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AGGREGATE EFFICIENCY OF RESOURCE UTILIZATION IN THE ROMANIAN AGRI-FOOD SECTOR – MACROECONOMIC EVOLUTIONS

ABSTRACT

The paper attempts to bring to public debate certain asymmetrical evolutions present in the complicated and difficult process of command economy transformation into a functional market economy, with a special focus on Romania's agri-food sector.

One of the economic phenomena acting as a "catalyst" in the deterioration of sector performance and of perennial asymmetries from the Romanian economy is the so-called "double fracture" that has been produced between crop production and animal production, inside agriculture, on one hand, and between agricultural production and food industry production, on the other hand.

The asymmetries of internal correlative evolutions appeared on the background of the relative stability of agricultural production (neither increase above 5% nor decrease greater than 10% compared to 1989), hence its important social "buffer" role.

The increase in gross value added was mainly due to the extensive factor (labour) and to the two intensive factors (gross fixed capital efficiency and gross value added intensity). The extensive factor (fixed capital endowment) had a negative influence upon the gross value added.

Comparing the dynamics of synthetic indicators in agriculture and food industry with that of overall national economy, it results that the national economy dynamics is outrun by the two components of the agri-food sector.

The productivity of fixed funds from agriculture has a higher dynamics than that of the food industry, due to the lower volume of these and to the underutilization of production capacities from the large food industry processing units.

The measurements of regional gaps in the aggregate efficiency of resource utilization in the agri-food sector reveal that, even in certain periods of time (from 1990 to 2011) characterized by economic growth at macro level, the regional gaps tended to grow larger, thus putting under question the reaching of convergence and social cohesion.

Key words: agri-food economy, extensive factors, intensive factors, factor productivity, regional gaps.

JEL Classification: D24, D61, E22, O47, Q11, R12.

1. FOOD CONSUMPTION AND AGRI-FOOD SUPPLY

1.1. Food consumption – starting point

Romania's agri-food sector is under process of restructuring and settling its structures on the market principles. The structural reform finality should be competitiveness increase in the overall agri-food sector and in each of its

components. For reaching the economic performance objectives it is necessary to evaluate what has been achieved so far and to outline the development directions in perspective.

The agri-food sector performance is ultimately reflected in the ensurance of food security for the population and in its participation to the structuring and harmonization of national economy development. The increase of the population's food quality and food self-sufficiency largely depend on agriculture integration with the food industry and related activities.

The food security for the population did not have a satisfactory level, mainly from the structural and quality point of view. The evolution and structure of food consumption per capita reveals the interdependency between agriculture and food industry performance and the country's economic power (Table 1).

The population's food consumption in the transition period has been largely influenced by the impact of the continuous deterioration of national production and incomes, amplified by unemployment and inflation.

The evolution of yearly average consumption per capita by main agri-food products reveals its worsening tendency, both in quantity and structural-quality terms. After the period of yearly consumption depreciation until 1989, a sharp improvement followed in 1990, due to the strong demand stimulation and massive penetration of agri-food imports. The national production decrease was also transmitted to the food consumption, which began its decreasing trend afterwards.

Among the main characteristics of the population's food consumption in the transition period, the following can be mentioned:

- High level of consumption of cereals and cereal-based products (in flour equivalent), bread and maize flour becoming basic foodstuffs in the diet of all population's households, both in the urban and rural area;
- Low consumption of meat and meat products, which reached only 46.3 kg/capita/year, i.e. slightly above the average EU consumption;
- Consumption decline in vegetables and vegetable-based products, as well as in fruit and fruit-based products, due to the considerable decline of domestic supply of fruit and vegetables, caused by the deterioration of a large part of farms where these products are obtained;
- Potato consumption increase, which, together with the cereals, contributes to the deficient quality of the food consumption structure in Romania, compared to the EU.

The complex analysis of the population's food consumption reveals, besides the above-mentioned characteristics, a series of features derived from the specificity of social structures from Romania. Thus, the high share of the rural population (over 45%) in our country determines a mixed food consumption pattern (an urban one, where access to food is mainly restricted by the household purchasing power, and a rural pattern, which includes the households with agricultural land whose food situation depends both on their own agricultural production and on their purchasing power).

Table 1
Yearly average consumption* per capita, by main agri-food products, in the period 1985–2010

	Cereals (equiv. flour)	Potatoes	Vegetables (equiv. fresh veg.)	Fruit (equiv. fresh fruits)	Sugar (equiv. refined sugar)	Veget. and anim. fat (gross weight)	Milk and dairy prod. (equiv. milk 3.5% fat, excl. butter)	Eggs (pieces)	Fish (fresh fish equiv.)	Meat and meat prod. (equiv. fresh meat)
	kg	kg	kg	kg	kg	kg	litri	pieces	kg	kg
1985	143,0	78,4	169,8	71,0	26,3	17,7	170,6	254	...	55,1
1989	157,3	71,7	135,6	53,9	24,7	16,7	135,9	229	...	50,2
1990	152,5	59,4	127	59,5	27,3	18,2	140,1	246	5,1	61,0
1991	145,3	48,0	111,4	45,7	26,4	16,5	163,3	241	6,7	54,4
1992	146,5	60,0	123,8	47,1	24,4	14,4	163,7	196	4,2	49,6
1993	159,6	73,9	135,1	64,3	23,7	14,1	176,9	190	2,1	51,6
1994	158,6	66,7	133,3	47,8	34,5	12,9	179,5	194	2,6	49,6
1995	162,4	71,0	140,4	45,8	23,5	14,2	188,6	197	2,8	51,2
1996	160,6	73,4	141,8	50,5	24,8	14,3	192,7	199	2,9	50,2
1997	169,8	81,7	135,9	44,5	19,9	13,0	192,4	186	2,0	48,5
1998	166,7	84,1	145,9	45,8	20,5	13,4	194,4	201	3,0	51,2
1999	166,2	86,1	156	43,4	20,9	14,5	194,0	206	2,2	48,3
2000	165,8	86,5	134,3	44,5	23,0	16,5	193,0	208	2,6	46,3
2001	166,9	88,0	147,2	48,1	24,0	17,1	197,4	227	2,6	48,0
2002	169,8	90,1	147,7	45,4	23,5	17,0	215,0	238	3,2	54,3
2003	162,2	95,4	177,7	59,6	24,3	17,2	225,0	239	3,5	60,3
2004	166,2	97,9	183,3	77,4	25,6	16,2	238,9	289	3,9	65,5
2005	162,6	98,0	162,6	75,9	27,4	18,2	239,2	284	4,5	68,3
2006	157,3	97,4	181,7	83,2	29,0	19,2	246,6	277	4,6	69,9
2007	156,0	96,1	164,1	67,8	24,9	17,1	252,8	268	3,8	66,7
2008	154,1	99,5	176	66,7	23,2	17,9	254,7	267	4,0	66,6
2009	151,7	93,1	168,2	62,3	25,8	19,9	233,2	243	4,8	67,5
2010	150,4	98,2	174,4	63,3	22,1	18,2	224,0	239	4,6	60,0

*availability of consumption

Source: Romania's Statistical Yearbook, 1991–2001, 1990–2010 Statistical series, NIS, 2012.

