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## THE SUSTENABLE DEVELOPMENT, ACADEMIC AGRICULTURAL EDUCATION AND HUMAN ECOLOGY

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### Abstract.

*Global economic crisis and food crisis create a lot of difficulties in the sustainable development and economic growth and have also a significant impact over poverty. The authors of the present paper propose an extension of human ecology through interferences towards agricultural academic education and scientific research. The first section of the paper describes the evolution to contemporary economic crisis and food crisis. The second section underlines how efficient an apparently forgotten concept like human ecology was during the last century and still is. The essential structure for human ecology remains the family, where an individual receives his first formative ideas of truth and kindness, where they learn what loving and being loved means, and so what being a unique person means, forming their matrix for their future intellectual energies, a matrix that will be completed during the later academic educational and cultural processes. Human ecology, as an interdisciplinary study domain, essentially refers to the manner in which human groups adjust to their life environment, and so it possesses, through the “antropo-ecosystem”, as spatial repartition of man’s life environment, its specific study object. The complexity of contemporary life has made human ecology evolves, in an interdisciplinary manner, along many directions: the study of a separate group of people, or of the population as a whole, in their interaction with the environment represented by a given territory, detailing the concrete aspects that have an impact on human life, such as the inclemency of the climate, the water reserves and the hydrological regime of the water sources, the chemical composition of the water from those sources, the general character of the relief, the peculiarities of the vegetation, the social and status, the traditions and customs, the degree of environment pollution, the level of home hygiene, the population’s coverage in point of housing facilities, the specificity of their activities, their food, etc. For Romania, whose current agricultural education system is so frequently being restructured, the acknowledgment is imperative of a macrostructure centred on human ecology, academic and intellectual energy, and a new hierarchy based on the contribution of the activities conducted to a sustainable development and a new quality of life.*

**Key words:** human ecology, sustainable development, academic agricultural education, intellectual energy.

## 1. INTRODUCTION

Today's language has emphasised the importance of the concepts of development and economic growth, and the complexity of contemporary life has made them evolve, in an interdisciplinary manner, along another three directions: sustainable development, life quality and social cohesion. A fourth direction, apparently long forgotten, seems to be decisively prevalent in the new, vast field of the quantifications of the continuity of progress, i.e. human ecology, which does not analyze ecological processes and phenomena proper, but rather social processes. A new connection between sustainable development, academic agricultural education and human ecology must be reanalysed during these decades.

Food and agriculture is at the heart of our civilizations. Many religions and cultures celebrate various aspects of food and agriculture due to the importance in our continuity. But continuity means sustainable development and human ecology also. For an issue that goes to the heart of humanity, it also has its ugly side called food crisis, reminding us the tradition of Malthusian theory or ideas about how absence or reduction of food could be dangerous than everything, for mankind. Major advances in the fight against extreme poverty from 1990 to 2005, for example, are likely to have stalled. During that period, the number of people living on less than \$1.25 a day decreased from 1.8 billion to 1.4 billion. But only in 2009, an estimated 55 million to 90 million more people will be living in extreme poverty than anticipated before the economic crisis. Likewise, the encouraging trend in the eradication of hunger since the early 1990s was reversed in 2008, largely due to higher food crisis and the evolution of food prices. The prevalence of hunger in the developing regions is now on the rise, from 16 per cent in 2006, to 17 per cent in 2008, and more than 18 per cent, in 2009-2010. A decrease in international food prices in the second half of 2008 has failed to translate into more affordable food for most people around the



world. And now the global financial crisis with the food crisis will have a more difficult impact over poverty. Failure to implement strong actions in the fight against hunger could give way to a long-lasting food crisis. The food crisis exposed fault lines in access to food from the village level up to the national, regional, and global level. In this situation there still is a good side called agricultural academic education as a possible solution for the next future of the humanity.

## **2. FROM SUSTAINABLE DEVELOPMENT TO HUMAN ECOLOGY AND THE ROLE OF AGRICULTURAL ACADEMIC EDUCATIONAL SYSTEM**

Today's jargon has further underlined the importance of economic development, hence the coinage of an apparently simple term, which has nevertheless become over the past few decades hackneyed and obsessive, i.e. economic growth. Economic growth is the result of quantitative, and at the same time relative approaches, plagued by all the uncertainties of measurement that are engendered by that kind of overlapping analyses. Economic growth (obviously, relative) is said to exist if a statistical result of the development defined through the GDP (or any other type of index, e.g. GNP), compared with "the state of rest", or the previous level, confers a positive image, in the case of a simple diminution, assimilated through the concept of ratio of the real domestic product:

$$R^{\text{real GNP}} (\%) = I^{\text{real GNP}} (\%) - 100 (\%) > 0.$$

Without trying to tone down the importance of economy and deny the virtues of its specific language, we can truly say that this quantitative growth, deeply relativistic, and physically uncertain, as in fact any measurement that relativizes itself, fails to express too many aspects of the complexity of contemporary life; that is the reason why it is particularized in a distinct,

interdisciplinary manner, along three different lines, by means of three conceptualization: sustainable development, life quality, and social cohesion.

The concept of sustainable (or viable, durable) development represents an attempt at redefining development, centred on the environment seen as an integrated system, and it was presented in the Brundtland report, titled *Our Common Future*, in 1987. This concept is synthesized through economic progress, requantified in an environment that was improved, or left unaffected in a destructive sense, combining both economic growth, focused on the quantitative aspects, on the distribution of wealth and personal income within the society, and the (positive or negative) influence of the changes in the economy on the standards of living, or the ways of living, the manner of thinking and behaving of the people, as well as the efficiency of the use of the resources and the operational mechanisms of the economic system, in such a way as to meet the needs of the present, without compromising a similar capacity relating to the future generations' own needs. Thus, a deeply ethical (and also exclusively theoretical) concept appears, viz. Intergeneration equity, a concept that cannot be found in the immediate reality, as the set of inputs, outputs, and even internal relationships of the system cannot be equitable with respect to time or space, through its dynamic nature. The conceptual direction of sustainable development is, for once, profoundly systemic, and within it the importance is notable of the interactions and compatibilities of four subsystems: the economic, the human, the environmental, and the technological. Sustainable development inflames the environmental subsystem, and is concerned with the quantification, within the final economic result, of the technological and human interactions on the environment, which is a priori considered as particularly important.

Along a different direction, obviously much more social and human in nature, the concept of development generates the need of delimiting life quality. Though it views features of society, human development is one of the

determining factors of the quality; the link between the two notions is, up to a certain extent, the link between the subsystems to the system, while observing the golden rule of the Gestalt phenomenon, i.e. the famous phrase The whole is greater than the sum of its parts. The specific approach to development from the angle of life quality is subject to both the theory of the systems, and the Gestalt laws, being compelled to permanently acknowledge the validity of the following statements, considered in keeping with the components or parts of the whole called state, or national economy: the parts of the system (the subsystems) communicate mutually; the system lies in an external environment with which one of its parts at least communicates (at least one subsystem); the system is a process of permanent change; the behaviour of the system cannot be predicted proceeding from the behaviour of the parts; all systems possess similar characteristics. There are opinions according to which the quality of life is “a subjective state of well-being”, “a level of satisfaction and fulfilment of people’s lives as a result of the economic, cultural, social and ambient conditions”, “the extent to which the intellectual, spiritual, economic, social and health-insurance goals are achieved and maintained”, “a subjective measure of accepting pain and suffering”, “a feeling of well-being, fulfilment, self-achievement or satisfaction resulting from the action of the environmental factors”, “a subjective concept defining the degree of satisfaction in life, based on four dimensions of personal experience and values”, etc.

A more recent direction, emerged over the last two decades, is that of social cohesion; it is a direction which grows increasingly quantified, especially because of the phenomena of regionalization and globalization, and is derived from economic cohesion, which is nowadays the central pillar of the development policies in Europe (The Single European Act of 1986, in accordance with which economic and social cohesion become an objective for Europe, no less than the single market, being defined as a form of sustainable, balanced development, meant to ensure the reduction of the structural disparities

between the regions and member states, while promoting equality of chances for everybody). As early as the beginning of the process of delimitation of this new angle of considering development, Emile Durkheim investigates this multidisciplinary concept, identifying two specific typologies: the mechanic solidarity, generated by the lack of social division of labour (to be met with in the typical village community, where all the members are peasants), and the organic solidarity, based on the social division of labour: the members of such a community need one another because each of them carries out complementary functions. At the beginning of the new millennium, the definitions of social cohesion are more and more diverse; it is looked on either as a continuous process of development of the values, challenges, equal opportunities within the community, based on trust, hope and reciprocity between all Canadians, or as a set of social processes that inoculate the individuals the sense of their belonging to the same French community, or as a situation where various groups and institutions unite to defy the differences, taking support on individual opportunities, on education, jobs, health, parental responsibility and family well-being, on strong, secure communities, and backing, on national identity, history, cultural inheritance and civil rights in New Zealand, or as a link between communities, between the people who coexist, interact and support one another, through material means, and share common beliefs, customs and expectations, in Australia, or as access to establishing the fundamental social relationships in society, such as participation in work, family life, politics and the activities in the civil society, in Denmark...

The objective of social cohesion in the European Union involves a reconciliation of system of organization based on the forces of the market, the freedom of the opportunities, and entrepreneurship, with the commitment of the values of solidarity and mutual support, which guarantee free access to the benefits and provide protection for all the members of society. At present, social cohesion identifies as the preoccupation to maintain inclusion within a society

that is thus becoming able to resist the external shocks, and the tough effects of cyclical world economics. The extended variant of the dimensions of social cohesion, in Paul Bernard's opinion, identifies the following aspects:

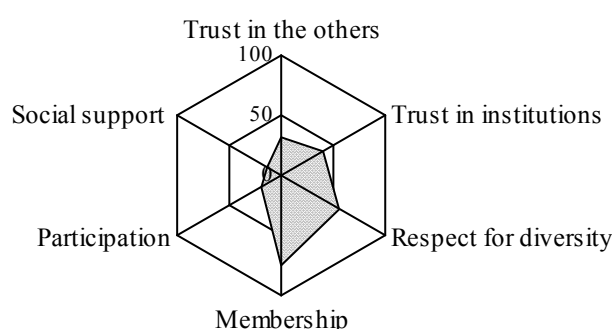
**Typology of the dimensions of social cohesion**

**Table no. 1**

Domain	Formal	Substantial
Economic	Inclusion/ Exclusion	Equality/ Inequality
Political	Legitimacy /Illegitimacy	Participation/ Passivity
Social and cultural	Acknowledgment/ Rejection	Belonging/ Isolation

Source: "Social Cohesion: A Critique", Bernard Paul CPRN, study no. F-09, p. 20

The temptation of a statistical measurement of those dimensions is huge, and so one of the authors of the present paper conducted such an attempt, in the year 2005, for Romania. At both the regional, and the national level, the social cohesion recorded was rather poor: its indicator reached a mere 50%, which demonstrates that one in two Romanians would manifest a real attitude of discouraging exclusion.



**Figure no. 1. The dimensions of social cohesion nation-wide**

The figure underlines the fact that the inferior level of cohesion is mainly generated by the very low values of *social support* and *participation*, and also of *trust in the others* and *trust in institutions*. The national value is 50%, and was exceeded only for the dimensions *belonging* and *respect for diversity*, which,

although having higher weights, did not annul the negative effect of the other dimensions. A few general comments, resumed after a couple of years, further highlight the relativity of measuring with respect to this direction of study, which is still at the beginning of its quantifications, undoubtedly historical. A different step in the new conceptualization is represented by the preoccupation with the structure of cohesion and exclusion, while the process of getting nearer the individual still remains a long-term desideratum. A fourth direction, apparently forgotten for a long period, seems nevertheless to have a decisive priority in this vast domain of the quantifications of development. In spite of the would-be similarity with the ecology of plants and animals, human ecology – for this is the direction referred to below – does not analyze ecological processes and phenomena proper, but rather social processes.

Developed as part of the Chicago School, in the second and third decades of the past century, human ecology is one of the first rigorous systemic sociological approaches, which considered the natural environment in explaining social phenomena (the intense promotion of human ecology belongs to Robert E. Park, Roderick McKenzie and Ernest W. Burgess). The unanimous acknowledgment of this new direction was already done after the Johannesburg Summit held in 2002. Ecology and solidarity become afterwards two inseparable elements, and, because ecology can only be a genuine sign of *human solidarity* that “obviously includes protecting and cultivating the resources of the environment” (in keeping with the document issued by the Vatican during the World Summit for Continuous Progress held in Johannesburg). It is imperative that the new approach should be centred on “solid ethical values, otherwise there may appear the risk of a complete lack of direction and de foundation on which the continuous progress under investigation can be built and sustained”, as the very gist of development. The concept of continuous progress is related to sustainable development and life quality, and it urgently requires a process of satisfying the needs of the present time without compromising the ability of the

future generations of satisfying their own needs. Human ecology is circumscribed to a new perspective on *integral and systemic human development*.

The complex notion of human ecology lies, first and foremost, in securing and protecting the moral condition linked with human action on the environment. *“The fact has also to be emphasised that the first and essential structure for human ecology is, and will remain, the family, where an individual receives his/her first formative ideas of truth and kindness, where they learn what loving and being loved means, and so what being a unique person means”*, forming their matrix for their future intellectual energies, a matrix that will be completed during the later educational and cultural processes. Within this context, peculiar attention should be paid to a social ecology of educating the human being, of scientific research, and of human work in general. In order to change the current view of poverty according to which the world’s poor are rather a problem than potentially productive and socially creative actors, such needs become crucial as creating new opportunities for work and employment, education, basic medical assistance, or even adequate homes. Yet all that demands a new vision on the whole educational and scientific research process, and they are convergent in backing the hypothesis of the present contribution, in accordance with which human ecology does not only refer to economic development – be it sustainable, or exclusively to life quality described by means of ecological processes – but mainly to the social processes, with special stress laid on education, research, continued cultural training, processes which, by means of a conceptual transformation, have been biologized in order to explain social reality in terms derived from natural sciences, based on a holistic and systemic thought. New models of consumption and production will have to be examined and promoted in full accord with the principles of human dignity and solidarity, using a vision specific to human ecology. The present crisis and

globalised recession are the result of the too slow rate of change in the directions expected from human ecology.

The academic educational system, alongside of scientific research, are component parts of our contemporary life, genuine alternatives in an optimal systemic approach, which will be able to enhance the tendencies of development in the direction of human ecology. To achieve that however, a few major changes are imperative in today's entrepreneurial and managerial thought.

Human ecology, as an interdisciplinary study domain, essentially refers to the manner in which human groups adjust to their life environment, and so it possesses, through the *antropo-ecosystem*, as spatial repartition of man's life environment, its specific study object. The researches carried out in the field of human ecology, usually include the study of a separate group of people, or of the population as a whole, in their interaction with the environment represented by a given territory, detailing the concrete aspects that have an impact on human life, such as the inclemency of the climate, the water reserves and the hydrological regime of the water sources, the chemical composition of the water from those sources, the general character of the relief, the peculiarities of the vegetation, the social and status, the traditions and customs, the degree of environment pollution, the level of home hygiene, the population's coverage in point of housing facilities, the specificity of their activities, their food, etc. The intention of making a succinct, yet challenging enough presentation of academic education and scientific research compels one to use the vision provided by human ecology in analysing the two subsystems of the economic and social macro system as complex adaptive or self-adaptive systems, through the use of the concept of emergent properties, or the distinctive characteristics and human behaviour, in its two stands: educational and research-oriented. Those subsystems benefit from the self-organisation features of the ecosystems and social systems, and if the concept of evolutive cycles is introduced, then the economic and social macro system as a complex system implies the stages of



growth, of equilibrium, dissolution and reorganization. All the systems of a complex type inevitably follow this cycle of the subsystems and their components.

In this procedure of revealing the progress and extension of human ecology into the contemporary economic and social macro system, some defining concepts must be analysed. The first is that of intellectual energy. Starting from the physical sense of energy as the capacity of a system of undertaking a mechanic load, by moving from one state to another, energy in general describes a similar capacity of a concrete form of existence of matter of producing transformations. Intellectual energy is a component part of energy, quantified in information mediated by human language, which produces the essential transformations that distinguish human society. Intellectual energy is responsible for starting and controlling any transformation in the social systems, including the way and means of using the other forms of natural energies. Intellectual energy is formed and develops exclusively through the (academic) educational system, and the system of scientific research, within which the education system has the determining place. It deeply affects man's personality, conditioning their capacity of dialogue and the individual and social productive potential. It is based on it that the processes of inter-human communication (an interaction specific to the economic and social macro systems), of knowing, of professionalization, of modelling personality and the environment. Acquiring intellectual energy exclusively through human education gives it the quality of artificial (i.e. man-made) energy, in contradistinction with the natural forms energy, existing independently of man's will / volition.

A first extension of human ecology imposes an essential modification, connected with the fact that the agricultural academic educational system is becoming the main producer, during a period of food crises, significantly more important than all the activities of other nature. Alongside of scientific research, it triggers the energy transformation within the concept of product or activity;

without the intellectual energy produced in those two subsystems, the very survival of the other subsystems is impossible, and much less their evolution, their continuous progress. This manner of viewing things also from an ecologic and human point of view ranks education / school and research in one of the top positions in the group of human activities in accordance with their coefficient of importance (where the criterion of energy is essential).

Another consequence of the intellectual energy produced by the agricultural academic educational system and by the system of agricultural scientific research is the modification of the type of entrepreneurial and managerial thought about surviving in a food crisis world. The authors of the present article consider entrepreneurial thought as the determining factor of economic growth and competitiveness, thanks to its really special abilities, in which the element represented by the intellectual energy is dominant. The agricultural entrepreneur is a creator of enterprises/organisations, and at the same time a trainer of managers, through the conditioning of his construction, called, in the lingo of market economy, “an agricultural business” but remains also the main provider of survival creative solutions during a food crisis period.

Among the three essential requirements of people even during a crisis period, we can mention a practical guaranteed access to the necessary resources for a decent life, including agricultural resources, certainly, a life expectancy as long as possible, as well as a real symmetry of knowledge and information through educational system. As long as an economic and geographical space does not allow the accomplishment of these three minimum requirements, the external migration becomes the only viable individual solution, sometimes extended to the family level, household or ethnical or religious group. According to these three essential requirements our agricultural academic educational system must present a new and innovative approach toward building future agricultural education curriculum and thus to solve the two problems from the three essential requirements. This could be also the major motivation

for a new and simplified model of advanced science in agricultural academic education able to emphasize the energy of the system: *Advanced Life Science: Animal*, *Advanced Life Science: Plant and Soil*, and *Advanced Life Science: Food*. A consensus must be achieved in the normal standard of the three directions about the courses and teachers. The courses could be developed not only by high academic level agricultural science teachers (biology professors, chemistry professors, plant geneticists, animal scientists etc.), but also by *agricultural business and industry representatives or entrepreneurs*.

The level of agricultural entrepreneurial thought and, all the more so, of the agricultural managerial one, is in keeping with the intellectual and moral availabilities and abilities of the entrepreneur and manager, as human individuals, hence with the quality of the agricultural academic education system they have gone through, by the energy transformation undergone by the academic system and the scientific research at the level of its intellectual energy. In this connection, the most visible and quantifiable energy-related effect is the agricultural academic educational one: the shaping of the students' personalities. Thus, the intellectual energy confers the agricultural entrepreneur and the manager a function unique in the set of the bio systems known, that of productive agricultural energy amplifier, i.e. that of being able to produce more than one has consumed, which represents the only source of profit of any economic activity. To conclude, the system of agricultural academic education and of scientific research constitutes a genuine field of a human ecology type.

**The typology of the general and particular principles, and their specificity in the Agricultural Academic Educational, and Scientific Research Subsystems AAESRS**

**Table no. 2**

<b>The general principle in the theory of systems</b>	<b>Specificity of the principle as applied to AAESRS</b>
<i>The principle of processive and structural ranking</i>	AAESRS is a component part of the economic and social macro system, and has three other subsystems: ministry, inspectorates and entities.
<i>The principle of dualism (dichotomy, dissonance):</i>	The subsystem of the agricultural teaching staff, and the subsystem of the student population

<i>The principle of conservativity of substance and energy</i>	The subsystems of agricultural academic education and of research have different energy inputs and outputs, through substance and intellectual energy consumption
<i>The principle of variation (of movement, of relativity, of oscillation)</i>	The subsystems of input and output generation are dynamic (the educational, and the labour force markets)
<i>The principle of reactive delay, or of inertia</i>	The subsystems of agricultural academic education and of research are inertial, conservative, remanent.
<i>The principle of the threshold value, of tolerance, of the critical size, of sensitivity</i>	The minimal access thresholds to AAESRS, as well as the maximal exit thresholds of AAESRS
<i>The principle of interaction</i>	Interaction between agricultural education and research on the plane of intellectual energy
The particular applicable principle	Specificity of the principle as applied in AAESRS
<i>Simple self-adaptability (1), and complex self-adaptability (2,3)</i>	Systems with a secondary loop (feedback) Systems with tertiary loop (with learning) Systems with layered structures (with learning and assessment of results)

The new systemic approach, centred on human ecology, involves new agricultural and managerial attitudes, ranging from acknowledging intellectual energy to repositioning the whole of the education system, as well as that of research, as essential producers of the new energy. Nature, this immense reservoir of the world's materiality, appears in its double quality – as a moral category, too.

The intellectuals, the producers of images concerning the significations of nature, and also of the attempts at defining the aims of human life, combine the two significations in order to generate either a harmonious, or a jarring image. The manner in which intellectual energy is incorporated strongly individualizes two distinct communication channels: that of ethical or religious information, and also that of scientific information.

Nonetheless, neither moral, nor religion, nor even science could ever be able to be the only source of understanding and control of the macro system in which the human being has been surviving and developing for thousands of years. The interferences of human ecology with agricultural academic education and scientific research can provide a new hierarchy of the subsystems, and – hopefully – also a new quality of human life.

#### 4. SOME FINAL REMARKS

Throughout human history, agriculture and education have always been very closely associated. Agriculture revolves around planting, cultivating, and harvesting schedules and animals or food, finally, while education contains references to animals and agriculture because it was the norm, a part of every man's life. However, as time progressed agriculture became an occupational specialty rather than a fundamental part of life that was evident in the academic education's curriculum. A fundamental change in the direction of agricultural academic education for a better understanding through human ecology must happen very soon indeed. For Romania, whose current agricultural academic education system is so frequently being restructured, almost to complete degradation, the acknowledgment is imperative of a macrostructure centred on human ecology, intellectual energy, and a new hierarchy based on the contribution of the agricultural activities conducted to the quality of life.

Drawing a final conclusion, we can asseverate that human ecology redefines the dignity of the contemporary individual, as a basis for the phenomenon of uniqueness of the human being in contradistinction to the rest of the creation, a uniqueness relying on the fact that man was created "in the image of God", without however necessarily entailing individual selfishness. "This similarity shows that man, the only creature on Earth that God wished for Himself, cannot fully discover himself otherwise than through his earnest self-offering", in accordance with the opinion expressed by the Vatican.

