Good Management Practices in Managing the Most Important Factors to Ensure Dureble Soil Quality

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The importance of sustainable development has started to be acknowledged in Romania as well, once the various pollution sources and the restrictions affecting industrial and agricultural pollution were identified, from an economic and ecological standpoint. Sustainable development represents the need of raising awareness about environmental protection and educating people, and this aspect is reflected by the evolution of communal policies in recent years, policies marked by a shift from an approach based on constraints and sanctions to a higher level of flexibility, based on incentives. The purpose of this paper is to make a recommendation for improving existing policy by making an assessment of economic incentives in order to stimulate farmers to adopt sustainable farming systems of a viable, sustainable agriculture, capable to apply the newest technologies and lead to profit and efficiency, to the economical and organizational consolidation. To analyse the effects of different zone packages on income of farmers and the environment a linear programming model is developed for a typical, 192 ha mixed farm in the Iasi region plain pilot area. The major activities of the farm is keeping dairy cattle, growing fodder (grass, alfalfa, silage maize) and cash crops (winter wheat and maize).

Keywords: *sustainable, development, environmental economics, indicators, strategy*

Farm management decision should consider the potential for erosion under different practices, especially on marginal land for crop production [1]. Areas at high risk for erosion due to steep slopes or erosion of soils may better suit for pastures or forests. The best ways to reduce erosion is protect the soil surface with growing plants or crop residues. Row crops such as wheat reduce erosion potential by third of fallow land, which is still considered excessive [2-7]. Sod crops such as permanent pasture keep soil erosion to a minimum and should, therefore, be used in rotation with other crops where erosion is a problem. Compared to continuous wheat, forage or pastures crops reduce soil loss by about 70 % [8].

Increasing grass covering or high residue crops combined with other conservation practices such as conservative tillage reduce erosion. Improved soil structure allows more water to filtrate reducing runoff and erosion. Therefore good soil structure is a result of management systems that include both the frequent return of organic matter in residues or manure and tillage practices avoiding unnecessary breakdown of soil structure [9].

Environmental protection is the obligation and responsibility of central and local public administration authorities, as well as all natural and legal persons[10].

Experimental part

Materials and methods

Measuring progress towards sustainable development is part of the strategy and Eurostat has to draw up every two years a report based on monitoring the Romania set of indicators of sustainable development. Eurostat has published three reports to monitoring the strategy: in 2007 and 2015. The latest report marks the progress on implementing the strategy and objectives of the main challenges.

The linear programming model uses the gross margins of activities of the farmers – as an input for the objective function of the model – which are calculated from a basic set of descriptive data of the farm and the parameters of its economic-policy.

Results and discussions

In the following, we will present the main aspects regarding the status of the fundamental natural factors (soil, air, water), as well as the situation of forests.

Soil erosion, soil aridity, soil degradation and soil pollution are among the most serious environmental problems mentioned in CEESA [11].

The soil quality in Romania has been deteriorating because approx. 12000 thousands of hectares (of which 7100 thousands of ha. plough able/ cultivable land) are affected by one or more factors which limit quality (table 1).

Their negative influences can be observed in the deterioration of the characteristics and functions of soil, as well as in its bio-productive capacity; moreover, an even more serious effect is a decrease in the quality of agricultural products and food security, with severe consequences on the quality of human life.

As one can observe by looking at the data presented above, drought affects the largest surface, approx. 7100 thousands of ha., because of a significant decline in irrigation facilities (in 2015 only 270,000 ha were irrigated). Also, a significantly large surface is affected by erosion caused by wind and water, the deterioration of soil structure and soil compaction, soil salinization and others.

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Factor	Affected surface*	
	total	cultivable
Drought** ,	7100	-
of which irrigation appliances	3211	-
Periodic humidity excess in the soil ,	3781	-
which with drainage	3196	-
soil erosion caused by water	6300	2100
of which with anti-erosion facilities	2274	-
Soil drifts	702	-
Soil erosion caused by wind	378	273
Excessive crystallization at the soil surface	300	52

Table 1
THE SURFACE OF AGRICULTURAL FIELDS AFFECTED BY VARIOUS FACTORS IMPOSING A LIMIT ON PRODUCTIVE CAPACITY 2015.THOUSANDS OF HA

Source: NIS [12]
******The same surface can be affected by one or more restrictive factors.*
*** Most of the facilities mentioned above are not functional, because of neglected maintenance and the lack of proper funding.*

In terms of air quality in Romania, we can mention the fact that, for common pollutants, the level of atmosphere pollution between 1995 and 2015 exhibited a slight decrease for SO_2 and NH_3 and a slight increase for NO_2. Within the same timeframe the level of atmosphere pollution with various types of dust and sediments slightly increased.