The effects of transition upon the dynamics of these consumption patterns were mainly materialized by the intensification of the subsistence and autarchic character, at least for the population segments in the poverty zone. In fact, in the rural area, there is solvent food demand only for the products that cannot be obtained on people's own households (sugar, edible oil, certain alcoholic beverages).

The divergent evolutions signalled out in the food consumption levels and structures in the transition period generated a series of disequilibria, characterized by: relatively low consumption of animal protein; relatively high consumption of animal fats; high share of cereal consumption; low fruit consumption; great seasonal differences, by seasons, in the consumption of vegetables, fruit, potatoes, eggs, etc.

The drawbacks of quantitative, structural and qualitative nature noticed in the agri-food consumption make it necessary to adopt a food policy targeting: production of certain agri-food products, sufficient in volume, structure and quality, to satisfy the population's food needs throughout the year; access to food for all the population categories, including the less-favoured ones; combining the equity and economic efficiency criteria in food production and distribution, for an increased efficiency and equity; obtaining complex, nutritious, clean products, with a quality in line with the international standards.

Meeting the population's food demand depends not only on the existence of availability of foodstuffs, but also on the population's solvent demand, consequence of the size of the gross domestic product and of the level of food prices. In the years of transition to the market economy, as a result of the gross domestic product and price evolution, a diminution of the population's purchasing power took place. At present, the share of agri-food products in total consumption expenditures is about 60% for the families of employees (compared to 51.1% in 1989), 77.1% for the families of peasants (69.9%) and 67.7% for the families of pensioners (59.8%). Such a situation hinders the domestic market development, representing a main obstacle to economic growth.

Hence the conclusion that the food policy is not only related to agriculture and food industry, but to the entire national economy as well. Surmounting the present situation equally depends on the macro-economic and sectoral policy, through which new correlations should be created between the evolution of the population and of the gross domestic product, between the national and sectoral labour productivity, between incomes and prices, which should result in an increased solvent demand, enlargement of domestic market and economic driving effects.

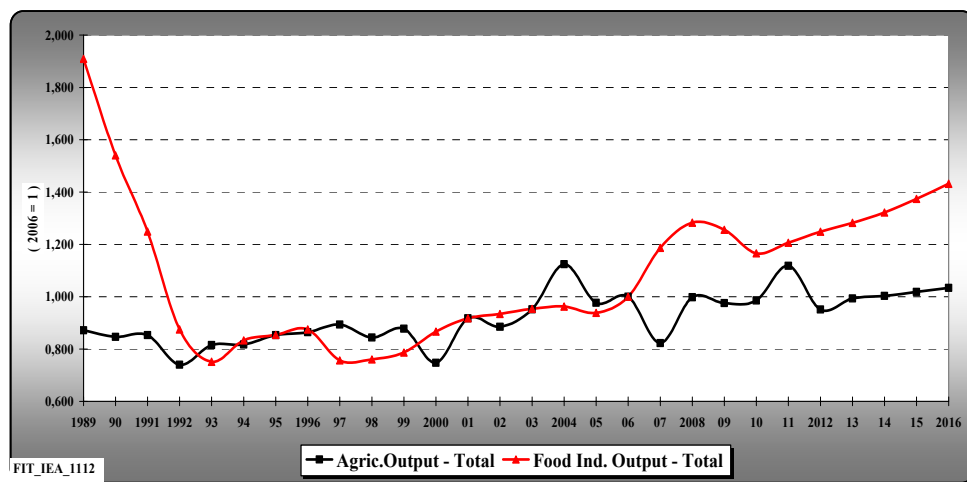
The food consumption pattern under its optimal form of generalized satiety can result in perspective both from income growth and from the diminution of food prices in real terms, so that the share of the population's cash expenses for food consumption in total consumption expenses decreases from over 50% to about 15–20%, which is the percentage in the EU countries.

In order to reach these levels, starting from the fact that the final food production is obtained on disparate economic units, one of the main food policy

options consists in the creation of an integrated organization modality of the entire agri-food system – agriculture, food industry, distribution – using the market mechanisms for this purpose – prices, credits, subsidies, taxes, etc.

1.2. Aggregate agricultural and food supply – evolution and prospective evaluations

The dynamic correlation between the agricultural production and the food production can reflect the distortions produced in ensuring the necessary agri-food products for the population's consumption in the period of transition (Figure 1).



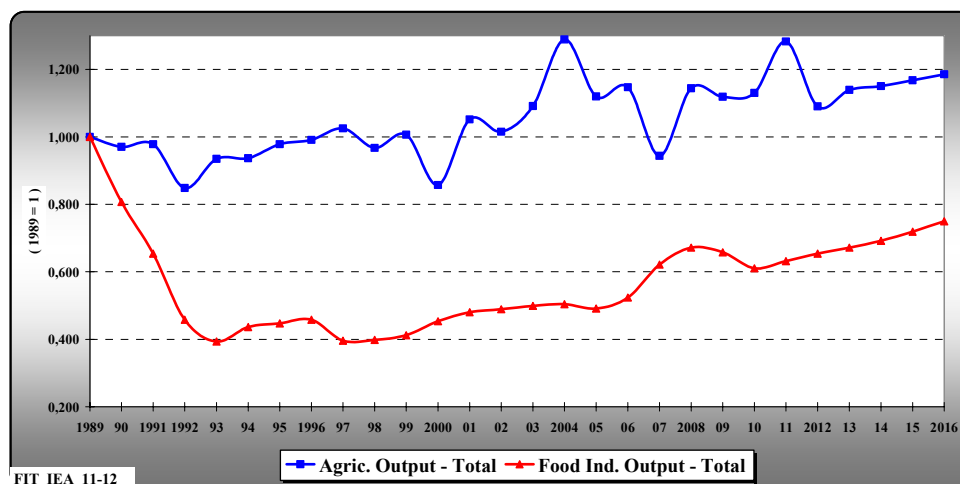
Source: Own calculations, based on data from Romania's Statistical Yearbook, 1990–2010 data series, NIS, 2012; for 2010–2016, Forecast of the National Forecast Commission, 23.11.2012.

Figure 1. Agricultural Output and Food Ind. Output in Romania, 1989–2016 (2006 = 1).

In the previous year to Romania's accession to the EU (2006), agricultural production was by 12.8% lower than that of the year 1989; throughout the transition and pre-accession period, the agricultural production unit was larger than one only in one year (2004). At the same time, in the year 2006, food production was by almost 91% under its level in 1989, yet by 24.9% above the maximum level of the "collapse" (1993 = 0.751).

Five years of EU membership practically meant a persistence of agricultural production rebound (by 7.4% in 2011 compared to 2006), yet a consistent advance of food production (by 36.2%), which can only make up for less than half of the decline compared to 1989. Competitiveness increase of Romania's agri-food sector in the post-accession period implies the qualitative improvement of the population's food consumption, prioritarily on the basis of domestic resources and getting closer to the EU level. Within the endogenous competitiveness resources of

the agri-food sector, it means the attenuation of unfavourable consequences of the persistent “agri-food disintegration” phenomenon (between the agricultural production and the agro-industrial processing)¹ (Figure 2).



