

INTENSIVE AND EFFICIENT AGRICULTURE AND THE NEED FOR ITS SUSTAINABLE DEVELOPMENT

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Abstract

The intensification of agriculture is subject to special concerns of agricultural economists. The degree of intensity of development region or national economy depends on its micro and macroeconomic levels. Economic efficiency of agricultural production depends largely on the intensity. Sustainable development requires a balance between economic growth and environmental protection, and on this basis, satisfying not only present but also future development of human society.

Key words: agricultural intensification, intensity, efficiency, ecology, sustainable.

INTRODUCTION

As defined in the approach of economic substance from intensifying agricultural production emerges three terms: intensity, efficiency and results. These notions, in one form or another, are found in the core concept to intensify the agricultural production, with its corresponding branch features.

Intensification and efficiency are interrelated as cause and effect, but also through indirect links. Development of agriculture in an intensive system causes the efficiency which, in turn, will be caused on a wider scale the intensification of agricultural production. Thus, intensive agriculture is an important way of enhancing economic efficiency of agricultural production. Therefore, farmers in the Republic of Moldova should choose an agricultural system based on sustainable intensification, which requires compliance appropriate agro-technology for each crop, and the selection and management of chemical fertilizers should be an element well-controlled, managed and combined with organic fertilization of soil.

MATERIAL AND METHOD

In research we used data from the Statistical Yearbook, the specialized forms of agricultural farms.

As research methods were used: monographic method, method comparison table method, average and relative size etc.

RESULTS AND DISCUSSIONS

The divergences in essence increasing the process led to development of various methodological approaches in determining the level of intensity and increasing the economic efficiency of crop production.

Economic efficiency of agricultural production depends largely on its level of intensity. Currently there is still no widely accepted system of indicators that can characterize the level of intensity of agricultural production.

In recent years there has been a descendant trend of increasing production in crops, while value indicators showed a significant increase. Increasing the value indicators of the level of intensity is explained by long-term tangible asset revaluation used in agricultural production, increasing prices for materials and other inputs, increased payroll related consumption. In these circumstances, the intensity of the agricultural production only on value indicators can be assessed objectively, but is indicated to compare the level of intensity of production in various economic entities.

To study the intensity's dynamics of the vegetable production is more reasonable to

analyze a specific set of physical indicators for the agriculture industry:

- consumption of labor per 1 hectare of agricultural land, man-hours;
- provide energetic resources (calculating on horsepower to 100 hectares of arable land) etc.;
- the amount of incorporated organic and mineral fertilizers (tons/kg active substance per 1 ha); the amount of chemical means for plant protection (kg per 1 ha of arable land) etc.

Note that some indicators of this system is problematic to determine due to the fact that specialized forms of agricultural entities in the initial data are missing.

The transition to intensive development is mainly considered a prerequisite to maintain stability and high rates of growth of the industry.

Intensification reflects the actual process of development of extended reproduction, indicating the occurrence degree of crop production insurance with land resources, material, financial and labor resources.

The output intensity can be determined by the ratio between qualitative and quantitative indicators of resource use. Production potential of agricultural enterprises includes land, capital goods for agricultural production, current assets, financial resources and labor force. All these factors work together and determine the production capability. Factors are to be correlated. Violation of certain proportions leads to weakening and partial use of production potential. Thus, the change in production potential size of agricultural enterprises in Moldova largely depends on the influence of different trends of change in each resource separately. First of all, depends on reduction of the labor resources and agricultural land, secondly, the changes in quantity and quality of fixed assets and current production, working capital etc.

In the agricultural enterprises (Table 1) the value of indicators characterizing the level of intensity have been increasing. Although in the dynamics value of fertilizers applied to 1 ha is increased by 70-80%, but values are low and in the last seven years are about 298 lei/ha. This increase is largely conditioned not from their volume growth in kind, but the account purchase price increase of 1 ton.

