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PREMISES OF THE NEW AGRICULTURAL ECONOMICS

Abstract

The industrial agriculture model faces a great deal of criticism nowadays, most of all because of its external effects. Also its driving forces run out. This model is replaced by the sustainable agriculture model, which takes account of the limitations of natural resources, external costs and public good as well as social and economic objectives. Development of agriculture according to the sustainable agriculture model requires that the market mechanism be supplemented with the institutional (political) mechanism. This mechanism is developed within the Common Agricultural Policy of the European Union. The model of sustainable agriculture corresponds to the new agricultural economics – a changed economic account covering, in addition to market “items”, other elements related to external costs and public goods created by agriculture. The globalisation process shifts the problems of agriculture to the global level, giving them new dynamics and strongly influencing agriculture in individual countries. External forces determine to a growing extent the functioning of agriculture, whereas the role of the institutional (political) factor is reduced, since globalisation in the political field lags behind the globalisation in the economy. The above mentioned factors exert their influence on the development of agriculture, adversely affecting the sustainable agriculture model.

Introduction

Over millennia agriculture had fulfilled criteria of sustainable (steady) development: it had produced food of good quality, protecting at the same soil, water and other natural resources and providing living conditions for rural community. However, such agriculture exists no longer. Under the conditions of the growing industrialisation, the agriculture underwent some major changes of destruc-

tive character. In order to improve provision of food for the rapidly growing global population, it was necessary to increase agricultural production. Through industrialisation of agriculture, highly developed countries and certain developing countries shifted from the stage of food shortage to the stage of structural food surpluses. It was possible due to the so called industrial model of agriculture. But this model is more and more controversial due to its weakening driving forces (causative) and increasing alternative costs (lost benefits). Thus, this model of agriculture is exhausting its possibilities. Not surprisingly, because nothing is given and lasts forever. Everything flows, *panta rhei*, to quote Heraclitus. At present, there are two driving forces for the changes in agriculture, namely the strive for sustainability and globalisation.

Agriculture's further development according to the industrial model is inhibited by limited natural resources above all (especially water and fossil fuels) and the capacity of the environment to bear the effects of anthropogenic activities. Emergence of environmental barriers influences the agricultural economy through changing price relations connected with the rarity theorem as well as – and maybe even above all – through a pressure to take into account (internalise) external effect of agricultural production, as well as “the rights” of farm animals and socio-cultural effects, including the influence on rural vitality.

At the same time there appear to be possibilities of the removal of the demand barrier for agricultural products, above all due to an increasing food demand and their use for non-food purposes. The needs in this respect – contrary to food products – are practically unlimited. They translate into demand according to the price relations.

The removal of the demand barrier would allow for the return to the strategy of maximizing of agricultural production, but this situation would increase the pressure on the natural environment through the expansion of cultivation area (at the expense of forests and pastures above all), intensification of irrigation and the increase in the use of agro-chemical means of production. It is in contradiction to the increasing awareness of the necessity to protect the environment. The resolution of this problem is not possible within the industrial model of agriculture. A new model of agriculture which would fulfil sustainability criteria is needed. It can be either an industrial agriculture model improved through scientific and technological progress or a sustainable agriculture model on the basis of laws of nature and social progress. The former one, as well as its modifications, is based on microeconomic classic theory. The latter – on theory of ecological economy. In a foreseeable future a dual development of agriculture is most likely, i.e. the occurrence of the both models. Such a situation is now taking place in most countries. It requires considerable engagement of political institutions (the State), because the elements of economic account significantly differ between these agricultural models, both in micro- and macroeconomic approach.

The above mentioned circumstances are further complicated by globalisation, which transfers agricultural problems into a global level, giving them new

dynamics and affecting agriculture of individual countries. Functioning of agriculture is determined to a growing extent by the external forces and the role of the institutional (political) factor is weakening because the globalisation in the political sphere cannot catch up with the globalisation in the economic sphere. Meanwhile, this factor plays a key role in creating conditions for sustainable agriculture in countries and certain regional groups (e.g. the European Union). Therefore, the possibilities of alleviating the undesirable effects of the global market or the activities of consortia continue to shrink. It pertains above all to external effects. The logic of the developing model of sustainable agriculture and new agricultural economics at the state level is verified by the globalisation process. Feasibility of this model and the new agricultural economics in globalisation conditions is a resultant of favourable and unfavourable conditions. The former ones predominate in our perspective.

From industrial agriculture to sustainable agriculture

Industrial agriculture had two main driving forces i.e. quickly increasing demand for agricultural products and profound technological changes in agriculture. The demand was determined by a rapid growth in the number of urban population and improvement in nutrition, including elimination of the plague of hunger. The fast increase of demand for these products strongly stimulated the growth of agricultural production. This growth was possible by introducing technological advances above all, which included: 1) separating process of agricultural production from the natural structure (agroecosystem) 2) intensive usage of industrial means of production, 3) concentration of the factors of production, especially land, in non-family enterprises, 4) increase in the scale of plant and animal production accompanied by their specialisation and separation of the two types of production, 5) orientation of agricultural activity only to the market and maximisation of profits, 6) progressive integration of agricultural holdings with their agribusiness environment, including above all running farms in compliance with its rules.

Technological changes led to the release of considerable resources of abundant workforce, which had to find new workplaces in efficient branches outside the agriculture. These people were replaced in agriculture by still more advanced (more efficient) tractors and other agricultural machines. These technological means allowed for the increase in the scale of production previously limited by workforce capacities, and resulted in releasing for consumption further labour resources as well as the agricultural products which were previously intended for feeding live draught force. Launching the process of motorisation and mechanisation of agriculture created the conditions for the growth of work efficiency. Also the natural growth factors of agricultural production were supported – sometimes even replaced – by chemical fertilizers and pesticides as well as the variety of growth regulators and veterinary preparations. The way to multiplying crops and productivity of farm animals was open. Intensity of agricultural production was on the increase – mainly due to the implementation of

capital consuming production techniques. Technological, agronomical and genetic progress was introduced to the agriculture. It allowed for the remarkable increase of yields and animal productivity and, above all, the labour productivity. Biological progress played a great role in this support, as it increased the capacities of plants and animals to effectively absorb natural and artificial means of agricultural production, as well as organisational and technological progress in the form of concentration and specialisation of production and also the progress in means of transport allowing for the long-distance transportation of agricultural products, which was essential for trade and competitiveness.