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## EVOLUTION OF MILK PRODUCTION IN THE NORTH WEST REGION OF ROMANIA

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### Abstract

*The paper aimed to present the evolution of Milk Production during the period 1990 -2009 in the North West Region of Romania, including Satu Mare, Arad and Hunedoara counties. It is based on the statistical data provided by Ministry of Agriculture , Forests and Rural Development . The data have been processed into the following indicators : cattle livestock, number of dairy cows, milk yield, milk production . During the analyzed period , cattle livestock has continuously decreased, so that in the year 2009 there are just 1,450 thousand cows in Romania of which in the North West part are raised about 25 %.. Milk yield has increased from 2,850 kg /cow in the year 1990 to 3,980 kg/cow/year in the year 2009 , but total milk production has decreased taking into account the reduced number of cows . As a conclusion, the North west region is traditionally suitable for cow rearing ,due to its pastures and meadows , the important number of cow stock and possibilities to produce ecological milk .*

**Key words:** milk production,NW Region , Romania,ecological milk. introduction

Dairy farming is an important branch of animal husbandry with a long tradition in our country . After 1989, the number of cattle stock has seriously decreased due to the dissolution of the state enterprises and cooperatives and numerous slaughtered animals [1] . At present the number of dairy cows counts for about 2,600 Million heads and are mainly raised in private subsistence households [2]. In the North West region of Romania contributes with more than 10 % to total milk production in the country [3] . In this context, the paper present an analysis of the evolution of milk production in the North West region of Romania, in order to put into evidence the evolution of the number of dairy cows, milk yield and total milk production in the period 1990-2009 [4].

## MATERIAL AND METHOD

In order to characterize the evolution of milk production, the following indicators were used: number of cattle stock, of which dairy cows and heifers, milk yield and milk production, milk consumption per inhabitant, number of dairy farms and cow density per ha. The period analyzed in this study is 1990-2009. The data, collected from Ministry of Agriculture, Forests and Rural Development, have been statistically processed and interpreted, building the trend line and setting up the forecast based on simulation models for the period 2008-2015.

## RESULTS AND DISCUSSIONS

The cattle livestock has continuously decreased from 5,381 thousand heads in the year 1990 to 2,680 thousand heads in the year 2009, as a result of the dissolution of the agricultural units and of the fact that many old cattle have been slaughtered because of their low production. The number of dairy cows has deeply decreased in the analyzed period from 3,200 thousand heads in the year 1990 to 1,440 thousand heads in the year 2009. Therefore, in 2009, in Romania there were just 45% of dairy cows compared to the year 1990. Taking into account the dynamics of cattle and dairy cows stock, the share of dairy cows in the cattle stock has recorded a similar decreasing trend. In the year 1990, dairy cows represented 59.46% of the cattle stock and in the year 2009, they registered just 53.73% (Table 1).

A similar evolution of cattle and dairy cow stock has been noticed in the North West part of Romania in Satu Mare, Arad and Hunedoara counties.

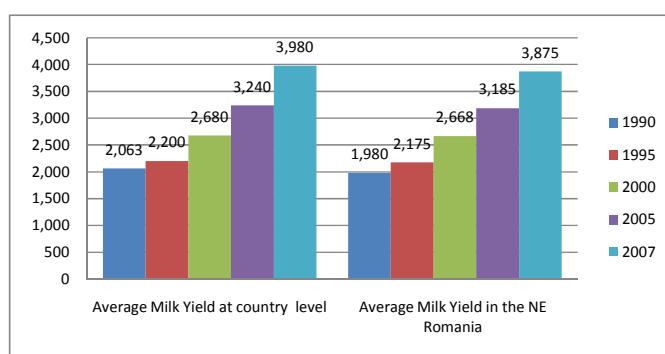


**Table 1 . Evolution of Dairy Cows during the period 1990-2009 (thousand heads)**

Specification	1990	1995	2000	2005	2009	2009/ 1990 %
Cattle, of which :	5,381	4,100	3, 520	3,050	2,680	49.80
Dairy cows	3,200	2,200	1,830	1,600	1,440	45.00
Share of dairy cows in total cattle stock (%)	59.46	53.65	51.98	52.45	53.73	-

The average milk yield has registered a continuously increase from 2,063 kg/cow in the year 1990 to 3,980 kg /cow in the year 2009. This positive aspect was determined by the reduced number of cows which has allowed a better feeding . Therefore , in the year 2009, the average milk yield was 1.92 times higher than in the year 1990 ,

In the North West part of Romania , the average milk yield registered a similar trend increasing from 1,980 kg/cow/lactation in the year 1990 to 3,875 kg/cow/lactation in the year 2009 ( Fig.1) .



**Fig.1.Evolution of Average Milk Yield**

Milk Production has been 66,016 thousand hl in the year 1990, but in the coming 5 years it has deeply decreased due to the lower number of dairy cows. In the year 1995 , milk production was 48,400 thousand hl , by 26.69 % less than in 1990. Starting from the year 1995, milk production has recorded a continuous increase , so that in 2009 it reached 57,312 thousand hl , being by 13.19 % less than in the year 1990 ( Table 2).

**Table 2 . Evolution of Milk Production (kg/year)**

Specification	1990	1995	2000	2005	2009	2009/ 1990 %
<b>Milk Production</b>	66,016	48,4 00	49,0 44	51,8 40	57,3 12	86.81

Milk Production in the North West part of Romania gives an essential contribution to milk production in the country and this is because of the high number of cows grown in this area where are available important surfaces of pastures and meadows.



**Photo 1. View from a Dairy Farm in the NW part of Romania**

### **Conclusions**

1. The number of dairy cows has continuously decreased during the period 1990-2009 , with a negative impact upon milk production.
2. Milk yield is the only positive aspect, because it has increased reaching 3,980 kg per cow in the year 2009.
- 3.As a consequence of the reduced number of cows but an increased milk yield, milk production has continuously increased, except the year 1995 when it recorded the lowest level.
5. The North West region is traditionally suitable for cow rearing, due to its pastures and meadows, the important number of cow stock and possibilities to produce ecological milk.

### **Acknowledgements**

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## RESULTS CONCERNING THE DINAMIC EVOLUTION OF THE BODY WEIGHT AND THE MIDDLE DAILY GRAIN FOR THE CROSSBRED SUFFOLK AND TURCANA

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### Abstract.

*In order to improve the sheep towards improving the quality and quantity of meat production in the ICDM Cristian Sibiu, experiments concerning the improvement of meat production were conducted, by crossing females breed with rams of breeds Turcana for the improval of meat production (Suffolk). In ICDM Cristian were established three experimental groups of lambs, kept indoors during the experiment. Lambs also received protein-vitamin-mineral supplements. The weight was recorded at calving and weighings were made at 30 and 70 zile. The obtained information were statistically processed and compared.*

**Key words:** sheep, average daily increase

### INTRODUCTION

Both the current economical and perspective situation reveal the necessity for the reevaluation of our potential in terms of the production of sheep meat and the enhancement of its favorable economical conditions. Considering the practice and experience of other countries that have achieved outstanding results in the production of meat, it would seem that the most appropriate and fastest way of increasing production, is the evaluation of the potential local breeds and populations, experiencing different selection schemes and cross, then the results on current practice recommendation for new technologies that can clearly contribute to increased production and quality of sheep meat. In the direction of increasing meat production are the main methods to be used for applying different types of cross industries, increase prolificacy, early allocation to mount the female youth, the organisation of three calving in two years.

## MATERIAL AND METHOD

In order to improve the sheep towards improving the quality and quantity of meat production in the ICDM Cristian Sibiu, experiments concerning the improvement of meat production were conducted, by crossing females breed with rams of breeds Turcana for the improval of meat production (Suffolk). In ICDM Cristian were established three experimental groups of lambs, kept indoors during the experiment. Lambs also received protein-vitamin-mineral supplements. The weight was recorded at calving and weighings were made at 30 and 70 zile. The obtained information were statistically processed and compared.

Batch no.1 - Lambs of Turcana breed

Batch no.2 - Crossbred lambs who came from crossing females of Turcana breed with rams Suffolk of meatbreed

Batch no.3 - Crossbred lambs who came from crossing the F1 generation (female x male Turcana Suffolk) with rams breed Suffolk.

## RESULTS AND DISCUSSIONS

Data from specialised literature, which shows the performance achieved by crossbred lambs, obtained by crossing breed Turcana with specialized breeds for meat production, reveals better performance than native breed.

Our research studies on growth performance, of the Metis Suffolk x Turcan, compared with lambs of the breed Turcan, are presented in Tab. no. 1 and 2

We can notice that the F1-products had initially (at birth) an average weight of  $3.653 \pm 0.133$  kg, 4.5% higher than Turcana lambs ( $3.494 \pm 0.125$  kg.) F2-products of an average weight of  $4.212 \pm 0.176$  kg, with 20 5% higher than the control group of lambs Turcana race. Their body weight compared at 30 days with Turcana race is 8.57% higher in the F1 generation and 27.3% in the F2 generation. At 70 days the body weight compared with Turcana race was higher by 15.1% to 31.9% F1 generation and the F2 generation.

**Dynamic evaluation of the body mass and average daily gain in lambs of Suffolk x Turcana Metis (F1 and F2) versus Turcana breed.**

Tab. no. 1

No.	Genotype	Body weight-kg						Average daily increase - kg			
		Birth	CV	30 days	CV	70 days	CV	0 – 30 days	CV	31-70 days	CV
Batch no. 1	Turcana	3,494± 0,125	3,5 8	8,782± 0,256	2,9 2	16,824 ±0,688	4,0 9	176 ± 5,53	3,1 4	201 ± 12,71	6,32
Batch no. 2 F1	Crossbred Suffolk X Turcana	3,653± 0,133	3,6 4	9,535± 0,283	2,9 7	19,365 ±0,507	2,6 2	196 ± 6,61	3,3 7	246 ± 8,06	3,28
Batch no. 3 F2	F1(Crossbred Suffolk X Turcana) X Suffolk	4,212± 0,176	4,1 8	11,182 ±0,446	3,9 9	22,200 ±1,074	4,8 4	232 ± 10,15	4,3 8	276 ± 17,6	6,38

**Table dealing with the comparison of the bo weight of the Turcana lambs with the F1 and F2 crossbred generation of Suffolk x Turcana**

Tab. no. 2

Comparison	kg at birth		kg at 30 days		kg at 70 days	
	Differences abs. -kg-	Test t	Differences abs. -kg-	Test t	Differences abs. -kg-	Test t
TA with F1	0,159 **	3,609	0,753 ***	8,125	2,541 ***	12,262
TA with F2	0,178 ***	13,655	2,400***	19,223	5,376 ***	17,383

The average gain recorded daily is higher in 30-70 days in all experimental groups. Note that F1 crossbred made greater gains than lambs of the breed Turcana with 11.3% in 0-30 days and 22.3% in 31-70 days and F2 crossbred realised greater gains than lambs of the breed Turcana with 31.8% in 0-30 days and 37.3% in 31-70 days. The bibliographic data states that crossbred have a better yield at slaughter, a greater quantity of meat in carcass and a good percentage of meat from fat. These qualities can give a much better price, so it make the farmer become more effective and also open the possibility of trading in European countries. Oriented meat production by hybrids of local breeds with breeds specialized for meat production may represent an opportunity for sheep breeders in the efficient holdings.

The Responsiveness of the farmers is different in terms of orientation of meat. One of them even admit that the meat production which makes more profit does not want to replace the local populations, with those used for meat. Others would accept the improvement program for the performances of the populations, provided that their milk production will not be affected.

### **CONCLUSIONS**

1. We can notice that the crossbred F1 Suffolk x Turcana had at birth weight of  $3.633 \pm 0.399$  kg, up 4.5% from Turcana breed lambs, which had a weight of  $3.494 \pm 0.125$ .
2. Crossbred F2 had at birth a weight of  $4.212 \pm 0.176$  kg, up 20% from 5 lambs Turcana breed.
3. The average gain, recorded daily is higher in the period of 30-70 days in all experimental groups.
4. The crossbred F1 made greater gains than lambs Turcana breed with 11.3% in 0-30 days and 22.3% in 31-70 days
5. The crossbred F2 made greater gains than lambs Turcana breed with 31.8% in 0-30 days and 37.3% in 31-70 days.
6. Weight differences recorded by F1 and F2(crossbred) Suffolk x Turcan, in various stages of the age, confirm the degree of precocity of the breed Suffolk.

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# AGRICULTURE IN A SYNCRONUS APPROACH WITH THE WORLD AROUND, THAT CAN SATISFY PRESENT GENERATIONS, BUT NOT COMPROMISING FUTURE GENERATIONS POSIBILITIES

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## Abstract

*Problems of humanity, nowadays, but especially in the future are linked to energy and food.*

*To answer the need for agricultural products, water, electricity, to eliminate waste rising along with the population, will have to get answers, to the scientific issues, today unsolvable after which there will be the need for new technologies and logistic systems, effective industrially speaking, apliable financially speaking, and socially.*

*All must take into account that although rise means change in quantity, development involves changes in quality, in a synchronus approach with the world around, that can satisfy present generations, but not compromising future generations possibilities.*

*In the context of globalization, inputs regarding production, and the agricultural products flow, are varying from legislation to economic, management, engineering data, marketing, and not to be ignored to the ethical ones.*

*To a strange irony, the new economic order is accompanied by a return to nomadry.*

*We are contemporans to this phenomenon: factories, intellectuals, students farmers, become travelers.*

*Everything, and everybody, are driven by the same desire to exist.*

*The production structures, but also those destined to services, and agrocommerce are adjusting themselves to new ranges.*

*This remark may be the explanation for the shortage of manpower in agriculture.*

**Keywords:** holdings, structure of agrofood production, holdings distribution

**JEL classifications:** Q, Q13, Q17

## INTRODUCTION

The problems of humanity nowadays, but especially in the future, are linked to energy and food!

Long before the shortage of energy to be noticed, there will be penuries to be overcome, the most significant is the one that regards agricultural products.



According to J.Attali, to feed the planet's population, by 2050, the agricultural production will have to be doubled, being necessary a rise with 50% in comparison to the one of the year 2006.

To answer the needs for agrofoods products, energy, water, materials, to eliminate waste, according to the growth of population, there will be the need to fix scientific problems today unsolvable, after which there will be developed new technologies and logistic systems, effective industrially speaking, applicable financially speaking and acceptable socially speaking.

It must succeed the modification of seeds in order for the cultures to consume less water, less fertilizers and less power.

It must succeed the storage of gas hydrogen in nanofibres to manufacture hydrogen batteries under high pressure and after that hybrid engines.

There will be to accomplish advances in miniaturization of some processes.

Biotechnologies and nanotechnologies are the goals of technological waves that are announced.

All this must take into account the fact that if the growth means change in quantity, the development forces changes in quality, in a synchronous approach with the time demands, that would satisfy present generations, but not compromising the possibilities of future generations!

But the dynamic of innovations seems to have slowed down. At the same time the ways of false progress are proliferating and this fact gets noticed under conditions that globalization will mean for Europe a fiercer competition from the creative economies such as the one in the United States Statele, as well as from some low cost economies such as China, India.

There are imposed and will be imposed reforms that will tackle the structural weaknesses that affects UE competitiveness.

The Lisbon Strategy, for growth and workplaces, forms the spine of the entire policy for „Internal Market” with important role regarding social economic-policies .

## 1 ACTUAL FRAME

The evolution of the economic conditions and environment come with two risks to the farmers: market risks due to prices and production risks due to climate conditions and health (diseases and harmful factors for plants and animals).

The introduction of a common managing risks is adequate and in the same time one to be desired for managing risks.

A solution for diminishing the effects caused by these phenomenons, might be forming a fund or a mechanism of insurance at comunitary level as part of Pillar I for situations generated by natural calamities or different diseases - it should be taken into consideration the co-financing the insurance bonuses for farmers from U.E budget / eventually with a component from national budgets.

A financing source to cope with the new challenges might form the annual savings recorded as part of Pillar I.

. The climatic changes over the last years presents a high risk factor for european agriculture in general, but especially for that in southern member states, including Romania.

In the context of globalization, inputs regarding production and the agricultural products flow, are varying from legislation to economics, management, engineering data, marketing, and not to be ignored to the ethical ones.

Rural development has become a key tool for restructuring the agricultural sector, encouraging diversity and innovation in rural areas.

Local initiatives such as Leader (financed by EU structural funds to help rural actors improve the long-term potential of their local region) can play an important role in encouraging innovation and entrepreneurship, promoting new ways of selling/dealing with risk in competitive markets, improving management processes in the agrofood chain, and applying the benefits of

research and development and information and communication technologies (ICT) on the farm.

## 2 SITUATION OF AGRICULTURAL FIELDS

In all *member states*, rural development is seen as promoting competitiveness in the agricultural fields and food processing sectors.

The majority (60.9 %) of the utilized agricultural area in the EU-27 was devoted to arable land in 2005 (see Table 1). This proportion rose to over 90 % in Bulgaria, Denmark and Finland.

In contrast, closer to two thirds or more of the utilized agricultural area in Ireland and the United Kingdom was permanent pasture.

Permanent crops (such as citrus and olive plantations and vineyards) accounted for a relatively high proportion of the utilized agricultural area in most Mediterranean countries, but particularly Greece and Cyprus, where they accounted for slightly more than a quarter of the land utilized for agricultural production.

Tabel 1  
Utilised agricultural area (1000 Ha)

	Total	Pământ arabil Arable land	Pășuni Permanent pasture	Culturi agricole Permanent crops
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
EU-27	171996	104717	55984	10872
BE	1386	845	519	21
BG	2729	2523	107	81
CZ	3558	2640	875	40
DK	2708	2501	198	9
DE	17035	11903	4929	198
EE	829	584	237	3
IE	4219	1152	3065	2
EL	3984	2058	824	1088
ES	24855	11937	8653	4260
FR	27591	18339	8131	1106
IT	12708	7040	3347	2286
CY	152	110	0	41
LV	1702	1076	599	25
LT	2792	1873	891	28
LU	129	60	68	2

HU	4267	3607	469	167
MT	10	8	0	1
NL	1958	1117	809	32
AT	3266	1405	1788	68
PL	14755	11308	3020	330
PT	3680	1241	1769	649
RO	13907	8867	4530	339
SI	485	174	282	27
SK	1879	1319	530	26
FI	2264	2233	26	5
SE	3192	2681	509	4
UK	15957	6114	9809	34

(1) Holding of less than 1 ESU accounted for 10,3 million hectares of utilised agricultural area in the EU-27, raising the UAA per commercial holding to an average 20,7 hectares

*Source* Survey on the structure of agricultural holdings, EF OV LUFT and EF OV KVAAesu

### 3 AGROHOLDINGS

There were 14.4 million agricultural holdings recorded in the EU-27 in 2005, a little under one half (46.6 %) of which were located in Romania and Poland together. However, almost half (46.0 %) of the EU-27's agricultural holdings were small units (typically semi subsistence holdings) of less than 1 economic size unit (ESU) and in Slovakia (81.2 %), Hungary (78.3 %), Bulgaria (77.9 %) and Romania (71.0 %), this share was considerably higher (see Table 2).

There were 7.8 million commercial holdings in the EU-27 in 2005 and a further 6.7 million small holdings. Almost 60 % of all commercial agricultural holdings (being of at least 1 economic size unit – ESU – and thereby excluding subsistence farming) in the EU-27 were located in Italy (17.7 %), Romania (15.8 %), Poland (13.8 %) and Spain (12.3 %).

The distribution of food and beverage manufacturing enterprises reflects more closely the economic weight of the Member State economies.

The highest concentration was in France, which alone accounted for a little over one fifth (22.0 %) of all the EU-27's food and beverages manufacturing enterprises.

Germany and Spain also recorded a high number of enterprises present within these activities.

A different pattern of geographic concentration was evident among food, beverage and tobacco wholesalers and among specialist food retailers; 46.6 % of the EU-27's food, beverage and tobacco wholesalers were located in France, Italy and Spain, while this same group of countries accounted for a clear majority (56.2 %) of the EU-27's specialist food retailers.

Almost twelve and three quarter million persons were employed full-time on agricultural holdings in the EU-27 in 2005.

A further 6.6 million persons were employed in restaurants, bars, canteens and catering throughout the EU-27, with just under a quarter of these (23.3 %) working in the United Kingdom.

Over one fifth (21.3 %) of the 5.1 million persons estimated to be working in the EU-27's non-specialized food retailing sector were also employed in the United Kingdom, a much higher proportion than in Germany (13.8 %), France (11.8 %) or other Member States.

The food and beverages manufacturing sector of the EU-27 generated EUR 188.2 billion of value added in 2005, which corresponded to EUR 40 147 per person employed, in both cases more than any of the other stages in the farm to fork chain. Value added per person employed was also relatively high in the food, beverages and tobacco wholesale trade (EUR 39 039 per person employed) and lowest for restaurants, bars, canteens and catering (EUR 16 437 per person employed) and primary agro food production (EUR 11 726 per full-time labor equivalent).

#### **4 THE STRUCTURE OF AGROPRODUCTION**

Other countries like Hungary, Bulgaria și Lituany are producing the aproximative level of consumption.

Acording to the data in 2006 it was estimated a production of 269,4 milion tons of cereals, of which 22.9% have as origin country France.

To cover the demand, UE-27 imported 22,4 milion tons of cerealsd in 2007, which 46.55 coming from Brazil and Argentina.

In contrast with the reported situation at cereals, it is prefered for perishable agricultural products to be imported in much smaller quantities.

To clarify, there were imported 0,3 milion tons of dairy products l and eggs from Switzerland and New Zeeland.

### 5 AGRICULTURE- FAMILY ACTIVITY

Agriculture remains very much a family-oriented activity in the majority of Member States: of the 17.9 million persons working regularly on commercial agricultural holdings across the EU-27 in 2005, around 90 % were farm holders or members of their families (see Table 3).

Table 2  
Number of agricultural holdings

	2000	2003	2005
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
EU-27		<b>15021410</b>	<b>14482010</b>
<b>BE</b>	<b>61710</b>	<b>54940</b>	<b>51540</b>
<b>BG</b>		<b>665550</b>	<b>534610</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>CZ</b>		<b>45770</b>	<b>42250</b>
<b>DK</b>	<b>57830</b>	<b>48610</b>	<b>51680</b>
<b>DE</b>	<b>471960</b>	<b>412300</b>	<b>389880</b>
<b>EE</b>		<b>36860</b>	<b>27750</b>
<b>IE</b>	<b>141530</b>	<b>135620</b>	<b>132670</b>
<b>EL</b>	<b>817060</b>	<b>824460</b>	<b>833590</b>
<b>ES</b>	<b>1287420</b>	<b>1140730</b>	<b>1079420</b>
<b>FR</b>		<b>614000</b>	<b>567140</b>
<b>IT</b>	<b>2153720</b>	<b>1963820</b>	<b>1728530</b>
<b>CY</b>		<b>45200</b>	<b>45170</b>
<b>LV</b>	<b>140840</b>	<b>126610</b>	<b>128670</b>
<b>LT</b>		<b>272110</b>	<b>252950</b>
<b>LU</b>	<b>2810</b>	<b>2450</b>	<b>2450</b>
<b>HU</b>	<b>966920</b>	<b>773380</b>	<b>714790</b>
<b>MT</b>		<b>10990</b>	<b>11070</b>
<b>NL</b>	<b>101550</b>	<b>85500</b>	<b>81830</b>
<b>AT</b>	<b>199470</b>	<b>173770</b>	<b>170640</b>
<b>PL</b>		<b>2172210</b>	<b>2476470</b>
<b>PT</b>	<b>415970</b>	<b>359280</b>	<b>323920</b>
<b>RO</b>		<b>4484890</b>	<b>4256150</b>
<b>SI</b>	<b>86470</b>	<b>77150</b>	<b>77170</b>
<b>SK</b>	<b>71040</b>	<b>71740</b>	<b>68490</b>
<b>FI</b>	<b>81190</b>	<b>74950</b>	<b>70620</b>
<b>SE</b>	<b>81410</b>	<b>67890</b>	<b>75810</b>
<b>UK</b>	<b>233250</b>	<b>280630</b>	<b>286750</b>

(.) About 6.7 million holdings in the EU-27 were smaller than 1 ESU in 2005, of which about

3.0 million were in Romania.