Table 1. Dynamics of the intensity of gross agricultural production in the agricultural enterprises of the Republic of Moldova during the period 2005-2011

Year	Per 1 ha of arable land, lei			Per 1 ha of arable land and perennial plantations	
	Average value of agricultural fixed assets	Material costs	Retribution of labor	Fertilizers, lei	Potential energy, H.P.
2005	4345	2129,0	804,0	214	2,48
2006	4875	2412,7	782,9	231	2,31
2007	4936	2803,0	794,2	250	2,24
2008	5327	3998,3	972,0	314	2,12
2009	6140	3211,9	885,5	235	2,16
2010	6616	4115,8	869,3	311,2	2,08
2011	7844	4964,7	961,7	529,6	1,99

Source: author's calculations based on specialized forms of agricultural enterprises in Moldova

Note that the potential energy insurance in the years 2005-2011, despite the fact they are at a low level and that are longer downward trend, the main cause is lack of financial resources to equip businesses with the potential energy.

Production potential is the total production capacity of producing materials and enterprises to produce a unit of time (typically, during) a certain amount of production quality, structure and appropriate range in terms of the rational point of the interests of society. This totality is determined both by the potential production resources available material production, as well as weather and economic conditions.

Manufacturing resources are distinctive elements of the production potential. Research resources production efficiency allows performing a deeper analysis and differential inputs of various reserves disclosure in order to accelerate economic development. Resource potential of the company serves as a criterion in determining production possibilities. Rational use of land resources, including agricultural land, is of great importance for the business economy. The earth appears as the object of labor, when man acts on the top layer of soil and create conditions for crop growth and development. Thus, the land becomes a means of labor, the cultivation of plants are used when mechanical properties, physical and biological soil for growing agricultural.

The technical and material development in agriculture is determined largely by the degree of insurance of production assets.

The degree of assurance and their use depends on rationality and the production rate of

agricultural production and its economic efficiency.

Intensifying the process is not only providing resources, but "the intensity of their use in order to increase production." This involves the practice of sustainable farming systems and technologies, to improve land productivity.

To characterize the economic efficiency of production intensification of agricultural production are indicators of value, which shows the means and resources from which production was obtained and which is the level of recovery of used means in the process of intensification.

Table 2. The dynamics of enhancing economic efficiency of gross agricultural output in agricultural enterprises of the Republic of Moldova during 2005-2011

Indicators	Year						
	2005	2006	2007	2008	2009	2010	2011
The gross agricultural output obtained, lei:							
• 1 leu per production fixed assets	0,76	0,63	0,44	0,94	0,63	0,70	0,64
• 1 leu per material costs	0,95	0,88	0,58	1,25	1,19	1,13	1,0
• 1 average worker per year	27817	30170	24836	65766	53288	70545	84577
Per 1 ha of arable land, lei:							
• Gross agricultural output(in comparative prices in 2005)	3307	3081	2156	5023	3842	4641	4994
• income obtained from selling the agricultural production	560,1	536,1	565,8	1043	324,5	1739	2173
Profitability level of agricultural production, %	17,9	17,5	18,9	26,1	8,5	38,4	39,1

Source: author's calculations based on specialized forms of agricultural enterprises in Moldova

Research results allow us to state the following: Indicators of economic efficiency increased in the analyzed period, and the higher results were registered in 2008. Resource potential in enterprises of Moldova is not used to a high level of efficiency. Agricultural lands yield consistently low, labor is used inefficiently, and labor productivity occurs on account of labor reduction, consumption of recovered materials is low.

As well, had increased the costs compared to selling prices of agricultural products, subsidies are at lower level due to lack of funds in the budget, which cannot positively influence the increase of production, there is implemented enough technical progress, advanced technologies, irrigation facilities, fertilizers, etc. Research and findings presented demonstrates that agricultural enterprises in the Republic of Moldova are characterized by low agricultural intensification efficiency, being not prepared for the transition to new market conditions and that in the agricultural sector there is a diffusion process in increasing the economic efficiency of intensification.