Until there was no the barrier of demand, farmers benefited from the results of maximization of the production. The situation began to change in the last decades of the nineteenth century due to both the increase of agriculture productivity, especially in the developed Western European countries and the import of cheap agricultural products from overseas countries with great capacities of agricultural production. The appearance of the demand barrier had enormous effects on agriculture because in the conditions of increasing supply, it caused the process of price reduction of agricultural products in real terms. As a result, the opening of the agricultural price scissors has been observed so far. It stimulated strongly the acceleration of the processes of concentration and specialisation, the changes in agrarian structure and the growth of capital intensity of agriculture. The process of transferring of the value added generated in agriculture to consumers and non-agricultural sectors of the economy was also commenced. It caused an abnormal situation when the progress in agriculture turned against farmers and started a race to “nowhere”. Moreover, it turned out that production and economic successes of industrial agriculture were paid dearly because of the considerable environmental and social costs. It concerns inter alia, the loss of soil fertility, pollution of water and air, loss of biodiversity, dependence on non-renewable resources, the growing production costs and decreasing prices, the increasing migration from agriculture and the diminishing rural communities. Furthermore, it turned out that the basic economic objective of farmers (economic benefit, income, profit), which was maximised through increase of production and reduction of costs (as a result of the increase of production scale and substitution of production factors), began to lose its foundations. Increase of production was hindered by the growing demand barrier whereas possibilities of economic substitution of production factors started to be exhausted. It was necessary for the institutional factor (the State policy) to participate in the game, so as to retransfer the income to agriculture from consumers and taxpayers, which had been transferred outside by the price mechanism [12, 39]. But possibilities in this respect are decreasing together with the progression of globalisation, which undermines the state’s position [8, 32, 34, 35].

The basic factor of agricultural success, which lays foundation for industrial agriculture economics, was mainly the use of fossil energy for mechanisation, irrigation and production of chemical fertilizers and pesticides. However, the age of cheap energy based on fossil fuels is over. Prices of oil and gas increase

faster than prices of cereals, which leads to the new – less advantageous for agriculture – price relations [3]. The growing prices of oil and gas (energy) affect agriculture in two ways. First, they directly increase production costs due to the rise in prices of fuels, fertilizers, pesticides etc. Second, they increase the demand for agricultural products for the purpose of fuel production. To put it clearly – supermarkets and petrol stations will be in more and more intense competition with each other for agricultural products.

Water, which has no substitute, is as important as fossil fuel. Agriculture uses over 2/3 of water drawn from ground, underground and surface (lotic) resources. The level of ground waters is lowering as a consequence of drawing water for agricultural purposes (irrigation) in the countries where over a half of the global population lives. Thus the situation arises, that the increase of the demand today leads inevitably to the decrease of production tomorrow [2]. In many countries the dilemma, whether to allocate water to industry and communal purposes at the expense of agriculture is a real problem [4, 5]. Therefore, one should expect a significant increase in prices of water used for agricultural production – also in the countries where water for agriculture is free of charge now.

Adverse effects of industrial agriculture give reasons for the development of environmentally friendly production systems, known under various names. All of them seek sustainability (durability). In the broadest sense, it means taking into account all functions of agriculture: productive, economic, social and environmental.

Post-industrial agriculture has two main directions. The first one is a continuation of the intensive agriculture through external inputs, which in fact is a continuation of industrial agriculture; however, under certain environmental (ecological) requirements¹. This model fulfils expectations in terms of competitiveness and cheap food products, as well as basic environmental standards². This direction is also represented by integrated and precise agriculture. Such agriculture along with achievements of biotechnology creates possibilities for further growth of agricultural production, harmonizes with the globalisation of agricultural and food sector, but it does not eliminate negative effects in social sphere, neither does it solve all environmental problems. The second direction is the sustainable agriculture of many varieties: from organic agriculture to socially sustainable, whose frames were outlined only few years ago [40]. There are many premises of the concept of sustainable agriculture [1, 19, 40], of which the most important ones are:

- belief that not only marketable goods, but also public goods are important for the development of agriculture (multifunctionality of agriculture);

¹ This direction may include – though it is very unlikely in the foreseeable future – the termination of field production and animal breeding in favour of making agricultural and food products in plants-laboratories. It would make the agricultural land available for afforestation, ecological sites, recreational grounds and other needs of civilisation development.

² Changes in the mechanisms of the Common Agricultural Policy serve this purpose, especially the cross-compliance principle, requirements of animals' welfare and agricultural and environmental programmes.

- need for rationality and private (microeconomic) efficiency together with social efficiency;
- combining modernity with tradition – not setting the categories against each other, but seeking their complementarity;
- harmonisation of the interests of various actors in the development process, including also the “silent” ones³;
- making use of technological progress and knowledge for broadening choice possibilities (for producers and consumers);
- taking advantage of chances created for everyone by globalisation and regional integration processes;
- response to needs (demand) of an increasing group of consumers interested in high quality food or (and) environmental protection.

The implementation of the model of sustainable agriculture requires supplementing of the market mechanism by a strong institutional component – mainly political. The weakening position of a State and the underdevelopment of institutional factor at a global level, do not create favourable conditions for such a model. However, the necessity is the mother of invention and effectively paves the way. With a dose of optimism, we can assume that it will be like that in this case as well.