Soil erosion

According to recent studies, approximately 11.4 % of the European Union (EU) territory is estimated to be affected by a moderate to high level soil erosion (more than 5 tonnes per hectare per year). This estimate is slightly lower compared to the previous estimations that 16 % of EU's land area is affected by soil erosion [13-16]. The most important problem refers to the erosion phenomenon that affects about 6500 thousands of hectares of agricultural land and shows an increasing trend [13]. Wind erosion, phenomenon recorded almost 378 thousands of hectares shows a propensity for extension due to deforestation. Investigation show that about 150 million tonnes of topsoil, which includes 1.5 million tonnes of humus, 0.4 to 0.5 million tonnes of nitrogen, phosphorus and potassium and large amounts of nutrient elements (calcium, manganese, zinc, molybdenum), are lost through erosion (table 2).

Considering the natural context of Romania (slope areas more than 67 % of the total country area, geomorphologic characteristics in favour of erosion processes) the decreasing area covered by forest is the main cause of water and wind land degradation. Additionally, landslides affect about 0.7 million hectares. Investigations show that this very dangerous erosion process increasing.

The use of sewage sludge as an organic fertilizer is currently of particular interest in the light of the upcoming new EU Directive concerning the use of sewage sludge, which requires cleaner production technology [16].

The sewage sludge obtained from wastewater treatment stations is an organic residue containing large amounts of mineral elements (N, P, K, Ca and Mg) and microelements (Zn, Cu, Mn and B) useful to plants [17].

Sewage sludge also contains pathogens and pollutants, requiring restrictive measures on their use [18]. Long-term experiments on the impact of applying sewage sludge to soil and plant crops (conducted in nine localities of the UK during 1984-2012) allowed us to establish relationships between the concentration of heavy metals found in sewage sludge and the content of heavy metals found in soil and plants [19, 20].

We found a positive correlation between extractable zinc and cadmium and the *p*H of soil, and a negative relationship between extractable copper from soil and Fe_2O_3 content of soil. The results obtained from the nine experimental devices on the changes in soil physical, chemical and biological characteristics, as influenced by

Factor	Affected surface-Thousands of hectares	
	Total	Plough able/ cultivable
Soil salinization	614	-
of which with high alkalescency	223	135
Soil compaction caused by inadequate agricultural measures	6500	6500
Primary compaction of soil	2060	2060
Soil aridity	2300	2300
Small/ extremely small reserves of humus in the soil	7485	4525
Moderate and high acidity	3424	1867
Low and very low reserves of mobile phosphorus	6330	3401
Low and very low reserves of mobile kalium	787	312
Low reserves of nitrogen	5110	3061
Lack of microelements (zinc)	1500	1500
Chemical pollution of soil of which:	900	-
- excessively polluted	200	-
- pollution through oil and salt water	50	-
- pollution through substances carried by wind	147	-
Destruction of soil through various excavations	15	-
Soil covered by residues and solid waste	18	-

Table 2
SOIL QUALITY RESOURCE CONCERNS -THOUSANDS OF HECTARES

Source: National Research and Development Institute for Soil Science Agrochemistry and Environmental Protection [13] applied sewage sludge, represent a scientific basis for the present regulations on the use of sewage sludge in farming. Results obtained over a long-term period have allowed us to establish accurately the limits of safe heavy metal concentrations in the soil [21]. They have also indicated the positive effect of sewage sludge on microbial biomass in the soil (which increased from 400 mg carbon/kg dry soil in the untreated control to 450- 600 mg carbon/kg dry soil following sewage sludge treatment) and on soil respiration. This increased from 0.4 mg CO_2-C/kg dry soil in the untreated control to 0.7-1.2 mg CO_2-C/kg dry soil after sewage sludge treatment.

Soil degradation

The primary cause of soil degradation is it use in activities for, which is not apt. The first sign of soil degradation the loss of structure that it evidenced by compaction. Compaction takes place mainly with tillage operations when humidity conditions of a soil are excessive. In areas where intensive, *mechanised* agriculture is practised, soil compaction ranks highly with other forms of land degradation as a major threat to sustaining current agricultural production levels [22].