From the time of appearing the global problem of food security is seeking some solutions on how to handle it. Despite contrary opinions, it is choosing between two ways to develop agriculture: extensive and intensive way.

For the extensive agricultural development is characteristic extension of the areas of agricultural land, without significant changes in production technologies, technical, personnel, improvement work etc., without enhanced quality of inputs. Extensive development path of agriculture is limited, given that land, the main means of production, is limited in extent. In addition, extensive mode of development does not ensure increased productivity of land. In turn, development of intensive agriculture makes continuous increase crop yields. This way allows more efficient use of available resources. These goals can be achieved by using scientific and technological progress, efficient use of land, material and labor.

All countries have tried to promote the development of intensive agricultural industry funded research in these areas, which allowed the accelerated growth of production, contributing to society in general. Reverse step

was not to be awaited. In the World, as well as in Moldova stands out negative trends of practicing intensive agriculture. Agriculture is a key generator degradation and is also a victim of degradation caused by itself.

The first signs appeared negative due to excessive use of fertilizers to increase production by giving concomitant administration of manure and other organic fertilizers. As a result, the soil start to lose its ability to maintain yields at the same level applied increasingly more chemical fertilizers.

Increased agricultural production was made possible by combining the use of high quantities of fertilizers adaptation of new crop varieties and hybrids with superior technical and economic characteristics. Unfortunately, the agricultural system was effective for half a century, but now does not work, because the soil is exhausted and increasingly polluted and chemical fertilizers, pesticides, and fungicides are harmful to the environment and health human.

Criticism of intensive agricultural system refers to: toxicity caused by chemical fertilizers and plant protection means (pesticides, fungicides, etc.) Damage for both the environment and human health as well, promoting soil erosion, increasing number of diseases and pests by practicing monoculture and decreased natural resistance of plants by the abundant use of chemicals; descent groundwater level (for drainage) or if the rise of excessive irrigation, restricting the area of biodiversity as a result of expansion of cultivated crop species, diminishing productivity of land and destruction of soil structure, is a outbreak of ill health through food, is an energy-intensive system, etc.

It is no secret that agriculture based on energy-intensive technologies and agricultural technological mistakes are major causes of environmental degradation. Their impact is manifested in negative impacts on various environmental resources: land, water, air, flora and fauna.

The most polluting aspect of production is chemical treatment intensification (fertilizers, pesticides, fungicides, items motivating retardation (inhibitors)). This means, to some extent have an impact not only on crop yield,

but also the environment, and not always positive. In some cases, negative results from the use of chemicals, neutralize the positive effects. Residues of pesticides and chemical fertilizers, heavy metals and other pollutants in soil, water, food chain, leading to deterioration of the natural environment, endangering the existence of humanity. Because of it, the spraying crops are polluting the atmosphere.

In some European countries like Belgium, Netherlands, Germany, Switzerland, with advisory centers, farmers are directed to a new strategy of using different types of fertilizers, the severe reduction in the quantities used in the coming years, but while maintaining balance of various nutrients in the soil [3, page 36].

Intensive agriculture (also called conventional) is considered one of the important causes of global climate change.

Protecting the environment requires the need to practice sustainable farming systems. Global economic crises of the 60s, 70s brought to the fore issues of environmental damage. When the company realized the seriousness of these issues and called for the development of environmental programs, environment protection was born the concept of sustainable development. This concept is not new, it expresses the meaning of current behavior met earlier in ancient Greek philosophy, and human relations harmonize with the environment, as well as current responsibilities to future generations. One caveat, the current formulation of the concept it is not known until the middle of the twentieth century.

In 1951, the International Union for Environmental Protection (IUCN), founded in 1948, published a report on environmental protection in the world (The State of Protection for Nature in the World, 1950) [1]. This report was the first of its kind to address the issue of reconciliation of economic and ecological phenomena.

