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Aspects of Technical Progress in Romanian Agriculture Compared to Some EU Countries

Florentina CONSTANTIN[1]
Laura CIOBANU[2]

ABSTRACT
The importance of using technical progress factors in agriculture varies from one country to another and the influences of these factors on yields and agricultural production are essential. Thus, in this paper we considered necessary and appropriate to achieve the dynamic analysis of the main factors of technical progress in agriculture referring to agricultural technical endowment, fertilizers and irrigation. On the other hand, we accomplished the dynamic analysis of the outcome indicators in agricultural production in Romania compared to some EU countries, as well as the gaps registered between countries under study. We also point out the positive and negative effects of technical progress in agriculture which had developed under the revealed indicators evolution.

KEYWORDS: *technical progress, irrigation, mechanization, soil fertilization, economic effects, ecological effect.*

JEL CLASIFICATION: *Q15, Q16*

INTRODUCTION

Performance in agriculture is maintained and amplified, among others, by the inputs (factors of production) promoters of technical progress, including: irrigation, mechanization and soil fertilization. In the literature these inputs are named also intensification factors.

Allocation of intensification factors in agriculture depend on: national specificities of each countries (natural conditions, structure of agricultural land, farm size, structure of production), agrarian policy measures adopted by public power in the direction of agricultural support (guidance budgetary funds to subsidize inputs, state involvement in land improvements, encourage investments in agriculture) and the degree of capitalization, especially of private farmers, for technical and technological modernization of production process.

The mechanization process was a prerequisite for the development of agriculture and it significantly increases the productivity. It is considered an intensification factor in agriculture and it means to develop agricultural tractors and machinery necessary to accomplish the whole production flow. On the one hand, mechanization creates the

[1] Research Centre for Regional Analyses and Policies, The Bucharest Academy of Economic Studies, Romania, fconst2002@yahoo.co.uk
[2] Research Centre for Regional Analyses and Policies, The Bucharest Academy of Economic Studies, Romania, lauraciobanu2010@yahoo.com

possibility of significant increase the labour productivity, a very important factor considering that agriculture transfer a part of active labour force to other branches. On the other hand, the process of mechanization has a great importance in increasing crops and livestock production to a higher level through performing on time and in good condition of various agricultural activities according to the biological requirements of plants that are created (Hartia, 1978).

Soil fertilization is acting artificially in the biological cycle of plants and accelerates it, completes continuously the necessary nutrients and simultaneously reduces the time needed for soil to reach the baseline condition of the natural fertility.

Knowing and guiding the processes on increasing soil fertility and plant nutrition requires compliance all laws underpinning the artificial ecosystem created by the human. If at the beginning chemical treatments generally involve the use of fertilizers, with the development of chemical industries, the concept has developed and acquired a broader spectrum and today the main chemical treatments in agriculture are: fertilizers, amendments and pesticides (Dincu & Bran, 2000).

1. METHODOLOGICAL ASPECTS

The importance given to the use of intensification factors in agriculture varies from one country to another, and the influences on yields and agricultural production are decisive. The positive aspects of using intensification factors are incontestable and easy to observe if we look from economic point of view, of the increase of worldwide agricultural production (Cicea et al., 2010). However, it is not known precisely the effect it can have on the ecosystems, soil and nature the long-term and irrational use of these factors. Environmental problems should not be overlooked if we do not want to compromise the possibility of future generations to have access to the same resources and to cover their needs.

Thus, in this study, we assess the effects of intensification factors under two aspects: economic and environmental. For this reason, we considered necessary and appropriate the comparative analysis of the main production resources of Romanian, Poland, Hungarian and Bulgarian agriculture including the resources to intensify agricultural production - irrigation, mechanization, soil fertilization. Also, we tried to identify the causes that have produced some positive or negative trends in each country and establish their effects on agricultural production.