Source: Own calculations, based on the data from Romania’s Statistical Yearbook, 1990–2010 data series, NIS, 2012; for 2010–2016, Forecast of the National Forecast Commission, 23.11.2012.

Figure 2. Agricultural and food production in Romania, 1989–2016 (1989 = 1).

According to the most recent statistical and forecast data, agricultural production in the year 2012 was by only 9% above that in the year 1989; in the period 1990 – 2012 the lowest production level could be noticed (in the year 2000, with an index of 0.857), as well as the highest production level (year 2004, with an index of 1.289).

On the other hand, industrial food production in the year 2012 was by 34.6% lower than in the year 1989; throughout the investigated period, the maximum “decline” was in the year 1993 (–60.7%), and the minimum decline in the year 1990 (–19.3%).

It is worth mentioning that, compared to the year 2012, the official production forecasts predict an increase by 8.72% of agricultural production in the year 2016, while the estimated increase of food production could reach 14.68%.

It is clear that the growth rate of agri-food processing outrunning the growth rate of the production of agricultural raw materials could lead to narrowing the gap between the two main components of agri-food economy.

Under these conditions, one question would arise: in how many years the food production level could be equalized to the level of agricultural production. Two calculation methodological alternatives could enable an answer to this question:

¹ See Zahiu, L., Toncea, V., Lăpușan, A., Toderoiu, F. Dumitru, M. (2003), *Structurile agrare și viitorul politicilor agricole*, Editura Economică, București, pp. 268–271.

– The first, which determines the period of gap recovery (in years), in the conditions of an yearly average growth rate of food production higher than that of the agricultural production;

– The second, which determines the yearly average growth rate necessary for food processing to reach the agricultural production level.

According to the first methodological alternative, at differentiated yearly rates, in the sense that food production could evolve at a rate of 5%, determined for the period 2001–2008 (2000 = 1), and the agricultural production by 2.8%, determined for the period 2001–2010 (2000 = 1), the time period necessary to equalize the two levels (starting from 2012) is almost 24 years; after this moment, both components of the agri-food system would be about 2.1 times as high compared to their levels in the initial year.

In the second methodological alternative, for food processing to reach the agricultural production level in the year 2010 (index versus 1989 = 1.130), starting from the index 0.454 (2000 versus 1989), an average yearly growth rate of about 9.5% would be necessary. In these conditions, the gap recovery rate could be reduced to about 8 years, and after this moment both sectors could reach a level by 36.1% above the level of the year 2012.

Thus, it results that at an annual “cruising speed” of about 2.8% of agriculture and by “forcing” the annual rate of food processing to about 9.5% (by 4.5 percent versus the first alternative), the gap can be recovered in a time period almost 3 times shorter. This makes this alternative be relatively plausible for the future development of Romania’s agri-food economy.

2. AGRI-FOOD ECONOMY – STRUCTURES AND PERFORMANCES

2.1. The agri-food economy structure and comparative performances

In the National Accounts, the agri-food sector is represented by two economic aggregates: **agriculture**² and **food industry**³.

The measurement and comparative analysis of the sectoral economic performance, as support to domestic competitiveness, can orient the internal and/or external investment flows. The National Accounts⁴ ensure, for the period 1989–2009, multiple quantification and sectoral analysis possibilities, which enable the evaluation of results in order to substantiate the development strategy and programs.

² **Agriculture** (AVSPP) comprises: crop production; livestock raising; auxiliary services (for farmers); forestry and hunting; forest operation; pisciculture and fisheries.

³ **Food industry** (IABT) includes: meat production and preservation; fish processing and preservation; fruit and vegetables processing and preservation; production of vegetable and animal fats and oils; production of dairy products; production of milling products, of starch and starch-based products; production of other food products (sugar included); production of other food products; tobacco industry; production of beverages.

⁴ The statistical information system of National Accounts became operational for the period 1989–2008.

The matrices of intermediary economic flows within the agri-food economy, for the period 1989–2008, make it possible to quantify two simultaneous processes, manifested in the pre-accession and post-accession transition years:

- the process of relative “agri-food disintegration”, which took place in most central and east-European countries, over longer or shorter periods of time, through the disaggregation of economic inter-relations in the six sub branches supplying agro-forestry raw products and the ten sub branches of food processing;
- the process of sectoral economic performance depreciation, measured by two economic resultative indicators that are sufficiently relevant: **material intensity of final production**⁵ and **net efficiency of intermediary consumptions**⁶.

Out of the multitude of quantification modalities of the structural changes produced in the sectoral economic performance level and trend, we chose to use a couple of relevant indicators which, in their final utilitarian expression, could represent **hierarchization criteria** of sub branches, according to capital fructification force. On one hand, we have in view the **intensity of intermediary inputs** (share of intermediary consumptions in the final agricultural output); on the other hand, the **net efficiency of intermediary inputs** (gross value added per one RON intermediary consumptions).

The intensity of intermediary consumptions in the two main components of the agri-food economy (EAA), i.e. the agricultural production “aggregate” (AVSPP) and food processing (IABT), compared to overall national economy (TRAM), features a wide range of situations, on one hand deriving from the specificity of these production activities and on the other hand, from the speed and intensity of economic and social processes that took place throughout the period 1989–2009 (Table 2).

A few remarks should be made referring to the material “behaviour” of the production intensity in agriculture, food industry, agri-food economy and national economy:

- the lowest shares of intermediary inputs are found in the aggregate “agriculture”, their oscillation margin ranging from the minimum level of 38.8% (1990) to the maximum level of about 54.8% (2007), the variation coefficient being 6.94%, the highest in the four investigated economic “aggregates”;
- the lower level of variation coefficient (6.47%) of the intensity of gross value added in the final agricultural output (VABv%) could be partly explained by the relative “stability” of the labour “stock” that, with a poor technological endowment and poorly paid, generates the critical mass of the newly created value;
- the material intensity of food production ranged from minimum 62.14% (2005) to maximum 76.23% (1989), the 14.1 percentage rebound being explained, be it in part, by the strong asymmetry of the destructuring and restructuring processes in the two segments of the agri-food economy;

⁵ Also found in the economic literature as material intensity of production, this indicator is determined as ratio of intermediary consumptions (IC) to final production (FP).

⁶ It is calculated as ratio of gross value added (GVA) to intermediary consumptions (IC).

- the maximum level of the intensity of intermediary inputs in agriculture (54.76%, in the year 2007) is under the minimum level of the material intensity of food production (62.14% in 2005).