Since Conference on Environment in Stockholm in 1972, people began to recognize that environmental degradation is dependent on human welfare and economic growth in general. In this respect, was established the World Commission on Environment and Development of the next United Nations (UN).

According to the Brundtland Report presented at the International Commission on Environment and Development (UCED) in 1987, sustainable development "that meets the requirements of the present without compromising the ability of future generations to meet their own needs" [5, pag.88]. This development includes, therefore, criteria to protect ecosystems, soil, air and water and the conservation of biological diversity, taking into account the needs of future generations.

Recently, we identified numerous definitions and approaches of sustainable development. But, most of these definitions are the fact that sustainable development requires, in harmony, the three essential dimensions: economic, social and environmental.

Minimum requirements for achieving sustainable development include the following [5, pag.89-90]:

- Resizing growth, given a most efficient and use resources more evenly so that to obtain quality products with minimum waste and toxic;
- enhance people's lives in conditions meet basic needs and reducing uncontrolled population growth;
- conservation of environment and natural resources, etc.

We believe that sustainable development requires a balance between economic growth and environmental protection, and on this basis, satisfying not only present but also future development of human society.

Over time, the concept of sustainable development entered in agriculture too. The concept of sustainable agriculture was the main subject of discussion at the twenty-first century Forum of the International Association of Agrarian Economists in Tokyo in 1991, is defined by its president, the Australian John W. Langworth as involving three components: a) economic growth (capital), b) distribution (market), c) the environment (environmental component) [3, pag.38].

Sustainable agriculture is a system of technologies and practices designed not only to ensure satisfactory production, but also to achieving the objectives. This is evident considering that sustainable agriculture has its scientific substantiation Bio-economic concept,

developed the first time by the American economist of Romanian origin N. Georgescu Roegen, a concept that summarizes the relationship between nature and humans.

In Moldova, sustainable agriculture has become a focus of programs and strategies of economic development and agriculture which is found whereas a number of strategies and action programs.

The main objectives to be met by sustainable agriculture are:

- Food security (human needs of food and fiber);
- conservation of environment and natural resources which agriculture depends;
- more efficient use of renewable resources and non-renewal;
- support the viability of farming and the quality of life of farmers and members of society as a whole;
- broad participation, with a decision power by the public.

Despite the fact that agricultural science already has a large number of technologies that meet the requirements of organic farming, sustainable agriculture in Moldova implementation still requires extensive research. Sustainable development of agricultural production must be achieved not only by organizational and economic measures, but also by the level of scientific argumentation farming systems. Currently, the recommended, in many cases, does not provide a rational use of the climatic resources nor the means to enhance effective implementation of agriculture, soil fertility reproduction, and ecological balance.

In Moldova there is great potential in terms of scientific development by intensive and sustainable system of plant culture. We mentioned that are made available to farmers and fundamental work, and practical recommendations how to efficiently use land, how to preserve fertility for future generations. Main factors in this sector are increasing varieties, hybrids, seeds, seed quality [4, p.3]. In some cultures are dozens of varieties and hybrids, in the State Register with over 900 [6]. One of the main directions of biotechnology innovation systems are creating new cultivation technologies, hybrids and varieties of crops

with new economic and technical features potentially high strength at low temperatures, high, etc.

Agriculture is apparently a branch less exposed to product innovations, nature cannot be changed from one day to another, as happens with a number of industrial products. However, technical innovations in the industry, biotechnology, and other kinds penetrate more rapidly, affecting the competitiveness of farmers' work [2, page 36]. Harmonization of agricultural development and environment can be achieved only through a systematic approach of political, environmental, economic and social, in which scientific research must contribute through innovations in biotechnology and technologies for increasing soil fertility.

CONCLUSIONS

To achieve the objectives of sustainable agriculture, it is necessary that budget resources be concentrated on modest development of scientific and technological solutions for sustainable intensification of production branch.

It is important to develop an efficient cooperation between science, staff training and production, to ensure the transfer of scientific, technical, biotechnological and their effective application in production.

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