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Strategies Regarding the Sustainable Development of Agriculture in Romania in Terms of Climate Risk

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Climate change suppression in agriculture is a priority objective of EU Member States strategic development activities. The interdisciplinary nature of these activities involves a comprehensive approach by identifying and linking development activities and intra and inter-sectorial implementation measures with the response to the effects of climate change. The complex effects of climate change on agriculture substantiate the need of decision making on risk suppression in order to maintain appropriate standards of crops and promote sustainable agriculture. Therefore, variability and climate change must be addressed through daily agricultural activities, with the help of suppression strategies and adaptation measures. Adaptation options are many and range from the technical to behavioural change at the individual level.

Keywords: *sustainable development; agriculture; climate change; agricultural holding; strategies*

Introduction

More and more often we meet terms like sustainable development, sustainable agriculture and organic agriculture. The novelty lies in the increased attention that is given to new green technologies, eliminating

chemicals of any kind, eliminate pollution in order to obtain products with high biological quality. Sustainable agriculture takes into account the development of some cultivation systems that meet human needs both quantitatively and qualitatively considering environment protection. Moving to a new type of agriculture should be done gradually but not to compromise its sustainability and to keep integrated and ecological aspect. Hence the need for an agriculture managed by ecological principles. [1]

All countries have tried to promote agricultural development by funding research, providing services and other support to stimulate production by providing subsidies. It's what allowed the fourfold increase of agricultural production of the century, contributing to society development in general. But at the same time, increased agricultural pollution and quality of a number of landscapes has deteriorated. In addition to these effects, extreme weather intervened causing the greatest losses in agriculture, which causes reorientation of research into this area

Strategies for sustainable development of agricultural exploitation in Romania in the conditions of climate risk

In countries with transition economy such as Romania, the problems of sustainable development of agricultural exploitations are linked more to poverty and lack of productive technologies than by the application of pollutant technologies and high levels of consumption as in developed countries. However indifference of authorities in combating climate change which affecting agriculture has determined unprecedented damage to the soil with a significant social and economic impact. Damage caused to the natural environment should be made public both big producers as well as farmers who have small farms. If households make decisions to change their agricultural exploitation, so not to cause damage to the environment and achieve sustainable production and adequate income, they should be helped by the government which has to provide advice and possibly financial support to be able to develop a plan to convert the household. To establish a sustainable agricultural exploitation will be taken into account: soil and climate, size of household, the report field-meadow, the space for sheds and buildings, liquid or solid manure, the space occupied by pits in m3, crop rotation , work soil, combating weeds and pests, labor force, labor organization, dissolution goods; funding.

In order to talk of a sustainable model of crops we must meet the following requirements: practicing crops in accordance with the soil suitability; zoning crops, which, besides soil suitability, take into account the climatic conditions: temperature, rainfall and so on; practicing crop rotation in order to cultivate preceding plants that favor high yields of future crops.

If we meet these requirements, we shall obtain production increases with the most efficient use of natural conditions and using small amounts of chemical fertilizers and large amounts of natural fertilizers. As a result, higher yields will result that will ensure high incomes to producers obtained through price, because they will sell a qualitative healthy product and they will not have to bear the cost of pollution and people's health. Implementation of sustainable agriculture in the agricultural holding of Romania still requires extensive research; however, agricultural science has, even still, an important arsenal of sustainable agricultural techniques, such as: soil tillage on the level curve, grassed strips, terracing with the establishment of forest belts; crop rotation which eliminates some problems with diseases, pests, weeds, provide alternative sources of nitrogen in the soil; reduces soil erosion, prevents water pollution risk; strategies against integrated control of pests and diseases by extending the physical, chemical and more especially biological techniques (biological control, plant bacterization, root mycorrhization); cultivating newly created varieties and hybrids, resistant to diseases and pests, for example, in Romania we created the wheat variety "Alex" resistant to yellow rust.

Besides all the other measures mentioned, in order to achieve a sustainable agricultural holding, we should meet the following requirements: increasing the size of farms by buying land, leasing agricultural land, especially by non-farming landowners or by elderly owners; the association of small producers, maintaining ownership of the land and other production factors; the use of chemical fertilizers and pharmaceuticals rational quantities; granting of financial incentives for farmers to be able to purchase agricultural machinery, varieties and hybrids, chemical fertilizers, etc.; advising farmers through information and training centers so that, to keep abreast of new technologies, and not least with the current state of agriculture both economically and ecologically.