(.) The rise in agricultural holdings in the United Kingdom between 2000 and 2003 is almost entirely accounted for by holdings that were smaller than 1 ESU.

*Source* Survey on the structure of agricultural holdings, EF OV LUFT and EF OV KVAAesu

Table 3  
 EU agricultural farm labor force,  
 excluding subsistence labour on holding of less than 1 ESU

Family labour force 16.1 million persons of which, 42% women			Non-family labour force	
Holders	Spouses of holders	Other family members	Regular non-family labour	Non regular labour force
7,6 mil pers	4.2 mil pers			
Of wich, 23% women	Of wich, 80% women	Of wich, 36% women	Of wich, 28% women	
AWUs 4,2 mil	AWUs 1,9 mil	AWUs 1,4 mil	AWUs 1,5 mil	AWUs 0,9 mil

*Source* Survey on the structure of agricultural holdings, EF OV LUFT and EF OV KVAAesu, 2005

The main exceptions are Slovakia and Czech Republic were labour familiar represents 15-20% of the total work labour. Relevant are the dates from the chart.

. Most regular non-family workers on agricultural holdings tended to work on a full-time basis, in contrast to many family members who only worked part-time .

There was a sharp decline in the volume of agricultural labor used in most of the Member States during the period from 2000 to 2007 (see Table 3).

Across the EU-27 the labor force shrank by 19.5 % during the period considered. The most rapid declines (between 32 % and 44 %) were registered in Romania, Bulgaria, Lithuania, Slovakia and Estonia, in large part reflecting structural adjustments during the period after land restitution and the relative pull from other sectors of the economy off erring alternative employment opportunities.

The relatively stable levels of agricultural labor witnessed in Greece, Ireland and Sweden should, nevertheless, be seen against the backdrop of substantial reductions during the decade to 2000, as the volume of agricultural labor almost halved in Ireland and was reduced by about a third in Sweden and a quarter in Greece between 1990 and 2000.

Across the EU-27, more people worked on mixed crop farms than on any other farm type.

In 11 of the Member States, however, the largest proportion of the agricultural workforce worked on dairy farms.

## **CONCLUSION**

In the context of globalization the inputs and outputs concerning agrofood chain are multiple, from legislation to reengineering and, very important to the ethical problems.

The food chain is large: it comprises a considerable number of operators, employs vast numbers of people, and generates considerable amounts of value added .

Globalization will mean for Europe a ferocious competition both from the low-cost economies ( China, India) and from creative economies like USA..

Reforms shall be issued to tackle the structural weakness that affects UE competitively.

The UE globalization and the creation and consolidation of an Internal Market for XXI, in which funds and resources from the member countries are due to become multiplying rich, modernization and equilibrium need clear rules, stable in such way the consumers and producers become solvable.

Once these rules are set, the internal market becomes the promotor for inovative goods, conducts the UE producers to specialize in the production of merchandise with high added value, all these in contex of a clear energy strategy which promotes efficiency.



The strategy of Lisabon, for growth and workplaces, forms the spine of the entire policy for „Internal Market” with important role regarding social-economic policies.

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## EFFECTS OF SOIL LIMING AND MINERAL FERTILIZERS ON THE PALATABILITY OF FODDERS AT GRAZING WITH YOUNG SHEEP

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### Abstract:

*The research has been made in Paltinis Experimental Field (1360m) on a brown acid soil, having a clayey texture, a strong acid pH 4.62-5.10 (in water), a high content of organic substance which gradually decreases in profile and a rapport C/N=16.7. We had in view the influence of the soil liming with calcium on the crop of dry substance, the efficiency of mineral fertilizers on non manured or manured pastures i.e. the effect of soil liming and chemical fertilizers regarding the palatability of the fodder grazed by the young sheep.*

**Key words:** soil liming, fertilizers, fodder, sheep

### INTRODUCTION

Establishing a lasting pratological system using optimal doses of mineral fertilizers and soil liming combined with organic fertilizers can lead to a favourable evolution of the floristic structure. The object of this paper is a research of the influence of soil liming and fertilizers on the crop of dry substance and on the palatability of the fodder grazed by sheep.

### MATERIAL AND METHOD

The experimental proceedings contains two blocks, one manured with 6 t/ha CaCO<sub>3</sub> and one non manured.

Each block contains four variants of 150 m<sup>2</sup>, the exploitation of the variants being made by grazing with sheep. The experimental variants have been the following:

Non-manured	Manured
V1-non treated witness	V5 - non treated witness
V2-N90	V6 - N90
V3-N90 P45	V7 - N90 P45
V4-N180 P90	V8 - N180 P90

A free grazing was made with young sheep ensuring the possibility of the animals to choose and graze at discretion in any of the eight plots. Observations were made periodically between 9-10; 13-14; 17-18 for two days writing down on the typified observation sheets the number of animals existing every five minutes on each plot. The burden of animals was of 50 young sheep in the previous year/ha.

In order to estimate the crop each plot had a probation enclosure from which the green fodder was harvested by mowing.

## RESULTS AND DISCUSSIONS

### The influence of fertilizers on the crop of dry substance (Paltinis 1999-2001)

Table no. 1

Ref. no.	Treatment applied	Crop of dry substance + /ha/year	Differences	
			+	-
V1	Non manured-non fertilized	2.82	*	
V2	Non manured - N90	3.00	+0.18	
V3	Non manured N90 P45	3.31	+0.49	
V4	Non manured N180 P90	3.62	+0.80	
V1A	Manured - non fertilized	3.91	+1.09	
V2A	Manured N90	4.31	+1.49	
V3A	Manured N180 P45	4.77	+1.95	
V4A	Manured N180 P90	5.16	+2.34	

Analyzing the influence of fertilizers on the crop of dry substance there can be seen positive differences at all the fertilized variants compared to the witness both on manured and non-manured soil. The highest differences were recorded

by the administration of a dose of N180 P90 i.e. +0.80 on non manured soil and + 2.34 on manured soil.

**The influence of soil liming on non fertilized pastures**

Table no. 2

Variant	Production t/ha dry substance	Relative production	Difference t/ha dry substance	Significance
V1 non manured (witness) non fertilized	2.82	100.00	0.00	-
V2 manured non fertilized	3.91	138.65	1.09	***

Analyzing the efficiency of manuring on the non-fertilized pasture there can be seen a difference of production of 1.09 - t/ha dry substance as compared to the non manured pasture.

**The influence of soil liming on fertilized pastures**

Table no. 3

Variant	Production t/ha dry substance	Relative production	Difference t/ha dry substance	Significance
V1 non manured (witness) non fertilized	3.31	100.00	0.00	-
V2 manured fertilized	4.75	143.40	1.44	***

DL 5% = 0.14

DL 1% = 0.23

DL 0.1 % = 0.43

Analyzing the influence of soil liming on the fertilized pasture, a difference of production of 1.44 t/ha can be noticed as compared to the manured pasture.

**The influence of mineral fertilizing on non manured soil on the crop of dry substance**

Table no. 4

Variant	Production t/ha	Relative production	Difference t/ha	Significance
Witness	3.17	100.00	0.00	-
V1	2.82	88.99	-0.35	000
V2	3.00	94.67	-0.17	00
V3	3.31	104.46	0.14	*
V4	3.55	111.87	0.38	***

Analyzing the influence of mineral fertilizers, applied in increasing doses, on the crop of dry substance on non-manured pastures, an increase of production when applying fertilizers with nitrogen and phosphorus can be observed.

Fertilizing with N90 P45 achieved a significant difference of productiveness of 0.14 t/ha and fertilizing with N180 P90 achieved a very significant difference of 0.38 t/ha of dry substance.

**The influence of mineral fertilizing on manured soil on the crop of dry substance**

Table no. 5

Variant	Production t/ha	Relative production	Difference t/ha	Significance
Witness	4.48	100.00	0.00	-
V1	3.69	82.25	-0.80	000
V2	4.31	96.08	-0.18	-
V3	4.77	106.45	0.29	-
V4	5.17	115.21	0.68	***

DL 5% = 0.36

DL 1% = 0.52

DL 0.1 % = 0.76

On manured soil the effect of increasing the doses of mineral fertilizers is stronger. The variant fertilized with a maximum dose of minerals and manured definitely managed to obtain a distinctively significant difference of production, 0.68 t/ha dry substance.

**The growth in wight of the young sheep**

Table no. 6

Ref. no.	Weight		Growth	
	At the beginning of the experiment (kg)	At the end of the experiment (kg)	Total period (kg)	Head/day (g)
1	34	35.3	1.3	60
2	32	33.5	1.5	71
3	36	37.7	1.7	80
4	38	39.2	1.2	57
5	35	36.4	1.4	66
6	37	38.8	1.8	85

The six sheep achieved a growth in weight between 1.2 kg -1.8 kg during the whole grazing period (20 days). The growth in weight per sheep per day was between 57 -g/sheep/day and 80 -g/sheep/day.

On the non manured variants the plots, wich got the highest dose of fertilizers, are preferred whereas on the manured ones the plots fertilized with medium dose are preferred (although they are not the plots with the highest productiveness).

## CONCLUSIONS

1. The application of soil liming on the natural pasture chemically fertilized created a medium increase of the crop of dry substance of 1.44 t/ha as compared to the fertilized but non manured witness.
2. Experimenting doses of No, N90, N180 and P2 O5 -45 and P2 O5-90, as compared to the average of the experiment increases of production have been obtained application of the fertilizers with nitrogen and phosphorus.
3. The efficiency of the chemical fertilizers applied on manured pastures is bigger, on average. Than the same doses of fertilizers applied on non manured pastures: the difference between the average of the variants being of 1.31 t/ha dries substance (41%) in favour of the variants.
4. The application of mineral fertilizers in maximum dose of N180 P90 on a manured soil ensured a crop of 1.62 -t/ha dry substance as compared to the non manured variants.
5. There can be pointed out the favourable influence of soil liming and medium doses of chemical fertilizers on the palatability of fodder.

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**THE PRESENT INTERNATIONAL CONTEXT OF  
BIOSAFETY DOMAIN**  
**Short Review**

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In 1995, the second Conference of the Parties (COP2) to the Convention on Biological Diversity (CBD), held in Jakarta, Indonesia, established a Biosafety Working Group (BSWG) to comply with art. Article 19.3 of the CBD, which requests parties to consider the need for, and modalities of, a protocol setting out procedures in the field of the safe transfer, handling and use of living modified organisms (LMOs) resulting from biotechnology that may have adverse effects on biodiversity and its components. This is also in line with the art. 8 g. of the CPB regarding the establishment of means to regulate, manage or control the risks associated with the use and release of the genetically modified organisms.

This BSWG held six meetings at global level between 1996 and 1999 (February 1999, Cartagena, Colombia), when delegates attempted to complete negotiations and submit the draft protocol to the first Extraordinary Meeting of the COP (ExCOP), convened immediately following BSWG6 without results in negotiating outstanding issues such as:

1. the scope;
2. relationship with other agreements, especially those related to trade;
3. its reference to precaution;
4. the treatment of LMOs for food, feed or processing (LMO-FFPs);
5. liability and redress; and

6. documentation requirements.

Compromise was reached on the outstanding issues, and the resumed ExCOP adopted the Cartagena Protocol on Biosafety on 29 January 2000 in Montreal, Canada. The meeting also established the Intergovernmental Committee for the Cartagena Protocol on Biosafety (ICCP) to undertake preparations for COP/MOP1, and requested the CBD Executive Secretary to prepare work for development of a BCH.

During a special ceremony held at COP5 (May 2000, Nairobi, Kenya), 67 countries and the European Community signed the Protocol.

The fourth meeting of the COP/MOP (May 2009, Bonn, Germany) marked the deadline for adopting a decision on international rules and procedures for liability and redress addressed by the art. 27 of the Protocol (Protocol to the Protocol). The COP clearly requested to the Parties that it should be adopted at the next MOP a liability and redress international regime focusing on an administrative approach and including a provision on civil liability that will be complemented by non-legally binding guidelines on civil liability redress based on a compromise that envisions a legally binding supplementary protocol today known as the *Bonn Compromise*.

The concept “liability” is associated with the obligation under a specific applicable law to provide compensation for damage resulting from an action for which that person is deemed to be responsible – and it is the cornerstone of the art. 27 of the Protocol for situations when transboundary movement of living modified organisms (LMOs) has caused damage.

Other relevant issues such as handling, transport, packaging and identification (HTPI) of LMOs; the BCH; capacity building; socio-economic considerations; risk assessment and risk management; financial mechanism and resources; and subsidiary bodies (not yet functioning) are still under debate.

At the COP/MOP5 in Nagoya Japan, after more than six years of intense negotiations, it was adopted the supplementary Protocol entitled *Nagoya-Kuala*



*Lumpur Supplementary Protocol on Liability and Redress to the Cartagena Protocol on Biosafety* for damage resulting from the transboundary movement of LMOs.

The text of the *Nagoya-Kuala Lumpur Supplementary Protocol* was agreed upon a few hours before the opening of the fifth meeting of the COP-MOP by a group of government representatives, known the *Group of the Friends of the Co-Chairs on Liability and Redress in the Context of the Cartagena Protocol on Biosafety* that was established by the last meeting of the governing body of the Protocol (COP-MOP) in Bonn, Germany.

Art. 3. Scope of the Supplementary Protocol is very important in setting out further capacity building planning for the Parties. It clears states that:

1. *This Supplementary Protocol applies to damage resulting from living modified organisms which find their origin in a transboundary movement. The living modified organisms referred to are those:*
  - a. *Intended for direct use as food or feed, or for processing;*
  - b. *Destined for contained use;*
  - c. *Intended for intentional introduction into the environment.*
2. *With respect to intentional transboundary movements, this Supplementary Protocol applies to damage resulting from any authorized use of the living modified organisms referred to in paragraph 1 above.*
3. *This Supplementary Protocol also applies to damage resulting from unintentional transboundary movements as referred to in Article 17 of the Protocol as well as damage resulting from illegal transboundary movements as referred to in Article 25 of the Protocol.*
4. *This Supplementary Protocol applies to damage resulting from a transboundary movement of living modified organisms that started after the entry into force of this Supplementary Protocol for the Party into whose jurisdiction the transboundary movement was made.*

5. *This Supplementary Protocol applies to damage that occurred in areas within the limits of the national jurisdiction of Parties.*
6. *Parties may use criteria set out in their domestic law to address damage that occurs within the limits of their national jurisdiction.*
7. *Domestic law implementing this Supplementary Protocol shall also apply to damage resulting from transboundary movements of living modified organisms from non-Parties.*

In the European Union, the Cartagena Protocol on biosafety provisions are covered by the European legislation on biosafety which is maintaining as a central cornerstone the precautionary principle. The liability provisions of the Supplementary Protocol are covered by the Directive 2004/35/CE on Environment Liability and it remains at the Parties level to develop redress measures.

#### *Current situation in Romania*

Romania adopted the Cartagena Protocol on biosafety through the Law 59/2003 and implements its provision according to the EU legislation:

1. Directive 2001/18 through the Emergency government Ordinance 43/2007,
2. Regulation 1829/2003 and 1830/2003 through the Government Decision 173/2006
3. Regulation 1946/2003 through the Government Decision 497/2007,
4. Regulation 65/2004 without a specific Romanian act in place

Also, Romania developed accordingly capacity building for the Protocol implementation and functioning.

During 2004-2006 runs the project National Biosafety Framework for Romania which revealed the gaps and needs for the biosafety system mainly based on the draft Directive 2001/18/EC.

Starting with the 1<sup>st</sup> January 2007 Romania joined the EU and tried to comply during the 2007 with the EU biosafety system, known as the best developed at international level. Thus, the main legal acts on biosafety are the Emergency Governmental Ordinance nr. 43/2007 for genetically modified organisms deliberate release into environment (M.Of. no. 435/28.06.2007) adopted by the Romanian Parliament through the Law 247/2009 (M.Of. no. 472/08.07.2009).

However, there still is a great need to develop further capacity building for issues such as: handling, transport, packaging and identification (HTPI) of LMOs, the BCH, socio-economic considerations, risk assessment and risk management – standards issues, financial mechanism and resources and subsidiary bodies.

*Legislation in force*

The main legal acts for the biosafety system according to the Cartagena Protocol on Biosafety in Romania are as following: the Emergency Ordinance 43/2007 regarding the deliberate release into environment and placing on the market of the genetically modified organisms approved with completions and modification through the Law 247/2009, Governmental Decision for the adoption of the Regulation 1946/2003, Regulation 1929/2003. Also, we remind the Governmental Emergency Ordinance 15/2009 for amending and completing the EGO 68/2007 regarding the environment responsibility for paying the repairing of the environment prejudice which in other words represents already the administrative approach for the liability and redress future Protocol.

Romanian biosafety policy is not yet defined and no vision or missions are either adopted by the Government.

Romania should further develop the technical and legal expertise for working under the Cartagena Protocol on biosafety at international level through the proper representation at all international levels by the nominated experts for

the Competent Authority in a decentralized manner based only on the best expertise to represent Romania.

The Ministry of Environment is entitled to take the lead on behalf of the Romanian Government at European and international levels for any aspect related to the Cartagena Protocol on biosafety and accordingly to any connecting aspect at the EU level based on applying the transparency principle in taking decision.

Thus the Ministry of Environment should further develop a vision regarding the agriculture future in our country based on an integrated approach for different types of agricultural systems especially due to the relief of our country: mountains, hills, plains, Danube Delta, protected and not protected areas.

In the end we are reiterating our former statement: even we are living in the beginning of the XXI century the general public is not completely ready to cope with the complexity of this domain either from scientific point of view either from technical and political points of views either from all points of view. These new emerging domains such as modern biotechnology, novel food or nanotechnology are practically living the first years of “ripping as philosophical concepts” because the society needs to develop further and needs to understand more in-between science, technical, legal and politics. This sine qua non condition of completely acceptance of new technologies on the market is however the time passing in the favour of applying high level standards in science (Antofie et al., 2009, Antofie et al., 2010).

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## PROPOSALS REGARDING TECHNOLOGICAL SEQUENCES IN THE CONTROL OF THE SPECIES *DIABROTICA VIRGIFERA* LE CONTE IN THE SIBIU COUNTY DURING 2009

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### Abstract

*In Romania Diabrotica virgifera virgifera was noticed for the first time in 1996 in Nădlag-Arad area. The researches and monitoring of this coleopteron continues because it permanently migrates, covering large areas cultivated with corn. These areas offer a climate that assures the evolution of this species.*

*In the Sibiu County the pest was noticed for the first time in 2001. During 2009 the species Diabrotica virgifera virgifera was monitoring intensively. In this respect there were put traps with sexual attractive pheromone. The monitoring took place in 10 collecting points. In the points such as Bratei, Laslea, Mediaș, Topârcea the monitoring was done in the culture of seed corn. In Agnita, Apoldul de Sus, Cârța, Dumbrăveni, Țapu the collecting was done in the culture of consumption corn and in Ocna Sibiu in the culture of biomass corn.*

*The monitoring of the dynamics of the number of adults as well as the evaluation of the damages produced by the larvae on the roots has been done during 15 weeks from the 15<sup>th</sup> of June to the 15<sup>th</sup> of September every year. There was established that during 2009 there were captured 513 adults, the maximum number being collected in July – 269 adults.*

**Keywords:** *Diabrotica virgifera virgifera* Le Conte, monitoring, integrated control

### INTRODUCTION

*Diabrotica virgifera virgifera* Le Conte belonging to the *Coleopteron* order and the *Chrysomelidae* family is a new pest for Europe.

Till the very beginning of its presence in Europe as well as in our country the published materials emphasized the strong pest potential of the species drawing the attention of the scientific world and the farmers upon this factor of reducing the corn productions. The researches done tried to figure out the main aspects regarding the biology and the ecological factors, which favorites the

development and mass multiplication that made this pest a very important one for the corn culture.

This pest is considered in U.S.A. among the 4 most important pests of the corn culture. It is appreciated that the losses produced in this country by *Diabrotica virgifera virgifera* were somewhere between 60 and 85 million USD yearly. If there are added the costs for the control of the pest, then the sum would be over 1,000 USD yearly (Roşca, 1999). As a result this species was called “the one milliard insect” (Popov&co-workers, 2008).

Till now the coleopteron hasn't produced major damages in our country, but there are chances that in the following years as a result of the lack of preventing measures against the attack of this pest, *Diabrotica virgifera virgifera* to be the main pest for corn in our country (Roşca, 1999).

## MATERIAL AND METHOD

- ✓ The investigations were done during 2009;
- ✓ For 2009 there was kept the delimitations of the national territory in 3 areas, as follows: A (for the infested area), B ( an area of 40km in width, having 10km in the infested area A and 30 km in the non infested area C and C( non infested area). The Sibiu County belongs to A area;
- ✓ In order to evaluate the efficiency of the control measures that were applied in the Sibiu County, during 2009 were established fixed points of monitoring for the producers of seed corn and consumption corn. The number of the fixed points was established taking into account the surface cultivated with corn, so in the Sibiu County for a cultivated surface of 24,966 hectares were established 10 fixed points of monitoring (Table 1).
- ✓ The monitoring was done with the help of the traps with sexual attractive pheromone, which attract the males and sometime by accident they attract females, too. The traps were put in the monocultures of corn occupying surfaces bigger than 2 hectares. The monitoring period was during 15<sup>th</sup>

June to 30<sup>th</sup> September, for 15 weeks. The reading of the traps was done weekly and there were registered the number of the captured adults. Once a month the pheromone traps were changed;

Table 1

**Monitoring Points Placed in the Sibiu County during 2009 for Monitoring the Species *Diabrotica virgifera virgifera* Le Conte**

The Culture	Monitoring Points/The Locality
Seed Corn	1. Bratei
	2. Laslea
	3. Mediaş
	4. Topârcea
Consumption Corn	5. Agnita
	6. Apoldul de Sus
	7. Cârța
	8. Dumbrăveni
	9. Țapu
Biomass Corn	10. Ocna Sibiului

- ✓ There were collected a number of 513 adults;
- ✓ The identification and the the proposal of the most efficient technological sequences in the control of the researched species.

**RESULTS AND DISCUSSIONS**

Sibiu County has a surface of 5,432 km<sup>2</sup> from which the total agricultural surface represents 305,351 ha. From this surface only 115,973 ha are arable soils. The surface that is cultivated in Sibiu County with corn for food, seed and biomass is indicated in table 2.