The admissible norms were exceeded for lead and cadmium in suspended particles in Baia Mare, Copsa Mica and Media°. Unfortunately, even though several protection measures were applied (employing filters in Baia Mare), after a while the inadequate maintenance and a lack of interest lead to a decrease of their efficiency and to a steady increase in pollutants' concentrations.

Most of the hydro structures suffered from an extended process of water contamination (nitrates); among the causes, we mention the following:

- permanent eluviation of soil by atmospheric precipitations contaminated with various nitrate oxides (NO_2);
- the evacuation of residual water, full of nitrates, in rivers and lakes;

A particular situation is represented by the intense contamination of the aquifers with organic substances, ammonia, especially pollution through bacteria.

Soil compacting was recorded more than 6500 thousands of hectares. Other aspects refer to the level of nitrogen (deficient on 4.8 million hectares), those of phosphorus (deficient on 6.2 million hectares), and also deficiency of other microelements (zinc, iron, calcium, magnesium). Strong and moderate acidification was recorded on 3424 thousands of hectares (table 3). About 18 thousand hectares are polluted by 300 million tonnes of solid waste. Oil and salty water affect other 50 thousand hectares. Chemical pollution affects 900 thousand hectares. Out of these, 200 thousand hectares are totally unproductive for agriculture [13]. Very acid soils due to acid rain (sulphide oxides and nitrogen oxides) were found in the neighbourhood of chemical plants producing fertiliser (ammonium nitrate), sulphide acid or non-ferrous metals.

Similar to Romania, at the global level the soil fertility is in a serious process of deterioration. The soil quality in Romania has been deteriorated significantly, from the total of almost 15 mil. ha. area used for agriculture, approx. 6.367 thousands of ha are affected by down-grade of more than 5%, which limit quality.

When used in the context of pressures on soil, erosion refers to accelerated loss of soil as a result of anthropogenic activity, in excess of accepted rates of natural soil formation [23]. In the last 10 years, soil degradation reached the level of desertification in certain areas, because of soil erosion, intense exploitation and pollution. The measures to combat soil erosion were taken at a much slower pace than the one which would have been needed by environmental conditions [13]. In some areas, the average figures of soil loss reached 40 tons/ ha, whereas the natural recovery capacity of the soil is between 2 and 6 tons/ha (table 4).

Soil erosion differs according to the manner of using the agricultural field as well. As one can notice, the most significant erosion is exhibited by grazing grounds (because of the discrepancy between the numbers of animals and the possibility for feeding), followed by plough able fields and unproductive ones. The effects of soil erosion it has led to increased loss of fertile land, pollution and sedimentation in streams and rivers, clogging these waterways and causing declines in fish and other species.

Sustainable land use can help to reduce the impacts of agriculture and livestock, preventing soil degradation and erosion and the loss of valuable land to desertification.

Non-sustainable deforestation to create plough able fields and grazing grounds, leading to an excessive soil erosion through torrents; excessive grazing on slightly

Table 3
THE VULNERABILITY OF AGRICULTURAL FIELD IN RELATION TO SOIL EROSION

Category of use	Average incline,		
	Surfaces with a down-grade of more than 5%, thousands ha	As percentage (%) of total surface	Percentages %
Agricultural field	6.367	43	18
Plough able field	2.572	28	17
Grazing grounds	3.360	69	22
Vineyards	169	56	16
Orchards	266	87	18
Forests	5.748	86	40

Source: National Research and Development Institute for Soil Science Agrochemistry and Environmental Protection

Table 4
THE INTENSITY OF SOIL EROSION FOR AGRICULTURAL FIELDS

Type of erosion	Loss of soil, tons per ha per year	Average loss of soil, tons per ha per year	Affected surfaces, as percentage, of total agricultural surface
Insignificant erosion	< 1	0.5	57.4
Mild erosion	2 – 8	5.0	3.0
Moderate erosion	8 – 16	12.0	19.0
Significant erosion	16 – 30	23.0	18.0
Excessive erosion	30 – 45	37.5	2.6

Source: National Research and Development Institute for Soil Science Agrochemistry and Environmental Protection

Fields	Soil loss	
	Millions of tons per year	Percentages (%)
Total surface	126.0	100
Agricultural field	106.6	85
Of which:		
Plough able field	28.0	22
Grazing grounds	45.0	36
Vineyards	1.7	1
Orchards	2.1	2
Unproductive fields (with heavy erosion)	29.8	24
Forests	6.7	5
Subtotal	113.3	90
Erosion in the river basins and human settlements	12.7	10

Table 5
EROSION IN RELATION TO THE USE OF THE FIELD

Source: National Research and Development Institute for Soil Science Agrochemistry and Environmental Protection

inclined surfaces; grazing in woods, interfering with natural regeneration. Another factor in agriculture which pollutes the environments and affects negatively the health of human and animal populations is the misguided use of pesticides.