Indicators within each agricultural resource, presented and analyzed in this study refer to:

- Agricultural area / arable land
- Irrigated agricultural area
- Hectares of arable land per tractors
- Chemical fertilizers per hectare
- Yields per hectare

Also, we point out that the analysis of indicators mentioned above was achieved for the period 1998 - 2008, within each studied country, compared them and compared with the EU developed countries indicators.

2. ANALYSIS OF THE MAIN TECHNICAL PROGRESS INDICATORS OF ROMANIAN AGRICULTURE COMPARED TO SOME EU COUNTRIES

Romania, Hungary, Poland and Bulgaria are countries that have important agricultural land resources at Central and Eastern European level (about 69% of agricultural area and 73% of the arable area) and the entire European continent (about 11% of agricultural and arable area), but especially in the European Union 27(EU27) (about 23% of agricultural area). Statistical data that we will present and analysis further are collected for the period 1998-2008 and they are relevant for the arguments already stated previously.

As it seen from table 1, in Hungary irrigated agricultural area is relatively constant over the period under review, recording a reduction of 90 thousand hectares, while in Poland irrigated agricultural area remains at 100 thousand ha until 2004, then it registered a insignificant increase of almost 20 thousand ha at the level of 2008.

The share of irrigated areas is very low in these two countries, that not exceeding 4% in Poland and 0.8% in Hungary which emphasizes the low importance given to irrigation and orientation towards other intensification factors (mechanization and soil fertilization).

Table 1. Evolution of irrigated agricultural area 1998 – 2008

Items	1998		2000		2002		2004		2006		2008	
	1000 ha	%*	1000 ha	%*	1000 ha	%*	1000 ha	%*	1000 ha	%*	1000 ha	%*
HUNGARY												
Agricultural land, of which:	6193	100	5854	100	5867	100	5864	100	5809	100	5778	100
- irrigated	230	3,7	236	4,0	225	3,8	197	3,4	147	2,5	140	2,4
POLAND												
Agricultural land, of which:	18443	100	18413	100	16899	100	16327	100	15957	100	16154	100
- irrigated	100	0,5	100	0,5	100	0,5	115	0,7	120	0,8	116	0,7
ROMANIA												
Agricultural land, of which:	14747	100	14857	100	14837	100	14130	100	14039	100	13546	100
- irrigated	234	3,4	216	3,7	488	3,9	327	2,3	96	0,7	257	1,9
BULGARIA												
Agricultural land, of which:	5645	100	5582	100	5325	100	5330	100	5160	100	5174	100
- irrigated	693	12,3	622	11,1	592	11,1	118	2,2	108	2,1	102	2,0

Source: * own calculations; FAOSTAT, 2011a

In the early of '90s Romania had a considerable irrigated agricultural land, 3.1 million ha, which represented 21% of total agricultural area (INS, 1991). For this reason Romania were placed among the European leaders because it exceeded the average share of the irrigated agricultural land registered in Western Europe, which were about 8%.

Irrigated agricultural area had registered an unexpectedly decline, reaching just 0.8% in 1998. After 2000 there is a modest increase of the value of this indicator, up from 3.9% in 2002, which is due to investments made by private farms, as a result of severe drought that occurred in Romania in 2000 and 2007. In 2008 this indicator decreased again to 1.5% (own calculation; INS, 2009).

In Bulgaria it was a similar situation as in Romania, in the sense that in the early of '90s irrigated agricultural land accounted 20.5% of the total agricultural land, then it started to decrease gradually and reaching 11,1% in 2002 and just 2% in 2008 (FAOSTAT, 2011a).

The causes which have contributed to diminishing the use of irrigation systems, both in Romania and Bulgaria were mainly related to inadequate implementation of land laws that caused excessive fragmentation of agricultural land and generated several obstacles to irrigate agricultural land. Also, during the dismantling of agricultural production cooperatives it has been created many thefts and damages of equipments for irrigation systems. Another cause was favoured by the lower state funds allocated for the land improvements, especially until the early of 2000's. In addition, changes in land ownership led to a significant decrease of irrigated areas due to the low interest of farmers for land improvements, caused by the lack of own funds and lack of stimulating policies for funding such actions.