Table 2

**The Cultivated Surface with Corn in the Sibiu County and the Number of the Producers**

Total Cultivated Surface (ha)/ Number of the Producers				
Biomass Corn	Seed Corn	Grain Corn	Sweet Corn	Total
999 ha/67 the producers	112 ha/2 the producers	23,855 ha/ 12.493 the producers	-	24,966 ha/12.562 the producers



From this surface of 24,966 ha cultivated with corn the monoculture surface for 2009 was of 16,086 ha. (Table 3).

Table 3

**The Surface in the Corn Monoculture during 2009**

The Total Corn Surface	The Monoculture Surface	The Duration of the Monoculture
24,966 ha	12,512 ha	2 years
	2,165 ha	3 years
	959 ha	4 years
	450 ha	abouve 5 years
	The Total Surface in The Monoculture : 16,086 ha	

**1. The Monitoring of the *Diabrotica virgifera virgifera* during 2009**

The monitoring of the adults during 2009 took place from the half of June when the first adults emerged till the end of September, using the pheromone traps „Atravirg”. The instalment of the traps was done mainly in the corn fields, in the points established by the Sanitary Unit in Sibiu (Table 4).

Studying the data in the table 4 we can draw to the following conclusions:

- During 2009 there were collected in the Sibiu County a number of 513 adults;
- The gathering was done in 10 fixed points: Bratei, Laslea, Mediaş, Topârcea (in the seed corn culture), Agnita, Apoldul de Sus, Cârța, Dumbrăveni, Țapu (in the consumption corn cultures), Ocna Sibiu (in the biomass corn culture);
- The most affected by the attack of the pest were the localities Ocna Sibiu (134 adults) and Agnita (72 adults);
- In the Atravirg trap placed in the locality Ocna Sibiului, the small plot, named “După grădini” having a surface of 6 ha corn in only one monoculture, there were captured only 25 adults of *Diabrotica virgifera virgifera*, although in the area were noticed 10-15 adults/plant, this being over PED, which is of 5-10 adults/plant;
- The great share that is cultivated with corn, the only culture of it as well as the climate contributed to the increasing and spreading of the pest.

## 2. Proposals of Technological Sequences in the Control of the Species *Diabrotica virgifera virgifera* Le Conte in the Sibiu County

### ➤ The Prognosis

An important role in establishing the control strategy of the Western worm of corn is presented by the prognosis of its appearance.

- The Prognosis for a Long Period of Time. The prognosis of the appearance of the pest is based on knowing the number of adults, eggs and larvae, on large surfaces, taking into consideration not only the density of the pest but also the climate conditions and especially the cultivating system existing in the area. There is very important the existence of a monitoring system of the pest and the cooperation of the interested farmers, as well.
- The Prognosis for a Short Period of Time (the Warning): The monitoring of the pest is done either by watching the adults or the larvae.
  - For the adults the corn field must be monitoring a little bit earlier before the appearance of the silk, counting the existing adults. In this respect there are used the active biological substances such as sexual pheromones of synthesis, known as “the third generation of pesticides”. The sexual pheromones are volatile substances produced by the glands with external secretion, which have the role of sex appeal. In this respect in the corn cultures can be put pheromone traps “Atravirg” for monitoring the appearance and establishing the level of the pest population.
  - For larvae the registration of the number is done during June in order to determine the number larvae/plant.

Table 4

**Monitoring the species *Diabrotica virgifera virgifera* in 2009**

Nr. crt.	Collecting period	Locality /Captured adults										Total collected adults year
		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	
		Mediaș	Bratei	Laslea	Topârcea	Agnita	Apoldul de Sus	Cârța	Dumbrăveni	Ocna Sibiului	Țapu	
1.	<b>15<sup>th</sup>-21<sup>st</sup> June</b>	-	-	-	-	-	-	-	-	-	-	
2.	<b>22<sup>nd</sup>-30<sup>th</sup> June</b>	-	-	-	-	-	-	-	-	-	-	
	Total June	-	-	-	-	-	-	-	-	-	-	-
3.	<b>1<sup>st</sup>-5<sup>th</sup> July</b>	0	1	2	0	8	0	0	0	0	2	
4.	<b>6<sup>th</sup>-12<sup>th</sup> July</b>	2	4	3	0	4	0	0	0	10	3	
5.	<b>13<sup>th</sup>-19<sup>th</sup> July</b>	15	5	3	0	3	0	1	1	15	9	
6.	<b>20<sup>th</sup>-26<sup>th</sup> July</b>	11	10	7	1	41	0	0	17	18	5	
7.	<b>27<sup>th</sup>-31<sup>st</sup> July</b>	5	6	5	1	12	3	0	5	25	6	
	Total July	33	26	20	2	68	3	1	23	68	25	269
8.	<b>1<sup>st</sup>-5<sup>th</sup> August</b>	4	7	6	2	0	5	2	3	7	4	
9.	<b>6<sup>th</sup>-12<sup>th</sup> August</b>	6	10	2	4	0	10	3	2	12	5	
10.	<b>13<sup>th</sup>-19<sup>th</sup> August</b>	11	8	0	2	1	6	1	1	8	7	
11.	<b>20<sup>th</sup>-26<sup>th</sup> August</b>	1	3	0	0	2	7	4	0	7	2	
12.	<b>27<sup>th</sup>-31<sup>st</sup> August</b>	2	1	0	0	1	3	2	0	3	1	
	Total August	24	29	8	8	4	31	12	6	37	19	178
13.	<b>1<sup>st</sup>-5<sup>th</sup> September</b>	2	1	1	3	0	4	1	0	15	6	
14.	<b>6<sup>th</sup>-15<sup>th</sup> September</b>	2	1	1	2	0	3	0	2	10	3	
15.	<b>16<sup>th</sup>-30<sup>th</sup> September</b>	0	4	0	0	0	0	1	0	4	0	
	Total September	4	6	2	5	0	7	2	2	29	9	66
	Total on each collecting point	61	61	30	15	72	41	15	31	134	53	513

➤ The Conduct of the Agricultural and Technical Methods in the Pest Control

- The rotation of the cultures can assure an excellent control because the eggs being laid almost exclusively in the corn cultures and the larvae have to find and to feed themselves on the roots of the corn in a short period of 3 days from hatching of eggs leads to the conclusion that in the absence of the corn culture they die.

Due to the great number of collected adults during 2009(513 adult samples) and taking into consideration the biological reserve in this years there is forbidden the cultivation of the corn in monoculture, so that in a period of 2 years one following the other on the sample field, the corn must not be cultivated on the same field more than one year.

- The workings of the soil also contributes to reducing the population of the pest by bringing to the air and dry zones of the eggs and the larvae that leads to their death;
- The destroying of the self-sown corn
- The fertilization also brings its contribution to the development of the radicle system as well as of the regeneration of the attacked one so the pest can't do too much harm in order to cause less damage.
- The sowing data influences the way of the pest attack. The early sowing corn cultures having a developed radicle system are more attacked by the larvae than the later sowing corn cultures that have a less developed radicle system. By reducing the degree of being available of the roots grows the mortality of the early hatching of larvae.
- The density of the plants. Having a great number of plants on a hectare favorites the development of the pest but in the same time, due to the lowering of the pressure of pest on the one plant (it is lowered the density larvae/plant) increases the percentage of the survival of the plants.

- The establishing of the trap fields having late sowing corn. The pest, as an adult, after eating the pollen and the silk of the corn after it becomes brownish or after fecundation it can migrate. Most of the females(almost 90%) lay the eggs in the same field where they have fed and fecundated but quite often, after the silk became brownish the females migrates to the field where the silk is still green, where they feed and lay the eggs. After they have laid the eggs the trap field is destroyed.
  
- The method of using the soils and the hybrids that is resistant and tolerant. There is known the phenomenon of resistance at the attack of this pest and there are cultivated hybrids or resistant lines, these referring to the abundance of the radicle system or at its capacity to recover itself. There are known as resistant ones a number of varieties (Haya Golden, Golden Republic, Midland yellow Dent etc.), synthetic populations (Iowa Stick Stalk Synthetic, etc.) or cosanguinical lines (SD 10, B69, Mo22, Oh05, A 231, W 202, etc.).
  
- Biological and biotechnical methods and means. There are known a series of parasites and predators that contributes to reducing the population of the pest. They try the bacteria *Bacillus thuringiensis f. tenebrionides* in some bio preparation.
  
- Chemical methods

Referring to this method, during the time there were two strategies of control of the pest, either by the application of the insecticides for the control of the larvae or of the adults (Popov & coworkers, 2008)

- The first strategy aims the control of the pest mainly by applying the insecticides in the soil during sowing or when is done the first weeding hoeing, as well as the treatment of the seeds in order to destroy the larvae.

- The second strategy aims the control of the adult by applying the insecticides in order to reduce the number of adults and in the same time reducing the number of eggs that leads the lowering the level of the population under the economic damage limit.
- There is recommended the application of the grain insecticides after sowing in the same time with fertilizing works.

In the latest period there were homologated by the National Commission of Homologation products for the protection of the plants in order to control the larvae and the adults of *Diabrotica virgifera virgifera* (Table 7).

The application of the chemical treatments against the adults is compulsory if there is reached the economic damage limit of 5-10 adults/plant in the case of the grain consumption corn and 5 adults/plant for the seed corn.

Table 7

**Homologated Products against the Western Worm of the Corn Roots in the Country**

Stadium	Period	The recommended product for the protection of the plants		
		Active Substance	Commercial Product	
			Name	Dose l, kg/ha
Adult	In the faze of appearance of the panicles and silk;	Zeta cipermetrin 10%	Fury 10 CE	0,2 l/ha
		Clorpirifos 250 g/l	Pyrinex 25ME	1,5 l/ha
	In the period of flying of the insects	Bifentrin 150 g/l	Seizer 10 EC	0,2 l/ha
Larvae	During sowing at a depth of 15cm	Terbufos 5 %	Counter 5G	25 kg/ha

**CONCLUSIONS**

1. *Diabrotica virgifera virgifera* Le Conte has extended its spreading areas in the Sibiu County, too.
2. The monitoring of the adults during 2009 was done from 15<sup>th</sup> June to 30<sup>th</sup> September; the maximum of the captured samples was registered in July.

3. The monitoring was done in 10 points: Bratei, Laslea, Mediaș, Topârcea (in a seed corn culture), Agnita, Apoldul de Sus, Cârța, Dumbrăveni, Țapu (in the consumption corn culture), Ocna Sibiu (in biomass corn culture)
4. The main factors that influenced the multiplication and the spreading of the pest in the Sibiu County are as follows: large surfaces cultivated with corn, the monoculture of the corn, the relative quite high density of the plants.
5. This dangerous pest of the corn should be monitoring further in order to prevent and to limit its spreading as well as an efficient integrated control.
6. The integrated control of the populations of *Diabrotica virgifera virgifera* Le Conte in the Sibiu County can be done using agricultural and technical methods (the rotation of the cultures, the establishment of the sowing period, harvesting in time and the cultural hygiene, early cultures as trap parts, cultivating the hybrids with a well developed radicle system) as well as chemical methods for larvae and adults.

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# CULTIVATION OF A NEW PLANT ON SOILS POLLUTED WITH HEAVY METALS AND THE USE OF THE RESULTED BIOMASS

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## **Abstract**

*The paper presents our results in cultivation on soils polluted with heavy metals (Pb, Cd) of *Miscanthus sinensis* 'giganteus', a sterile hybrid, as well as the tests we have performed for the use of the stems cropped after two years.*

*The results are very encouraging and we expect more and more farmers to cultivate this plant, with benefit for them and for environment.*

**Keywords:** *Miscanthus sinensis* 'giganteus', heavy metals, briquettes

## **INTRODUCTION**

Soils polluted with heavy metals (Pb, Cd) pose a great environmental risk, but when these soils are cultivated with edible/forage plants, as the case of Copsa Mica region in Romania, the risks are much greater. Even though the situation is well documented (Dumitru 2004, Lacatusu 2008, Constantinescu 2008), and there are some attempts in remediation of these soils (Barbu and Grovu 2001, Barbu et al. 2006, Dumitru et al 2002, Dumitru 2004), until now no feasible solution for the decontamination of this large region has been found. On world scale, after a boost of phytoremediation and especially phytoextraction, with thousands of research papers, it turned out that this method, although elegant and environmental friendly, is not sustainable on large pieces of land, and even the greatest names in this field suggested other approaches, such as phytoexclusion, i.e. selecting crops that do not translocate high concentrations of metals to edible parts (Dickinson et al., 2009).

In our work we have started from the following assumptions: heavy metals already existing in soil are difficult to be removed, due to the very high



costs and/or long time to perform any known remediation method; because groundwater level is quite deep (3 -10 m), it is unlikely to be contaminated; until a feasible method will be used, farmers in the area depend on their land, and cultivation of non-edible plants, with market value, could be a solution for their well-being.

After screening many species of non-edible plants, we have chosen for our research a new hybrid, *Miscanthus sinensis x giganteus* (Poaceae), trying to determinate if it can be cultivated on these lands (considering the climate and the pollution degree) and what is the amount of heavy metals in its useful parts.

## MATERIALS AND METHODS

*Miscanthus sinensis x giganteus* Greef et Deu is a triploid hybrid between *M. sinensis* Anderss. (a diploid species) and *M. sacchariflorus* Hack (a tetraploid species), which is unable to produce viable seed, thus reducing the risk to become invasive (Jones and Walsh, 2001). Giant miscanthus is a perennial warm-season grass, with a special type of photosynthesis (C4), which implies the return of the nutrients in the rhizome during the cold season (Fruhwirt and Liebhard, 2004). As temperatures decrease in the fall, the dark green foliage fades to buff and drops, leaving stems (and sometimes sterile flowers at their terminus). Stems are the most commercially important portions of miscanthus, and harvesting the dried stems takes place during late winter or early spring (March-April). Propagation is made mainly by rhizomes and, in the third year of cultivation plants reach a height of 3-4 m, with a yield of 20 tons per hectare (at 15% humidity). It is worth to state that there is a big difference between *M. sinensis* and *M. sacchariflorus*, on one hand and their "off-spring" *M. Giganteus*, on the other, in what invasiveness concerns: while the "parents" produce seeds and therefore can be invasive, 'giganteus' gives a sterile blooming, and all the attempts to multiply it otherwise than by rhizomes or seedlings have failed. A major mistake is given by the similarity of names: *Miscanthus sinensis* and

*Miscanthus sinensis* 'giganteus'. Even the most thorough research made in U.S.A. and Europe have proven no sign of invasiveness and therefore 'giganteus' is NOT on the European invasive species list.

Its current use is for energy, but research are performed for other industrial uses, as pulp and paper, additive in concrete walls, plastics replacement (Pyter et al. 2007).

For our experiments we have chosen a piece of land (5000 m<sup>2</sup>) at the borders of Copsa Mica town, situated two km eastwards from the pollution source (SOMETRA SA). Land characteristics were determined according to the current Romanian standards, the average sample consisting on 10 sub-samples taken from different places. Soil and then plants loading with heavy metals were determined in solid state, using a High-resolution continuum source atomic absorption spectrometer ContrAA 700, manufactured by Analytik Jena (Germany). On this land, after soil preparation, we have planted manually, in May 2008, *Miscanthus* rhizomes (from Fa. ARGE GmbH, Austria), in rows (1 x 1 m), at a depth of 10-15 cm. No pesticides and fertilizers were used. In April 2010 we have cropped the aerial parts, using a trimmer, and then we grinded them using a household cereal mill, the product looking similar to sawdust. This dust was sent to be analyzed by a certified combustion tests laboratory (Oscar von Muller Co., Bucharest) and briquetted on a sawdust press. To determine the amount of heavy metals, soil and vegetal samples were oven dried at 105°C, for two hours and then grinded under 10µm (Fritch – Pulverisette 0). For each analysis there were taken at least four samples. In the AAS graphite furnace there were introduced amounts of 1.0000 mg at a time.

## RESULTS AND DISCUSSION

The piece of land where we have performed our research was a poor one, acidic (pH=5.2) heavily polluted with Cd (13.47 mg · kg<sup>-1</sup> dry weight) and Pb (682.50 mg · kg<sup>-1</sup> d.w.) (Barbu et al. 2009). Despite these, the results are encouraging: the plants have grown, with a survival rate of more than 90%, and

from rhizomes have developed rootlets until the depth of 1.2 m, where the pollution degree is lower, this demonstrating that *Miscanthus sinensis x giganteus* can be successfully cultivated in Romania, even on poor, acidic soils, heavily polluted with Pb and Cd. The amounts of Cd and Pb in the aerial parts were  $2.12 \pm 0.44 \text{ mg kg}^{-1} \text{ d.w.}$  and  $3.71 \pm 0.73 \text{ mg kg}^{-1} \text{ d.w.}$ , respectively). These very low values make the plant unsuitable for phytoextraction, but allow its almost unrestricted use for energy, and not only. In what the chemical composition and combustion characteristics concern, as determined by a third party laboratory, the results are presented in Table 1:

**Table 1. Chemical composition and combustion characteristics of Miscanthus dust**

No.	Characteristic	Value (% wt)	Test method
1	Total moisture	9.30	SR 5264:1995
2	Ash	1.70	ASTM D 3174:2004
3	Volatile matter	74.28	STAS 5268:1990
4	Carbon	44.21	ASTM D 5373:2006, ISO 351:1996 CEN/TS 15104:2005
5	Hydrogen	6.21	
6	Oxygen (by difference)	48.57	
7	Sulfur	0.00	
8	Nitrogen	0.56	
9	Chlorine	0.45	ISO 3634:1979
10	Lower heating value	16039 kJ/kg	ISO 1928:2009
11	Higher heating value	17673 kJ/kg	CEN/TS 15148:2005

These results, very similar with those reported by Collura et al. (2005), show clearly that *Miscanthus*, even cultivated on polluted soils, has very few ash, no sulfur, and its heating value is comparable to that of lignite.

Preliminary tests with the briquettes (cylinders 10 cm diameter, 7-12 cm length), obtained for the first time in Romania, gave also good results, without ash agglomeration, which is a major concern in biomass use for energy.

## CONCLUSIONS

1. *Miscanthus sinensis x giganteus*, a valuable energy plant, can be successfully cultivated in Romania, even on soils heavily polluted with Pb and Cd.
2. The amount of Pb and Cd in the upper parts of the plants, even cultivated on soils heavily polluted with Pb and Cd, is very small, this allowing its unrestricted industrial and energetic use.
3. Combustion characteristics of *Miscanthus* dust and briquettes are very good, making possible the partial replacement of coal in new or existing heating units.

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## NEUTRALIZATION OF RED MUD USING GRAPE MARC

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### Abstract

*Red mud is a great environmental issue for the alumina industry due to its high pH (>10.5), fine-grained nature (>90% is finer than 10 microns), elevated sodium concentration (>50 g/kg), and soluble alkalinity which reduce its transport and reuse options. The neutralization of red mud provides potential reuse options because neutralization lowers pH, increases grain-size (e.g., coagulation), and precipitates or converts alkalinity.*

*This paper investigates the neutralization of accidentally spilled red mud (as the recent Hungarian accident) using a bio-degradable waste, obtained in wine-making industry.*

**Key words:** red mud, pH reduction, wine waste.

### INTRODUCTION

Red mud is a [solid \[1\] waste](#) product of the [Bayer process](#), the principal industrial means of refining [bauxite](#) in order to provide [alumina](#) as raw material for the [electrolysis](#) of [aluminium](#). A typical plant produces one to two times as much red mud as alumina. This ratio is dependent on the type of bauxite used in the refining process. The [red](#) color is caused by the [oxidized iron](#) which can make up to 60% of the mass of the red mud [\[2, 3\]](#).

Red mud cannot be disposed of easily. In most countries where red mud is produced, it is pumped into holding ponds. Red mud presents a problem as it takes up land area and can neither be built on nor farmed, even when dry. Due to the Bayer process the mud is highly [basic](#) with a [pH](#) ranging from 10 to 13. Several methods are used to lower the [alkaline](#) pH to an acceptable level to decrease the impact on the environment. Research is done to find a suitable way to utilize the mud for other applications, but drying the mud requires much energy ([latent heat](#) for [water evaporation](#)) and can represent high costs if [fossil fuels](#) have to be used in the drying process [\[2, 3\]](#).

A chemical analysis would reveal that red mud contains silica, aluminum, iron, calcium, titanium, as well as an array of minor constituents, namely: Na, K, Cr, V, Ni, Ba, Cu, Mn, Pb, Zn etc. The variation in chemical composition between different red muds worldwide is high.

Like most ores and soils, bauxite can contain trace quantities of metals such as arsenic, beryllium, cadmium, chromium, lead, manganese, mercury, nickel and naturally-occurring radioactive materials, such as thorium and uranium. Most of these trace elements stay with the residue. A wide variety of organic compounds are also present. The following compounds have been reported: Polybasic and polyhydroxy acids, alcohols and phenols, humic and fulvic acids, carbohydrates, sodium salts of succinic, acetic and oxalic acids.

These organic compounds, giving red mud a distinctive odor, are derived largely from decomposed vegetation and roots. Under the alkaline oxidative conditions existing in the Bayer process, they break down to more simple compounds such as the sodium salts of succinic, acetic and oxalic acids. Predominant among these salts is sodium oxalate.

The composition of red mud varies largely, depending on the bauxite used. In case of Romanian ores, red mud contains 40-50% iron oxides, 10-20%  $\text{Al}_2\text{O}_3$ , 3-20  $\text{SiO}_2$ , 5-12%  $\text{TiO}_2$ , 2-10%  $\text{CaO}$ , 2-10  $\text{Na}_2\text{O}$ .

Red mud is a very fine material in terms of particle size distribution. Typical values would account for 90 volume % below 75 $\mu\text{m}$ . The specific surface (BET) of red mud is around 10 $\text{m}^2/\text{g}$ .

In October 2010, approximately one million cubic meters of red mud, from an [alumina](#) plant, stored in a holding pond near [Kolontár](#) in [Hungary](#), were accidentally released into the surrounding countryside, killing nine people and contaminating a large area [\[4\]](#). All life in the [Marcal](#) river was said to have been "extinguished" by the red mud, and within days the mud has reached the [Danube](#) [\[5\]](#). A big problem was the soil and water alkalinity and several expensive inorganic neutralizers have been tried. What was not tried was the grape marc, a

waste material existing in large amounts in the region affected by the spill, as well as in the Tulcea area, where is located the only Romanian alumina manufacturer. It is worth to mention that the easiest solution, use of mine acid drainage is not possible to be used, neither in Hungary, nor in Romania [6].

Waste grape marc is obtained wine making, when processing 100 kilograms of grape-vine approximately 20-25 kilograms of marc is produced. The grape marc contains high amounts of organic and inorganic colloidal constituents.

Grape marc (pomace) typically contains approximately 50% skins, 25% seeds and 25% stalks. Winery residues are lignocellulosic biomass, which typically consists of three basic polymers: 50% cellulose  $(C_6H_{10}O_5)_x$  - glucose polymer, 35% hemicellulose  $(C_5H_8O_4)_m$  - xylose polymer and 15% lignin  $[C_9H_{10}O_3(OCH_3)_{0.9-1.7}]_n$ .

