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MANAGING THE SUSTAINABLE DEVELOPMENT OF AGRICULTURE IN ROMANIA BASED ON THE PRINCIPLES OF MULTIFUNCTIONALITY AND SYSTEMIC ECOLOGY

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Abstract: Multifunctionality, or multifunctional agriculture are terms used to indicate generally that agriculture can produce various non-commodity outputs in addition to food. The working definition of multifunctionality used by the OECD associates multifunctionality with particular characteristics of the agricultural production process and its outputs: (i) the existence of multiple commodity and non-commodity outputs that are jointly produced by agriculture; and that (ii) some of the non-commodity outputs may exhibit the characteristics of externalities or public goods, such that markets for these goods function poorly or are non-existent. The idea of multifunctionality in agriculture emerged from a complex and long-term analysis of the interactions between the structural and functional units, differentiated on a scale of species and time within the ecological hierarchy, consisting of a socio-economic construction (agroindustrial complex, village) a regional or national socio-economic system, with all the production infrastructure and related social organization and the foundation that supports it (ecosystems, complexes of natural ecosystems, semi-natural and anthropogenic ecosystems). In the Romanian agriculture, these dynamic socio-ecological complexes represent, by approaching ecosystem and adaptive management, the support and the object of sustainable development. The present paper proposes a new concept of management of the socio-economic model of sustainable development based on the principles of multifunctional agriculture and on an ecosystem approach, ecosystem management and adaptive development.
Keywords: multifunctionality, multifunctional agriculture, adaptive management

INTRODUCTION

Spatial-temporal relations between socio-economic constructions and their foundations (for example, spatial relationships, mass and energy changes) have remained, at least apparently until the mid-20th Century, at a level that did not exceed the limits of support capacity and the resilience of the entire ecological hierarchy.

Since the second half of the twentieth century the process of awareness of the crisis in the "human-nature" relationship has led to a series of actions and studies on the relationship between the paths and the rate of socio-economic development in developed and developing countries, on the one hand and the speed, the forms, respectively the magnitude of the phenomena of deterioration of the structure and the quality of the environment (by environment understanding the nature as a whole), on the other hand. After 1950, a dichotomy between the national, regional and global socio-economic systems, on the one hand and the components of natural capital, on the other hand, became increasingly apparent. In order to evaluate and sample such phenomena of decoupling and divergent evolution of erosion, restriction and diminution of the resilience of the foundations that had to support and serve (to feed with resources, to process the waste in solid phase, gaseous and liquid) the socio-economic constructions, a wide range of international research and monitoring programs have been launched and realized. Among them, the programs coordinated and sponsored by UNESCO have made major contributions. These programs focused on:

i. geological resources, water resources and biological resources;
ii. human needs;
iii. the climate system and the planetary ocean and iv) human-nature interaction (Di Castri, 2000).

The development of these programs has generated a wide range of data and information that showed that in the last centuries, the main forces that had a major impact on nature were those of human origin.

After Brundtland report (1987), perceived from the beginning as one of the most consistent and convincing arguments in favor of a new model of socio-economic development, it was possible to mobilize political structures at national, regional and global level and then involved in the a broad, complex and very difficult preparatory process for the UN Conference on Environment and Development, held in June 1992 in Rio de Janeiro, Brazil. All the activities carried out during the preparatory period and the conference proceedings themselves focused on the ways and means of intersectoral integration: environment (nature), society and economy, in a new development model finalized at the UN summit in September 2000 in a report adopted as the "Millennium Declaration", Millenium Ecosystem Assesssment (MA). This document, which reaffirms the attachment of the community of 189 states, defines the general framework for the long-term social and economic development of humanity. MA is at the same time the most comprehensive assessment of the global resources of Terra's natural capital and management of sustainable directions,

meaning eight general objectives, 18 specific objectives and a set of 48 indicators. Summarizing dramatically the huge quantity of this report (5 volumes, more than one thousand and half pages), it is indicates the main human impact of the nature such as:

i. demographic growth rate of human population;
ii. overexploitation of ecological ecosystems (ore, forests, soil, water;
iii. pollution with renewable and non-renewable pollutants, including CO_2 emisions, and
iv. alien invasive species introductions.

The present paper proposes a new concept of management of the socio-economic model of sustainable development based on the principles of multifunctional agriculture and on an ecosystem approach, ecosystem management and adaptive development.