Of the four Central and Eastern European countries under study, Poland has the highest degree of agricultural mechanization, in fact inherited from the period before 1990. In Polish agriculture the number of tractors registered a moderate ascending evolution in the whole period, from 1.31 million in 1998 to 1,56 million in 2008 (the increase was about 16.3%). Hectares of arable land per tractor are reduced from 10.7 ha in 1998 to 9,5 ha in 2002 and 8 ha in 2008, which ranked Poland below the U.E. average level, which is 11 ha.

In the early of 1990s Romania had a machinery and equipment industry for agriculture well-developed, which allowed, at least in the first part of the transition period, to guarantee a moderate increase of the number of tractors. Even if the number of tractors has registered a favourable development in the period under review, the degree of mechanization of Romanian agriculture is extremely low compared to countries such as Hungary and Poland, as well as to the developed EU countries. During the period 1998-2008, the number of tractors has known an ascending trend (from 164,000 to 174,000), the increase was 6%. In these conditions, hectares of arable land per tractor decreased from 71 ha in 1990 to 56 ha in 1998 and 50 ha in 2008. While in Romania hectares of arable land per tractor were never less than 50 ha, in the EU countries with developed agriculture, in 2005, the indicator values were: 15,7 ha per tractor in France, 14,3 ha per tractor in Germany, 8,9 ha per tractor in Belgium and 7,7 ha per tractor in Netherlands (own calculations; FAOSTAT, 2011a; FAOSTAT, 2011b).

Bulgarian agriculture has experienced a 40% decrease the number of tractors in the period 1990-2002 (from 52 thousand in 1990 to 32,000 in 2002), the situation has improved after 2005 when there was a modest increase. Hectares of arable land per tractor increased from 74 ha in 1990 to 105 ha in 2002, and then it was reduced to 58 ha in 2008 (own calculations, FAOSTAT, 2011a; FAOSTAT, 2011b).

Quantitative and qualitative increase of technical resources, recorded after 2005 in both Romania and Bulgaria, was mainly achieved due to accessing by farmers of the EU pre-accession funds and post-accession funds for farms modernization.

After 1990, consumption of chemical fertilizers showed a strong tendency to decrease in Romania and Bulgaria. Hungary recorded a moderate reduction, and in Poland quantities of chemical fertilizers have maintained relatively constant until 2002, then until 2008 these recorded significant increases. Thus, in 2008 compared to 1998 in Hungary consumption of fertilizers per hectare increased by 23% (from 73 kg nutrients/ha in 1998 to 90 kg nutrients/ha in 2008), in Poland, consumption of fertilizers increased by 70 % (from 108 kg nutrients/ha to 184 kg/ha), in Romania consumption of fertilizers increased by 20% (from

36 kg nutrients/ha to 43 kg nutrients/ha) and in Bulgaria consumption of chemical fertilizer increase by 74% (from 44 kg nutrients/ha to 77 kg nutrients/ha).