The levels of soluble salts, though not excessive, are elevated. Heavy metals are not present in any significant levels. Next to sugars, organic acids are the most abundant solids present in grape marc. The principal organic acids found in grapes are tartaric, malic, and to a small extent, citric. Many other organic acids, including amino acids, are also found in juice and wines, but tartaric and malic acid account for over 90% of the total acids present. During the early period of berry growth, concentration of both acids increases in the fruit. With the onset of ripening, as the sugar accumulates in the fruit, the acid concentration decreases. Generally the reduction in malic acid is greater, and consequently, at maturity, the fruit contains more tartaric acid than malic. Grapes are one of the rare fruits that contain tartaric acid. It is present as free acid and a salt, such as potassium bitartrate. Bitartrate is an important constituent since it affects pH and the cold stability of the wine [7].

The acid composition of grapes is influenced by many factors such as variety, climatic region, and cultural practices. Generally in ripe grapes, the acid levels are lower in a warmer climatic region than in a cooler region. The acidity

is expressed as titratable acidity (TA). It is an important parameter used in quality evaluation of juice and wine. Acids upon dissociation liberate H<sup>+</sup> ions, which are measured and expressed in terms of pH. Thus acidity and pH are related. However, the relationship is neither direct nor predictable. Due to the presence of various kinds of acids and their salts, the relationship between acidity and pH is a complex one. Understanding the role of pH in winemaking is crucial to making good wines, as well as in using grape marc [8].

## MATERIAL AND METHODS

Considering the accident that took place in Hungary and because we have already worked with red mud as amendment for acidic soils in Copsa Mica, we decided to try the capability of partially fermented wine marc (acidic) to neutralize red mud (alkaline). For this experiment we have used air dried red mud from CEMTRADE S.A. Oradea and partially fermented red grape (Nova) marc from a local producer.

Initial parameters of the materials are presented in Table 1.

**Table 1 Initial parameters of red mud and grape marc.**

	Red mud, solid	Red mud, 1:5 water suspension	Marc, solid	Marc, 1:5 water suspension
pH	11.58	10.32	2.78	3.43
Humidity, %	5	-	25%	-
Density (kg dm <sup>3</sup> )	1.54	1.22	1.12	1.04
Pb (mg kg <sup>-1</sup> )	52.5	ND	-	-
Cd (mg kg <sup>-1</sup> )	4.0	ND	-	-
Zn (mg kg <sup>-1</sup> )	91.3	ND	-	-
Cu (mg kg <sup>-1</sup> )	50.0	ND	-	-
Mn (mg kg <sup>-1</sup> )	65.0	ND	-	-

ND: not detected

For both materials pH was determined in solid state using a Hanna Instruments 253 pH meter and a Boeco 5190005 pH meter. Humidity was determined by oven-drying for 2 hours, at 105 °C. Density was measured with a picnometer. Heavy metals content was determined by atomic absorption



spectrometry, after mineralization with *aqua regia*, using hollow cathodes, by the Monitoring Department of Sibiu County Environmental Protection Agency.

The mixtures of solid materials were made considering 5%, 10%, 15%, 20%, 25%, 30%, 50% and 90% grape marc, respectively. Each mixture (weighing 100 g in all) 100 was made in three replicates, manually.

Because we were interested in pH determination, this parameter was measured during several days.

## RESULTS AND DISCUSSION

The first step was to determine pH after 2, 24 and 48 hours respectively. The results are presented in table 2 and Figure 1.

**Table 2. pH values of red mud-grape marc mixtures, in time**

Grape marc %	Red mud %	pH (2 h)	pH (24 h)	pH (48 h)
5	95	8.880	9.152	9.251
10	90	7.840	8.270	8.426
15	85	7.420	7.905	8.055
20	80	7.260	7.701	7.820
25	75	7.090	7.543	7.605
30	70	6.960	7.161	7.331
50	50	6.353	6.763	6.972
90	10	5.175	5.688	6.013

It may be seen that in all cases pH decrease and then increase after 24 and 48 hours, due to the complex processes that occur in the mixture (release of alkaline cations from marc and its transformation).

Considering the results presented above, we suggest that, in case of accidental spills, a 25-30% (dry matter) of grape marc to be used immediately after the first soil cleaning and, within 48 hours, a new replacement to take place, in order to leave the ground as clean as possible and to prevent both its alkalization, and the release of toxic heavy metals existing in red mud.

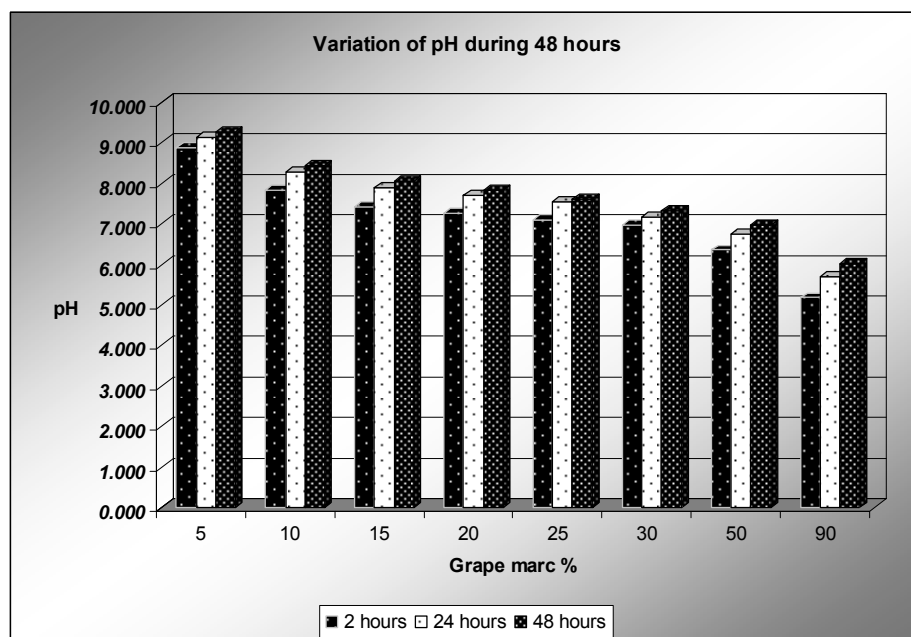


Figure 1. Variation of pH during 48 hours.

## CONCLUSION

This laboratory experiment shows that neutralization of highly caustic red mud can successfully be done using grape marc, if this added as soon as possible, and removed after maximum 48 hours. Due to its neutralization potential red mud should be tested on larger scale, maybe even for contaminated water.

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## STUDIES ON THE ECONOMIC PERFORMANCES OF TRACTORS AND AGRICULTURAL MACHINES

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### Abstract:

*The paper studies the 3 aspects connected to the economic performance of tractors and agricultural machines, which are: machine performance, power performance and operator performance, researching the way in which each of these aspects affects the overall performance of a machine.*

**Keywords:** economic performance, cost, efficiency

### INTRODUCTION

The performance of a machine system is profitable only when it can add value to products and processes beyond the systems cost of operation. A minimum cost would appear to be an optimum economic goal, but overall profit maximization is the true goal of business and on the farm this does not necessarily occur with a minimum cost system of operations. Good machinery management requires that the individual operations in a machine system must be adjusted and combined in a manner such that their overall performance returns the greatest profit to the farm business.

The three components of economic performance are the following:

- Machine performance
- Power performance
- Operator performance.

### MACHINE PERFORMANCE

Measures of agricultural machine performance are the rate and quality at which the operations are accomplished. Rate is an important measure because

few industries require such timely operations as agriculture, with its sensitivity to season and bad weather. As most of agricultural materials are fragile and many are perishable, the amount of product damage or reduction in product quality due to a machine operation is another important measure of machine performance. Quality as well as quantity must be considered when evaluating machine performance.

A rate of machine performance is reported in terms of quantity per time. Most agricultural field machine performance is reported as area per hour. Harvesting machine performance is sometimes quoted as quintals per hour or tonnes per hour, and in the case of balers, bales per hour.

Capacity, when expressed only as area per time, is usually not a sufficient indicator of a machine true performance. Differences in crop yields and crop conditions can mean that one machine may have a low area per hour capacity when compared with an identical machine in a different field. In this case, a valid comparative capacity would be mass per hour.

Combines, potato harvesters and similar machines that separate desired material from undesirable material need a special capacity comparison term. Rather than a report on the weight of material harvested, the weight of material handled is the proper capacity measure.

Time efficiency is a percentage reporting the ratio of the time a machine is effectively operating to the total time the machine is committed to the operation. Any time the machine is not actually processing the field is counted as time waste

Such time waste are: machine preparation time, travel time to and from the field, turning time, time to load or unload the machine containers, maintenance time, etc.



**Fig.1.Harvester combine during working**

Considerable time and space are required to turn large machines at a headland. The turning radius of implements is an important factor effecting the time lost in end travel and at corners. The radius is of most concern to the machine operator in irregular or contoured fields.

### **Power performance**

A second measure of a machine economic performance is the effectiveness with which power is applied to accomplish the farm production objectives. Tractor power on farms will continue to be an absolute necessity for agricultural production.

Tractor delivers power in several ways. Pulled or towed implements are powered through the traction of drive wheels and the pull or draft from the drawbar. Rotary power is obtained from the power take-off shaft or from a belt pulley. Both linear and rotary power can be reproduced by a tractor hydraulic system.

A typical tractor engine performance is shown in fig.2. The power ratings for the engine alone are shown with dashed lines. The performance is different when the engine is mounted in a tractor and is shown by solid lines.

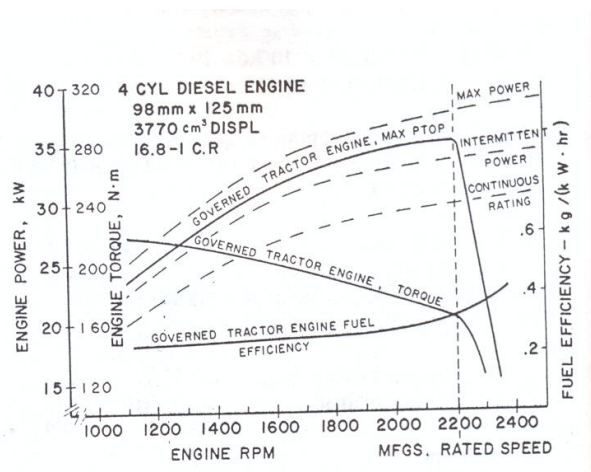


Fig.2. Typical diesel engine performance

## CONCLUSIONS

If we want to appreciate correctly a machine performance, we must consider all 3 factors which contributes to its efficiency: machine performance, which consists in its real capacity of working, time efficiency, machine maneuverability and crop and soil conditions. The second factor is power performance, which is the effectiveness with which power is applied in the agricultural process, and the last factor is operator performance. This last one has a great importance, especially in a modern agriculture, in which machines are more and more complex, so the operator must know to use the machine corectly and at full capacity.

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## STUDIES ON COST DETERMINATION OF AGRICULTURAL MACHINES

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### Abstract:

*The paper studies the 3 aspects connected to the economic performance of tractors and agricultural machines, which are: machine performance, power performance and operator performance, researching the way in which each of these aspects affects the overall performance of a machine.*

**Keywords:** cost, profit, efficiency, depreciation

### INTRODUCTION

Costs have a great influence on the farmer profit. Machinery costs are divided in 2 categories, fixed costs and variable costs. Variable costs increase proportionally with the amount of operational use given the machine, while fixed costs are independent of use. The cost of fuel, lubrication, daily service and maintenance, power and labor are clearly costs associated with use. The 2 remaining cost items, depreciation and the cost of repairing seem to be functions of both use and time.

### DEPRECIATION

Depreciation, the largest cost of farm machinery, measures the amount by which the value of a machine decreases with the passage of time whether used or not. The decline occurs due to different factors, such as:

- The parts of the machine become worn with use and cannot perform as effectively as previously. These parts are the economically irreparable mechanism in a machine.
- The expense of operating the machine at its original performance increases as more power, labor and repair costs for the same unit of output

are requires. Repair and adjustment can renew the machine but at an increased rate with age.

- A new, more efficient machine become available. In this situation, the existing machine is said to be obsolete. In this case, the existing machine may be functionally adequate, but because of new technology it is uneconomic to continue to operate it.
- The size of the enterprise is changed and the existing machine capacity is not appropriate for the new situation.

When the machine life is concerned, 3 concepts of machine life can be considered: physical life, accounting life and economic life. The physical life is terminated when a machine can not be repaired because of an irreplaceable part failure.

An accounting life is the predicted life in hours of use for a machine based on the surveyed use of existing machines and upon the design life used by the manufacturer.

The economic life of a machine is defined as the length of time from purchase to that point where it is more economic to replace with a second machine than to continue with the first.

#### Depreciation methods

An estimated value method may be the most realistic determination of depreciation. At the end of each year, the value of machine is compared with its value of the start of the year. The difference is the amount of depreciation.

Examination of the depreciation and trade-in value curves indicates that this method of evaluating depreciation is the most remote from actual trade-in values, as the rate of depreciation is the greatest near the end of the machine life (fig.1).

In times of substantial monetary inflation, a machinery manager must include the effects of inflation on machinery planning. Inflation causes increased prices for goods and services in the future years.



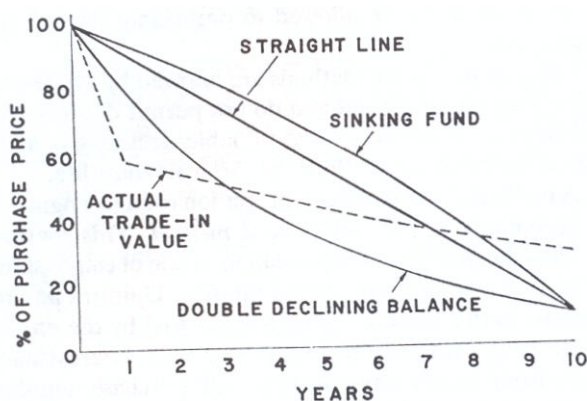


Fig.1. Remaining value for 3 methods of compared with actual trade-in values

In fig.2 is presented the average inflation in machinery prices. In this figure are presented farm equipment prices in the years after 1973. These price ratios and the expression for the inflation factor permit the determination of inflation rates .

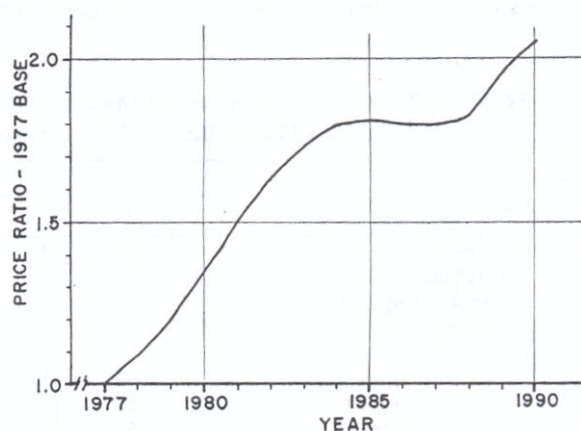


Fig.2. Average inflation in machinery prices

Variable costs, costs that vary with use, are added to the fixed costs to arrive at the annual cost for a machine operation. Variable costs may be greater than fixed costs for some high-use machines. Thus, it was acknowledged the variable costs for tractors to be about 64 % of all costs, with the greatest single cost being that for operator labor. The greatest single cost of self propelled combines was depreciation, and variable costs comprised only 38 % of all costs. These structures of costs are presented in fig.3.

## CONCLUSIONS

A good farm manager should consider the costs of the machines he operates, this being one of the most important aspects of his business. That is why this paper analyses the structure of costs, the depreciation of a machine and the way in which a farmer can maximize the use of an agricultural machine.

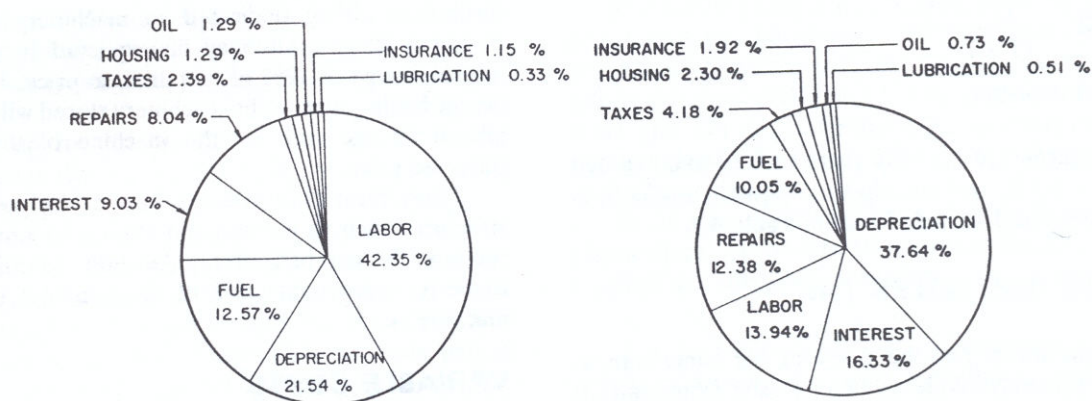


Fig.3. Relative importance of all costs items for diesel tractors (left) and combines (right).

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## RESEARCH REGARDING THE DEVELOPMENT OF CERTAIN PERFORMING SUSTAINABLE AGRICULTURE FOR THE HILLY-MOUNTAIN AREAS

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### Summary

*Practicing a performing sustainable agriculture is a very complex process characterized by a slow evolution during which appropriate models are developed and implemented regarding the sustainable farming systems for the recovery of mountain-hilly land performance based on biological principles and fully complying with international regulations and standards regarding the development of a sustainable agriculture system. This paper aims at designing and development for the implementation of a sustainable farming system for hilly-mountain area.*

**Keywords:** agriculture, sustainable system, hilly-mountain, production.

### INTRODUCTION

Romania integration into the EU and especially at its technological standards requires among other, the adoption of major measures in the conventional agriculture in terms of adoption and application of technologies leading to obtaining high yields in conditions and eco-sanogenesis and eco-economy (Iagăru P., 2010).

Under these conditions, the agricultural development within its affordability limits and resilience, the nature in time and space, the agricultural production as effect and purpose of rational use of natural resources, have found their expression in a new concept, that of sustainable agriculture contributing to qualitative increase of agricultural production because, on one hand of high resistance to diseases and pests (e.g. variety and seed quality), and on the other hand on the application of appropriate technologies to facilitate nutrient absorption and its genetic competition with weeds.

Therefore we are emphasizing the role and the need of applied technologies into sustainable agricultural system for protecting the soil functions which should be a starting point for sustainable agriculture "as a agro-technique innovation, based on understanding the evolution of soil fertility laws by subordinating the know how in agriculture to the basic criterion expressed into the biodynamic agriculture as following: "What is biologically correct is economically advantageous" (Stefan Gh 1999). Within the EU, and in our country too, there are concerns on the development of sustainable agriculture, materializing in funding many studies on this topics. (European Commission, 2001; Esty et al., 2005; McRae, Smith and Gregorich, 2000; Piorr, 2003).

#### **MATERIAL AND METHODS**

This paper aims at framing the current trend of transition from intensive exploitation of agro-ecosystem, based on progressive and continue allocation of non-renewable resources, to exploitation of renewable resources produced by the biosphere, to ensure the restoration of ecological balance under the antropic pressure. The objective of this paper is the development of an experimental model which should include aside traditional species other new species, such as Phacelia less studied in our country and having multiple uses (honey producer, fodder, green manure). For this we are emphasizing the quality of biological material that must be adequate in terms of resistance to diseases and pests, with good absorption capacity. We are proposing the promotion of this plant species within culture technologies to ensure sustainable agriculture production cost and quality in terms of reducing or ceasing the amount of pesticides and fertilizers and thus ensure an improved quality of environment.

Based on the proposed objectives, the designing of a system of sustainable agriculture can be achieved in three stages, as follows: the first stage is considered the preparatory stage, will pursue those actions that lead to efficient scientific research and experimental activities. Thus, it will be prepared

studies, documentation and modalities for putting into practice the project will recruit and economic agents interested in the experimentation of system sustainability.

The second phase of experimentation stage is designed for parameters determination, technological and energetically, designed to increase system performance for sustainable agriculture production using advanced techniques applicable to direct and potential beneficiaries. Thus, we recommend the quantifying of applied measures on the health status of plant production and its quality. Technical and scientific results obtained will allow comparative analysis of current technology and alternative sequences and will be completed with the development of experimental model, allowing the application of sustainable farming systems and sustainable economic performance integrated

The third stage includes dissemination activities with the organization of practical demonstrations of scientific writing and publishing scientific papers. The expected results consist of large-scale promotion and expansion of sustainable farming systems.

## **RESULTS AND DISCUSSIONS**

The sustainable agriculture model is based on the following principle: “the implementation of the concept of sustainable agriculture must be made in accordance with the specific circumstances in Romania (Cornel Răuță, 1997). In developing the experimental model was followed, on one hand, the dynamic equilibrium of agro-ecosystem restoring and maintaining its normal productive potential and competitiveness and high economic efficiency, allowing the development of production cycles in the upper parameters, and secondly it was intended to consider the following components of sustainable agriculture as essential:

1. Crop rotation and their classification in long-term crop rotation (4-7 years) with adequate crop structures to ecological areas, including inheritance and breeding plants based on scientific criteria (SALONTAI, AL. si colab., 1990).

The structure of five crops - phacelia, potato, triticale, red clover and corn for 2011 and 2014 crop rotation is shown in Table no. 1

**Tabelul 1**  
**Structure and crop rotation. Experimental model for sustainable agriculture**

<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>
Maize	Facelia	Potato	Triticale	Maize
Mash	Potato	Triticale	Maize	Facelia
Potato	Triticale	Maize	Facelia	Potato
Rye	Red colver	Red colver	Red colver	Red colver
Beet	Maize	facelia	Potato	Triticale

2. Proposal of technological alternatives that promote sustainable agriculture techniques, such as (Table 2 ):

2. Use of chemical fertilizers and plant protection products in reasonable quantities on the "economic optimum dose (EOD), soil and foliar applied and promote the use of natural fertilizers.
3. Preparing the ground in the "minimal work" to increase productivity, save energy and water in soil
4. Ground work on contours, grass strips, terracing the establishment of forest plantations
5. Cultivation of new varieties and hybrids, resistant to diseases and pests, and increased animal breeds with qualities of productivity, quality and superior physiological.
6. Integrated pests and diseases control by extending physical techniques, particularly chemical and biological (biological control, bacteria treatment of plant roots mycorrhiza) exclusion of highly toxic pesticides and limit those with low toxicity.

In the experimental model will grow as red clover field waterfall, secondary, support for other major crops (facelia, potato, triticale, maize) because of its properties regarding the natural recovery of soil structure and soil enrichment with natural fertilizing substances, especially nitrogen.