Table 2

Intensity of intermediary consumptions in Romania's economy, in the period 1989–2009

	AVSPP		IABT		EAA		TRAM	
	Ch%	VABv%	Ch%	VABv%	Ch%	VABv%	Ch%	VABv%
1989	49.22	50.78	76.23	23.77	62.34	37.66	70.08	34.74
1990	38.80	61.20	72.95	27.05	53.23	46.77	62.32	37.68
1991	49.59	50.41	75.04	24.96	59.68	40.32	62.52	37.48
1992	49.88	50.12	73.79	26.21	59.44	40.56	61.34	38.66
1993	47.65	52.35	67.60	32.40	54.66	45.34	57.08	42.92
1994	44.79	55.21	64.84	35.16	52.19	47.81	54.20	45.80
1995	45.48	54.52	69.81	30.19	54.84	45.16	54.95	45.05
1996	47.92	52.08	71.47	28.53	57.93	42.07	57.57	42.43
1997	46.23	53.77	69.54	30.46	56.29	43.71	56.42	43.58
1998	47.56	52.44	67.45	32.55	56.09	43.91	53.51	46.49
1999	47.24	52.76	69.22	30.78	57.18	42.82	54.86	45.14
2000	48.55	51.45	67.43	32.57	57.66	42.34	53.65	46.35
2001	46.44	53.56	63.23	36.77	53.91	46.09	53.62	46.38
2002	48.17	51.83	63.55	36.45	55.07	44.93	53.68	46.32
2003	46.98	53.02	64.70	35.30	54.83	45.17	54.00	46.00
2004	47.03	52.97	65.08	34.92	54.71	45.29	54.35	45.65
2005	51.11	48.89	62.14	37.86	56.42	43.58	53.42	46.58
2006	50.51	49.49	62.36	37.64	56.36	43.64	53.65	46.35
2007	54.76	45.24	62.36	37.64	58.84	41.16	53.02	46.98
2008	53.43	46.57	62.67	37.33	58.05	41.95	53.48	46.52
2009	52.13	47.87	62.49	37.51	57.45	42.55	53.84	46.16
Average	48.26	51.74	67.33	32.67	56.53	43.47	56.26	43.97
StDev	3.35	3.35	4.55	4.55	2.41	2.41	4.35	3.66
CoV%	6.94	6.47	6.76	13.94	4.26	5.54	7.73	8.32

Source: own calculations, based on data from Romania's Statistical Yearbook, 1990–2010 data series, NIS, 2011.

The gross efficiency (through final output) and net efficiency (through gross value added) of intermediary inputs in the two important segments of the agri-food economy (EAA), i.e. the agricultural production “aggregate” (AVSPP) and the food processing (IABT), compared to the overall national economy (TRAM), features a higher variability than the material intensity of production (Table 3).

There are a few relevant aspects worth mentioning in relation to the sector tendency to generate value added in national economy:

- in the “agriculture” aggregate, the net efficiency of intermediary consumptions (VABv/CIv) in the period 1989–2009 has values ranging from 1.58 RONs VABv/ RON CIv (1990) to 0.83 RONs/ RON (2007), the performance rebound having an yearly rate of 3.73%; this trend can be considered as an alarming trend for the challenges that agriculture will have to face;
- on the contrary, in the agri-food processing sector, the capacity to generate value added of a monetary unit of intermediary input has experienced a slight

improvement tendency, from a minimum level of 0.31 RONs/RON (1989) to 0.61 RONs/RON (2005), with a performance growth rate of 4.27%; this trend will be also imprinted to the agri-food economy aggregate (EAA).

Table 3

Net efficiency of intermediary inputs in Romania's economy, in the period 1989–2009

	AVSPP		IABT		EAA		TRAM	
	PFv / Cfv	VABv / Cfv	PFv / Cfv	VABv / Cfv	PFv / Cfv	VABv / Cfv	PFv / Cfv	VABv / Cfv
1989	2.03	1.03	1.31	0.31	1.60	0.60	1.53	0.53
1990	2.58	1.58	1.37	0.37	1.88	0.88	1.60	0.60
1991	2.02	1.02	1.33	0.33	1.68	0.68	1.60	0.60
1992	2.00	1.00	1.36	0.36	1.68	0.68	1.63	0.63
1993	2.10	1.10	1.48	0.48	1.83	0.83	1.75	0.75
1994	2.23	1.23	1.54	0.54	1.92	0.92	1.84	0.84
1995	2.20	1.20	1.43	0.43	1.82	0.82	1.82	0.82
1996	2.09	1.09	1.40	0.40	1.73	0.73	1.74	0.74
1997	2.16	1.16	1.44	0.44	1.78	0.78	1.77	0.77
1998	2.10	1.10	1.48	0.48	1.78	0.78	1.87	0.87
1999	2.12	1.12	1.44	0.44	1.75	0.75	1.82	0.82
2000	2.06	1.06	1.48	0.48	1.73	0.73	1.86	0.86
2001	2.15	1.15	1.38	0.38	1.85	0.85	1.87	0.87
2002	2.08	1.08	1.37	0.37	1.82	0.82	1.86	0.86
2003	2.13	1.13	1.55	0.55	1.82	0.82	1.85	0.85
2004	2.13	1.13	1.54	0.54	1.83	0.83	1.84	0.84
2005	1.96	0.96	1.61	0.61	1.77	0.77	1.87	0.87
2006	1.98	0.98	1.60	0.60	1.77	0.77	1.86	0.86
2007	1.83	0.83	1.60	0.60	1.70	0.70	1.89	0.89
2008	1.87	0.87	1.60	0.60	1.72	0.72	1.87	0.87
2009	1.92	0.92	1.60	0.60	1.74	0.74	1.86	0.86
Average	2.08	1.08	1.49	0.49	1.77	0.77	56.26	43.97
StDev	0.15	0.15	0.10	0.10	0.07	0.07	4.35	3.66
CoV%	7.41	14.25	6.57	19.94	4.21	9.65	7.73	8.32

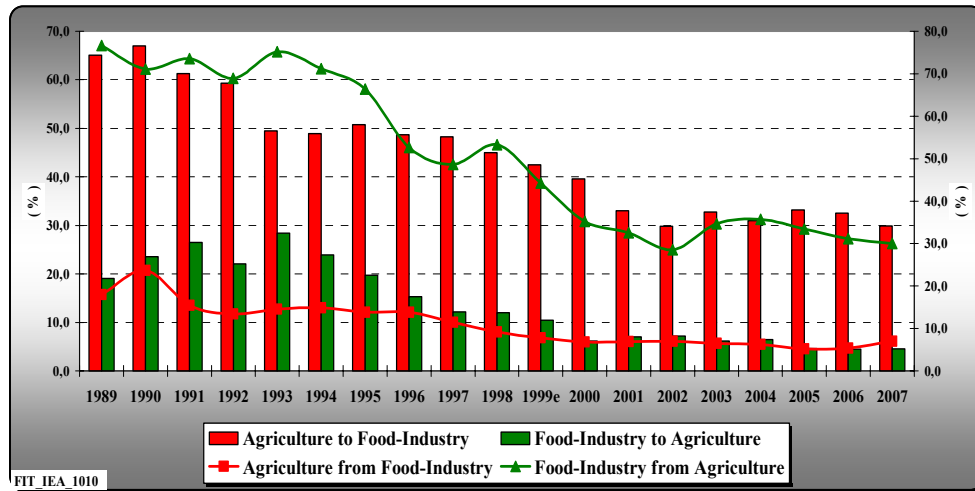
Source: own calculations based on Romania's Statistical Yearbook, 1990–2010 data series, NIS, 2011.

2.2. “Agricultural production – agri-food processing” inter-relations

The synthetic expression of the presence of an agri-food disintegration process in Romania's economy, throughout the period 1989–2007, results from the analysis of the intensity of economic flow between the “agriculture” aggregate and the “food industry” aggregate, both from the perspective of intermediary deliveries (destinations) (LI) and of intermediary acquisitions (origins) (AI).