In conclusion, we define sustainable farms as those that: use complex and advanced management techniques to ensure the ecological

integrity of the natural environment and even to consumers; they are area-specific according to soil and climate and ensure a certain relationship between supply and demand of products, meaning to be flexible; farm size should be appropriate to its specialization and not least consistent to applied technologies, in order to be effective; they preserve biodiversity, landscape beauty and other property that are not assessed on existing markets; are profitable for producers in the long term; they are economically efficient from a social perspective, namely: they ensure food security and adequate incomes to farmers.

In order to convince the heads of farms to practice sustainable agriculture, we need, primarily, financial support, but at the same time, they are interested in earned income and their status in society, if they will improve they no longer need constraints. [2]

Crop production varies year to year, being significantly influenced by the fluctuations of climatic conditions and particularly by the appearance of extreme weather events.

In Central and Eastern Europe, the scenarios show an obvious decrease in rainfall, especially in the summer season, therefore a rainfall deficit which will affect all fields, mainly agriculture, population and ecosystems. The most vulnerable species will be mainly annual crops of grain and weeding crops, water scarcity in the summer season, which coincides with the peak water demands, causing major declines in production. In this sense we require a new shift in the structure of the crops, namely varieties or with a high tolerance towards high temperatures and water stress caused by the lack of water. Also, agricultural technologies must adapt to the water resource, soil water conservation by choosing a minimum tillage system representing a new trend to shift the requirements on soil and water quality and conservation. Also, decreasing water resources by 10-30%, especially in poor areas, will emphasize the consequences of lack of water, its effects being amplified by pollution and inappropriate technologies.

Through the European project INTERREG IIIB CADSES: ACRETe – “Agriculture and Climate Change: how to Reduce Human Effects and Threats”, co-funded by the EU, where Romania attended through the National Meteorological Administration, we developed "Code of Attitudes to reduce the impact of climate change in agriculture", a publication that can be considered the "European Farmer’s Manual". The document includes recommendations for adapting agricultural technologies and specific

activities of all agricultural production processes to climate change effects, as well as examples of best practices that lead to the reduction of greenhouse gases.

Crop sequence in time and space is an effective way for each farmer to protect the productive potential of the soil and thus ensuring constant production. Opportunities to establish a sustainable management system in crop structure and choice of crop rotation, include: adaptability of genotypes to the potential of ecological zones; direct effects on the physical properties (structure and structural stability), chemical properties (nutrient content) and biological properties (the amount of organic matter) of soil; reducing the risk of transmission of diseases and pests and weed growth; protecting the soil against erosion, runoff and surface crust formation; reducing erosion and maintaining agricultural production at constant values; the efficient use of nutrients for plants; agricultural land management using a rotation system, keeping a balance on the share of permanent crops in relation to the annual crops; the prevention of water pollution through streaming and water percolation out of areas crossed by the root system of plants, in the case of irrigated crops.

Recommendations and adaptation measures:

- selected varieties cultivated by correlating local environmental conditions with the degree of resistance of genotypes against the limited vegetation conditions (drought, excess moisture, high temperature, cold / frost, etc.);
- crop management and rational use of land are necessary measures for maintaining production potential, while maintaining a low impact of agricultural practices on the environment and climate;
- cultivating a greater number of varieties / genotypes, respectively varieties / hybrids in each agricultural year, with different vegetation period, for a better use of climatic conditions, especially moisture regime and rescheduling agricultural works;
- choosing genotypes resistant to limited vegetation conditions, with a high tolerance to "heat", drought and excess moisture;

- selection of plant varieties with natural resistance to specific diseases caused by pathogens;
- at farm level, it is recommended to practice crop rotation and establishment of a crop structure that includes at least three groups of plants, namely straw cereal 33%, weeding crops – industrial plants 33% and 33% vegetables. In crop production we can use the following types of crop rotation: agricultural, fodder special and mixed.

The basic principles in the implementation of adaptation measures are based on:

- using varieties / hybrids of plants well adapted to pedoclimatic conditions;
- practicing crop rotation in high culture for the production of raw materials in food processing, textile, chemical industries, etc.;
- polyculture, in order to effectively use agricultural space and increasing biodiversity;
- Organizing crop rotations with green manure in order to improve the physical, chemical and biological properties of degraded soils.

In crop structure, choosing varieties / hybrids is based on their adaptability to the pedoclimatic conditions of the region correlated with market requirements. In terms of topography, groundwater depth and surface water knowledge ensures the prevention of pollution risks as a result of applied technologies. Also, we must consider the size of slopes for performing tillage, especially plowing, to prevent soil degradation phenomena due to water erosion.