**Tabelul 2**

**Tehnologii de cultură cu elemente de agricultură durabilă**

FACELIA	POTATO	TRITICALE	RED CLOVER	MAIZE
winter plowing	organic fertilization with manure	organic fertilization with manure	winter plowing;	organic fertilization with manure
driving land;	winter plowing;	winter plowing	driving land;	winter plowing
land preparation with the equipment GPGS;	driving land în primăvară;	driving land	land preparation with the equipment GPGS;	driving land
Preparing land for sowing;	preparing land for planting;	Preparing land for sowing	Preparing land for sowing	Preparing land for sowing
sowing	plantatul potatoului	sowing;	sowing	sowing;
rollers after sowing;	Biological material with: increased resistance to pests and reduced requirements for technological inputs.	Spring fertilization;	Rollers after sowing;	Manual plowing
Manual weeding;	rebilonat;	harvesting.	Plot cleaning up	Mechanical plowing
Weeding;	prașilă manuală cu îndepărtarea resturilor vegetale și refacerea bilonului;		Mowing I + 2;	harvesting
harvesting	pesticides;		Swathers;	
	Haulm distruction		Hey Wrapper	
	harvesting;			
	sorted stock			

## CONCLUSIONS

Currently industrial practiced conventional agricultural technologies require very high cost, leading to exhaustion soil fertility, environmental pollution and increase the growing vulnerability of ecosystems;

Designing an experimental model of sustainable agriculture is contributing to a sustainable agricultural for the model farm level to obtain plant products that are healthy, innovative technologies will be applied species-

specific culture, thus contributing to maintaining and improving soil characteristics;

Sustainable agriculture can be promoted only if they successfully meet certain conditions by the farmers, especially relating to crop rotation, fertilization, weed control, diseases, pests and reduce energy consumption. Reducing energy consumption through the 'system for soil conservation works SLCS.

Presentation of scientific and technical information (obtained through applied research) mediates the transfer of licensed operators, professional associations, students, techniques and modern ideas on sustainable agriculture.

### Acknowledgments

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## CONTRIBUTIONS CONCERNING SEPARATION PROCESSES IN FOOD INDUSTRY USING MEMBRANES TECHNIQUE

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### Abstract

*Osmosis is a physical phenomenon that has been extensively studied by scientists in various disciplines of science and engineering. Early researchers studied the mechanism of osmosis through natural materials, and from the 1960s, special attention has been given to osmosis through synthetic materials. Following the progress in membrane science in the last few decades, especially for reverse osmosis applications, the interests in engineered applications of osmosis has been spurred. This paper provides dates of the physical principles and applications of forward osmosis as well as their strengths and limitations.*

**Keywords:** Osmosis; Forward osmosis; Direct osmosis; Desalination; Reverse osmosis; Pressure-retarded osmosis

### INTRODUCTION

Osmosis is a physical phenomenon that has been exploited by human beings since the early days of mankind. Early cultures realized that salt could be used to desiccate foods for long-term preservation. In saline environments, most bacteria, fungi, and other potentially pathogenic organisms become dehydrated and die or become temporarily inactivated because of osmosis. Conventionally, osmosis is defined as the net movement of water across a selectively permeable membrane driven by a difference in osmotic pressure across the membrane. A selectively permeable membrane allows passage of water, but rejects solute molecules or ions. Osmotic pressure is the driving force for many of the applications. Present-day applications of the osmosis phenomenon extend from water treatment and food processing to power generation and novel methods for controlled drug release. In the field of water treatment, reverse osmosis is generally a more familiar process than osmosis. Because of this, a brief description of the RO process is given prior to further discussion of osmosis. RO

uses hydraulic pressure to oppose, and exceed, the osmotic pressure of an aqueous feed solution to produce purified water. In RO, the applied pressure is the driving force for mass transport through the membrane; in osmosis, the osmotic pressure itself is the driving force for mass transport. Numerous publications on the use of RO for water treatment and wastewater reclamation appear in the literature.

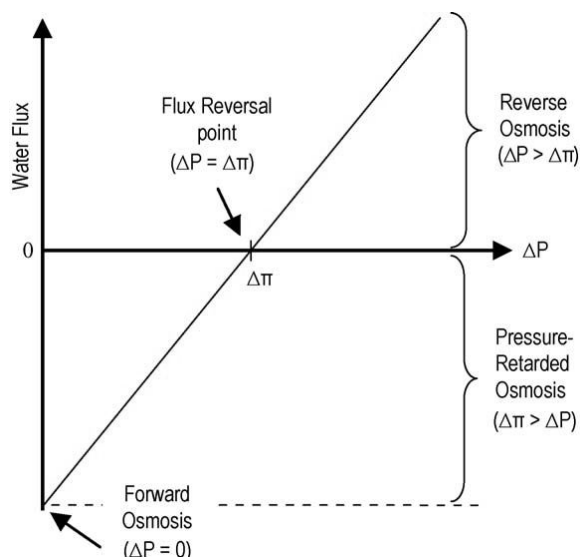
Fewer publications on the use of osmosis – or forward osmosis (FO), or direct osmosis (DO) – for water treatment/engineering applications appear in the literature.

This paper presents a review of FO and closely related membrane processes. The review begins with an introduction of the basic principles of the FO process, including comparison to other closely related processes. Special aspects of mass transport in the process as well as the membranes used for the process are described.

## OSMOTIC PROCESSES

### CLASSIFICATION OF OSMOTIC PROCESSES

Osmosis is the transport of water across a selectively permeable membrane from a region of higher water chemical potential to a region of lower



water chemical potential. It is driven by a difference in solute concentrations across the membrane that allows passage of water, but rejects most solute molecules or ions. Osmotic pressure ( $\pi$ ) is the pressure which, if applied to the more concentrated solution, would prevent transport of water across the

**Fig. 1** Direction and magnitude of water flux as a function of applied pressure in FO, PRO, and RO.

membrane. FO uses the osmotic pressure differential ( $\Delta\pi$ ) across the membrane, rather than hydraulic pressure differential (as in RO), as the driving force for transport of water through the membrane. The FO process results in concentration of a feed stream and dilution of a highly concentrated stream (referred to as the draw solution).

PRO can be viewed as an intermediate process between FO and RO, where hydraulic pressure is applied in the opposite direction of the osmotic pressure gradient (similar to RO). However, the net water flux is still in the direction of the concentrated draw solution (similar to FO). The general equation describing water transport in FO, RO, and PRO is

$$J_w = A(\sigma\Delta\pi - \Delta P) \quad (1)$$

where  $J_w$  is the water flux,  $A$  the water permeability constant of the membrane,  $\sigma$  the reflection coefficient, and  $\Delta P$  is the applied pressure. For FO,  $\Delta P$  is zero; for RO,  $\Delta P > \Delta\pi$ ; and for PRO,  $\Delta\pi > \Delta P$ . The FO point, PRO zone, and RO zone, along with the flux reversal point, are illustrated in Fig. 1.

## DRAW SOLUTIONS

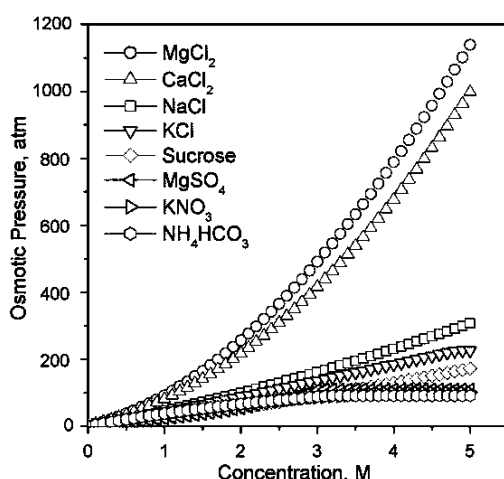


Fig. 2 Osmotic pressure as a function of solution concentration at 25 °C for various potential draw solutions. Data were calculated using OLI Stream Analyzer 2.0

The concentrated solution on the permeate side of the membrane is the source of the driving force in the FO process. Different terms are used in the literature to name this solution including draw solution, osmotic agent, osmotic media, driving solution, osmotic engine, sample solution, or just brine. For clarity, the term draw solution is being used exclusively in this paper. When selecting a draw solution, the main criterion is that it

has a higher osmotic pressure than the feed solution. The osmotic pressures of

several solutions being considered for use as draw solutions were calculated using OLI Stream Analyzer 2.0 and are presented in Fig. 2 as a function of molarity. This software uses thermodynamic modeling based on published experimental data to predict the properties of solutions over a wide range of concentrations and temperatures.

## **CONCENTRATION POLARIZATION IN OSMOTIC PROCESSES**

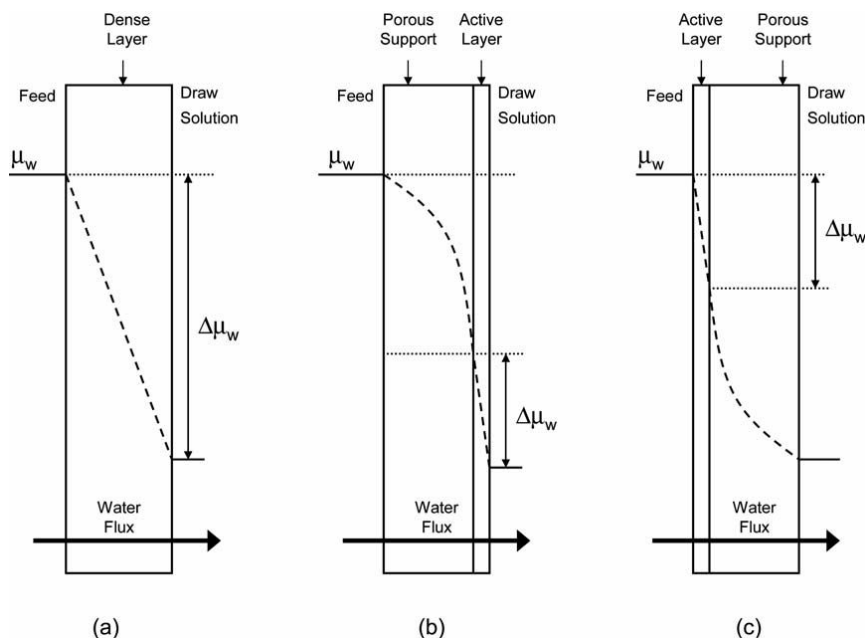
### **EXTERNAL CONCENTRATION POLARIZATION**

In pressure-driven membrane processes, convective permeate flow causes a buildup of solute at the membrane active layer surface. Referred to as concentration polarization (CP), this phenomenon reduces permeate water flux due to increased osmotic pressure that must be overcome with hydraulic pressure. CP due to water permeation is not limited to pressure-driven membrane processes and also occurs during osmotic-driven membrane processes, on both the feed and permeate sides of the membrane. When the feed solution flows on the active layer of the membrane (like in RO), solutes build up at the active layer. This may be called concentrative external CP and is similar to CP in pressure-driven membrane processes. Simultaneously, the draw solution in contact with the permeate side of the membrane is being diluted at the permeate–membrane interface by the permeating water. This is called dilutive external CP. Both concentrative and dilutive external CP phenomena reduce the effective osmotic driving force. The adverse effect of external CP on osmotic-driven membrane processes can be minimized by increasing flow velocity and turbulence at the membrane surface or by manipulating the water flux. However, because water flux in FO is already low, the ability to diminish external CP by reducing flux is limited. For modeling external CP phenomena in FO, equations similar to those developed for CP of pressure-driven membranes can be used.

Due to the low hydraulic pressure used in FO, membrane fouling induced by external CP has milder effects on water flux compared to the effects in pressure-driven membrane processes. It has been shown that external CP plays a minor role in osmotic driven membrane processes and is not the main cause for the lower-than-expected water flux in such processes.

### INTERNAL CONCENTRATION POLARIZATION

When an osmotic pressure gradient is established across a completely rejecting dense symmetric membrane, as depicted in Fig. 3a, the driving force is the difference in osmotic pressures of the bulk solutions in the absence of external CP. However, FO membranes are asymmetric, adding more complexity to the CP phenomena. When a composite or asymmetric membrane consisting of a dense separating layer and a porous support layer is used in FO, two phenomena can occur depending on the membrane orientation.



**Fig. 3. Illustrations of driving force profiles, expressed as water chemical potential,  $\mu_w$ , for osmosis through several membrane types and orientations. (a) A symmetric dense membrane. (b) An asymmetric membrane with the porous support layer facing the feed solution; the profile illustrates concentrative internal CP. (c) An asymmetric membrane with the dense active layer facing the feed solution; the profile illustrates dilutive internal CP. The actual (effective) driving force is represented by  $\Delta\mu_w$ . External CP effects on the driving force are assumed to be negligible in this diagram.**

If the porous support layer of an asymmetric membrane faces the feed solution, as in PRO, a polarized layer is established along the inside of the dense active layer as water and solute propagate the porous layer (Fig. 3b). Referred to as concentrative internal CP, this phenomenon is similar to concentrative external CP, except that it takes place within the porous layer, and therefore, cannot be minimized by cross-flow. As water permeates the active layer, the draw solution within the porous substructure becomes diluted. This is referred to as dilutive internal CP (Fig. 3c).

### MODELING CONCENTRATIVE INTERNAL CONCENTRATION POLARIZATION

Unlike RO, for which water transport through the membrane is mostly affected by the hydraulic resistance created by the membrane structure, in FO, internal CP in the porous support layer also substantially affects mass transfer of water across the membrane. Adopting the models that were developed by Lee et al., Loeb et al. introduced a simplified equation to describe the water flux during FO without consideration for membrane orientation:

$$J_w = \frac{1}{K} \ln \frac{\pi_{Hi}}{\pi_{Low}} \quad (2)$$

where  $K$  is the resistance to solute diffusion within the membrane porous support layer, and  $\pi_{Hi}$  and  $\pi_{Low}$  are the osmotic pressures of the bulk draw solution and feed solution, respectively, neglecting external polarization effects.  $K$  is defined as

$$K = \frac{t\tau}{\varepsilon D_s} \quad (3)$$

where  $t$ ,  $\tau$ , and  $\varepsilon$  are the membrane thickness, tortuosity, and porosity, respectively, and  $D_s$  is the diffusion coefficient of the solute. However, it has

been recently demonstrated that Eq. (2) is valid only for very low water fluxes. Further development of this equation has led to a more general governing equation for concentrative internal CP:

$$K = \left( \frac{1}{J_w} \right) \ln \left( \frac{B + A\pi_{Hi} - J_w}{B + A\pi_{Low}} \right) \quad (4)$$

where  $B$  is the solute permeability coefficient of the active layer of the membrane, which can be determined from an RO-type experiment using

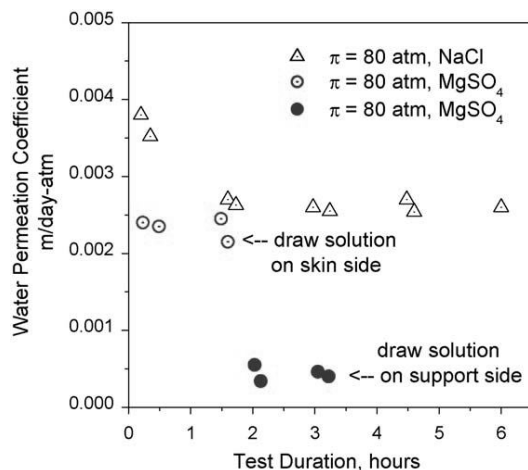
$$B = \frac{(1 - R)A(\Delta P - \Delta\pi)}{R} \quad (5)$$

where  $R$  is the salt rejection. Eq. (4) can be used to quantify the severity of internal CP; larger values of  $K$  are associated with more severe internal CP.

### INFLUENCE OF INTERNAL CONCENTRATION POLARIZATION ON WATER FLUX

Mehta and Loeb studied the effect of the porous support layer on internal CP and the effect of high draw solution concentrations on the overall permeability coefficient of the membrane. Results show that upon swapping the working fluids on the two sides of the membrane, flux (as indicated by the permeability coefficient) sharply declines due to internal CP (Fig. 4).

Experimenting with DuPont B-9 (flat sheet) and B-10 (hollow fiber) Permasep RO membranes, Mehta and Loeb pointed out that  $A$  (the membrane permeability constant from Eq. (1)) is not constant in FO and PRO; it declines with increasing osmotic pressure (i.e., increasing concentration) of the draw solution. The decline of  $A$  was explained by partial drying or osmotic dehydration of the membrane at high osmotic pressures. Such partial drying can be accompanied by pore contraction, known as “osmotic deswelling”, and hence increased resistance to water transport. Results from recent studies confirmed that internal CP is actually the cause of the substantial flux decline.



**Fig. 4. FO tests with NaCl and MgSO<sub>4</sub> solutions as draw solutions. The effect of internal CP can be seen after 2 h when the support side of the membrane is exposed to the draw solution instead of DI water. The water permeation rate sharply declines after dilutive internal CP starts**

## CONCLUSIONS

Theoretical background presented above open a horizon for applications of forward osmosis in many fields of industries. It can make real the usage of this process because of its advantages given by low energy consumption (low pressures) and not many parts involved in industrial devices.

## Acknowledgements

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## METHOD OF ANALYSIS FOR POPULATION LIMITATION OF THE LEPIDOPTERA PEST IN FRUITERS (LEPIDOPTERA, INSECTS) IN SIBIEL VILLAGE, OWN ORCHARD, CONDITIONS OF YEAR 2009

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### Abstract:

*In the present work is described an experiment in Sibiel, made in an apple orchard of 0,50 ha surface, which was kept under observation in order to combat the *Cydia pomonella* L. pest. It was used a pheromone trap as a combat method, for the application of the plant treatments in time.*

**Keywords:** population, Lepidoptera, insects

### INTRODUCTION

In our country *Cydia pomonella* L. „the apple worm” is one of the most important pest of the apple tree, which can be found in every fruit-growing area where this fruit-growing species are cropped.

In the soil and climate conditions that we can encounter in Sibiu, pest *Cydia pomonella* L. has two generations per year, generations against which is absolutely necessary to apply plant treatments at the right moment, with chemical substances that are approved, or biological treatments (using pheromone traps, natural predators, vegetal biological concoction, biological products based on *Bacillus thuringiensis*, light traps, belt traps). In order to achieve economic control of the „apple worm” it is very important forecast the mass appearance of the adult pest.

In order to warn about the plant treatment against pest *Cydia pomonella* L. in the present experience, it was used the complex method of warning, in which were gathered the data about insects’ biology, the flight dynamics (after

catches on pheromone traps), the climate conditions that are specific to the area which was studied, phenological phases of the soils, the existing biological protection.

As a control method for this specific pest we used sexual pheromone traps because these traps can be used as a means of biological control as well as a means of establishing the right moment of the butterflies appearance in spring and also to monitor the biological evolution of the pest in natural conditions, in order to apply the plant treatments at the right moment. In Romania, the sexual feromon atraPOM is synthesized by the “Raluca Ripan” Institute of Chemistry in Cluj-Napoca, from where it was purchased by the Phytosanitary Direction of Sibiu.

## MATERIALS AND METHODS

The experience has been installed in a private orchard in Sibiel village, which is in Sibiu county, more specifically in a apple orchard of 0.50 ha, in which was monitored the evolution of ther biological stages of the *Cydia pomonella* L. pest. Experiența a fost instalată în livada proprie din satul Sibel din județul Sibiu într-o livadă de măr cu o suprafață de 0,50 ha, în care s-a ținut sub observație evoluția stadiilor biologice a dăunătorului *Cydia pomonella* L. For this surface it was necessary to lay out just one trap with pheromones. To be mentioned the fact that in this orchard were not applied any other chemical treatments for any other apple tree crops pest before.

The trap was laid out in the shape of a apple tree head at a height of 1.6 meters above the ground, at the beginning of the third decade of April 2009, before the appearance of *Cydia pomonella* L.

In general, in order to give a correct warning of the plant treatments there should be used 3 or 4 pheromone traps per ha, laid out at about 50 meters between them

*THE TRAP- for the pheromone*– consists of two plastic elements which fold out and symmetrically assemble by dint of a reinforcing steel or even plastic. Thus folded like this the two valvae have the knob toward the exterior, providing a , a relatively closed space, the distance between them is about 3-4 cm. The inner surface of the vulva is provided with a special adhesive film, non-drying, odorless, and off color.

*The Sexual Attractant CAPSULE* is a impregnated cork. The sexual attractant capsule is placed on the inner botom of the trap with the building pit upward.

On this pheromone capsule are attracted the Lepidoptera males because the sexual attractant is the pheromone that the females discharge in the period when she is sexually.

In the period of time in which were made observations there were taken into account the following:

- There were used clean tweezers (sterile) for placing the capsule in the trap and for eliminating the captured males.
- The placing of the capsule with pheromone on the trap (plastic material or adhesive) was made directly on the crop in the moment of attaching it to the tree.
- The replacement of the capsule with pheromone and the lower botom was made in 6 weeks from the settlement.
- There were eliminated from the crop the capsules and the effetes botoms.
- The pheromone capsules were kept in the refrigerator before they were laid out.

Catch record – was made tree times a week (Monday, Wednesday, Friday). The butterflies were eliminated from the glue at every observation in order not to influence the following observations. If there were recorded more captures, and the botom with glue was dirty this was replaced with another one.

## RESULTS AND DISCUSSION

*Data interpretation*– the warning of the first treatment was given depending on the maximum flight of the monitored generation, meaning between 3 and 4 days in reference to the flight curve, and also to the climate conditions ( table 1.)

The plant treatment will be made undelayed in the following 2-3 days in the biologic phase of the pest. In this period of time will be combated the adults as well as the eggs that have been deposited, and the following treatment will be done 10 days later, after the first one is finished, against that specific generation (G-I or G-II). At the second treatment for the next generation are controlled the adults as well as the deposited eggs in this period of time that are in a phased called “the red ring”.

In the big orchards, where the plant treatments are done “at warning”, the treatments against this pest are segregately done on lots, depending on the existing biological save, meaning for captures on an average/ trap/ week.

At 2-3 captures on a average/ trap./ week correspondes a risk attack( frequence attacked fruits) of de 2%.

"Warning Bulletin" for the first generation was given on 20<sup>th</sup> of May 2009, with the optimum period to make the chemical treatment is 22<sup>nd</sup>-26<sup>th</sup> of May 2009. Recommended substances were:

- Sinoratox 35CE 0,1%
- Carbetox 37 CE 0,4%,
- Calypso 480SC 0,02%,
- Cipertrin 10EC 0,015%

Tab. 1

THE CLIMATIC DATA IN SIBIU

Months	Atmospherical Temperature °C				Atmospherical Humidity %		Atmospherical Condensation L/MP
	Max.	Min.	Med. 2004	Med. last 10 years	Med. 2009	Med. last 10 years	
April	25.1	-1.6	10.9	10.0	68	70	78.4
Mai	27.1	3.5	14.0	15.3	76	69	56.8
June	30.2	8.6	18.1	18.4	78	75	64.8
July	33.7	7.8	20.0	19.8	81	77	188.4

CONCLUSIONS

For the second generation of the pest the "Warning Bulletin" gave in 13<sup>th</sup> of June 2009, the optimum period for making the chemical treatment starting with 15<sup>th</sup>-19<sup>th</sup> of June 2009. Recommended substances:

- Karate Zeon 0,015%
- Actellic 50EC 0,05%,

To be mentioned that for both generations of the pest was recommended to repeat the plant treatment at 8-10 days after the first one is finished.

Centralizing data on the registered captures at the pheromone trap in order to apply the plant treatment against the *Cydia pomonella* L pest.