Thus, from the perspective of intermediary deliveries, one can notice a diminution by over 35% of the intensity of intermediary deliveries of agriculture to the food industry (from 65.1% in 1989 to only 29.9% in 2007, with a maximum point of 67.0% in 1990 and a variation coefficient of 27.6%) (Figure 3).

At the same time, the intensity of intermediary deliveries of food industry to agriculture dropped by more than 14.5 percentage points (from 19.1% in 1989 to 4.6% in 2007, with a peak of 28.4% in 1993 and a variation coefficient of 60.7%).



Source: own calculations, on the data from Nat. Accounts, 1990 - 2007, NIS;

Figure 3. Inter-relations between agriculture and food industry, 1989–2007.

The experienced decline has multiple causes, which are found both in the development pattern of the agri-food sector in the command economy and in the failures of transition to market economy, among which the following can be mentioned:

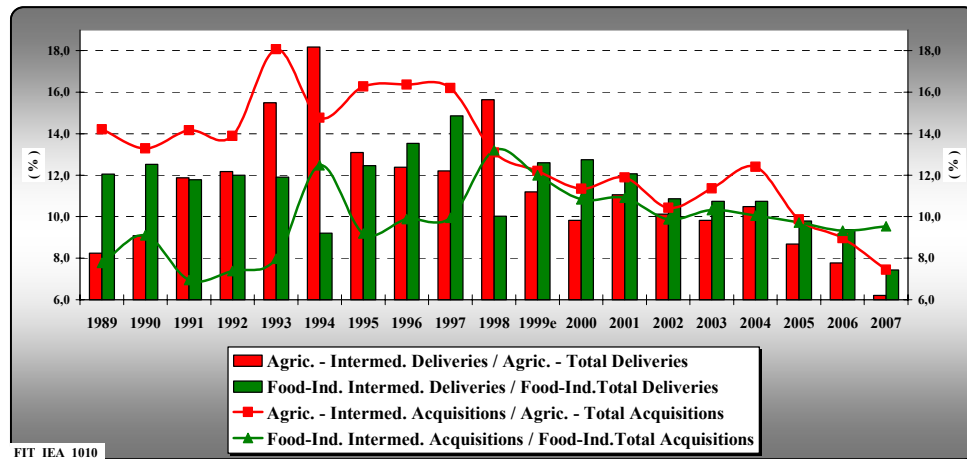
- asymmetry of destructuring in agriculture (much faster and more radical), compared to that in the food industry (slower and more superficial);
- narrowing the population's final agri-food consumption demand, as a result of the general economic rebound, under the background of persistent hyper inflation.

On the other hand, as regards the intermediary acquisitions, we must signal out a stronger diminution (by 46.7%) of the intensity of intermediary acquisitions of food industry from agriculture (from 76.7% in 1989 to 30.0% in 2007, with a variation coefficient of 35.8%).

At the same time, the intermediary acquisitions of agriculture from the food industry decreased their intensity by 11 percentage points (from 18.0% in 1989 to 7.0% in 2007, with a peak of 23.7% in 1990 and a variation coefficient of 46.7%).

One of the explanations of the agri-food disintegration phenomenon in the Romanian economy resides in the situation created by the excessive increase in number of the suppliers of agricultural raw products, compared to the relatively low number of agri-food processors, asymmetric "atomization" generating very high variation coefficients.

The other modality to reflect the internal agri-food economy convergence consists in measuring the intensity of intermediary deliveries (**LI**) and of intermediary acquisitions (**AI**) respectively, of each of the two component aggregates (agriculture – **a** and food industry – **ia**) in the corresponding total (Figure 4).



Source: own calculations, on the data from Nat. Accounts, 1990 - 2007, NIS;

Figure 4. Share of agriculture and food industry in total intermediary deliveries and acquisitions of the respective sectors (LI and AI), 1989–2007.

A few remarks can be made on the persistence of the agri-food disintegration phenomenon in Romania's economy:

➤ The highest relative instability (measured through the variation coefficient) is found in the "agriculture" aggregate, its shares ranging from 18.2% (1994) to 6.2% (2007), with a variation coefficient of 26.2%, at intermediary deliveries, and from 18.1% (1993) to 7.5% (2007), respectively, with the variation coefficient 21.2%, at intermediary acquisitions;

➤ The "food industry" aggregate had lower shares, ranging from 14.9% (1997) to 7.4% (2007), with an average variation of 15.2%, at intermediary deliveries, and from 13.2% (1998) to 7.0% (1991) respectively, with a variation coefficient of 16.8%, at intermediary acquisitions.

Thus, it results that the endangerment of reaching economic convergence through agri-food integration, generated by the strong relative instability of agriculture intermediary deliveries, as a cumulative reflex of the weather-dependence influences and of the economic-organizational risks in this field, is mostly obvious.

Among the factors that influenced the regression trends of sectoral performance, we can list the following:

- Non-clarification in due time of the juridical relations with regard to ownership statute on land and production means in agriculture, which generated a certain instability in agricultural production;

- Acquisition and utilization of intermediary inputs on an increasingly small scale, as a result of their becoming more expensive. The input prices increased more than the prices of agricultural products. Cost increase was also the result of the destruction of fixed productive capital stock in agriculture (irrigation and desiccation systems, agro-zootechnical constructions, fruit-tree and vine plantations, breeding livestock herds, etc.);

- The instability of agricultural production in quantitative terms was transmitted to the downstream sectors, and mainly to food industry, where the processing capacities, sized for the large suppliers of raw agricultural products, largely remained unused due to the excessive fragmentation of the domestic supply of agri-food products and to the increased propensity to self-consumption of individual farmers.

2.3. Extensive and intensive determinants of internal economic growth

A relevant modality to determine the influence of extensive and intensive factors on the sectoral output dynamics is based on the utilization of the synthetic indicators of agricultural production from the national accounts. We refer here to the aggregate expression relation of the gross value added dynamics as a result of multiplicative interlinking of four extensive and intensive factors (Table 4), namely:

$$Y = [L * (K / L) * (P / K) * (1 - C / P)] \quad [1]$$

where: Y = gross value added; L = labour force; K = fixed capital stock; P = final agricultural output; C = intermediary consumptions; K/L = fixed capital endowment; P/K = gross efficiency of fixed capital; Y/P = gross value added intensity.

In the previous formula [1], we mention that the extensive factors are labour and fixed capital endowment, while the intensive factors are gross efficiency of fixed capital and gross value added intensity.