Economic paradigm of industrial and sustainable agriculture

The classical economy paradigm gave industrialisation the theoretical foundation. It evolved according to inevitable facts and problems, especially environmental ones. First, it was expressed in the Keynesian economics, which raised issues of intergenerational fairness in use of the environment, assessment of political character on the quality of natural environment and elimination of environmental (natural resource) barrier by technological substitution. The market forces cannot handle these issues [16]. The Keynesian economics shook the very core of the classical economics, that individual (microeconomic) decisions made by economic entities through market mechanisms would lead to maximisation of welfare (which according to this theory means maximisation of material goods consumption). Next, the theory of institutional economics rejected the assumption of zero transaction costs, perfect competition and complete information, and assented to the influence of informal factors (e.g. culture, custom, moral and social standards, ownership rights, game rules etc.) on the process of economic exchange [24]. Political institutions which play a basic role in providing public goods are of particular significance [6].

In the second half of the twentieth century the following facts became obvious: scarcity or even exhaustion of natural resources (especially mineral), the growing environmental degradation, global ecological problems, external effects of economic activity and the importance of the environment for the qual-

³ A term “silent” actor, referring to Gaia, other inhabitants of Earth and future generations, was introduced in this article [43].

ity of life. The economic theory could not ignore them any longer. These problems started to be considered thoroughly in 1960s and 1970s, particularly the concept (theory) of ecologically conditioned economic growth was developed (the so called paradigm of ecologisation of the economy), when rejecting the theorem of unlimited possibilities [30] and formulating the opposite theorem of impossibility [14].

The next step has been made by the environmental economics which is concentrated on natural resources, external effects and creation of public goods. In this case the methodology of neoclassical economics is adopted to analyse relations between the economy and the environment. It follows the so called paradigm of environmental economisation, which requires that the utilization of the environment should be in accordance with the economic principles. The environment is regarded as a supplier of natural resources and an absorber of waste materials. In the light of this economics, the environment is subordinate to the economy – the smallest possible role of the environment is sought, without any depreciation of the economic objectives.

A completely new approach – a new paradigm – is presented by the ecological economics, which lays emphasis on macroeconomic and long-term aspects, and thus on state policy and institutional structure. This economy embeds economic system in natural environment, taking into consideration issues regarding natural resources, waste and external effects and going beyond the financial matters. The most important thing is that according to this approach the economic system is included in the environmental system (ecosystem). Both of these systems are treated as closed. In the case of economic system, such an approach is consistent with the development philosophy. Technological progress increases the possibilities of the economic system, but also is against its closeness. In the case of environmental system the closeness is not of absolute character if we reduce this system only to biosphere, where there is a continuous inflow of solar energy, cosmic radiation and other kinds of energy and matter. Moreover, it is important for the economic system, at least due to the substitution of energy from fossil fuels by solar energy directly or in the form of energy produced from biomass. The relations between economic and environmental systems are multidimensional and complex, although they have their borders which cannot be crossed [45].

Industrial agriculture is based on the paradigm of classical economics (neoclassical), whereas sustainable agriculture is based on the paradigm of ecological economics. There are big differences between these paradigms. In this article the differences of key importance for the new agricultural economics will be presented only. There are six types of differences pertaining to: 1) the market perfection, 2) the concept of homo oeconomicus, 3) the efficiency criterion, 4) the limited ecosystem, 5) the external effects, 6) the system of values. The differences will be briefly described below.

The assumption of perfect market (which fulfils all conditions of perfect competition, with complete information available for all market participants), with prac-

tically unlimited number of producers and consumers, who follow the principle of maximising individual benefit (usefulness) and act rationally according to microeconomic criterion, is one of the fundamental assumptions of the classical economics. Feasibility of this assumption received a great deal of criticism, already on the ground of the classical and neoclassical theories, in the light of undisputable facts of oligopolies, monopolies, monopsonies, incompleteness and asymmetry of information. The market functions according to the short-term economic criterion, taking no account of long-term effects (which determine development), external effects, or the interests of the “silent” participants to the market. Although in the static study the market can lead the society to achievement of welfare in Pareto meaning, in the dynamic study it cannot be achieved. The similar situation is with regard to environmental interests. Neither the valuation of many environmental goods and services nor the estimation of the level of the environmental resources’ utilization can be made by the market itself. Therefore, the appropriate policy is needed in this scope.

The concept of *homo oeconomicus*, according to which a human being is an economic individual, striving only for maximising one’s usefulness (as a consumer) or one’s benefit or even a profit (as a producer), has its weaknesses. The concept has two key assumptions about following only the microeconomic criterion, according to which the maximisation of private – microeconomic – usefulness (benefit) is achieved and that the maximisation of benefits (usefulness) of individual market participants (producers selling goods and consumers buying goods) automatically leads to an overall balance ensuring maximum of welfare (in terms of Pareto optimum), *implicite* benefits for the whole society. It turns out however, that assuming the economic benefit as the only objective is not justified and that even the most economic activities of individuals do not necessarily lead to social optimum, thus a significant divergence is observed between microeconomic optimum and social optimum. At present, this view is considered to be obvious, although the liberal side still support the above assumption. The concept of *homo oeconomicus*, according to the liberal principles, is not only a theoretical model, but also a sociological reality which puts aside social bonds.

The efficiency criterion in the classical paradigm means the criterion of microeconomic (private) efficiency only. Following this criterion in itself cannot be considered to be bad. The problem however, consists in the fact that it takes into consideration only money valuation of goods in the market while ignoring external effects. For that reason it is more and more frequently questioned as a base for allocative policy in favour of social rationality criteria. The policy assumes that the activity of an individual, which maximises one’s profits, but at the same time lessens the welfare of the whole society, because either it brings about the loss of a part of particularly important public goods or the whole society has to incur the costs related to it [41], cannot be accepted.