Maintaining soil organic matter content at levels that are consistent with the natural characteristics of the soil (i.e., loamy soils will generally have higher organic matter than sandy soils) helps soil biological activity and the healthy microbial and macro faunal populations that are required for efficient nutrient cycling. These populations include bacteria, fungi, actinomycetes, nematodes, and earthworms. Crop rotations (required for all organic operations) are crucial for organic systems because the vegetable crops [24], (e.g., alfalfa and red clover) provide nitrogen (N) and also help recycle nutrients, such as phosphorus (P) and potassium (K).

Including crops with deep root systems in the rotation helps extract nutrients from lower soil depths and return them to the surface when the vegetation dies. Crop residues also provide the carbonaceous biomass upon which soil micro fauna (e.g., earthworms and beetles) and microorganisms depend on for survival [25, 26].

In 2007 it was drafted sustainable development strategy *Horizon 2020* agricultural reforms that emphasize environmental protection.

For this strategy can be implemented successfully, the following actions are needed:

- Improving soil quality, waste management and reduce the number of historical polluted areas,
- Development of infrastructure for waste management in urban centres, Development of infrastructure in terms of water supply and wastewater collection followed by treatment in rural and urban,
- Reduce polluted water with cleaning agents and elimination of water pollution by hazardous substances.

Economic modelling of Romanian farms incorporating agri-environment schemes

There are currently agri-environment schemes in Romania and also in all UE countries.

Agri environment schemes vary markedly between countries even within the European Union. The main objectives include reducing nutrient and pesticide emissions, protecting biodiversity, restoring landscapes and preventing rural depopulation. In virtually all countries the

Measurement type	Sample size, n	Median, mm/year	Mean, mm/year	Standard error, mm/year
Conventional agriculture	500	1.711	4.384	0.357
Conservation agriculture	52	0.091	0.138	0.024
Native vegetation	72	0.014	0.059	0.018
Soil production	209	0.019	0.040	0.004
Geological	1029	0.323	0.193	0.334

Sources: Own calculation

Table 6
CHARACTERISTICS OF EROSION RATE DISTRIBUTIONS FOR THE COMPILED DATA PRESENTED

No	Priority Axis	EU Investmnt [euros]	National Public Contribution [euros]	Total Environmental Investments [euros]
1	Extension and modernisation of water and wayhewer system	2.776.532.160	489.976.263	3.266.508.423
2	Development of integrated waste management	934.233.079	233.555.770	1.167.778.849
3	Implementation of adequate infrastructure of natural risk prevention in most vulnerable areas	171.988.693	42.997.174	21.4985.867
4	Technical assistance	130.440.423	43.480.141	173.920.564

Table 7
BREAKDOWN OF FINANCES BY PRIORITY AXIS 2007-2014

Sectorial Operational Programme Increase of Economic Competitiveness 2007-2014 [27] uptake of schemes is highest in areas of extensive agriculture where biodiversity is still relatively high and lowest in intensively farmed areas where biodiversity is low [28].

The effect of the prescriptions is not enough to consider only in hectare (crop) base, but it needs a wider, whole farm based analyses. If certain crop prescriptions cause some changes within production technology, the whole-farm plan should be analysed, not only that particular crop. That is why the financial effects of prescriptions should be analysed on a farm level (instead of hectare level) in order to calculate the amount of payment more realistically. For these calculations a linear programming model is used.

The use and the development of mathematical models which can simulate the functioning of agricultural exploitations have an extremely rich tradition and practice not only in Romania but as well as in the wide world.

Model Specification

The whole area of the farm is situated in an area with general nature conservation objectives. This means that the natural values are important in these areas, such as Iasi region. These areas serve as feeding or nesting sites for protected or strictly protected species. The aim is, especially in the case of ground-nesters, to provide undisturbed nesting and suitable feeding sites, to decrease environmental pressure and to reconstruct the habitats. In order to achieve these goals, the establishment of large uninterrupted grasslands is proposed. (In some parts of this zone arable lands that border existing grasslands were designated to be converted into grasslands. For remaining arable lands particular packages are made available.)

Linear programming maximizes labour income by finding the optimal set of activities, under the restrictions such as maximum building capacity, crop rotation etc. Given the objective function, the solution procedure determines the optimum set of activities under given the restrictions. New production techniques and packages can easily be incorporated by adding new activities to the model.

