasture, are very likely to integrate the environmental and economic objectives. It is the basis for a further development of this type of production in Poland, particularly in regions especially predisposed (East and North-East Poland).

The evolution of support directions of the CAP (EU) taking place in the recent decades[6], which conditions the farm support on the maintenance of environmental standards (e.g. the principle of cross-compliance[7]), meeting the requirements for crop diversification, the maintenance of existing permanent grasslands and pro-ecological areas ("greening", CAP 2014–2020), the introduction of the modulation mechanism, support for the areas less-favoured for agriculture (LFA), the payments for extensification of livestock farming or the support for reforestation, include the existence of the

[4]For example, a study carried out by W. Wrzaszcz shows that environmental and economic sustainability (ensuring income parity for family member full-time workers on the farm) farms was achieved in 13% of farms engaged in agricultural accountancy of the FADN system in Poland. The average acreage of land used for these units was 53 hectares (Wrzaszcz 2012).

[5]For example, the research shows that the total external costs of the UK agriculture in 1996 amounted to 2.3 billion pounds, which gives about 208 pounds per 1 hectare (Pretty et al. 2000).

[6]Changes in this area can initially be observed in 1992 in the Regulation EEC 2078/92 on agricultural production methods in accordance with the requirements of environmental protection and landscape conservation.

[7]The principle of cross compliance means a relation between the amount of the obtained direct payments (in the framework of the EU CAP) with the fulfillment of specific requirements for the animal well-being or protecting the environment by the beneficiaries (farmers).

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complexity of operation in agriculture and rural areas. It neutralizes the cost of the fallacy of composition and the increase of entropy. A particular importance can be attributed to the most common instrument of the EU CAP – direct payments. Due to the fact that they perform the income, environmental, and social functions, one can state that they are factors that enable a tighter connection between the macro-, microeconomic and environmental rationality. Consequently, it limits the fallacy of composition, and thus allows for the sustainable development of agriculture.

Previous reports (The reform of… 2008) show that, e.g. in France, the UK or Italy in the farms with intensive production techniques, the principle of cross-compliance has enabled a reduction of negative external effects. However this does not solve the problem in its entirety. In the case of the livestock pig farming, the support for these farms by direct payments is often low due to the small scale of plant production to which the payments refer. For example, in Germany, there exists an additional protection in the form of solutions regarding the construction law, which protect against the construction of buildings that would host the production dangerous to the environment.

The analysed issues of complexity indirectly concern price and environmental dumping, which are especially reflected in the food trade between foreign partners. They cause the distortion of markets and instability (Josling 1993). In the case of price dumping, despite the limitations of direct support to food exporters under the WTO agreements, there is the possibility of an indirect influence (e.g. subsidies to insurance, product promotion, support for investment), which translates into competitive prices. The progress in the liberalization of world trade can lead to a drop in food prices in the EU countries, and this, in turn, leads to a reduction in the farmers' income. There may appear the fallacy of composition based on the fact that what is good for society in the form of lower prices of food products is not beneficial to farmers. In such case, the means of compensation in the EU may include, among others, direct payments to farmers, which enable compliance with the sanitary, veterinary, quality, or rules relating to the maintenance of biodiversity in agricultural production (Czyzewski and Stepien 2010). This indirectly allows maintaining the viability of rural areas. Such kind of support distorts the international competition to a lesser extent, while taking into account the environmental criteria. As a result, the indirect beneficiary of these activities is the whole society (Wilkin 2003). At the same time, social spending from the state budget is limited to that part of agricultural producers, who would not be able to cope with the competitive pricing. In this way, direct payments can neutralize the fallacy of composition.

In the case of different standards and solutions to environmental issues between different countries, there is the possibility to compete in the global market with food products with worse health and nutritional values. For example, the EU countries have achieved relatively high standards of quality of food production and animal welfare. However, this is connected with higher production costs, which can[8] weaken the price competitiveness in the world market[9]. At the EU level, another contradiction connected with the problem of complexity appears. The point is that whereas it is in the interests of agricultural producers to increase the income by direct support (first pillar of the EU CAP), the taxpayers (consumers) are more interested in realization of the public goods that are associated with the instruments included in the second pillar of the EU CAP. It seems that the changes proposed in the instruments of the CAP for the period 2014–2020, and related to the so-called "greening", meet those expectations and allow for more synergy between these diverse approaches. The challenge at the level of the EU CAP remains the question of a further remuneration provided to agriculture by the support system[10] for the creation of public goods of the social and environmental context.