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Metodici de prognoză și avertizare a tratamentelor împotriva bolilor și dăunătorilor plantelor de cultură (1980) București

## USE OF CROP CIRCLE IN PRECISION AGRICULTURE

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*“Lucian Blaga” University of Sibiu*

### Abstract:

*Precision farming or precision agriculture is an [agricultural](#) concept relying on the existence of in-field variability. It requires the use of new technologies, such as global positioning ([GPS](#) and [DGPS](#)), [sensors](#), [satellites](#) or aerial images, and information management tools ([GIS](#)) to assess and understand variations. Collected information may be used to more precisely evaluate optimum sowing density, estimate fertilizers and other inputs needs, and to more accurately predict crop yields. It seeks to avoid applying inflexible practices to a crop, regardless of local soil/climate conditions, and may help to better assess local situations of disease or lodging. The ACS-430 Crop Circle belong in this direction is a last generation equipment.*

**Key words:** Crop Circle, agriculture.

### INTRODUCTION

The Crop Circle ACS-430 is a unique light sensor that can measure plant canopy reflectance day or night. The sensor can be mounted to virtually any type of vehicle to remotely sense crop or plant canopy biomass on-the-go. The sensor incorporates its own polychromatic light source technology to illuminate a plant canopy. The light source technology simultaneously emits visible and near infrared light (NIR) from a single LED light source. The key benefit of this new light source technology is that the area of plant canopy illumination is identical for both visible and the infrared light bands, essential mimicking the spatial composition of natural light. The Crop Circle ACS-430 measures reflectance in three bands simultaneously: 670 nm, 730 nm and NIR bands. Reflectance data measured by the Crop Circle ACS-430 allows the user to calculate classic vegetation indexes from plant canopies such as the NDVI and SRI indexes. The reflectance data produced by the Crop Circle data is height invariant. This allows the user to use dozens of vegetation indexes developed for aerial and

satellite remote sensing applications. Serial data produced by the sensor can be easily captured using a laptop PC, PDA or other data acquisition devices.

## MATERIAL AND METHODES

The Crop Circle Handheld System integrates our popular ACS-210 (or ACS430 and ACS470 sensors), GeoSCOUT GLS-400 and our new FieldPAK PS-12 power supply into a single, portable and easy-to-use scouting instrument. The Crop Circle Handheld System is ideal for plot work and crop scouting. Fig. 1 below shows the main features of a Crop Circle Handheld System.



Fig. 1 Crop Circle Handheld System components

The Crop Circle Handheld System may be operated in one of two data acquisition modes. These modes are the MAP mode and the PLOT mode. One of these two modes is selected by the user when the GeoSCOUT is powered up. If the MAP mode is selected, a GPS is required for proper operation of the GeoSCOUT. The PLOT mode does not use the GPS signal and subsequently ignores the GPS if it is connected to the GeoSCOUT.

MAP Mode: When the MAP mode is selected, the GeoSCOUT will collect both GPS and sensor data and store this data to a comma separated

variable (CSV) file on the SD flash card. Data can be later retrieved and analyzed using third party map rendering software.

**PLOT Mode:** When the PLOT mode is selected, the GeoSCOUT will collect only sensor data and save this data to a text file on the SD flash card. The file format will include a plot number (starting at 1) followed by the sample number within the plot followed finally with the sensor data.

File naming in both the MAP and PLOT modes is automatic. In the MAP, the GeoSCOUT uses the UTC Date string from the GPS as the filename with a 2 digit Crop Circle Handheld System letter index extension.

101205AA.csv: In the PLOT mode, the files are given the name "SITE" followed by a 4 digit numeric extension. This file naming convention will allow 10,000 plot files to be created and stored on the SD flash card. For example, a PLOT filename may look as follows:

SITE0000.CSV: A sample portion of a GeoSCOUT data file is shown in Figure 2. The data file contains plot data collected from a Crop Circle Handheld System. This sample field has data collected from three plots (1, 2 and 3). The sensor fields in this file, SF1 to SF6, represent the sensor elapsed time, sensor mode, ACS-210 internal sample number, normalized difference vegetative index (NDVI), near infrared band reflectance (NIR) and visible band reflectance (VIS), respectively. Additional vegetative indices may be calculated from the reflectance band information. Please refer to the Crop Circle Sensor User's Manual for a list of indices and data field listing.

#### Sensor Usage Considerations

Fig.3 diagrammatically shows the beam divergence for an ACS-210 sensor at height  $h$  above a plane target. The width of the projected beam when mounted height  $h$  above a target is defined by the following equation, where  $\theta$  is the angular FOV in degrees (~32 degrees for the ACS-210),

$w$  is the projected beam width and

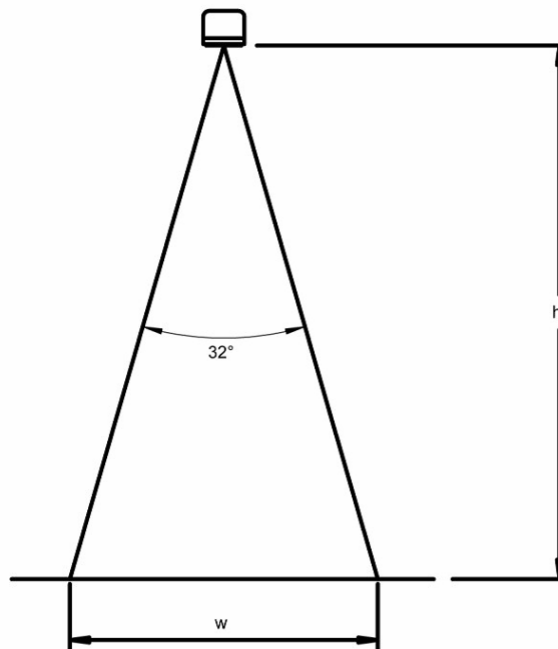
$h$  is the height of the sensor above the target.



	A	B	C	D	E	F	G	H
1	Plot	Sample	SF 1	SF 2	SF 3	SF 4	SF 5	SF 6
2	1	1	113100	49	1131	0.09	1.5868	1.325
3	1	2	113200	49	1132	0.09	1.586	1.325
4	1	3	113300	49	1133	0.089	1.5852	1.325
5	1	4	113400	49	1134	0.09	1.5887	1.327
6	1	5	113500	49	1135	0.088	1.5908	1.332
7	2	1	114400	49	1144	0.088	1.5954	1.336
8	2	2	114500	49	1145	0.088	1.5948	1.336
9	2	3	114600	49	1146	0.088	1.5961	1.337
10	2	4	114700	49	1147	0.088	1.5978	1.339
11	2	5	114800	49	1148	0.088	1.5955	1.338
12	3	1	115800	49	1158	0.088	1.6014	1.341
13	3	2	115900	49	1159	0.088	1.6016	1.341
14	3	3	116000	49	1160	0.088	1.6006	1.341
15	3	4	116100	49	1161	0.088	1.6002	1.341
16	3	5	116200	49	1162	0.088	1.6007	1.341
17	3	6	116300	49	1163	0.088	1.6002	1.34

**Fig. 2** Sample data set collected by Crop Circle Handheld System in PLOT mode using ACS-210 sensor

Sensor Field-of-View (FOV): The sensor should be positioned between 30 and 48 inches from the top of the plant canopy for optimal measurement performance. Please note however, the sensor's measurement range is ~10 to 120 inches. When selecting a plant-to-sensor measurement distance, take in consideration the FOV angle of the sensor. For example, the beam width at canopy level will be ~0.57 times the distance between the sensor and canopy. At a plant-to-sensor distance of 36 inches the beam width will be ~20 inches wide. Selecting the appropriate plant-to-sensor distance can be useful in minimizing soil background reflectance in certain applications.



**Fig. 3 Sample data set collected by Crop Circle Handheld System in PLOT mode using ACS-210 sensor**

## CONCLUSION

Plant tissue readily absorbs light in the visible portion of the spectrum (and reflects a small amount typically 2% to 10%) and reflects NIR light (35% to 60%) due to a discontinuity in the refractive indexes between cell walls and intercellular air gaps. The interplay between canopy reflectances in the visible and NIR portions of the spectrum can be utilized to determine the approximate biomass (or comparative status) of a plant remotely. The ACS-430 has been designed precisely to take advantage of this phenomenon. When near infrared and visible light emitted from the sensor is directed toward a plant canopy, a portion of that light is reflected back to the sensor. The portion of emitted light reflected back to the sensor is detected by an array of spectrally sensitive photosensors. Additionally, by modulating the light source (rapidly pulsing the light source on and off many times a second), the ACS-430 can distinguish its own light signal from that of surrounding ambient light. This allows the sensor

to make canopy measurements under all ambient lighting conditions: cloudy skies, full sun, complete darkness, or artificial lighting. The measured reflectance signals are then utilized by the sensor to make vegetative biomass calculations. The magnitude of this vegetation calculation is directly proportional to plant biomass (for red/NIR sensor measurements under partial canopy closure conditions; LAI<2) or plant biomass/stress (for Red-Edge/NIR sensor measurements under full canopy closure; LAI>2). Tables 1 and 2 list the output fields contained in the ACS-430 serial data stream and Table 3 lists some useful vegetative indices that can be calculated from reflectance data produced by the ACS-430.

*Table 1*

**SENSOR FIELDS FOR MULTISENSR MODE**

SF1	SF2	SF3	SF4	SF5
<b>NDRE</b>	<b>NDVI</b>	<b>Red-Edge</b>	<b>NIR</b>	<b>Red</b>

*Table 2*

**SENSOR FIELDS FOR AUTO SEND MODE**

SF1	SF2	SF3	SF4	SF5
<b>Red-Edge</b>	<b>NIR</b>	<b>Red</b>	<b>NDRE</b>	<b>NRE</b>

*Table 3*

**SUMMARY OF TWO-BAND AND THREE-BAND VEGETATION INDEXES  
 COMPATIBLE WITH ACS-430 ACTIVE SENSOR. THIS TABLE WAS ADAPTED,  
 IN PART, FROM GONG ET AL. (2003)**

Vegetation Index	Formula	Index Name
SRI Chl I PVI	a-soil line slope b-soil line intercept	Simple Ratio Index- Red Chlorophyll Index- Red Perpendicular Vegetation Index
NDVI	NDVI=	Normalized Difference Vegetation Index

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## APUSENI AREA REGIONAL DEVELOPMENT STRATEGIES AND MODELS

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### Abstract:

*This paper provides a more complete image of the problems that the Apuseni Mountains Area is struggling within, it makes a survey of the initial status from the economical, social, ecological and cultural point of view, to propose solutions intended to eliminate this area's recorded imbalances, and for the sustainable development of this territory.*

*The main goals: social-economic imbalances analysis, establish of development poles, and a regional development policy making, for Apuseni Mountains Area and a model for regional development, applicable for this area.*

*In order to aim these goals a lot of activities, consisting in area marking, data collecting, data synthesis, statistic analysis, meetings with regional authorities bodies, involved in regional development of Apuseni Mountains Area have been done.*

### Key words:

Regional development ; Regional disparities; Competitive advantages; Regional development modeling; Regional development policies; Instruments of policy regional development; Development regions; Disadvantaged areas; Assisted areas; Development programs; Diagnosis; Strategy; National Development Plan; Demo-economic forecasting; Socioeconomic profile; Structural Funds; Financial incentives

The Apuseni Mountains Area is the place where a lot of disparities regarding production level, incomes, unemployment, as well as infrastructure providing, education alternatives, and environment quality occur.

This paper aims to put out these disparities and to propose fighting active measures, providing proposals regarding plans and programs improving with particular objectives regarding Apuseni Mountains Area, a good and efficient implementation thereof. Despite of only 7% of country territory, and around 2.80% of whole population, the Apuseni Mountains Area remains a challenge for regional development efforts.

Within a new regional development concept, adopted by Romania after 1997, dividing national territory in eight development regions, Apuseni Mountains Area takes a part of three development regions. Thus, this area of common characteristics of economy, social life, culture, history and ethnographic links, level of living was divided.

Apuseni Mountains Area dispersal reduces the chance in central, regional and local administration authorities pay attention to its problems and the founding attraction alternatives, necessary for confronting problems and solving as well. An approach of this area particular problems within an more than one development region and not in an unitary manner have the result of acute problems splitting, and make this area to lose the argument's strength which it still has, in order to obtain efficient facilities in gradually solving present imbalances.

The quantitative and qualitative status of infrastructure, demography potential, labour available numerically, inter-branches, and territorially, informational means supplying was observed by a total survey done for 1990-1999. For a realistic characterization of economic-social phenomena evolving in Apuseni Mountains Area, a lot of data have been used. For the prognosis model, data from the last census of 2002 have been used, for analysis have been used data from National Development Plan 2004-2006. The difficulty consisted in the fact that Apuseni Mountain Area spreads over six counties territory and official data refer only to county as a whole. For this reason it was necessary to collect for each intended locality and town, from Statistics Department of county of Alba, Arad, Bihor, Hunedoara, Sălaj.

This paper analysis Apuseni Carpathians as a whole, also the neighboring areas, as area have considered as well defined social, economic, ethnographic entity. From present research stage analysis towards regional development in Romania and economical-social problematic of Apuseni Mountains Area result that this paper is the first one with a total geographic covering of the area.

Beginning with the theoretic and practical context of regional development policies described. Here we make briefly conceptual separations of regional development notions, underlining the goals of regional development in European Union, in Romania, and naturally in Apuseni Mountains Area. We consider as necessary the European Union regional development approach, because the European Union has a long experience in this matter and has applied the regional development policy with very good results, promoting systematically a redesigning of intended goals of structural funding principles and also cohesion funding, for the scope of efficiency in all these funding usage.

Moreover, even developed countries have disparities between regions, and the goals are redesigned upon territory economical-social evolution, and a dynamic approach makes the study efficient.

Regarding to regional development goals in Romania, we stressed that among general goals followed by international practice, consisting in territorial disparities reducing, making a relative balance between economic-social development levels in different areas of a national territory, we have to take in account the facilitating of structural and sectorial adjust.

Regarding to Apuseni Mountains Area goals, we have supplementary in mind the problem of depopulation, the problem of acute ecological balance establishing, of stopping of depopulation.

Were described preoccupations of research and studies made in the field of regional development, either at international level and Romanian level? Without an exhaustive manner, the main tendencies of thinking in regional science were laid down.

An economic-social profile of Apuseni Mountains Area was described, using in analysis ten years data. It was offered as possible as complete image in aspects of locating, human resource evolution, economic resource, social potential, infrastructure status and environment status.

We described positive and negative aspects which can have influence development, the positive and negative influences upon area, using SWOT analysis method upon production sector, infrastructure, labour resource, environment, service, and tourism. It have been identified the goals of economic development in agriculture, silviculture, industry, tourism, and services in order to establish a development policy for the area of Apuseni Mountains, which permit the region launching and eliminate present imbalances.

Moreover, we identified the main actions for the intended goal aiming, of durable development making in economy and social of Apuseni Mountain's area, by putting in value of nature and human potential of this region, and taking the necessary measures apart for economic activity fields.

We detailed the existing development plans and programs for this area. First we described a few development alternatives for rural environment by means of putting in value of competitive advantages of administrative units with existing financing programs use.

Then, as the fact area Apuseni Mountains is located within six counties and three development regions, the policies' goals in regional development equal in regional development plans of all these regions (Centre, West, and North-West), we made a short presentation of the plans in Regional Development of these regions. These plans contain general evaluation of regions with details toward population and human resource, economy, infrastructure, rural place, environment and living place, regional disparities etc. The plans also contain SWOT analyses, programs for finance and institutional support, respectively regional development policies.

This paper has as principal goal - the improvement of these programs regarding the particular aims for Apuseni Mountains, respectively to contribute more efficient implementation in this area.

We described the particular financing programs of Apuseni Mountains Area as a whole, and the special programs intended only for un-favoured areas.



In this context we presented FIDA financing program and we made a description of the four un-favoured areas which Apuseni Mountains Area contain, and the facilities accorded by law with the role of stimulating the will of invest in these areas, in order to increase these areas attractiveness.

Further we made a presentation of the concept of regional development design and established a prognosis model in particular for Mountains Area. Having regard of many theories and models in development, appears difficult to choose for a model or another, as more as the Romanian society pass through huge transformations, as result of market economy transition, and study of some segments in national economy (regions) confronted with the lack of necessary data for parameters appraisal from this type of models. For Romania, even for the case of existing chronological regional series, these are too short for a separate survey of each region (county), and covered field is narrow. We chose for use of econometric analyses of data type panel (approaching simultaneously of data in time and space). As the fact that statistical series of data, available for Apuseni Mountains and neighbor area, were not permit to build a model for economic and social development, we have chosen to build an econometric model for Apuseni Mountains and neighbor area. We took in mind an extended area, including entirely county of Alba, Arad, Hunedoara, Cluj, Bihor, and Salaj. This model tries to quantify determination factors influence of an economic, demographic, and social indicators for the region, and also regional macroeconomic variables (employed population, unemployed rate, human develop index etc.). The model contains 16 variables (6 of them external and 10 internal into the model), 20 equations, (12 equations for conduct, 8 equations for definitions or balance) and four blocks. The model is solved by the smallest square method, preferred that in the model circulation take place. The method has the advantage of residual self-balance attenuation. Using ECONOMETRIC VIEWS program has done the model correct solving. Econometric tests validate the model build.

Moreover, the results follow the specific economic theory for this field. The written model by changing the coefficients with these parameter estimators converges after 30 iterations. With a good precision, the model estimates the values of indicators recorded at national level.

The model described and tested has been used for population prognosis and employed population.

Between 1992 and 2002 Romania population decreased to 1.1 million inhabitants. Almost 1/5 from total population decrease has recorded in counties that have Apuseni Mountains as territory (-210 thousand people). That is why a prospective analysis of population and labor resources is important not only from regional perspective.

Population forecast from region of Apuseni Mountains and some elements of human resources (eager employed population, employed population) will be done following a mathematics model from analytical forecasting class.

This paper ends with the following *conclusions and proposals*:

- Policies in regional development have as main goal reducing territorial disparities, making a relative balance between economic and social development levels of different areas from national territory, by putting in value of natural and human potential of this area;
- The derived goals of regional development policies are related to problems of general development and to specific of each local entity;
- Regional policy goals are achieved by cooperation between national public authorities with local and regional public authorities;
- For Romania, one regional policy goal is *to facilitate structural and sectorial adjust*, to sustain economic redesign and launch, territorial flexibility, to remake and stimulate the competition capacity of regions, to sustain stages in European integration;
- Operational goals of regional development policies are local problems solving, in environment matters, in economic conversion, town-keeping and dwelling;

- Countries in majority, including economically developed countries, face to regional problems, consequently applies regional development policies;
- Disparities in economic development do exist not between different regions, but merely into the same region;
- Regional development goals become practice by using of specific modifying instruments. The instruments for regional policy, applied in countries that have experience in this field, are derived from instruments used in economic strategy (fiscal, budgetary, monetary instruments). They can be as direct intervention for locating and development of certain activities, or to give utilities in territory, or stimulating measures for development;
- *New approach in regional policy requires using new instruments*, meaning to assure a *infrastructure* which offer a favorable place for companies' development, to offer *information*, to apply subventions on development starting period, labor market intervention for human resource converting and forming;
- In Romania regional development policy becomes reality by legislative and institutional basis establishing. *More stability is necessary towards institutions, which conduct regional development policy applying*. Should be taken measures to increase the capability, either for companies and public local authorities, to make projects by which funds such as SAPARD, PHARE or ISPA can be accessed, and to good implementation of these projects;
- We propose in this way that Regional Development Agencies, Commerce Chambers; County Councils open consulting offices and advertise these offices, as well as the ways of funds' accessing. The Romanian Government, by its territorial regional development agencies have to *train specialists* seriously;
- As result of very hard conditions of life and of acute differences as level of life between localities from Apuseni Mountains Area and other country regions, inhabitants' situation from this geographic area impose *support in economy*

*and social durable development, necessity of program applying which can put in value natural and human potential of this area;*

- A characteristic for Apuseni Mountains inhabitants, especially those living in rural places, *is severe poverty*, and one of these facts is *insufficiency in resources put in value*, resources which do exist in this area;
- Apuseni Mountains Area does have important natural resources, such gold ore deposit and non-ferrous ore deposit, forests of fir, spruce fir, foliage tree, forest fruits, wild animals;
- *The main goal is the achievement of durable economy and social development of Apuseni Mountains Area, by putting in value of natural and human potential of region.* The main actions to aim this goal resulting from intended analysis are:
  - superior assessment of natural potential of area, by economic activities efficiency, redesign, and diversify, by stimulating SME's having private capital;
  - isolation ending of some localities by improvement of technical supplying and area integration in major infrastructure networks (transportation, electric power, communications);
  - population stabilization by a life level assuring, comparable with other area from country;
  - natural and building patrimony safeguard, in order to durable and performing develop of rural tourism;

As result of very hard conditions of life and of acute differences as level of life between localities from Apuseni Mountains Area and other country regions, inhabitants' situation from this geographic area impose support in economy and social durable development, necessity of program applying which can put in value natural and human potential of this area;

In order to achieve the above objectives, strong administrative measures are necessary in:

- *establish a government structure for Apuseni Mountains Area as that one created in Danube's Delta and a governor state secretary naming;*
- *urgently applying of "Mountain Law" approved by Romanian Parliament in 2004, elaboration of Strategy for durable development of mountain area, tracking implementation and financing resources assuring for law facilities applying, to stimulate the mountain farm, population stabilization in mountain area;*
- *introducing in National Development Plan of one chapter describing the poverty zones in Romania, including Apuseni Mountain Area;*
- *establishing of economic-financing facilities and fiscal facilities to contribute on poverty amelioration, on depopulation stopping, and economy activity launch with the respect of restriction providing from negotiation chapter with European Union regarding concurrence and state grant;*

The six county councils representatives, towns' representative and localities' representative from studied area, and Mayors' League from Apuseni Mountains, will have concerted actions for:

- *sustain measures applying provided in laws;*
- *investment special programs settlement for roads modernising, land amelioration, water supplying constructions and canalisation, reconstruction of landscapes, historical monuments restoration, tourist infrastructure, investments in production sector; All these actions and measures described above can serve as basis for development programs;*
- *favourable conditions assuring for specialists in education and health, organising traditional occupation courses within schools;*

With this paper we brought a contribution on a complex study of Apuseni Mountain Area problematic. This paper is analysing *the entire area*, as a whole, starting on *total observation* organised especially for this scope, lasting a *period of ten years* on all component localities level. Based in this we offered

development solutions, applied modern methods in economic-mathematics design at regional level and not at least, to be a way of sensing the central and local public administration representing, an instrument for elaboration of development strategy of this area.

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## CONSIDERATION REGARDING THE RESULTS OF THE PROJECT „MOUNTAIN RESOURCES AND SUSTAINABLE DEVELOPMENT”

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### **Abstract:**

*The paper present the results of the project with the title: "Mountain resources and sustainable development". Also it was presented the documentation from the existing specialized literature concerning traditional sheepfold products. The paper also present the aims, the objectives and the activities of the project.*

**Key words:** project, objective, activities

The Society "Progresul Silvic" Sibiu, a NGO with environmental protection and sustainable development profile, implements during this year the project "Mountain Resources and Sustainable Development", financed by the Governments of Iceland, Lichtenstein and Norway, through the Financial Mechanism of the European Economic Area (EEA). The other partners within the project are the University of Pitesti, the Chamber for Agriculture of Sibiu County and the Public County Service Salvamont Sibiu.

Implementation period: Dec. 1. 2009 - Nov. 30.2010.

Sustainable rural development in what environment and economy concerns aims those processes that involve changes in the structure, organization and activity within a social and economic system. It is the only alternative for increasing the quality of life. Sustainability is not limited to biological aspects involved, but it includes also economical, technological, environmental and sociological issues.