Table 2. Mechanization and chemical fertilizers consumption, 1998-2008

Items	1998	2000	2002	2004	2006	2008
HUNGARY						
Tractors (nr.)	92270	113306	116175	119044	120477	-
Arable land (1000 ha)	4819	4602	4606	4598	4597	4573
Hectares of arable land per tractor* (ha/tractor)	**52.2**	**40.6**	**39.6**	**38.6**	**38.2**	-
Chemical fertilizers ** (tonnes nutrients)	370600	417024	501321	565914	559589	431000
Agricultural land *** (1000 ha)	5045	4803	4786	4804	4794	4768
Chemical fertilizers per hectares* (kg nutrients/ha)	**73,5**	**86,8**	**104,4**	**117,8**	**116,7**	**90,4**
POLAND						
Tractors (nr.)	1310510	1306700	1364579	1365400	1495287	1566340
Arable land (1000 ha)	14057	13993	13010	12610	12368	12571
Hectares of arable land per tractor* (ha/tractor)	**10.7**	**10.7**	**9.5**	**9.2**	**8.3**	**8.0**
Chemical fertilizers ** (tonnes nutrients)	1557160	1584100	1511700	1628400	1970700	2393476
Agricultural land *** (1000 ha)	14379	14330	13337	12962	12741	12970
Chemical fertilizers per hectares* (kg nutrients/ha)	**108.3**	**110.5**	**113.3**	**125.6**	**154.7**	**184.5**
ROMANIA						
Tractors (nr.)	164756	160053	169240	171811	174563	174790
Arable land (1000 ha)	9325	9381	9376	8915	8939	8721
Hectares of arable land per tractor* (ha/tractor)	**56.6**	**58.6**	**55.4**	**51.9**	**51.2**	**49.9**
Chemical fertilizers ** (tonnes nutrients)	360000	304279	326123	380004	362884	397965
Agricultural land *** (1000 ha)	9843	9908	9859	9344	9408	9096
Chemical fertilizers per hectares* (kg nutrients/ha)	**36.6**	**30.7**	**33.1**	**40.7**	**38.6**	**43.8**
BULGARIA						
Tractors (nr.)	40000	34709	32071	30962	41046	53100
Arable land (1000 ha)	3536	3526	3355	3313	3099	3061
Hectares of arable land per tractor* (ha/tractor)	88.4	101.6	104.6	107.0	75.5	57.6
Chemical fertilizers ** (tonnes nutrients)	169000	151500	381693	267862	300520	250227
Agricultural land *** (1000 ha)	3816	3778	3583	3529	3305	3245
Chemical fertilizers per hectares* (kg nutrients/ha)	44.3	40.1	106.5	75.9	90.9	77.1

** nitrogen+phosphate+potash, *** arable land+permanent crops
Source: * own calculations; FAOSTAT, 2011b; FAOSTAT, 2011c

In these circumstances the gap between the consumption of chemical fertilizers of the four countries and the EU-27 average (127 kg nutrients/ha) was 1:1,4 Hungary, Poland 1:0,68, 1:2,9 Romania and 1:1.64 Bulgaria. In Romania, Bulgaria and Hungary from 1998 to 2008, it have not touched the quantities of chemical fertilizer administrated at 1990 - in Romania 120 kg/ha, in Bulgaria 220 kg/ha and in Hungary 129 kg/ha (own calculations, FAOSTAT, 2011c; FAOSTAT, 2011a)

The main causes of the decrease of chemical fertilizers administrated in all four Eastern European countries were: the high costs of these substances, the differences recorded between the prices of agricultural products and industrial products ("price scissors" has always acted against agriculture) and lack of financial resources of the private farmers.

3. ANALYSIS OF THE OUTPUT INDICATORS

During the reporting period, except for agricultural years 2000 and 2007 when drought affected agricultural production of all four European countries studied, yields per hectare for the main crops had moderate upward trends.

Thus, in 2008 compared to 1998, the evolution of yields for the main crops in Hungary, Poland, Romania and Bulgaria was as follows: for wheat has increased by 20%, 12%, 36% and 46%; for sugar beet has increased by 42%, 20%, 70% and 78%; for vegetables has increased by 25%, 8%, 8% and 36% (own calculations following the data from Table 4).