CONCEPTUAL STRATEGY OF THE SUSTAINABLE DEVELOPMENT MODEL BASED ON THE PRINCIPLES OF MULTIFUNCTIONALITY AND SYSTEMIC ECOLOGY

After Brundtland report the socio-economic model of sustainable development, although it was unanimously perceived as one of the most consistent and compelling models of development, it turned out to be one difficult process, requiring a whole series of clarifications and completions that were brought after the publication of the WCED report by UNESCO, UNEP or ICSU and IUCN, following critical analysis, continuation or the promotion of new research programs and application of this model. Derived on the theory was two main directions to follow:

i. the continuous progress of theoretical base, which should underpin the understanding of the complexity of the development process and address its specific problems, and
ii. the continuous need to develop and materialize strategies and policies focused on applying sustainable management systems by adapting economic development cycles and paths to the development and evolution cycles of natural capital components.

Theoretically, the research directions were aimed at eliminating the high degree of ambiguity in interpreting the concept of sustainability, understanding that the ecosystem approach involves admitting that the physical and biological environment has a hierarchical organization in which the socio-economic systems are integrated and the absence of an operational infrastructure or due to the fact that the social component was neglected in the process of intersectoral integration (Figure 1) (Vădineanu, 2004; Costanza et al., 2014).

What defines the actual ecological crisis is in fact the decoupling or erosion of the spatio-temporal connections between the socio-economic constructions and their foundation (natural capital), and the capacity to support of the components of the natural capital reflects, on the one hand, the stability and the resilience of the ecological systems, and on the other hand, their capacity to supply socio-economic systems with resources and services (Musters et al., 1998; Vădineanu, 1998; De Groot, 1987; De Groot, 1992; De Groot et al., 2010; Costanza, 1997, 1992, 2008, 2014).

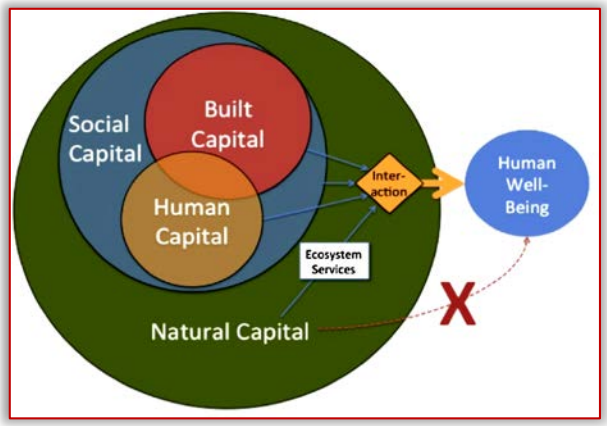

Figure 1 - Interaction between built, social, human and natural capital (© Costanza et al., 2014)

Following the numerous theoretical researches, a whole series of extensive theoretical works have appeared which have led to guaranteeing the operationalization of the sustainable development model on a conceptual framework associated with the holistic and adaptive management system that will promote an ambitious and strictly necessary political project for ensuring social security, as a result of economic development and guarantee of ecological security (WSSD / 2002). It is necessary to mention also the fundamental works of Vădineanu, 1998 and 2004 in Romania and Costanza & Daly, 1992; Costanza, 1995; Gunderson & Holling, 2002; Schmitz, 2007; Gunderson et al., 2010, abroad. Many new ecological concepts were introduced like "panarchy" which are invention of a new term to replace the rigid term of hierarchy, term that captures the adaptive and evolutionary nature of adaptive cycles that coexists one within the other across space and time scales (Holling et al., 2002).

Another important gain of this period of research, at the beginning of the 8th decade of the 20th century, starting from the recognition that natural resources must be considered as a factor of production in the systems created and controlled by man, together with the stocks of capital and the power of work has been shaped by a new discipline, the economics of the environment or, later, the eco-economy, a term introduced by Lester Brown in 2001 and theoretically substantiated by a number of economists, among which a number of important contributions were made by the American economist of Romanian origin, Nicholas Georgescu-Roegen in 1997 and 2008 and Brown 2007, 2010.

But, unfortunately, despite of such theoretical progresses the model applications has been done on a small scale at local and regional level, being often considered inefficient, primarily due to conceptual and decision-making limitations and not to the means and instruments of operation. In this context it could be placed the model applications which was the concept of permaculture created by Bill Mollison and Reny Mia Slay in 1991. After Mollison, permaculture is a design system for creating sustainable human environments. The word itself is a contraction not only of permanent

agriculture but also of permanent culture, as cultures cannot survive for long without a sustainable agricultural base and landuse ethic. Later the term was completed by Holmgren, co-originator of the permaculture concept (Holmgren, 2002). About Holmgren, permaculture is defined like integrated, evolving system of perennial or self-perpetuating plant and animal species useful to man or consciously designed landscapes which mimic the patterns and relationships found in nature, while yielding an abundance of fond, fibre and energy for provision of local needs.