### **Aims of the project:**

- identification of the natural and human resources of certain pastoral villages of the mountain zone in the counties of Sibiu, Arges, Valcea;
- analysis of the economical, social and environmental situation of certain mountain villages;
- information, education and awareness of the local population in what the valorization of the natural and human patrimony concerns as well as the laws in force.

**The project's objectives are:**

- description of the traditional activities with pastoral character within those areas, in places with a rich tradition in sheep and goats breeding;
- finding of ways and means for the development of pastoral activities within these mountain-rural zones;
- stimulation of the integral valorization of the resources provided by the mountain area;
- creation of an inter-universities collaboration platform, as well as between universities and NGOs with environmental protection activity and youth clubs.

Targeted area: Sibiu County (villages Săliște, Poiana Sibiului, Rod, Tilișca, Jina, Râu Sadului, Sadu, Gura Râului, Rășinari, Cârțișoara), Argeș County (villages: Corbeni, Rucăr, Domnești), Vâlcea County (Vaideeni).

**State of implementation and performed activities:**

We have made a study concerning the number of sheep and goats breeders within the targeted area (378 households) and the number of animals (100,102 heads).

It was made a large documentation from the existing specialized literature concerning traditional sheepfold products and there were collected information



from animal breeders. These have been used for a book written in common by many authors, that contains chapters concerning the sheepfold products and by-products, which is at the final editing before printing at the Publishing House of the “Lucian Blaga” University of Sibiu, recognized by C.N.C.S.I.S.

It was made a study concerning the traditional cultural and spiritual relationships existing between the rest time of the basic pastoral activity and the great religious holydays of the Romanians from the rural mountain area, i.e. the timetable of the pastoral and religious activities and celebrations in the “Marginimea Sibiului” area as well as in other places, historically and occupationally influenced by this, inside the Southern Carpathian and Subcarpathian arc. The volume is written by a team of many authors and is at the final editing before printing at the Publishing House of the “Lucian Blaga” University of Sibiu, recognized by C.N.C.S.I.S.

There were collected information about folk craftsmanship in the rural area and it was elaborated a list with the 38 craftsmen existing in the Sibiu County villages included into the project.

A group of six members of the implementation team have participated in the elaboration of eight chapters of the Rural Tourism Book, in printing at C.H. BECK Publishing House, Bucharest.

There were collected information about the functioning tourism structures existing in the targeted area (136 pensions), and a sociological survey within them is being performed these days by volunteer students from “Lucian Blaga” University of Sibiu, Department of Agro-Sciences and Environmental Protection.

There have been presented and published five scientific papers in the XIXth and XXth volumes of the XIIth National Conference with international participation “Romanian rural tourism within the context of sustainable development. Actualities and perspectives”, held at Vatra Dornei, from May 29 to May 30, 2010.

Within this project it has taken place, during the period July 6-12, 2010 the “Summer University” named “Sports – tourism – culture – environmental protection in the rural areas”. At the classes and practical activities performed within it there have participated 60 students and teaching staff from “Lucian Blaga” University of Sibiu, University of Agronomy and Veterinary Medicine Bucharest and University of Pitesti.

The invited speakers, belonging to the teaching staff of the three universities, representatives of the Forest Board Sibiu or of certain associations and NGOs, as well as researchers in the field of sustainable development of the rural areas have presented lectures on: management of sustainable development projects, Romanian traditional occupations and the way they are reflected in the household structure, conservation and valorization of the rural patrimony through the Association of the Regional Eco-museum Sibiu in localities of Tarnava Valley, forests protection and defense, forest tourism offer of Sibiu County, pastoral tradition, culture and civilization in Marginimea Sibiului, as reflected in Sibiel village organization – an interdisciplinary approach, milk and its derivatives from an anthropological perspective, tourism impact on environmental quality, causes of mountain accidents, the chance of a new vision for biodiversity conservation on global level.

The practical applications have envisaged issues related to: identification of the main natural and human tourist objectives of Rasinari village, identification of the main species of the wild flora of mountain pastures, cleaning of a tourism pathway in Paltinis mountain resort, self-defense exercises, tourist orientation and mountain hiking.

During the seven days of the Summer University Sibiu 2010, the participating students have taken photos that will be presented within a traveling exhibition in the three universities, starting with October 1, 2010, booth at “Lucian Blaga” University from Sibiu and U.S.A.M.V. București.

The courses of the Summer University ended Monday, July 12, with the presentation of the token photos, awarding the best students and giving Participation Diplomas, to the students and invited speakers.

NGO was co-organizer of the Local Fair of producers to the Festival of Cheese and Brandy, Rasinari, of the sheep breeding seminar at Tilișca, in August 2010.

In this project people have restored 25 miles of trail and mountain trails marking in Făgăraș and Cindrel mountains.

In the project were printed 12,000 flyers and a brochure About the state of rural tourism development in the county of Sibiu.

The project was completed by disseminating the results in a Symposium entitled "Natural and human heritage of the pastoral villages of the mountains area", which take place at "Lucian Blaga" University from Sibiu, in Nov. 26., 2010.

## STUDY REGARDING TO THE CONTRIBUTION OF THE ECOTOURISM AT A SUSTAINABLE RURAL DEVELOPMENT IN ROMANIA

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### Abstract:

*The study presents the ecotourism as a part of the sustainable tourism, setting the strong and the weak points of the romanian ecotourism, off. We carried a SWOT analysis out, resulting the elements which may transform the romanian ecotourism market in a reference market for the tourists.*

*We also present the first ecotourism associations in Romania, as well as The Ecotourism Association Romania, the one which elaborated the basic principles of the present and future ecotourism.*

**Key words:** ecotourism, sustainable tourism, ecotourist principles

Rural areas are very rich as regards the ecological and cultural diversity. Their dimensions and complexity make difficult a generalization of the problems or values, even if some common characteristics exist.

The sustainable development concept is related to an economic growth, meeting the needs of the society – prosperity, on short, medium and especially on long terms. This concept stands on the following reason: the development must be faced with the present needs without endangering the future needs.

The sustainable tourism includes all the types and activities of the hospitality industry, as well as the conventional mass tourism, the ecotourism, the cultural tourism, the business tourism, the rural tourism, the cruise tourism, the religious and sport tourism, the urban tourism. The orientation towards the sustainable development is a process which requires the coordination of the governmental authorities and needs to be sustained by the local authorities.

The sustainability in tourism as well as other industries, includes three aspects: economic, social-cultural and environmental. The sustainable development concerns permanence, it means that the sustainable tourism must

use optimal the resources (including also the biological diversity), has to minimize the negative economic, social, cultural and environmental impact and to maximize the benefits of the local communities, the national economies and of the nature conservation. As a normal result, the sustainability concerns also the managerial structures, necessary to achieve these purposes.

The attainment of the sustainable tourism has to be part of the national and regional development plans. These actions may have economic targets (to increase the incomes, to diversify and integrate activities, to control, drive and distribute the development), social aims (to ameliorate poorness and the unequal distribution of the incomes, to protect the social and cultural indigenous patrimony, the participation and involvement of local communities) or ecological purposes (to protect the functions of ecotourism, to preserve and use in a sustainable way the biodiversity). Some experts prefer to speak about a sustainable development of the tourism, rather than a sustainable tourism. The first includes all the aspects of the development, the second only some aspects and components of the tourism – like aerial transport at large distance, that can't be sustainable, taking into account the actual technological conditions, even using the best practices.

### **Defining Eco-Tourism**

Eco-tourism focuses on local cultures, wilderness adventures, volunteering, personal growth and learning new ways to live on our vulnerable planet. It is typically defined as travel to destinations where the flora, fauna, and cultural heritage are the primary attractions. Responsible ecotourism includes programs that minimize the adverse effects of traditional tourism on the natural environment, and enhance the cultural integrity of local people. Therefore, in addition to evaluating environmental and cultural factors, initiatives by hospitality providers to promote recycling, energy efficiency, water re-use, and the creation of economic opportunities for local communities are an integral part of ecotourism.

Historical, biological and cultural conservation, preservation, sustainable development etc. are some of the fields closely related to Eco-Tourism. Many professionals have been involved in formulating and developing eco-tourism policies. They come from the fields of Geographic Information Systems, Wildlife Management, Wildlife Photography, Marine Biology and Oceanography, National and State Park Management, Environmental Sciences, Women in Development, Historians and Archaeologists, etc.

Ecotourism is considered the fastest growing market in the tourism industry, according to the World Tourism Organization with an annual growth rate of 5% worldwide and representing 6% of the world gross domestic product, 11.4% of all consumer spending - not a market to be taken lightly.

### **Principles of Sustainable Tourism**

Increasing evidence shows that an integrated approach to tourism planning and management is now required to achieve sustainable tourism. It is only recently that there has been a growing recognition of the importance of combining the needs of traditional urban management (transportation, land use planning, marketing, economic development, fire and safety etc.) with the need to plan for tourism.

Some of the most important principles of sustainable tourism development include:

- Tourism should be initiated with the help of broad-based community-inputs and the community should maintain control of tourism development.
- Tourism should provide quality employment to its community residents and a linkage between the local businesses and tourism should be established.
- A code of practice should be established for tourism at all levels - national, regional, and local - based on internationally accepted standards. Guidelines for tourism operations, impact assessment,

monitoring of cumulative impacts, and limits to acceptable change should be established.

- Education and training programmes to improve and manage heritage and natural resources should be established.

The implementation of the politics and tourist plans represents a responsibility of the govern but also of the private sector. The private sector is responsible for fixing the strategy, the planning and research, the fulfillment of the basic infrastructure, the development of some tourist attractions, for fixing and administration of rules in offering facilities and services, for introducing measures in order to administrate and capitalize a region and to preserve the environment, for fixing the professional standards in tourism specific vocational training, for maintaining the public health and security.

The private sector is responsible for the development of the accommodation services, the tourist agencies, the activity of the firms specialized in tourism and is based on infrastructure, on the development of tourist attractions and on the way they are promoted within the field of marketing.

The political engagement regarding the development of the sustainable tourism is very important, as well as the implication of different non-governmental organizations, more and more involved in the development of the tourism.

Several methods of implementation are used. The logical mounting and the development projects programming are also very important. Within this domain they must exist efficient organizations in the public sector and in the private one, organizations able to assure the protection of the environment as well as the facilities standards for the tourists.

The development of human resources in tourism has to be a priority, these must be able to offer high quality services, expected on the tourism market and needs to be approached in a systematic manner (to lay out the demand on

human resources and to fix the modality these persons are going to be trained) in order to provide qualified people in the public and private sectors. If national or regional institutions specialized in these kinds of vocational training are not able to provide the demanded people, then a local institution must be established.

Also very important is the usage of marketing methods and know-how: to set up the objectives and marketing strategies and to achieve a promotional program.

The deployment of marketing activities has to take place in the governmental tourism offices, at the local tourism office and in the private sector, the development of a positive image of the new tourism sector is very important.

The Law nr.5/2000 regarding the Development Project of the National Territory - section III Preserved Areas – named 17 sites as natural protected areas. These areas of national interest represent “reservations of biosphere, national or natural parks” , with a surface of 1132175 ha, including 134 natural reservations or natural monument, on 129643 ha.

Beginning with 2007, in Romania 17% of the country surface are natural protected areas: the Biosphere Reservation of Danube Delta on 580000 ha, 13 national parks on 315000 ha and 13 natural parks on 756000 ha. The National Forest Administration ROMSILVA manages 12 national parks (307000 ha, 10 natural parks (540000 ha), more than 200 reservations and natural monuments on 33000 ha.

According to the actual laws and settlements in this field of the protected areas (OUG 236/2000, L 462/2001, HG 230/2003, Ord.850/2003) ROMSILVA applies for the management of the backwoods national and natural parks, ensuring the necessary resources for a sustainable and maintaining management of these areas, according to the management plans approved by the environmental central public authority.



The management of the national parks ensures the maintaining of geographic and natural conditions, the protection of the ecosystems, the conservation of genetic resources and biological diversity under conditions of ecological stability, preventing and excluding every kind of natural resource exploitation and land using, incompatible with the prescribed purpose.

In the last years most of these areas were included in the ecotourist round trips. They exist independent administrations for the Biosphere Reservation of Danube Delta, National Park Piatra Craiului (a protected area since 1938), National Park Cozia, National Park Retezat (the first in Romania, since 1935), National Park Domogled – Valea Cernei, National Park Rodnei Mountains, National Park Calimani, National Park Ceahlau, National Park Bicazului - Hasmas Canyon, National Park Macinului Mountains, National Park Buila – Vanturarita. Most of them dispose of economic capitalization and tourist programs.

Generally they exists three groups of managerial targets in these parks:

Main targets (conservation of biodiversity, maintaining of ecological functions, tourism and leisure)

Secondary targets (wildlife protection, protection of natural and cultural sights, ecological public education and scientific research)

Potential applicable targets (the sustainable usage of natural ecosystems resources in buffer areas without negative effects on biodiversity).

The custodians, administrators and guides have to operate without tracking while visiting cultural, historical and architectural sights or while crossing woods or other natural areas.

## **Romanian ecotourism**

### **Strong points:**

- Diversity of natural tourist resources
- The rich fauna and flora, including unique species

- The presence of wild areas, unharmed by man
- An undeveloped infrastructure for accessing the protected areas
- The existence of a legal frame, which delimits the natural parks and the protected areas and fixes the rules and conditions for the management of these

**Weak points:**

- The extending of built up areas near or inside the protected area, the aim is in these cases the development of resorts
- The overexploitation of natural resources, the excessive pasture, illegal woodcuttings, wild trespass or uncontrolled tourism
- The deficient administration of the existing tourist facilities, generating big quantities of wastes
- The deficient abundance by protecting rules, because of the absence of land demarcations, in buffer areas to
- The absence, in some protected areas, of administrations able to run an efficient management

One of Romania's competitive advantage to well known tourist destinations is the maintaining and presence of an unharmed environment. Inside natural reservations there exist a lot of species, stated as natural monuments or endemic species. In Romania we can find regions with flora and fauna species, disappeared in other countries or found out in captivity. Because of the weak development of the classic tourism in some regions, good conditions for the development of ecotourism were created. This means that Romania is able to become an important destination for this kind of tourism.

**SWOFT Analysis**

**Strong points:**

- The rich natural patrimony inside national and natural parks

- The rich number of sights included on the UNESCO patrimony list, which are located in parks
- The permanent development of the protected area system
- The existence of the necessary legal frame which allows this development

**Weak points:**

- The marketing of national/natural parks is reduced especially on regional/local field, that means the ignorance of these sights
- Insufficient market studies
- The low vocational training level (for guides, people who manages these activities)
- The low accommodation capacity inside the protected areas
- Reduced services and leisure offer
- The incapacity of the managers and local communities to understand that this kind of tourism may bring incomes
- The absence of ecological education
- The big wood cuttings and the waste disposal in the areas
- A chaotic buildings layout
- The absence of other types of fuel so that the wood is cut uncontrolled
- The pollution of creeks in regions where there is no drainage

**Opportunities**

- the increasing number of tourists and demand
- the diversification of the offer by including representative natural sights - Danube Delta, Rodnei Mountains or Retezat Mountains
- to promote natural events from the “ Calendar of the Nature” (the call of the stag, the blossom of the snow rose)

- to offer facilities to investors interested in this kind of tourism

### **Threats**

- the international competition
- the superior waste management in other countries
- the urbanization of the country people and the wastage of the cultural patrimony
- the income decrease in this regions as a result of the restraint system of different economic activities
- the development of other tourism types near these protected areas

The first ecotourism associations were set up in Romania in the XIX – th century: The Transylvanian Carpathians Tourism Society (SKV), The Tripper Circle, The Tripper Guesthouse, The Touring Club Romania, The Academic Tourism Society Romania, The National Tourism Office.

In the presence in Romania exists the Ecotourism Association Romania (AER), based on two international models:

- The Trusted Program on Nature and Ecotourism developed in Australia
- Nature's Best, the certification system of the Ecotourism Association in Sweden

AER elaborated the following principles to be applied by those who offer ecotourist products and who plans the development of an area based on ecotourism:

1. The ecotourism occurs in the nature and is based on the direct and personal experience of the tourists in the nature.
2. The ecotourism has a large contribution for a better understanding and assessment of traditional nature for the tourists but also for the local communities.
3. The ecotourism offers the best practices for a sustainable development and for the nature conservation.

4. The ecotourism concurs in a positive manner with the natural areas protection. The ecotourism offers practical methods for an efficient management and for the natural area protection (may offer financial support for rehabilitation actions or contributions for the conservation organizations).
5. The ecotourism offers sustainable contributions in order to develop the local communities. The local benefits derive by using the local guides, consumer purchase or usage of local facilities.
6. The ecotourism needs to reduce the negative impact on the local visited community but also to conserve local culture and traditions. Ecotourist activities offer also contributions on long terms for the local community.
7. The ecotourism must be able to face with all the tourist expectations. The potential tourist is usually high-bred, that's why the satisfying level of his demands is high.
8. The ecotourism marketing has to offer complete and responsible information, able to concern the tourist about preserving the culture and environment.

Our country disposes of the legal frame necessary for the development of ecotourism. This means to capitalize the protected area but also to practice a type of tourism based on ecological principles, adapted to a sustainable development.

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## EDUCATION'S CONCEPT OF GIORGIU POPA (1841-1897) ON THE PHYSICAL EDUCATION

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### **Abstract:**

*Giorgiu priest's fundamental concern in physical education was the preservation and strengthening of health. It was a hygiene problem but also an ethical question a man's duty to himself and a citizen duty.*

*Such care involves liability to develop "body faculties' concern for cleanliness, food reasonable care ("Moderate"), avoiding" intoxication with smoking and alcohol, sleeping and resting time, because "so the body will look nice and nimble."*

*In this program retention and strengthening of health, hygiene add more classrooms and gym.*

**Keywords:** hygiene, education, exercise, health, cleanliness, body

### **Content:**

Popa Giorgiu saw daylight in the village of Lower campaigns, descended from an ancient priestly family, whose ancestors participated in the uprising led by Korea. In the same village, has its origin and Tuducescu John, cousin, friend and collaborator of our teacher, popular education on the field, recognized author of textbooks.

Giorgiu Popa was born on 14 July 1841, the parents and Ana Vasile Popa Codau. Childhood spent in a village, with two sisters (Martha and Ann). At the young age of 13 years (1854) mother died and left an orphan. Biography shows how his family was poor material circumstances, and hampered by the loss of his mother.

At age 6, little Giorgiu attended elementary school in Baita, and after two years, the last in class III at the same location, the school "nemțească" in care of another teacher, Anton Mayer.

At 10 years, finishing school (in German), he entered the Greek Catholic Gymnasium of Beius, where he remained until his graduation in the year 1858-1860. During secondary school, he passed exams with "eminence" and is supported almost entirely from his own gain. 1 gymnasium was completed during the first 19 hours between colleagues. Maturity exam, "mature", 1 has passed the highest score on all items of education - "eximus maturus modo.

In autumn 1860, the Foundation School "Jiga" founded by Nicholas Jiga (1792-1870) began operating. G. Popa was among the first students enjoyed using them. So he came to pursue studies in Law Academy of Oradea, for two years (1860-1861 and 1861-1862), they ended each year with "distinction". G. Popa and has completed legal studies in Budapest (1865), where in autumn, reached a trainee lawyer.

In 1872 he was elected to the assessors consisting Arad - School Secretary. G. Popa already had "an established reputation for distinguished scholar of his time."

On July 4, 1897 Giurgiu Popa dies in a sanatorium in Vienna. Popa Program Giorgiu seen completed by factors - natural tempering (water, clean air) and supports the idea that physical education begins in the family, the child's first moments of life, being primarily an education problem and a problem family social education.

H. Spencer's influence is seen in considerations of G. Popa, about how preservation and strengthening of health.

In the home, consider that it should meet three criteria: to ensure "health, safety and convenience or skill."

Gymnastics, the object of education in school, has a gift "to support and, respectively, to restitution harmony between mind and body, individual development going in other words, harmony is the ultimate improvement to the overall follow-1. He notes very good correlation between physical education and other components of education. Exercise not only strengthens the body, but

"support the liveliness of spirit, spark and developing aesthetic taste, man inspires his confidence." Thus, to achieve positive results in gymnastics, the teacher must teach anthropology.

Rational diet conflicts with alcohol (wine or spirits) and cigarette smoking. G. Popa stops at length - on the defects that digging the foundation body and the spiritual life of the individual and the nation.

First, he acted totally against alcohol (even "poison"), stating that it "is not nutritious and alcohol that the body receives it needs from fruit they eat, secondly, it puts in light of direct and indirect consequences of alcohol abuse: heart attacks, stomach, throat, lungs, liver, kidney, brain and spinal cord, and with it the fingers and hands start shaking, weakening intellectual and moral powers, lack of will and energy, weakening the body's resistance to diseases, shortening life, poverty at home, and abnormalities in physical and spiritual issue.

Against alcoholism, safe remedy is "regular nutriture with healthy nutrients and well-trained" - beginning with good bread and tasty: Here comes the role of women - wives, in preventing and combating alcohol. The second remedy would be for the state to provide its citizens' work and income "and" healthy eating and cheap "Thirdly, the remedy would be the establishment of temperance societies.

Regarding smoking, G. Popa, take a trip in history and smoking habit, based on a thorough analysis reveals character of harmful to health (for lung and brain - memory weakens, disturb the process of nutrition, etc..) And exaggerating, concludes with French journalist and historian Jules Michelet (1789-1874) who believes that due to smoking, have fewer people today than in the Renaissance. Also, bring a witness statement Galopid A famous French physician, that 'family goes that counted among its four generations of smokers.

Cleanliness is a way to preserve and maintain health, it also embraces the body, clothing, housing, court etc.



Particular attention attaches clean body, based on the idea that skin is the most extensive sense organ in the body. "... by washing, the skin is kept constantly in an active and alive. The skin of this lack of activity would deprive us of health and long life. "On these considerations, G. Popa formulate some rules of hygiene: wash every day with fresh water, massage skin, the more powerful for give "more life and activity" general bath at least once a week, changing clothes from the body, as often, they just, bedding, ventilation whole house, especially bedrooms, dressig, after season.

It insists on the formation of hygienic habits and skills but also on some qualities of will (self-mastery, patience), in relation to need and natural flesh (hunger, thirst, etc.). G. Popa insists the habit of sitting right in the bank but also hygiene and school classrooms and the gym.

Since the first day of school, teacher observing each child, giving advice on the correct position in the bank not to raise too hard with the strap (because blood flow and prevent harmful to health), have clean clothes in order, as to dress, to keep the body clean, hair cut, washed and combed, etc.

Through it all, says the teacher, ie the outer dress, we sincerely express what they wore to others - the teacher, parents, etc. - And to himself, through extraordinary dress, we recommend in front of other people - that show who we are. Surprise here that idea, intimate correlation between outer appearance and inner life of man, by dress and demeanor.

Hygiene school and classrooms, in essence, be reduced to maintain order, the cleanliness and ventilation of all locally. The author closes the panel detail. "Every place of learning (each classroom), even one that would possess Ventilation, vent should be three times a day 1 / 2 hour". Follows more motivated about ventilation, dusting, etc.

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