The limited ecosystem was not taken into consideration by the classical theory, which assumed unlimited (inexhaustible) natural resources, i.e. unlimited global ecosystem. However, hardly anybody holds to such rigid assumption. It is weakened by taking the assumption of unlimited substitution of more rare resources by more

abundant ones. Besides, the problem of finite resources arose before in the classical economy, understood as absolute limitation (Thomas Malthus) or relative limitation – of cheaper (more efficient) resources (David Ricardo)⁴. Therefore, the theory of limitation (scarcity) of resources distinguishes: a) the absolute scarcity of resources and b) relative scarcity of resources – meaning the necessity to utilize less efficient, i.e. more costly resources and their substitutes. In relation to natural resources (limited), the neoclassical theory assumes that the decrease of these resources (exhaustion) causes the increase in their prices, which leads to the smaller usage per unit, the substitution in particular, which eliminates the so called raw material barrier.

The exploitation of the natural resources is one of the spheres of interrelations between the economy and the environment. The next important sphere is the emission of pollution to the environment, which has a specific capacity to absorb and neutralise it. This sphere was noticed by the economic theory later, although even John Baptista Say had mentioned the problem of polluting the environment by waste.

The supremacy of the environment over the economic development is the basic attribute of ecological economics. Such an approach was initiated by Kenneth E. Boulding⁵, who compared the Earth to a spaceship with predetermined amounts of resources and energy as well as the capacity to absorb pollution. It corresponds with the Gaia hypothesis. The ecological economics introduced the term of natural capital which embraces natural resources and ecosystems. This capital is divided into the basic capital and the other capital. The former includes the basic elements of ecosystem for life, which cannot be replaced by the anthropogenic capital (climate, ozone layer, air, biological diversity etc.), the latter is composed of the renewable natural resources and some non-renewable resources which can be replaced by the anthropogenic capital [38].

Distinguishing of the natural capital is of great importance for economic processes for two reasons. Firstly, basic natural capital is invaluable because it is crucial for life processes and cannot be replaced by any other kind of capital. Therefore, this capital should be especially protected, which would result in restrictions for the economic activities. Secondly, the market valuation of the remaining natural capital should be made, so that it could be used in accordance with the principles of economic accountancy.

Limitation of the environment⁶ is different in the micro-scale – for economic entities and consumers – and in the macro-scale, especially in the global scale. In the first

⁴ T.T. Malthus assumed the absolute limit of resources i.e. the volume of resources is constant and the development faces the barrier of limited resources. But in D. Ricardo's opinion, the development faces the barrier of relatively limited resources, i.e. as the available resources run out it is necessary to reach for the resources which are less available (theory of land rent). K. Marx – contrary to D. Ricardo – did not treat the environment as a growth barrier and declared the necessity to control Nature by people.

⁵ K. E. Boulding: *Economic as a Science*. New York 1970. Quoted after: [16].

⁶ Limitation of the environment may be referred to resources used in economic activity, to ability to regenerate (environmental capacity) and to the quality of the environment which affects the quality of human life.

case limitation is not absolute because environmental goods (services) are available and the problem is in the price of a given good or its substitute. In the second case limitation may be absolute and the problem is in the political choice.

The external effects determine market inefficiency. Taking no account of external effects, both negative (external costs) and positive ones (public goods), causes divergence between the microeconomic (private) optimum and the macroeconomic (social) optimum as well as between the static (current) optimum and the dynamic (long-term) optimum.

According to the neoclassical economics, the occurrence of external effects leads to ineffective allocation of resources, thus it is necessary to internalise external disadvantages (costs) through corrections of functioning of the market, in other words – through intervention in the market. Without the intervention of institutional (political) factor the market spontaneously produces negative external effects in excess and positive ones in deficit in relation to social demand. This correction may consist in using the concept of the Pigou tax or Ronald Coase's theorem. It was proved that internalisation of external effects through market mechanism is cheaper (more efficient) than through legal and administrative methods [36].

The specific feature of agriculture is that the side effects (coupled product) of agricultural production are both negative and positive environmental effects. For example, in relation to the water – agriculture causes its contamination by fertilizers and pesticides and at the same time reduces the flow of water and protects against flood. In relation to the air – agriculture leads to the pollution on the one hand, also through the emission of greenhouse gases, on the other – it absorbs carbon dioxide. In relation to the soil – on the one hand it causes degradation and erosion, on the other – it maintains fertility and prevents erosion. In relation to biodiversity – on the one hand agriculture limits it, on the other – preserves and protects it. As to the landscape, the situation is quite similar – on the one hand agriculture destroys it through odours and noise, on the other – it creates the agricultural landscape of great aesthetic values. It is also worth mentioning that agriculture in itself is not harmful for the environment, but its certain technologies are. Application of appropriate agricultural practices is not only safe for the environment but it may even enrich it. The coupling of negative and positive effects with agricultural production (activity) creates great problems for internalisation of these effects in the prices of agricultural products. Another factor, except for the negative effect on the natural environment, is a *novum* in the form of animals' welfare. Taking into consideration that animals are not the machines which enable farmers to convert fodder into products useful for people is an important step forward in the development of civilization. It is reflected in the costs of animal production of course. Finally, the agriculture's functions in the scope of preserving landscape and cultural values as well as rural vitality place the processes of concentration and specialisation in a new light. It is also reflected in the economics of agricultural production.

The necessity to take external effects caused by agricultural activity into account obviously imposes limitations on the intensity of agricultural produc-

tion, including the application of chemical means of production (particularly fertilizers and pesticides) and also many medicines, premixes, growth regulators and other “miraculous” chemicals. The agricultural production in such conditions may prove to be more cost-consuming. Therefore, on economic grounds, the intensification of agriculture through application of the growing amounts of industrial production means is not so approved as it was previously.

External effects of agricultural activity generally are not taken into consideration as the microeconomic criterion of making decisions by farmers. There is a need for intervention of an institutional factor (politics), which can introduce – apart from direct market instruments – also administrative and legal instruments in the form of standards or financial transfers for internalisation of these effects. Political instruments ought to help farmers to achieve the conformity of microeconomic (private) criterion with social criterion in the decision making.