The result of the LP model is the optimal labour income and the corresponding optimal production structure (i.e. activities) including certain packages. Part of the solution is the marginal product values (shadow prices and opportunity costs). It shows the additional income that non-optimal activities should *produce* in order to be in the optimal plan of the model. Sensitivity analysis is performed to test the influence of the individual packages on the income of the farmer and on the production structure of the farm. In the alternative situation the following separate activities are included into the model:

-EP_1: alfalfa establishment and production;

-EP_6: fallow;

-GM_2: grassland management with grazing.

These packages are added as new activities to the model, which compete with the existing activities. In case of alfalfa the model chooses between the traditional alfalfa (basic alfalfa) production method and EP_1 alfalfa establishment and production (alternative alfalfa), which incorporates certain measures to protect nature. In Table 1 only those actions are included which influence the production method and the income of the farmer.

In case of fallow, the situation is a bit different because its incorporation into the model depends on the crop type it replaces. In case of grass the alternative grass production with grazing is more expensive, because the grass production is less per hectare due to the lack of fertilizer, and the cow density is 2 cows per hectare instead of 6.

Permanent grassland and pastures occupy around 9.3 % of the erosive lands in EU-28. Around 10% of those permanent pastures is estimated to suffer from moderate to severe erosion, which equates to around 38 900 km²

Table 8

DIFFERENCE BETWEEN BASIC AND ALTERNATIVE ACTIVITY OF ALFALFA

Basic alfalfa	Alternative alfalfa (EP1)	Effects
Use total area for production	A margin of at least 5-m wide must be left non-mown	20% less yield, less cost
NPK fertilizer	Excluding fertilizer	10% less yield, less cost
Use herbicides and pesticides	Excluding every chemical application	5% less yield, less cost
Total changes:		35% less yield

Sectorial Operational Programme Increase of Economic Competitiveness 2007-2014

Table 9

GROSS MARGIN CALCULATION OF COMPETITIVE ACTIVITIES (EUROS) ON HA

On ha base	Alfalfa	EP_1 alfalfa	Grass	GM_2 grass	Wheat	Maize	Fallow	Total euros
Variable (xi)	X_1	X_2	X_3	X_4	X_5	X_6	X_7	
Costs	-329	-371	-366	-357	-400	-620	0	-329
Returns	893	1067	1067	1067	1111	1489	0	893
Costs counted by government	0	-239	0	-185	0	0	-195	0
Government payment	0	287	0	222	0	0	234	0
Gross margin	564	1222	701	1117	711	869	429	564

Sources: Own calculation

[29]. This demonstrates the importance of maintaining permanent vegetation cover as a mechanism to combat soil erosion. The gross margins of basic and alternative activities which are the input data for the objective function in LP model are shown in table 9.

In order to analyse the effect of certain environmental packages on the optimal labour income and production structure of the farm, two situations (basic and alternative) are compared.

In the basic situation the farmer's income is optimized without applying any packages. His main activities in the chosen pilot area would be keeping livestock, growing roughage (grass, alfalfa, silage maize) and cash crops (winter wheat and maize). The total average income is 893 euro per year and hectare (table 9).

First the above mentioned three packages were built into the basic model and then with sensitivity analysis one additional case was analysed. In this last case we modelled how the production structure of the farm will change if the government gives enough support (calculated from the LP shadow price) for the alternative package which couldn't get into the model (in our case GM_2 grass).

Production structure and the income of the farmer in all three cases is shown in table 9. In all cases the number of dairy cows are at the maximum stall capacity (77 cow places), because it is economically the most attractive activity in the farm. In the basic situation on one half of the area of the farm fodder crops are produced (alfalfa, maize and grass) to fulfil the needs of animals, and on the other half cash crop (winter wheat) [30].

In the alternative case only EP_1 alfalfa activity could have a base in the production structure instead of basic alfalfa activity, the GM_2 grass and EP_6 fallow activities are not attractive enough to get into the base [29]. EP_1 alfalfa package needs more area to produce the same amount of fodder (as in the basic situation) which is taken from the area of winter wheat (table 10).

The shadow prices of the activities (table 11) show the amount of money the certain activity has to be supported with to get into the base, otherwise the total income of the farmer will be less if he includes the less profitable activity in his production structure.

From the shadow prices the amount of minimum support for this farm is calculated for each package (table 12). In EP_1 case less payment would be. In case of GM_2 grass and EP_6 fallow the payment given by the government should be higher.