THE CASE STUDY APPROACH OF MULTIFUNCTIONAL AGRICULTURE

The term 'multifunctional agriculture' was 'officially' used for the first time in 1993 by the European Council for Agricultural Law in an effort to harmonise agricultural legislation across Europe and to provide a legal basis for sustainable agriculture (Losch, 2004; Garzon, 2005) – emphasising the EU-centrism of early multifunctionality debates. In the EU, meanwhile, the commitment of the European Commission to multifunctionality was formally articulated in the Cork Declaration in 1996 (European Commission, 1996; Potter and Tilzey, 2005). This Declaration recognised the declining economic role of conventional agriculture in marginal rural areas and the need to find other rationales for public subvention (Lowe et al., 2002). It also emphasised that agriculture should be seen as a major interface between people and the environment, and that farmers have a responsibility as 'stewards of the countryside' (Gorman et al., 2001; Losch, 2004).

The Cork Declaration suggested that "integrated rural policy must be multifunctional in effect, with a clear territorial dimension. It must apply to all rural areas in the Union. It must be based on an integrated approach, encompassing within the same legal and policy framework: agricultural adjustment and development, economic diversification the management of natural resources, the enhancement of environmental functions, and the promotion of culture, tourism and recreation" (CEC, 1996). This formed the basis for the establishment of the 2nd pillar of the CAP (Lowe et al., 2002). However, there are continuing debates about the introduction of the notion of multifunctionality at the Cork meeting, in particular linked to criticisms of Commissioner Fischler's personal interests based on his Austrian background – a country in which implementation of multifunctional farm development pathways may be easier than in others. Nonetheless, many have described the Cork Declaration as marking "a new and decisive stage in European rural policy" (Delgado et al., 2003).

The notion of *multifunctional agriculture* refers to the fact that agricultural production provides not only food and fibre but also different non-market commodities. These non-commodity outputs include the impacts of agriculture on environmental quality, such as rural landscape, biodiversity and water quality (Ollikainen & Lankoski, 2005). OECD (2001) provides a "working definition" of multifunctionality. This definition gives as the fundamentals of multifunctionality:

i. the existence of joint production of commodity and noncommodity outputs and
ii. the fact that some of the non-commodity outputs exhibit the characteristics of externalities or public goods (OECD, 2001: 13).

OECD emphasizes that in developing the notion, it is useful in the first phase focus predominantly on positive and negative agricultural environmental non-commodity outputs. Also, it is acknowledged that including food security and rural viability to multifunctionality is disputed and they do not fit well the framework of multifunctionality (OECD, 2001: 31). Boisvert, 2001, Romstad et al., 2000, Guyomard et al., 2004, Anderson, 2002, Paarlberg et al., 2002, Vatn 2002, Peterson et al., 2002 and Lankoski and Ollikainen 2003, focus on the properties and policy design of multifunctional agriculture either in a closed economy or in an international trade framework. Studying many years after the beginning of the reorganization of the property of the agricultural land I found like many other experts that Despite the unanimous recognition of the need to reorganize agriculture following the principles of sustainable development, understanding how this complex process of reform must take place remains extremely confusing and often dependent on old approaches, specific to outdated historical periods (Vădineanu, 2004). Notions of multifunctionality have not been restricted to forestry and agriculture. A fruitful debate has also emerged in multifunctional *urban planning*, and although the linkages between this body of literature and multifunctional agriculture are not explicit, debates about the changing functions of urban spaces have also influenced debates on multifunctional agriculture. Of particular relevance have been debates on multifunctional urban land use that emerged in the late 1990s, with a recent issue of the journal *Built Environment*, for example, entirely dedicated to the subject (Priemus et al., 2004).

So, in the present paper we propose a new model of farms organization based on the principles of main guidelines of Communitary Agricultural Policy (CAP) and the model of multifunctionality which could combine both of the traditional agricultural practices and the managerial trend of the European model of agriculture. The model was presented in the diagram from the Figure 2.