The system of values in the classical paradigm is characterised by excessive anthropocentrism (considering the natural environment only as a provider of advantages for people) and the concentration on economic benefits determined on the market (money as the only value). The economic achievements in the industrialisation period were at the root of the belief that only progress and constant economic growth would ensure well-being. As a result, the rate of economic growth was regarded as a basic social objective according to the assumption: “the more – the better” [23]. This system follows the code of monetary (money) value taking no account of the code of life value. The former consists in the sequence: money → goods for sale → more money, whereas the latter: life → livelihood → more life [22]. In the code of monetary values it is better to possess more money by definition, i.e. life is for money [31].

Ecological economics puts the emphasis on ethics – justice within and between generations. This economics acknowledges the rights of future generations and rejects the economic benefit as the only criterion for development while adopting the criterion of the quality of life⁷. Therefore, the dynamic criterion should be added to the static criterion of efficiency. The static criterion originates from the Pareto optimality concept and is based on the principle of equal growth of marginal benefits and costs. The dynamic criterion requires that the current values of benefits and costs from all periods should be calculated.

Globalisation and the agricultural economics

Globalisation is accompanied by significant changes in many factors affecting the agriculture. The most important are: the formation of a new balance on the market of agricultural and food products (the weakening, perhaps even the removal of the demand barrier, which along with the internalisation of external effects may reverse the trend towards worsening relations of agricultural prices), the threat of increasing pressure on the environment (effect of trade liberalisation), the growth in importance of microeconomic criteria, the domina-

⁷ There are also propositions to favour “non-profit economy” instead of following the profit motive [21].

tion of transnational corporations, the total competition and the imperfect global institutions.

The removal of the barrier of demand. Analysis of factors which affect changes in demand and supply of agricultural and food products indicates, that the surplus of supply of these products on the world markets has weak foundations at present⁸.

In the scope of creating demand for agricultural products the situation is determined mainly by the two following factors: the needs for food and the demand of non-food sectors for agricultural raw materials. In relation to the first factor, the needs – which are not fully reflected in demand – are determined by fast growth of the size of the population in the developing countries with high income flexibility, in which the level of nutrition is low (multiplier effect), with changes in consumption structure in favour of animal products, whose production requires more original calories. The anticipated growth of income in the developing countries (especially in such populous countries as China, India and Brazil) will be reflected in the increase in demand and consumption of food products [25]. It will intensify the multiplier effect of the increasing food consumption per capita resulting from the growth of population and incomes.

As regards the second factor, the situation is less clear, although an increasing demand for agricultural products is observed from many non-food industries, especially chemical, textile, pharmaceutical and particularly fuel and energy industry. At present, the needs in this respect are sharply increasing. After the period of fascination with synthetics, the growing popularity of products based on natural raw materials can be observed. This is a good sign, because non-renewable raw materials (minerals) are gradually used up, whereas agriculture can produce substitutes for these raw materials (sometimes even of better quality) in a renewable and inexhaustible process. In particular, the possibilities of operations appear for agriculture together with the exhaustion of minerals which are the sources of energy, especially fuels, although generally, the renewable agricultural raw materials have lost in economic competition with non-renewable mineral raw materials so far. In the production of renewable energy, the larger plant cultivation areas for production of biodiesel, bioethanol and solid fuels will be required.

New kinds of utilisation of agricultural products may be very important both for the economy, because of the weakening demand barrier, the use of the abundant workforce in agriculture (also new workplaces in the biofuel industry) and the increase of farmers' income, as well as for the environment (no pollution caused by fossil fuels). All these conditions improve the difficult situation of agriculture when the stagnation of demand – especially in the developed countries – for agricultural raw materials and food products sometimes poses a barrier to agricultural development.

As to the supply, which is the resultant of forces decreasing and increasing it, the situation is more complex than in the case of demand. The most impor-

⁹ Presented in detail in other paper [44].

tant **factors that impede the supply** of agricultural products are: 1) loss of soil due to wind and water erosion and soil salinity as well as soil degradation due to over-pasturing, deforestation, water deficit, monocultures, sandstorms and dust storms, 2) increasing deficit of water (for which agriculture is in more and more intense competition with other sectors of the economy including the household sector), 3) change of grain and crude oil price relations to the detriment of the former, which impedes the usage of chemical fertilizers (“oil for beef steaks”), 4) effects of climatic changes in the form of loss of the most fertile areas of land (as a result of the rising sea levels after ice melting) and intensification of extreme weather phenomena, 5) resigning from the use of pesticides and growth regulators due to environmental requirements⁹.

Among the factors **influencing the growth of supply**, the most important one is the future progress, especially in terms of biotechnology as well as the possibility to increase the area of crops in certain regions of the world (mainly in South America). In real terms, the possibilities of increasing the area of crops are rather limited, because usually it is against ecosystems’ as well as other needs. Practically, it is impossible to increase the cultivation area without any damage to forests and water. Due to the increase in the size of the population, the amount of soil useful for agricultural production per capita is gradually declining¹⁰.

Progress is undoubtedly a key factor of agricultural production growth. It refers both to the conventional progress in the developed countries (precise agriculture) and in the developing countries (still with the large potential for growth), as well as to the genetic progress and possibilities to use forces of nature. However, it seems that the further conventional progress, especially by means of agricultural chemistry agents, will face severe public criticism mainly due to the threat for human health and bad effects on ecosystems (natural environment)¹¹.

The new development strategy should include replacing industrial intensification by agrobiological intensification, making use of the laws of nature, the progress in microbiology and the truly unlimited resources: solar energy and knowledge, which is not only a renewable resource, but also positively reproduced. It is necessary to follow the principle of keeping the balance in nature and to appreciate the internal value of nature rather than its usefulness [28].

In recent years the great progress based on biotechnology (agrobiotechnology) has been made. It was forecasted by Aldous Huxley more than fifty years ago [18]. It became an object of sharp disputes. Although the benefits resulting

⁹ It is worth adding that the development of aquaculture (necessary in the light of hindering and even lowering of sea fishing) requires water and soil (for fodder).

¹⁰ The resources of agricultural soil per capita are estimated to decrease from 0.6 ha in 1995 to 0.4 ha in 2025, which means that in the developed countries they will remain unchanged (0.8 ha) and in the developing countries they will decrease from 0.5 to 0.3 ha [3].