- using varieties / hybrids adapted to the farm crop rotation system;
- using mixed crops, intercropping cultures, permanent crops, double crops on the same parcel or in the farm to increase biodiversity.

Agriculture through irrigation is based on the artificial distribution of water in the land for crop establishment and ensuring agricultural plant growth. Choosing the irrigation system according to local needs and conditions regarding the surface, type of crop and soil properties are the

basic requirements in a sustainable agricultural management system, taking into account the following aspects:

- one's own irrigation system must be adapted to the cultivated area and financial resources, subject to the existence of a nearby lake or river with permanent water, and especially the existence, at the depth of 5-10 m, of a permanent layer of groundwater that can be brought to surface through a well and a small pumping station;
- knowledge of soil properties such as soil's capacity to retain water and depth until it reaches plant roots;
- monitoring all aspects of organization before applying irrigation, during and after administration of standard irrigation, namely choosing the timing of application, checking the water cycle by measuring application performance and uniformity;
- using several monitoring mechanisms for irrigation planning, the most commonly used include the measurement of soil moisture, remarks on plant status and testing drainage tubes after irrigation, in order to make the necessary changes for the next watering;
- establishing an irrigation control program, current technologies having automatic programming capabilities, based on the analysis of samples or a set of soil samples.

The main directions for revitalizing the irrigation sector, as a first step to reduce the effects of drought, are the following:

- developing a comprehensive study on prioritizing rehabilitation of land improvement and irrigation sector;
- rehabilitation of pumping irrigation facilities declared of public utility, in order to reduce energy consumption and increase hydraulic yields;
- sealing of transport, supply and water distribution channels in irrigation facilities; adapting hydrotechnical schemes of irrigation systems to new operating conditions and establishing surfaces that can be declared of public utility, in view of their optimal operation;

- speeding up the transfer of property or use of interior irrigation infrastructure to the federations or organizations of irrigation water users;
- continuing to subsidize irrigation in order to encourage the exploitation of irrigation facilities that provide great economic potential;
- implementation of the project "Reform and Rehabilitation of the Irrigation Sector" financed by the World Bank.

The specific activities in the field of livestock adaptation process refers to the gene pool, specific measures to develop diet, grazing and animal shelter, as well as manure storage techniques. Therefore, emissions of greenhouse gases from the livestock sector can be significantly reduced by improving genetics, by analyzing the genetic potential of selected livestock breeds, through an appropriate balance between energy and protein in the diet, by building appropriate shelters and suitable manure deposits [3]. Introducing appropriate grazing systems on farms can also contribute to reducing the emissions of greenhouse gases.

For the livestock sector, the code of good agricultural practices recommends:

- large, sealed and adequately equipped manure storage platforms;
- manure storage in cool and shady places;
- covering basins with liquid waste in order to reduce ammonia emissions into the atmosphere by using tarpaulins;
- providing adequate manure quantities in farms specialized in its collection and processing;
- construction of biogas installations, resulting in the reduction of methane emissions and the energy obtained is used to reduce fossil fuels;
- outdoor grazing compared to increasing in systems with shelters;
- education, raising awareness among farmers on the consequences caused by the effects of climate changes;
- continuous review of agricultural strategies to ensure their flexibility in relation to climate change effects and adaptation measures.

Global warming and the prospect of depletion of conventional energy sources has required a new approach through the introduction of biofuels in order to decrease polluting emissions and reducing carbon dioxide in the atmosphere [4]. Therefore, the wide use of alternative sources will lead to the gradual transition from fossil fuels to renewable energy sources, in order to reduce emissions of greenhouse gases.

For the effective management of renewable energy sources it is recommended:

- to increase biodiversity on farms by introducing new crops;
- to cultivate annual or perennial herbaceous with high-energy value (reed, grassy plants such as couch grass, sorghum, etc.);
- to collect, store and use residual organic materials from agriculture, food industry and farms with a high protein content (liquid manure, sewage and wastewater, scrap forage, crop residues, waste from slaughterhouses);
- to increase biogas production crops such as corn, sugar beet, rape, and so on, which can be cultivated as a feedstock for biogas factories;
- to install solar panels for the heating of water and enclosures.

Conclusion

The measures to combat climate changes must be addressed and implemented both at macroeconomic and microeconomic level. The key to combating these changes may be, on the one hand, research on the other hand, effective communication at all levels. Climate variability affects all sectors but agriculture remains the most vulnerable, and its impact is stronger now because climate changes and variability are more and more accentuated. With all of that we know that we can create strategies to adapt to the situation, but all the strategies must be in concordance with the environment.

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