Following the analysis of the four extensive and intensive factors that contributed to gross value added formation, the following conclusions can be drawn:

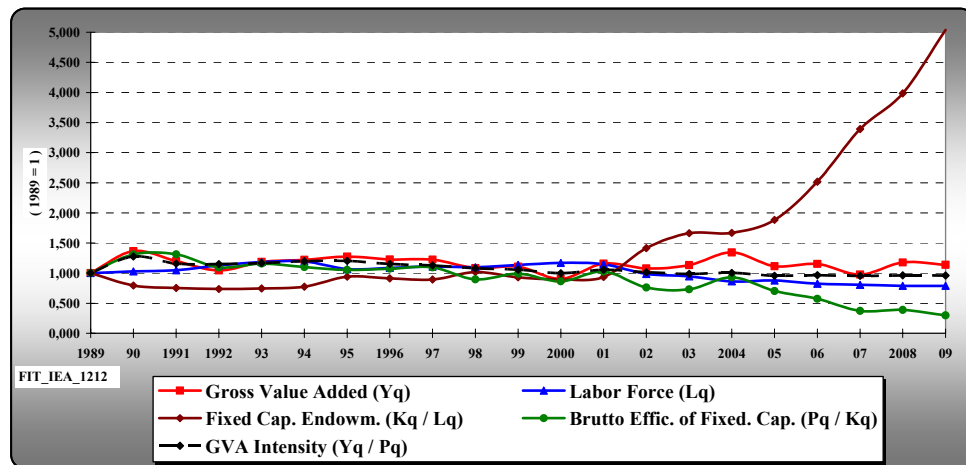
- Labour force in agriculture (extensive factor) was down by almost 21% in the period 1989–2009;
- Fixed capital endowment (extensive factor) was down by 26.3% in the year 1992 compared to 1989, as a result of fixed capital diminution in agriculture and increase in the number of persons employed in agriculture; since 2002, the fixed capital endowment has grown, under the background of the continuous rebound of the labour force stock in the same period;
- The gross efficiency of fixed capital (intensive factor) slightly improved until 1991 (mainly due to the increase of gross value added and considerable diminution of fixed capital stock), to have an oscillating tendency afterwards, resulting from the yearly variations of final agricultural output;
- The intensity of gross value added (intensive factor) relatively slowly increased until 1995, to follow a decreasing trend afterwards.

In conclusion, it results that the gross value added increase was mainly due to extensive factors (labour) and to the two intensive factors (gross efficiency of fixed capital and gross value added intensity). The extensive factor (fixed capital endowment) had a negative influence upon the gross value added (Figure 5).

Table 4
Influence of extensive and intensive factors in agriculture on GVA, 1990–2009 (1989 = 1.000)

	Gross Value Added (Yq)	Labor Force (Lq)	Fixed Cap. Endowm. (Kq / Lq)	Brutto Effic. of Fixed. Cap. (Pq / Kq)	GVA Intensity (Yq / Pq)
1989	1,000	1,000	1,000	1,000	1,000
90	1,364	1,029	0,793	1,309	1,276
1991	1,200	1,049	0,752	1,313	1,159
1992	1,046	1,127	0,737	1,095	1,150
93	1,187	1,183	0,743	1,157	1,166
94	1,220	1,193	0,776	1,101	1,197
95	1,275	1,068	0,941	1,054	1,202
1996	1,226	1,086	0,912	1,074	1,153
97	1,225	1,109	0,893	1,096	1,128
98	1,084	1,098	1,017	0,897	1,082
99	1,107	1,135	0,930	0,991	1,057
2000	0,904	1,170	0,895	0,864	1,000
01	1,159	1,146	0,935	1,025	1,056
02	1,079	0,987	1,415	0,762	1,014
03	1,133	0,945	1,662	0,730	0,988
2004	1,344	0,863	1,669	0,929	1,004
05	1,113	0,876	1,884	0,704	0,958
06	1,152	0,824	2,518	0,574	0,966
07	0,975	0,807	3,392	0,373	0,954
2008	1,178	0,788	3,985	0,390	0,963
09	1,140	0,789	5,037	0,298	0,961

Source: own calculations, based on Romania's Statistical Yearbook, 1990–2010 data series, NIS, 2011.



Source: own calculations, based upon Romania's Statistical Yearbook, 1990–2010 data series, NIS, 2011.

Figure 5. Extensive and intensive determinants of Gross Value Added increase in Romania's agriculture, in the period 1990–2009 (1989 = 1).

The experience of countries with performant economies reveals that if the value added modification follows a positive sense, on the basis of intensive factors, this tendency can be appreciated as economic efficiency growth.

2.4. Real prices and factor utilization efficiency matrices

The share of the main three synthetic indicators of agriculture (final output, intermediary consumptions and gross value added) in national economy, the share of intermediary consumptions and of the gross value added in final output and the net efficiency of intermediary consumptions, as well as the dynamics of these indicators in the period 1989–2009, can be considered as the “structural battery” of the agri-food economy efficiency. On the basis of information from the National Accounts, for the period 1989–2009, it results that the share of final agricultural output in national economy (recalculated in 2009 constant prices) ranged from a minimum 6.19% (2007) to 11.81% (1993) (Table 5).

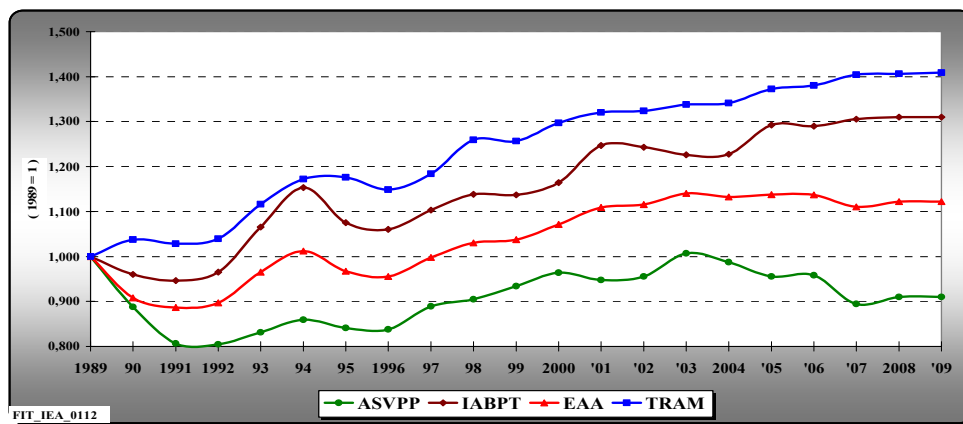
Table 5
Share of agriculture in final output, intermediary consumptions
and gross value added in national economy, 1989–2009

	Final Output (%)	Interm.Consum. (%)	Gross Value Added (%)
1989	7,98	8,49	8,19
90	10,01	8,12	11,45
1991	11,12	10,48	11,42
1992	10,87	10,36	10,94
93	11,81	11,11	12,01
94	11,39	10,43	11,85
95	10,85	9,71	11,58
1996	10,29	9,44	10,83
97	11,05	10,27	11,55
98	10,67	10,29	10,81
99	10,78	10,42	10,98
2000	8,97	9,11	8,72
'01	10,07	9,46	10,56
'02	9,26	9,06	9,37
'03	9,31	9,20	9,36
2004	9,91	9,54	10,23
'05	8,26	8,31	8,19
'06	7,76	7,66	7,85
'07	6,19	6,15	6,22
2008	6,81	6,65	6,99
'09	6,94	6,74	7,18

Source: calculations on the basis of National Accounts data, 1989–2009, NIS, 2011.