¹¹ Great chemical inventions, like polychlorinated biphenyls, DDT, dioxins, “miraculous” medicines (diethylstilbestrol or thalomid), proved to be harmful both for humans and animals after years. It is rather strange that for some of them a Nobel Prize was given [10].

from it are unquestionable, it cannot be treated as panacea for all agricultural problems, e.g. the necessity to increase productivity, to eliminate chemical plant protecting substances and even to feed the world's population [26].

The liberalization of trade. The growing liberalisation significantly stimulates the international trade, leading particularly to limitation of tariffs, withdrawal of subsidies and other forms of protection. Such a tendency, strongly supported by the Uruguay Round, is expected to be intensified by the Millennium Round.

Liberalisation of trade in the conditions of food system globalisation leads to a rise in turnover in agri-food products. The basic effect of globalisation in agricultural and food sector is the winding of competition spiral: *Production surpluses on the global market → decrease in prices → competitive pressure → concentration and consolidation → more and more powerful multinational corporations (which control product markets) → decreasing area of farmers' decisions → decreasing share of agriculture in the final prices of food products*. In fact, it constitutes the transfer of a capitalistic vicious circle at the global level [9], which means creating a strong premise of the decrease in prices. It would be like that but for the fact that the relations of demand and supply in the global agricultural market keep changing. The growing competition however, may lead to social dumping of poor countries [13] and ecological dumping consisting in lower environmental standards [42].

Development of international trade does not exert only the positive influence on the natural environment. There are some suggestions that it may cause the additional pressure on the environment¹². Above all, increase of demand from the developing countries will concentrate on animal products and cereals. The rapid increase in demand for animal products in these countries means the increase in demand for fodder cereals, because the growth of animal production mainly takes place in big industrial farms oriented to commercial networks. It especially concerns poultry and pig production. It may inhibit the attempts for solving global ecological problems, i.e. the solution of one problem may cause another problem, as it happened many times in the highly developed countries¹³. Pressure on the environment in the developing countries may be even greater because generally they set lower ecological standards.

Simulations of subsidies and tariffs reduction indicate the decrease in intensity of cultivations in the EU favourable for the environment, but on the other hand – the increase of area and intensity in South-East Asia as well as the increase in intensity in the USA¹⁴.

¹² This influence is disaggregated to: 1) technology effect (change of methods towards clean technologies, increase of wealth) and dirty technologies (incentive for attracting capital); 2) scale effect (growth of production scale increases pressure on the environment); 3) structure effect (liberalisation of trade affects changes in production structure through reallocation of less effective means to more effective sectors, branches).

¹³ Animal production in big farms obviously has negative environmental effects, despite lower emission of pollution for one production unit. If this production is based on fodder concentrates the demand for grain will grow, which in turn will stimulate the increase of chemical fertilizers usage, especially in the developing countries where the good agricultural practices are not known at all.

¹⁴ These are the results of a simulation with the use of FARM model (Future Agricultural Resources Model) applied by ERS USDA [11], in the chapter written by J. Sullivan and K. Ingram).

This situation may lead to export of waste from the developed countries to the developing ones. However, the increase of wealth – also in the developing countries – should result in greater sensitivity to environmental problems and raising the standards also in the developing countries (vide environmental Kuznets curve). But it may turn out that certain unique environmental goods are lost forever, whereas the demand for them quickly increases¹⁵.

The increase of microeconomic criteria significance. Liberalisation of product, capital and innovation flow causes microeconomic conditions, particularly natural potential and human potential of economic entities, to grow in importance in the competition. Also the limitations which were imposed in the particular countries have been removed. The limitations pertained to demand and political solutions (state interventions). In the closed economy within the state the demand barrier was more and more visible together with the increasing possibilities of production created by the development of industrial agriculture. The development of farms could be achieved only through elimination of other, less competitive ones, from the market (production). The process of elimination, however, faced a lot of resistance from political, social and macroeconomic reasons. The issues are generally known and will not be discussed here. Liberalisation *de facto* eliminates also the obligation of the national governments to ensure food safety, i.e. lifts the compulsion of food production typical to the closed economy. Agricultural production is conducted only by economic reasons. Thus, the liberalisation in the conditions of globalisation leads to a situation when there is no barrier of demand for the competing economic entities and state interventions are much smaller. Such conditions allow for following the microeconomic criterion in making decisions and the global market – fully anonymous – removes any moral scruples in choosing this criterion only.

In the conditions of liberalisation – domination of big commercial and production corporations as well as free trade, capital flow and also putting aside transport costs – the main factors determining the competitiveness of agricultural entities are related to natural conditions of agricultural production as well as efficiency and payment for work. Natural conditions in this case are determined by the value of agricultural production space – high quality of land with comparable capital and work inputs. Efficiency of work depends above all on relation of agricultural land area to engaged work resources. Significance of relation land/work is currently increasing due to negative external effects of intensive methods of agricultural production. The countries with big land resources per capita or with bigger size of farms have *ceteris paribus* greater competitive potential in relation to ones with smaller agricultural land resources. Due to deteriorating price relations of means of agricultural intensification, less intensive agriculture is gaining its advantage. However, the pay-

¹⁵ One of the main objects of dispute within the Millennium Round is whether the agri-environmental support can be included in a “green box”. It is argued that it does not have any significant impact on competitiveness, because it improves the state of the environment but does not affect the production volume [7].

ment for work is important, because the consent to lower payment for work means improvement in competitiveness in relation to agriculture where this payment is higher, provided that it is not compensated by higher work productivity. Thus, in the conditions of full liberalisation of trade and mobility of capital, which aims to equalise marginal productivity, the role of completely immobile factor (nature, land) and little mobile factor (workforce) is growing in importance in the competition.

Immobility of land – irreplaceable factor of agricultural production – determines the specific nature of agriculture as compared to other economic activities. This specific nature is not changed by globalisation. It means that despite full liberalisation of trade in agricultural and food products, it is impossible to adopt the theory of equalising marginal remunerations for the production factors [13].