In the last step, changes in the production structure were analysed in case that the payment is as much as calculated from the shadow price of GM_2 activity. The area of the grass land is three times bigger, and the area of maize and alfalfa production are less due to the changes in density of the cows per hectare, which means they need less alternative fodder (corn silage, alfalfa). The difference between calculated and original payment is substantial, because the area of winter wheat also gets smaller. On the same area which would be converted into grassland less fodder could be grown than alfalfa or silage maize [30].

Table 10
THE NUMBER OF ANIMALS, AREAS OF CROPS AND INCOME RESULTS FROM THE LP MODEL

Specification	Basic case	Alternative case	GM2 + 25%
Number of dairy cows	77	77	77
Use of area (ha):	0	0	0
Winter wheat	97	88	64
Maize	0	0	0
Corn silage	41	41	39
Alfalfa	39	0	0
Grass	15	15	0
EP1 alfalfa	0	48	40
GM2 grass	0	0	49
EP6 fallow	0	0	0
Total area	192	192	192
Income	893	921	936

Sources: Own calculation

Table 11
SHADOW PRICES OF THE ACTIVITIES (EUROS/HA)

Crops	Basic case	Alternative case	GM2 +25%
Winter wheat	0	0	0
Maize	0	0	0
Corn silage	33.3	33.3	33.3
Alfalfa	0	25.9	25.9
Grass	0	0	175
EP1 alfalfa	not	0	0
GM_2 grass	not	31.6	0
EP_6 fallow	not	32.2	32.2

Sources: Own calculation

Specification	EP_1 alfalfa	GM_2 grass	Fallow (wheat)
Government payment	239	185	195
Shadow price	25.9	31.6	32.2
Sum	265	217	227
20% incentive	53	43	45
Suggested payment	318	260	273
Difference in %	33.0	40.5	39.8

Table 12
CALCULATED PAYMENT FROM LP (EUROS/HA)

Sources: Own calculation

Within Romanian Agri-environmental Programme for the Environmentally Sensitive Areas [27] a payment system was set up. The amount of payments was determined for the individual schemes using the support calculation methodology of the EU. This payment system calculates the support on a hectare or units of livestock basis for individual packages without taking into account the production system of the farm. In real life the farmers will incorporate these packages into their farm production structure thereby influencing also other activities [31]. With similar kind of calculation it is possible to analyses the amount of necessary payments for these packages. The shadow prices and opportunity costs show support or refute the amount of payments for the individual packages. Because of the general nature of the current model it is not yet useable in all real world situations, but it can give a reliable indication of the effects connected to management decisions. With some more development the system could be a considerable asset in evaluating the financial consequences of nature conservation and environmental protection packages.

Conclusions

The paper aims to bring a contribution in increasing the economic efficiency of the agricultural exploitations and to make a recommendation for improving existing policy by making an assessment of economic incentives in order to stimulate farmers to adopt sustainable farming systems of a viable, sustainable agriculture, capable to apply the newest technologies and lead to profit and efficiency, to the economical and organizational consolidation.

The construction of a linear programming model implies the achievement of a strong connection between the objectives and the constraints which take in account the activity of agricultural decider. The constructed system constraints represent a simplified image of the environment in which the farmer substantiates his decisions.

At the level of this agricultural exploitation it is desired to construct a behavioral simulation model, which can predict for example the agricultural decider's behavior in the conditions of changing policy of the agricultural loan.

Also, several experiences have demonstrated that effective control is achieved conserving and improving soil structure with management systems that include regular use of soil improving, return of crop residues and tillage practices, thus avoiding unnecessary breakdown soil or compaction structure. Conservation tillage increased organic matter levels improving stabile soil structure, aeration and infiltration. Models are important tools for sustainable soil management. Beside deterministic models, the alternative approach will be presented. Numerous example of application of such approach will be presented: water flow and chemical transport, flood estimation, soil losses, effects of different soil practices, etc. Most suited combination of method maybe will be applied in improvement of the soil quality in Romania.

The increasing number and complexity of issues relating to pollution made imperative need to revise existing tasks in the field and formulate new ones.

The environmental actions are defined in close connection with the policy of economic development, social and economic forecasts on medium and long term.

In order to achieve the conservation and sustainable utilization of nature and natural resources, better information on the economic importance of natural areas alone, however, is not enough. Unless ecological information is structurally integrated in economic planning and decision-making, solving environmental problems will prove difficult, if not impossible.

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