DISCUSSIONS

It was quite clear during this transitional period after 1990 that the reform of the agricultural policy in Romania is a process that depends not only on the internal situation but also on the evolution of the CAP and the international situation on a global level as a result of the increasingly intense process of globalization.

Vădineanu, (2004), made a realistic analysis of the first period of transition in which a lot of time and resources have been wasted in the wrong direction, which continues today. Terms have been circulated with which the specialized literature has been enriched especially in the last decade and which would define the coordinates of the sustainable development model in agriculture, but which are often attributed to limited and even erroneous meanings. It speaks

of the necessity of the clear option of the transition to capitalism (Alecu and Cazac, 2003; Oancea M., 2003), of the transition from state and cooperative ownership to private property, of the restoration of large agricultural holdings, of organic farming, of ecologic farming, of alternative agricultural practices, of multifunctional agriculture, of agrotourism or even sustainable intensive agriculture (Manole, 2013; Antonie, 2013).

There are also, frequent debates on the issue of choice between liberalism and interventionism, two seemingly opposing concepts of agricultural activity management, the need to improve agricultural structures (including land ownership and cooperation), the need to increase investment effort and the need of promoting performance management (Vădineanu, 2004). An increased degree of multifunctionality may result from the addition of functions to the area (notion of 'multifunctionality by diversity'), from an increase in dispersion of the number of functions ('multifunctionality by interweaving'), or from an increase in spatial functions ('multifunctionality by spatial heterogeneity').

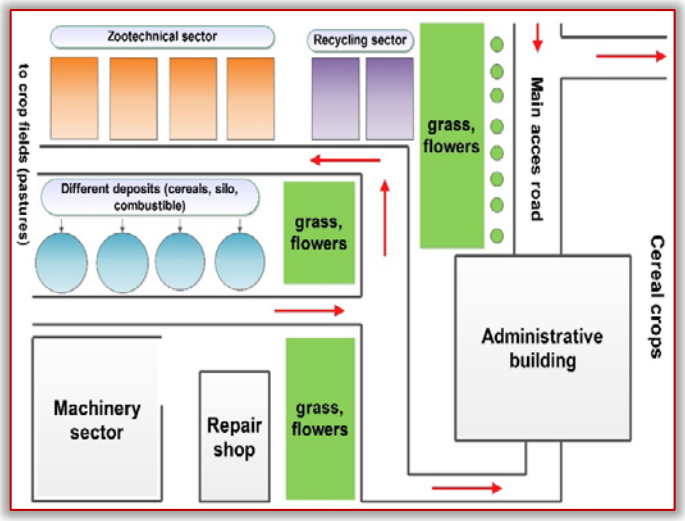

Figure 2 – Physical and spatial model of multifunctional farming system of sustainable agriculture

In my vision the only realistic option of the holistic model (Figure 2) it includes beside the constructed infrastructure, part on the socio-economic system and the foundation including soil, water, climate and biodiversity. The physical structure includes (Figure 2):

a. administrative buildings;
b. zootechnical and veterinary sector;
c. machinery park;
d. recycling sector (manure, compost etc.);
e. repair shop;
f. the storage sector;
g. the recreation area;
h. the guest house;
i. green energy producing systems (wind systems, solar panels);

Natural capital of such model involves the structure and crop rotation of anthropic ecosystem (such as cereal crops) and seminatural ecosystem (such as pastures, gardens, orchards, shelter belts, forests and so on). The evaluation of the functioning of the socio-economic systems of the type of the multifunctional farm and of their performances in relation to the impact exerted on the structure, quality and productive capacity and support of the foundations that support and feed them can be carried out in a coherent and useful form ecosystem and adaptive management, using the process of quantifying the ecological balance (O'Neill et al., 1997; Clark J., 2003; Vădineanu, 2004).

Approaching such a model of the multifunctional farm within the MEA implies an adequate management plan based on an analysis and estimation that establish in monetary terms the balance and the ecological efficiency of such a socio-economic system. After the building of the farm and implementing of the multifunctional model the inputs flows in mass, energy and human staff will be quickly cleared by benefits of ecosystem services converted in monetary flow (Ayres, 1998).

The quantification and estimation of the impact of economic activities on the environment, occurred as a result of an extension of the neoclassical economic theory, based on the monetary flows in the field of resources and environment economics and focused on the economic evaluation in monetary terms of the main resources and services by which the natural capital was defined. The flows of materials and energy in, through and outside the socio-economic systems are basically the expression of the functioning of the socio-economic systems, the supplier and the material support of the production cycles and, therefore, the material/physical foundation of the economic activities.