Table 4. Yields per hectare, 1998 – 2008

Kg / ha

Items	1998	2000	2002	2004	2006	2008
HUNGARY						
Cereals, of which:	4.555	3.632	3.962	5.589	5.097	5.666
- wheat	4.139	3.604	3.519	5.117	4.071	4.981
- maize	6.007	4.179	5.076	7.001	6.816	7.465
Sugar beet	41.967	34.388	41.076	56.942	52.409	59.666
Sun flower	1.682	1.618	1.858	2.472	2.210	2.669
Potatoes	21.804	18.473	22.122	25.321	24.994	26.901
Vegetables	16.671	16.776	16.657	19.508	19.520	20.578
POLAND						
Cereals, of which:	3.071	2.534	3.240	3.537	2.598	3.217
- wheat	3.624	3.226	3.853	4.281	3.244	4.071
- maize	5.827	6.063	6.156	5.693	4.160	5.814
Sugar beet	37.900	39.427	44.336	42.826	43.789	46.484
Sun flower	-	-	-	1.586	1.162	1.784
Potatoes	20.037	19.376	19.323	19.626	15.039	19.758
Vegetables	24.881	23.043	24.056	26.947	22.862	26.491
ROMANIA						
Cereals, of which:	2.645	1.856	2.439	3.995	3.102	3.247
- wheat	2.596	2.299	2.058	3.477	2.773	3.422
- maize	2.795	1.606	2.902	4.549	3.575	3.227
Sugar beet	20.677	13.778	22.947	32.393	29.431	34.889
Sun flower	1.131	822	1.106	1.682	1.554	1.446
Potatoes	12.830	12.273	14.398	16.654	14.185	14.048
Vegetables	13.107	10.866	11.895	15.915	14.886	14.241
BULGARIA						
Cereals, of which:	2.675	2.526	3.154	4.077	3.572	4.094
- wheat	2.805	2.842	3.012	3.809	3.402	4.167
- maize	2.731	1.723	4.236	5.540	4.532	4.154
Sugar beet	14.834	10.434	23.736	24.346	19.755	25.720
Sun flower	973	832	1.370	1.819	1.594	1.802
Potatoes	9.404	7.526	12.089	18.685	15.775	16.309
Vegetables	11.086	9.185	8.555	12.845	15.168	15.894

Source: FAOSTAT, 2011d

However, we consider as more relevant the gaps between Central and Eastern European countries studied in terms of quantities of agricultural products obtained per hectare and the gaps between the four countries and UE.27 average or developed countries within the EU27. Thus, in 2008, from the four countries, Hungary has achieved the highest yields for almost all agricultural products:

- wheat 4981 kg / ha with 22% higher than Poland (4071 kg / ha), 45% higher than of Romania (3422 kg / ha) and 19% higher than Bulgaria (4167 kg / ha);
- maize 7465 kg / ha with 28% higher than Poland (5814 kg/ha), with 131% higher than Romania (3227 kg/ha) and 79% higher than Bulgaria (4154 kg/ha);
- sugar beet to 59666 kg / ha with 28% higher than Poland (46484 kg/ha), with 71% higher than Romania (34889 kg /ha) and 131% higher than Bulgaria (25720 kg/ha);
- potatoes 26901 kg/ha with 36% higher than Poland (19758 kg/ha), with 91% higher than Romania (14048 kg/ha) and 65% higher than Bulgaria (16309 kg/ha).

Nevertheless, in 2008, the yields achieved in the four countries from this study were half and often under half of those recorded in developed European countries as France and Germany where the yields for the main crops were as follows: wheat 7100 kg/ha and 8087 kg/ha, maize 9293 kg/ha and 9809 kg/ha, sugar beet 86762 kg/ha and 62287 kg/ha, potatoes 43586 kg/ha and 43760 kg/ha, vegetables 20737 kg/ha and 30564 kg/ha (FAOSTAT, 2011d).

From the analysis and interpretation of data on the yields per hectare for the main crops in the period 1998 - 2008, we consider the following:

- Hungary and Poland due to higher level of endowment with intensification factors, recorded superior yields per unit area than Romania and Bulgaria;
- In Romania and Bulgaria due to the low level of technical equipment and poor allocation of fertilizers it has established high fluctuations of the yields per hectare from year to year. The general trend for this economic indicator was to declining. We must point out that those fluctuations of the yields also occurred according to climatic conditions;
- In the four countries studied and for all crops, with few exceptions, in the certain favourable agricultural years, there were high differences from the average value of yields per hectare recorded in the European Union - 27.