The share of intermediary consumption of agriculture in national economy oscillated from a minimum value of 6.15% (2007) to the maximum value of

11.11% (1993) in the 21 years of the investigated period. As regards the gross value added in agriculture, it can be considered that its share ranged from 6.22% (2007) to 12.01% (1993). The aggregate efficiency of resource utilization in the agri-food economy is also influenced, besides the quantitative relations between inputs and outputs, by the conversion of factors, as well as by the real prices of factors and products. Methodologically, the correlations between the real prices from the agri-food economy are also synthetically reflected by the so-called real price “scissors” (Figure 6).



Source: own calculations, based on data from Romania’s Statistical Yearbook 2011, NIS, 2012.

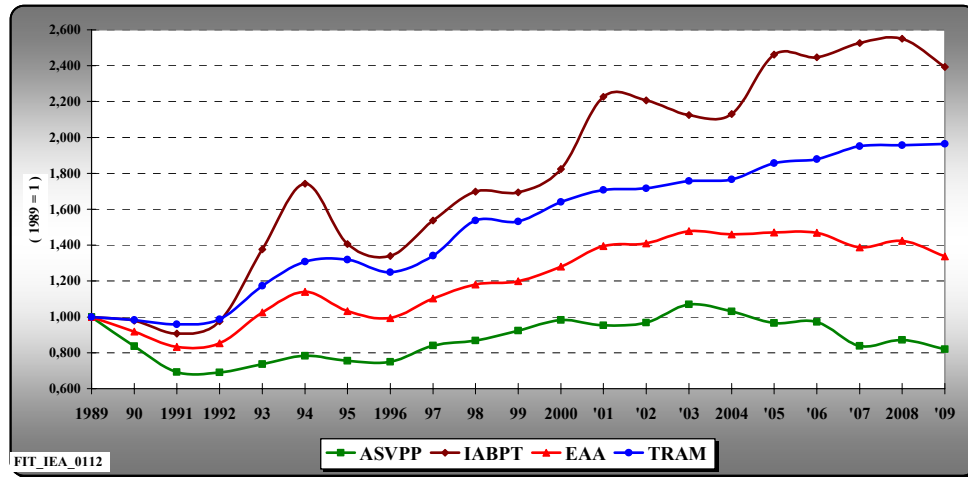
Figure 6. Real price scissors in agri-food economy and national economy (through the final output), in the period 1990–2009 (1989 = 1).

The real price scissors (calculated as ratio of real price index of final output to real price index of intermediary consumptions) features the most unfavourable trend in the “agriculture” aggregate of the agri-food economy, in the sense that it is only in the year 2003 that the “scissors” reached its 1989 level, and the real price ratio got worse again afterwards.

The fact that 12 indices out of 20 of the real price ratio in the agri-food economy are larger than one derives from the fact that in the agri-food processing sector 17 indices are larger than one, which means that in this economic segment remunerating prices were used, much above the prices in agriculture.

Calculated on the basis of gross value added, the real price scissors becomes even more illustrating for the extent to which, through the intermediary input prices, the purchasing power of outputs is eroded (Figure 7).

As a synthetic method of the analysis of aggregate efficiency of resource utilization, at the level of any economic entity, the “matrix of behavioural states” of the inputs (efforts) – outputs (effects) combination is mostly relevant (Table 6).



Source: own calculations, based on data from Romania’s Statistical Yearbook 2011, NIS, 2012.

Figure 7. Real price scissors in agri-food economy and national economy (through gross value added), in the period 1990–2009 (1989 = 1).

Table 6

Matrix of efficiency “states” in agriculture (ASVPP) (final production = Y_q ; intermediary consumptions = X_q), 1989–2009

ASVPP	EFFECT (Yq)	EFFORT (Xq)	< 1			= 1	> 1			STATE-TOTAL	
			Xq < Yq	Xq = Yq	Xq > Yq		Xq < Yq	Xq = Yq	Xq > Yq		
0	A		1	2	3	4	5	6	7	8	
1		$Y_q > X_q$	2			4	6			8	2 FE + 6 E
2	> 1	$Y_q = X_q$									
3		$Y_q < X_q$							4	4	4 NE
4	= 1										
5		$Y_q > X_q$									
6	< 1	$Y_q = X_q$									
7		$Y_q < X_q$			6				2	8	2 FNE + 6 NE
8	STATE-TOTAL		2		6		6		6	20	

Source: own calculations, based on data from Romania’s Statistical Yearbook 2011, NIS, 2012.

In the “agriculture” aggregate, out of the 20 “states”, for the period 1990–2009, 8 favourable states were noticed (6 “efficient” and 2 “highly efficient”) and 12 unfavourable states (2 “highly non-efficient” and 10 “inefficient”).

On the other hand, in the “agri-food processing” aggregate, the matrix of states reveals much more unfavourable behaviours of the dynamic efforts/effects ratios (Table 7).

Table 7
Matrix of the efficiency “states” in the food industry (IABPT)
(final output = Y_q ; intermediary consumptions = X_q), 1989–2009

IABPT	EFFECT (Y_q)	EFFORT (X_q)	< 1			= 1	> 1			STATE-TOTAL	
			$X_q < Y_q$	$X_q = Y_q$	$X_q > Y_q$		$X_q < Y_q$	$X_q = Y_q$	$X_q > Y_q$		
0	A		1	2	3	4	5	6	7	8	
1		$Y_q > X_q$					1			1	1 E
2	> 1	$Y_q = X_q$									
3		$Y_q < X_q$							12	12	12 NE
4	= 1										
5		$Y_q > X_q$	1							1	1 E
6	< 1	$Y_q = X_q$									
7		$Y_q < X_q$			6					6	6 NE
8	STATE-TOTAL		1		6		1		12	20	

Source: own calculations, based on data from Romania’s Statistical Yearbook 2011, NIS, 2012.

Practically, in the agri-food economy, out of the 20 “states”, for the period 1990–2009, 18 were “inefficient” and only 2 states were “efficient”; this inefficiency in the food processing considerably influenced the situation of resource utilization efficiency in overall agri-food economy (Table 8).

Table 8
Matrix of efficiency “states” in the agri-food economy (EAA)
(final production = Y_q ; intermediary consumptions = X_q), 1989–2009

EAA	EFFECT (Y_q)	EFFORT (X_q)	< 1			= 1	> 1			STATE-TOTAL	
			$X_q < Y_q$	$X_q = Y_q$	$X_q > Y_q$		$X_q < Y_q$	$X_q = Y_q$	$X_q > Y_q$		
0	A		1	2	3	4	5	6	7	8	
1		$Y_q > X_q$	1				5			6	1 FE + 5 E
2	> 1	$Y_q = X_q$									
3		$Y_q < X_q$							6	6	6 NE
4	= 1										
5		$Y_q > X_q$									
6	< 1	$Y_q = X_q$									
7		$Y_q < X_q$			6				2	8	2 FNE + 6 NE
8	STATE-TOTAL		1		6		5		8	20	

Source: own calculations, based on the data from Romania’s Statistical Yearbook 2011, NIS, 2012.

While in agriculture, in the period 1990–2009, 8 efficiency states coexisted, and in food processing only 2 efficiency states, in agri-food economy 6 “efficient” states were signalled out.

The conclusion that stems from the matrix analysis of states is that throughout the transition, pre-accession and post-accession period, the persistent inefficiency states prevailed in the Romanian agri-food economy.