These are essential not only for the elaboration and application of the decisions and for the behaviors that underpin the maximization of profits and the competitiveness of the costs, but they are increasingly recognized as agents or control factors through which human activities have an impact on the components of natural capital and on the socio-economic system itself (Arrow et al., 1995; Daly and Cobb, 1989; Adriaanse et al., 1997; Vădineanu, 1998, 1999; Daniels and Moore, 2002).Part of the basic components of such multifunctional system are presented in the Figure 3, 4, 5 and 6.

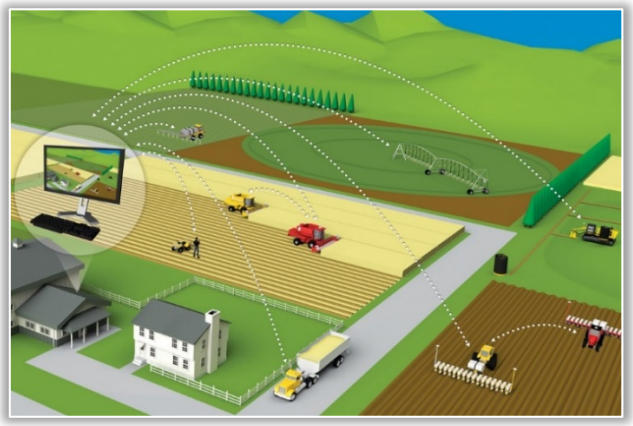

Figure 3 - Model of agriculture organized on the principles of the multifunctional farm in the United Kingdom

Figure4 – Multifunctional farm in UK (Millington farm) build on the multifunctional model

Figure 5 – Main components of the multifunctional farm furnished by ecosystem services: building for rural tourism and welfare (left) and sustainable exploit of system resources (right)

Figure 6 – Intercropping system of multifunctional farm based on enhancing the heterogeneity of rural farm land

Vădineanu, (2004) shows that the transition from intensive agricultural production farms, whose potential seems to have reached the limits of performance and which is the main cause of the deterioration of the natural capital from agriculture, to the multifunctional farms capable of exploiting the multifunctional potential of the rural areas, is also imposed by one of the basic directions of their activity, namely the rehabilitation and conservation of biodiversity as well as the control of diffuse pollution. The proposed agricultural model responds to the basic principles of sustainable development through: rapid and sustainable balancing of the structural and functional parameters of the ecosystem and, in the same time while reducing energy and matter inputs to the system as a result of the use of renewable resources as well as due to a wide range of services (regulation, support, agrotourism, ecotourism) that the multifunctional farm can provide to the adjacent socio-economic system.

The designing of such model of multifunctional farm need to keep in attention some functional characteristics like:

1. density and efficiency of energy flows (ratio of diffused/concentrated energy inputs);
2. density and quality of nutrient, pesticide, etc. flows;
3. dynamics and internal stability for adjacent or integrating systems;

Thus, the main problems regarding the structural organization of the multifunctional farms will have to include: the dimensions, the connectivity of the ecological structures, the hydrogeomorphological complexity and the trophodynamic modules, the complexity of the functional activities and compartments (production, processing, harvesting, marketing, services, agrotourism, etc.), the relations between farm compartments.

CONCLUSIONS

The multifunctionality and the model of organization of the Romanian agriculture on these principles imply a whole series of advantages that give priority to a sustainable development of the rural space, preserving and conserving all its structural characteristics.

A multifunctional model allows the creation of a competitive agricultural sector that can cope without the competition subsidies on international markets. It allows different forms of agriculture, healthy production methods, rich in traditional practices, which protect the environment, are oriented towards an increased level of production but that preserves rural diversity and dynamic and active rural communities, capable of ensuring quality products, in the varieties required by the population by generating and maintaining a high level of employment.

It also allows the resizing of semi-intensive agricultural practices in relation to the productive and supportive capacity of the biophysical infrastructure of natural capital and, on this basis, a simpler and more flexible agricultural policy that clearly sets out what decisions need to be taken.

The model also allows the management of the functional relationships between the organizational components of the farm for three purposes:

i. rehabilitation, conservation and capitalization of the components of the natural capital, including the wild species and the semi-natural ecological structures;
ii. increasing the efficiency of activities at local level, with emphasis on meeting the needs and involvement of local communities, and instrumentation of measures for biodiversity conservation and pollution control at the

macro-regional level and to contribute to the control of the global climate change.

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