Process of globalisation moves the problem of negative external effects and public goods to a higher level. Negative external effects are closely connected with agricultural production. Omitting them in the microeconomic account lowers production costs, *ergo* increases competitive force. Internalisation of these effects to microeconomic account – making it obligatory for farms to take them into account – may be put into practice only through state intervention. The gradual erosion of the state's strength in the process of globalisation may lead to weaker intervention to internalise external (negative) effects. In other words, the issue of external effects may be taken advantage of in the competitive struggle. It means a straight way to production of these effects in excess. However, the situation is not as pessimistic as it seems to be, due to a public nuisance because of these effects, the growing awareness of lost benefits and social pressure (especially non-governmental organizations). Therefore, on the whole, producers have a choice to either reduce negative external effects or to suffer from the results of their creation. In both cases it usually leads to the increase in agricultural production costs. Too many negative external effects on global scale can hardly be controlled due to the lack or the weakness of institutional (political) factor at global level. There are also many difficulties in reaching and enforcing settlements of which a good example is the current round of WTO negotiations.

The similar situation takes place in relation to public goods, which in *stricte* market conditions are produced in shortage. These goods can be found at local, national, regional and global levels. At the local and national levels money transfers from taxpayers are needed to encourage farms to produce public goods, i.e. payment for their production. It is possible at the regional level when there is an appropriate organisation as in the case of the European Union. Such transfers take place. However, on a global scale, up till now, no mechanism of remuneration for providing global public goods has been developed. At the most there are attempts to prevent such goods from being degraded (preventing destruction of rainforests, protecting oceanic fisheries, counteracting pollution of seas and oceans, preserving traditional varieties of cultivated plants and animal species). Meanwhile, international community demands more decisively to take actions in the interest of global public goods, including global natural envi-

ronment. The same situation is in respect of the reduction of harmful external effects [32]. A lack of any enforcement action to make enterprises cover the real social costs of damage to the natural environment is a specific form of subsidy, thus it does not stretch the rules of fair competition [33].

Knowledge is an especially important good, which embodies progress, especially biological progress¹⁶. Patents and the protection of intellectual property rights interfere with dissemination and usage of knowledge, inhibiting innovations and slowing down general progress [32].

However, the restrictions in this respect are contrary to the interests of biotechnological companies which are the main advocates of intellectual property rights. A certain solution is, on the example of CGIAR (the Consultative Group on International Agricultural Research), a proposal to finance research which brings private benefits from private resources and research on public goods from public resources [17].

The dominant position of transnational corporations. The global market exerts great pressure to bear on the processes of concentration and consolidation of entities participating in agribusiness. This consolidation is carried out through acquisitions, mergers, *joint ventures*, partnership, contracts and agreements. It leads to the development of global corporations which cover the whole food chain: from biotechnology through production, processing to final trade. The only aim of these multinational corporations, which anyway are also subject to the consolidation process, is making profit (there is a synonymous term in the USA which conveys well the essence of such entities: *moneymaking corporation*). Vertical integration in agribusiness, which was started some decades ago at the national level, was moved to the global level. Agribusiness is more and more subordinated to the big commercial chains. Big retailers, who have a monopoly and competitive capital, became the most powerful players in the global market¹⁷. The big commercial chains became a driving force in terms of food provision, with their own infrastructure, logistics, systems of impact on agriculture for meeting consumers' demands, with their own brand products' labelling – all for winning the competition. Oligopolistic power of these food chains forces processing enterprises to lower the prices, which generally means the decrease of realised economic surplus because they cannot place this entire burden on farmers nor are they able to increase efficiency of production accordingly. However, the chains which grow in strength create conditions for weakening the competition not only at the local level but also in the world market [15].

¹⁶ According to Joseph Stiglitz's opinion, knowledge meets the conditions for public good, because using it by one individual does not cause costs for others, nor does it diminish possibilities to use the knowledge; he quotes Thomas Jefferson who compared knowledge to a candle which lights another candle without losing its brightness [32].

¹⁷ For example, in EU countries the concentration of retail trade in food is observed, which results in the sharp decrease of the number of traditional and specialised retailers/shops. Generally, the share of the 5 biggest companies exceeds 50% of retail turnover in food, and in certain countries even 4/5 (e.g. in Sweden) [15].

At present, there are production corporations, which launch product chains – promoting the most profitable products, and trade networks (corporations) which launch product chains most demanded by consumers [20]. The corporations in the competitive struggle, aiming at multiplying benefits, in the conditions of the demand barrier intensify the concentration (up to a global oligopoly¹⁸ – in response to stagnation of profit margins and liberalisation), as well as take advantage of natural conditions of agricultural production, innovations, use of national aid (low taxes, ecological standards etc.), paying no attention to the environment, food quality and safety.

The quality aspects in a competition. In the globalisation conditions the prices of agricultural and food goods are equalised as well as the marginal costs of their production, in other words there is a tendency towards equalising marginal benefits from the engaged capital. Temporary advantage of certain producers may result from differences in natural conditions of agriculture or from lower payment for work. If the possibilities in this respect are exhausting, the role of price as an instrument in the competitive struggle is decreasing in favour of food quality and safety as well as the diversification of assortment of offered products – adapting it to various needs and tastes of consumers. Besides, it corresponds with the increasing awareness of consumers regarding food quality (not only in highly developed countries). That is why the attention of producers is directed on consumers to stimulate their demand for a given product (consumerism phenomenon). In the commercial chains the significant changes determined by intensification of total competition are also observed. Expression of the above is a fierce advertisement battle, the creation of product chains according to consumers' demand, the changes in the scope of market diversity and niche markets as well as the use of quality in the competitive struggle.

Consumers' sensitivity to food quality made corporations to implement quality standards in the whole food chain¹⁹. The eternal problem of quantity (volume growth) gives place to quality aspects (safe food) and environmental protection. The competitive struggle starts to move to this field.