2.5. Prospective evaluations of the agri-food sector

The previous subchapters presented the development levels and trends of the agri-food sector, through the endowment in resources, final output structure and productivity of production factors, from the internal competitiveness perspective. The reference period of the analysis was 1989–2009, considered a reasonably reliable period for eventual forecasts.

There is not an abundance of prospective evaluations on the future development of the Romanian agri-food sector, and the accessible forecasts are relatively few in number and incomplete in scope. Unfortunately, with regard to the food industry, no forecast data on the gross value added are available, with the specification that “food industry, in particular, as main beneficiary of raw agricultural products, took over the deep transformations produced in our country’s agricultural sector after 1990”.

Another forecast⁷ refers to the agri-food sector also in disparate and incomplete terms. While the dynamics of value indicators stops at the forecast year 2005 (at the agricultural output value⁸), the quantitative estimates of the physical indicators of agricultural and food production also reach the forecast horizon 2010. No reference is made to other sectoral synthetic indicators, such as gross value added, value of output, etc.

The incompleteness of available forecasts on the future development of the agri-food sector, in its entirety or by its components, made it necessary to produce forecasts that take into consideration the inertial trends of the main resource and result indicators, on a longer period of time.

The first forecast is based on the multiple regression model in which the resultative variable is the gross value added in agriculture (Y), and the factor variables are the following: total agricultural area (S), active population employed in agriculture (L), fixed capital stock (K) and the average cereal yield per hectare (T), as an expression of the technical progress.

The period referred to by the empirical data on the five variables is 1980–2000; this period is relevant for revealing the multitude of situations that intervened in the level of indicators taken into consideration.

The final expression of the multiple regression⁹ of gross value added (Yf), according to the four factor variables is the following:

$$Yf = [65.866 + 0.324*T + 0.185*K + 0.322*L - 6.233*S] \quad [2]$$

with $CD^{10} = 0.534$ și $DW^{11} = 2.169$.

⁷ We refer to the *Development Strategy of Agriculture, Food Industry and Forestry on Medium and Long Term (2001–2004 and 2005–2010)*, Synthesis, December 2001.

⁸ The yearly growth rates are taken over from the Pre-Accession Program.

⁹ The multiple regression model operated with the logarithmic vectors of the quantitative variables (agricultural area, active population working in agriculture, cereal yields per hectare) and of the valoric variables (gross value added and fixed capital stock, both recalculated in 2000 prices), using the “Mathcad 4.0” software.

For the utilization of multiple regression [2] in the gross value added forecast three scenarial hypotheses were used on the expected levels of the four factor variables (Table 9).

Table 9
Scenarial hypotheses of the gross value added forecast in Romania's agriculture

Scenarios	Agric. Area (S) mln. ha	Active population working in agriculture (L) mln. pers.	Fixed capital stock (K) Thousand bln. RON '00	Average yield of cereals (q/ha) Quintals	Gross Value Added (Y)	
					Empirical level Thousand bln. RON '00	Forecast level Thousand bln. RON'00
S1: 1980–2000 average	14.885	3.1814	25.0118	28.84	102.4225	102.4768
S2: 1993–1996 average	14.794	3.3836	28.0188	26.78	115.3280	108.2726
S3: 1997–2000 average	14.796	3.3900	25.8438	27.83	101.2770	107.9868

Source: calculations based on the regressional model [2].

According to the first scenario, in which the four variables would be at the level of their yearly averages from the reference period 1980–2000, the gross value added forecast for Romania's agriculture would reach 102,4768 thousand bln. RON (2000 prices), i.e. almost equal to the multi-annual average, yet by about 20.5% higher than its level in the year 2000. This scenario significance resides in the fact that we can expect economic growth in agriculture even though the agricultural area and the employed population decrease, but the fixed capital stock increases and the cereal average yield per hectare improves.

In the second scenario, for factor variables levels equivalent to the yearly averages from the period 1993–1996, the first time of the transition period with economic growth in overall national economy, the gross value added forecast would reach 108,2726 thousand bln. RON (2000 prices), by 6.1% lower than the 1993–1996 average, yet by 27.3 higher than in the year 2000, taken as reference in the few forecasts carried out on this theme. This scenario also confirms that the multiplying factors of the newly created value in Romania's agriculture are labour and fixed capital, to which the average yields per hectare are also added.

The third scenario, in which the levels of the four factor variables are between those of the two presented hypotheses (except for the populaiton

¹⁰ The coefficient of multiple determination, whose minimum significance threshold is considered 0.500.

¹¹ Durbin–Watson coefficient, significant when the value is close to 2.

employed in agriculture), envisages a gross value added of 107.9868 thousand bln. RON (2000 prices), by 6.6% higher than the 1997–2000 average (period affected by the general economic decline) and higher by 26.9% than its value in the year 2000.

Thus, from a comparative perspective, the 29.4% increase of the gross value added in agriculture in the year 2005 compared to the year 2000, envisaged in the *Government's Pre-Accession Economic Program*, would fall within the forecast values of the previously presented multiple regression model.

CONCLUSIONS AND OPENINGS

1. The population's food consumption in the transition period was largely influenced by the impact of the continuous deterioration of the domestic production and incomes, amplified by unemployment and inflation.

2. The distortions produced in ensuring the base for obtaining the agri-food products necessary for the population's consumption in the transition period can be synthetically revealed by presenting the dynamic correlation between the agricultural production and the food production.

3. Five years of EU membership practically meant a persistence of agricultural production decline in Romania (by 7.4% in the year 2011 compared to 2006), but also a consistent advance of food production (by 36.2%).

4. The outrunning of the production of raw agricultural products by the agri-food processing in growth rate terms could lead to the narrowing of the gap between the two main components of the agri-food economy.

5. With differentiated yearly rates, i.e. the food production might grow at a rate of about 5%, determined for the period 2001–2008 (2000 = 1), and the agricultural production by about 2.8%, in the period 2001–2010 (2000 = 1), the necessary time for equalizing these levels (starting from 2012) would be almost 24 years.

6. At a "cruising speed" of agriculture of about 2.8% and "forcing" the yearly rate of food processing at about 9.5% (by 4.5 percentage points compared to the first alternative), the gap can be recovered in a period three times smaller; this is a relatively plausible alternative for the future development of the Romanian agri-food economy.

7. The lowest shares of the intermediary inputs can be noticed in the "agriculture" aggregate, the oscillation margin ranging from minimum 38.8% (1990) to maximum 54.8% (2007), the related variation coefficient being 6.94%, the highest among the four investigated economic "aggregates".

8. In the "agriculture" aggregate, the net efficiency of intermediary consumptions ($VABv/Civ$), in the period 1989–2009, had values ranging from 1.58 RON $VABv/$ RON Civ (1990) to 0.83 RON/RON (2007), the performance rebound yearly rate being 3.73%, which is considered quite an alarming trend for the challenges that agriculture will have to face.

9. The gross value added increase was mainly due to extensive factors (labour) and to the two intensive factors (efficiency of gross fixed capital and intensity of gross value added). The extensive factor (fixed capital endowment) had a negative influence upon the gross value added.

10. Throughout the pre-accession and post accession transition period, the Romanian agri-food economy mainly experienced persistent inefficiency states.

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