It is not without significance for the preventing of costs associated with the complexity in agriculture to promote the development of ecological awareness, the creation of property rights to resources, protecting water resources, and maintaining the biodiversity. For this reason, farmers are depositaries of natural resources, while the management of these resources is a responsibility of the general public. As shown by the research (Moller et al. 2008), biodiversity decreases with the increase in the intensification of agriculture,

[8]It remains an open question of how much high quality standards influence the substitution of price by quality competition on the world market.

[9]Results of a simulation indicate that changes in environmental policy in the United States in relation to agriculture could change world food prices by as much as 9% (Whalley 2004).

[10]On the other hand, it is also about creating disincentives in order to prevent the creation of negative external effects.

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or, in other words, predisposing the values evaluated by the market (not necessarily by the society). One can even state that sustaining economic, social, and cultural viability, or rustic landscape in rural agriculture is also a public good shaped by agriculture (Zegar 2011).

CONCLUSION

The problem of complexity indicates the need for a deeper reflection on the holistic perception of economic processes, as well as an excessive formalism in their modelling. This is particularly evident in the case of agriculture, where evaluating based on the microeconomic approach through the perspective of the effect/outlet relationship loses sight of the environmental, social and cultural context. This is due to the fact that the market for these goods operates only to a limited extent, and there are widely different time horizons relating to the appearance of such effects (economic, environmental, and social). Therefore, the dilemma of how to divide the issue between the market and the state should be replaced with another one: how the market and the state should work together to encourage the emergence of synergies and adaptations of the socio-economic system in accordance with the social valuation of these phenomena.

Difficulties of economics in explaining reality are related to the constant evolution and complexity of socio-economic systems. The use of the (neo)classical economic theory that expresses the microeconomic rationality is not sufficient in the context of the complexity of business processes, the appearance of emergent properties and thus the importance of increasingly stronger external effects. Therefore, paradoxically, agricultural economy is more advanced in study of the complexity and has the chance to enrich the general theory of economics with an integrated approach to the evaluation of economic phenomena (Wilkin 2009b).

Agriculture, being a complex system, requires in the evaluation of developmental mechanisms an interdisciplinary approach based on different economic theories. This also includes the entropy approach, which takes into account the open character of socio-economic systems, and the limitation of resources, including the natural ones. In this area, one may find a variety of cognitively inspiring achievements in such trends of economics as the economics of complexity or the new institutional economics. They allow a more complete look at the issues of the development in the agricultural sector and the treatment of rural space as a public good for the whole community of the EU (Forum Inicjatyw... 2010).

One should positively assess the current trends of the EU CAP, which accommodate a wider valuation of the processes in agriculture and its social and environmental surrounding, and positively influence the reduction of entropy and the cost of the fallacy of composition. One can observe the evolution of the policy in such way as to increase the rationality of the social and environmental cost of microeconomic productivity associated with the support of agricultural producers. But it would be utopian to expect a complete elimination of the negative effects of the complexity that are expressed with the discrepancy between rationality at the micro-, macroeconomic (social) and environmental levels. That is why there is a need for a broader perspective on the issues of efficiency of agricultural production, environmental quality, and the social context of the agricultural market adjustments.

Both the operating practice of agriculture together with the institutional surrounding, and agricultural economics are more advanced in the area of solving the problems of complexity on the practical and theoretical grounds in comparison to other sectors, as well as the overall economy. Especially in the recent decades, there has occurred a significant acceleration in this field. In this way, the research on the sector known as decadent, with dwindling share in the GDP, can be helpful (on the basis of cognitive references) for a better understanding of economic processes in the non-agricultural areas. This is centred on a holistic approach through the synthesis of the economic, natural and social sciences, a broader accommodation of the external effects of economic processes in the economic analyses and economic calculations, as well as the creation of public goods. There also exists a need for a further research and action within the area of complexity of socio-economic systems at the national and international level. This has been highlighted by the recent experience of the economic crisis from which it may be concluded that the recognition of the reasons for its occurrence lays beyond the analysis of the changes in demand, supply, prices, or cyclical fluctuations in the economy.

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