Finally, after we have analyzed how the four countries using technical progress in agriculture and the gaps that they have registered compared with the EU27 average in the intensification factors use, we conclude that Hungary and Poland mainly practice intensive farming (industrial agriculture system), while Romania and Bulgaria still widely practice extensive farming (traditional agriculture system).

4. NEGATIVE EFFECTS OF TECHNICAL PROGRESS FACTORS USED IN AGRICULTURE

4.1 Negative effects of irrigation

Irrigations make productivity to explode, in other situations maintain crops in drought years or expanding agricultural lands in arid areas. (Brown, 2001)

In some irrigation systems improperly managed, equilibrium of the natural factors of soil has been broken, which in the near future could lead to a fragile ecosystem, with unforeseen consequences for farmers. In this respect, under the influence of increased quantities of irrigation water it takes place biomorphologic changes and configuration of new physical and chemical properties of soil. Thus, as a result, there are the following: a strong compaction of soil, destruction hidrostabile aggregates, reducing soil porosity, slower

movement of water in the soil and reducing the quantity of water in the arable layer. Also, germination and sprouting seeds are more difficult, roots have difficulties to growing, plants after sprouting is not uniform. As a final result, it is obtained poor yields per hectare or in the worst case the crop is fully compromised.

4.2 Negative effects of mechanization

Achieving the mechanized agricultural work is accompanied, at the same time, by the some negative effects, which have different scale and taking part directly to environmental pollution. These effects are inevitable, but through the rational use of equipment and judicious choice of technologies, they can be maintained at a lower level. Mechanization of agriculture has its "share of guilt" regarding environmental pollution, through the proper specific activity, but also in combination with other factors of agricultural production (Mitroi, 2003).

Many of the effects polluting occur directly by using the technical means, tractors and farm machinery for mechanization in agriculture, other effects are indirect, such as those generated by the production of tractors and agricultural machinery or the specialized workshops for repair the agricultural machinery.

Air pollution as a consequence of the emissions from internal combustion engines of farm machinery

Among the polluting effects of mechanization in agriculture, CO2 emissions are the worst polluting factors. The carbon dioxide results from combustion and reach after some time in the upper atmosphere, causing together with other quantities of CO2 from other industrial activities, the worsening the greenhouse effect, with serious negative consequences on the global climate.

Soil compaction or excessive settlement

It is one of the most frequent and more pronounced forms of pollution because of the mechanization. Compaction from the surface is generally caused by the heavy equipment - the wheels tractors, agricultural machinery - and is aggravated by repeated passing on the same land surface of an aggregate. By excessive compaction or settlement, both soil characteristics and rules for the movement of air and water changes to a negative sense. Preventing soil compaction at the surface is possible by: limiting the use of heavy equipment, limiting the number of passes of the tractor or aggregate on the field.

Soil erosion facilitated by some mechanical work

Soil erosion has many causes, but under certain conditions mechanization could act aggravating, for example by making inappropriate tillage on the slopes or the contour lines, but also through the mechanization works which spread the soil, then it is swept away by the wind.

Soil and water pollution

This could be caused by low accuracy of mechanical work with chemicals, such as spreading of chemical fertilizers and spreading of insecticides, fungicides, pesticides and herbicides to combat weeds, diseases and pests. In this case, the main causes of pollution are the chemical treatment, but with high precision mechanical equipment could keep polluting effects within reasonable limits. On the contrary, low accuracy of machinery, especially in terms of uniformity of strength, fineness and uniformity of droplets,

aggravates the pollutant effects of chemicals. Irregular distribution of the chemical fertilizers leads to overdosing or underdosing of the nutrients.