In view of the above, the global agri-food system is undergoing another transformation: from competition through maximisation of production/turnover (which caused negative effects for farmers, small companies, consumers and the environment) to a situation where rival sellers are competing by better quality of product, which becomes the main driving force of the restructuring of global agri-food sector at present. The global commercial chains use standards

¹⁸ To stimulate the concentration process in the direction of counteracting monopolies, or in other words, protection of free market by political instruments, including antimonopoly law – as learned from the experience of the United States with over a 100-year history of antitrust law – is very difficult and the results are mediocre; the more it applies to global conditions.

¹⁹ More and more often transnational corporations set their own standards (using them in a competitive struggle). These standards include: quality (e.g. appearance, cleanness, taste), safety (e.g. pesticides, microorganisms), authenticity (e.g. guarantee of the place of origin, traditional technology), goodness of production process (e.g. towards workers, people, animals, environment), technological standards [27].

as a mechanism of restructuring, control and coordination of the global agricultural and food system. The process of setting the standard moves from the front of the agri-food chain, where it is publicly discussed, to the back, where it is dominated by big trade corporations. Obviously, these standards aim at corporate interests and not at social well-being. But in this case the “Smithian” reconciliation between individual and social interests is noticeable.

The need for establishing global institutions. Ensuring fair competition on the global market, internalisation of external costs and protection of global public goods are basic premises of creating global institutions in the economic sphere. It is obvious, when problems resulting from market imperfections and principles of social justice, at the state level which were solved (mitigated) by the state, are transferred to the global level. The institutions functioning at the global level at present (UN, WTO, WB, and IMF) including the non-governmental organisations fall behind the intervention in real global processes in terms of real possibilities of acting. They cannot act as a global government because they cannot command America. There are no chances for creating such a government in the foreseeable future, which means the existence of the global economy without any global government [35].

At the national level the social objectives are set and stimulated by political institutions, which decrease the gap between microeconomic (private) rationality and social rationality. But in the conditions of globalisation – which was indicated by Władysław Szymbański – there is no entity which would have democratic legitimacy of defining the global rationality and which could impose actions subordinated to such rationality or sanctions. [34]. The global rationality could mean existential rationality – what to do to preserve life on Earth? This rationality assumes that: 1) economic activities are conducted within the ecological system (finite absorption capacity of Earth); 2) the term “best fulfilment” should be replaced by “sufficient fulfilment” of needs. It is extremely important because the civilization process leads to the tendencies opposite to future existence [34].

New elements of economic account

Adopting an orientation towards the sustainable agriculture and the globalisation put economic account of agriculture in a new light. In this paper the issue will be only mentioned, leaving it for a detailed description later. Traditional economic account has microeconomic and macroeconomic aspects. In the first case it includes elements important for microeconomic objective function (according to the *homo oeconomicus* concept), whereas in the second case it includes also elements related to macroeconomic (social) objectives and flows between economic entities.

Economic account of agriculture which develops according to sustainable paradigm includes certain new elements both at the micro- and macroeconomic level.

At the microeconomic level in economic account there appear new items on the costs side, such as: 1) direct internalisation of external costs (standards of using the environment, *cross-compliance* requirements, requirements for ani-

mals' welfare); 2) indirect internalisation of external costs (higher prices of production means: fertilizers, pesticides, fuels, energy, machines, taking into account environmental standards); 3) payments for using the environment (e.g. for water or emission of greenhouse gases, costs of management/recycling of waste, sewage and excrement); 4) results (costs) of adapting farms for participation in agri-environmental programmes; 5) costs of providing certain public goods (or lost benefits).

On the side of revenues, new items, which correspond to cost items, are: 1) direct payments, benefits from quality improvement, possibility to apply labels and ecological certificates; 2) benefits from more rational use of production means; 3) possible benefits from management/recycling of waste; 4) payments (premium) for participation in agri-environmental programmes; 5) payments for public goods and services.

The new elements of economic account mentioned above will appear in sustainable agriculture model if macroeconomic (social) account is implemented by political institutions. It takes place in the particular countries or regional groups (e.g. in European Union). The hitherto process of globalisation, as indicated before, intensifies competition based on microeconomic account, weakening at the same time social account, especially at the global level. The weakness of the institutional factor – both political and social (NGOs) – brings about difficulties in implementing instruments on a larger scale, which would cause the above items to be included in the economic account [37]. However, it is only a matter of time.

Conclusions

Transformation of agriculture from industrial model to sustainable model creates premises of the growth in prices of agricultural products, mainly due to internalisation of external costs of agricultural activity. Apart from the higher prices, agriculture may benefit from payments for non-marketable public goods and services. To gain these benefits, the government intervention is necessary, accompanied by the weakening (or even the removal) of the demand barrier. The removal of the demand barrier along with internalisation of external effects creates premises of reversing the tendency of getting agricultural products relatively cheaper. If it happens so, it will essentially change the position of agriculture against the other sectors. Agriculture will gain in economic importance in competition with the other sectors.

In principle, the globalisation does not have a clear impact on agricultural prices. On the one hand, it will favour dismantling of the demand barrier, especially for efficient producers. On the other hand, the total competition, relying on strengthening of the microeconomic criteria and weakening of the social criteria will counteract internalisation of external effects. The competition may lead to more efficient distribution of the production, it is difficult, however, to clearly assess the transfers of agricultural products between regions (countries). Moving the burden of competition from prices to quality may also be of importance.

Along with the development of agriculture according to sustainable paradigm, the agricultural economics is changing, and the new elements of economic account grow in importance. They are a logical consequence of the social evaluation of agriculture's environmental and social functions and their importance for life quality and the constant (sustainable) development. The presented article gives a general picture of circumstances leading to new economic relations. But the picture contains many doubts, especially concerning the situation on the agri-food market, the determination of the world's community to protect global public goods as well as the role of external effects in the assessment of welfare and quality of life. Nevertheless, the agricultural economy seems to be moving in the already settled direction.

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