Through underdosing the plants cannot produce according to their genetic potential and they are also sensitive to some factors such as pests or meteorological factors. For the plants receiving higher doses can appear quality impairment, they are susceptible to diseases and pests and heterogeneous maturation process. However, chemical fertilizers allocated in excess, especially nitrogen unused by plant reach into the deeper layers of soil to groundwater.

Indirect pollution caused by equipment for mechanization of agriculture

Indirect pollution is considered that caused to manufacture of tractors and agricultural machinery as well as scrapping or dismantling through harmful effect on the environment damage because of paints, varnishes, solvents (Dumitru, 2000).

4.3. Negative effects of chemical fertilizers

In recent decades, many scientific studies point out the negative effects can be caused by chemical treatment in agriculture, especially where fertilizers and pesticides are not rationally used (Cuculeanu, 2011). Of these effects can include: soil and ground water pollution, land degradation, agricultural land erosion, decreasing of agricultural production, destruction of microfauna and microflora, soil poisoning, etc.

Where there fertilizer consumption is excessive, nutrients reach into the rivers and oceans and it can lead to multiplication of algae that consume the entire quantity of oxygen from the water and die, creating through their decomposition an area without marine life. Agricultural production increases to the detriment of aquatic ecosystems (Brown, 2001).

In many countries it was found that the allocation of excessive quantities of nitrogen fertilizer increases the nitrogen content into the groundwater and thus in drinking water from an agricultural area.

Concerns about the risks of chemical fertilizers in agriculture, both in terms of consumer health and environmental effects have occurred since the '60s. However, the research attempts to find technological alternatives to reduce the negative effects, their results materializing in alternative agricultural systems, which eliminate or significantly diminish the consumption of chemical fertilizers and pesticides, such as: organic farming, sustainable agriculture, biodynamic agriculture, permaculture etc.

Implementation of such agricultural systems depends on the extent to which environmental objectives do not affect the economic performance of farmers (Rădulescu, 2004).

CONCLUSIONS

Knowledge the effects of intensification factors used in agriculture from the two aspects - economic and ecological - is particularly important if we evaluated from the perspective of some of the most important issues facing the mankind worldwide.

One of the main and essential objectives for mankind is food security. But at worldwide level, the virgin land resources susceptible to be cultivated are close to exhaustion, in these

circumstances increase the land productivity is the key for feeding of the 80 million people added annually.

Intensification factors of agricultural production were resolving at least a part of this. Since the middle of last century, if farmers were not able to almost triple the productivity of agricultural land (in some developed countries the multiplication was even higher) it should have been deforestation some important areas from remaining forests in order to produce food. On account of intensification factors, countries like USA, China, France, Britain, Germany etc. have increased four times yield per hectare.

If gradually intensification the effects of factors relating to increasing agricultural production are unsatisfactory, there is a solution for farmers to increase the quantities applied per hectare without knowing the side effects that can occur. Structuring of factors intensification and finding the optimal quantity that can be applied is particularly controversial because of the different reactions that could result. Oversizing the quantities can lead to economic and especially ecological imbalances that can cause soil pollution, degradation and many other negative situations and often irreversible.

The positive aspects of using intensification factors, as shown above, are easily and undoubtedly observed if we look in terms of agricultural production and economic growth worldwide. However, does not know exactly the effect it can have long and irrational use of these factors on ecosystems, soil and nature.

Chemical fertilizers, irrigation, mechanization of agriculture and any of the other factor intensification, should be rationalized in terms of quantities applied, the structures and methods used in their application. In this respect, it is necessary to find possible equilibrium between economic and ecological. This is very difficult because often the economic optimum is not the same with the ecological and in most cases is aimed to maximize the profit to the detriment of ecological consequences. Nevertheless, in recent years, the ecological effects of the intensification factors represented a serious concern for both researchers and farmers.

The interdependence between economy and ecology is a subject very debated. If attention is not given to the correlation between economic and ecological effects, it will lead inevitably to severe degradation of the environment with disastrous effects on society as a whole.

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