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# ECOLOGICAL AGRICULTURE AND BIODIVERSITY - RELATIONSHIPS, CONGRUENCES, OBJECTIVE CONDITIONS AND PERCEPTIONS OF LOCAL ACTORS

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**Abstract:** Ecological agriculture provides a favourable framework for maintaining biodiversity by using economically and socially efficient friendly farming practices, generating modern attributes to rural communities and offering a different lifestyle and a different quality of life to the entire society. In two counties ranking in the top ten counties with areas cultivated under organic farming system, Cluj and Suceava, there are positive implications of these farming practices on biological diversity. Qualitative research methods were used to see the local/rural actors' opinion on this topic: hybrid forum and in-depth-interviews. Farmers' decisions to adopt sustainable practices for the environment, which provide positive externalities for biodiversity, water, soil and landscapes, are generated by business-specific economic and social rationality tending to achieve profit specific objectives by using traditional knowledge and skills from the intangible rural heritage.

**Key words:** *ecological agriculture, biodiversity, rural communities, local actors*

**JEL Classification:** *Q15, R11*

## INTRODUCTION

Worldwide, the decline in biodiversity has reached alarming values: in the year 2019, about one million plant and animal species were in danger of going extinct (IPBES, 2019). Biodiversity loss and the collapse of ecosystems were ranked among the top five threats facing humanity by the World Economic Forum (WEF, 2020). The scientific concerns regarding biodiversity stemmed from a social order, when people got aware of the threats facing biodiversity and humanity began to have a significant interest in biodiversity protection; the cognitive theories and systems began to decipher the intricate characteristics of biodiversity, the multiple relationships with the farming activity and the other action types and the way farmers relate to this whole relational conglomerate.

The reference year is 1992, when the Rio Conference took place and where “3 levels of organization were established: ecological diversity (or ecosystem diversity), specific diversity and genetic diversity” (INRA, 2008).

The evolution of the concept has been permanently subject to coherent approaches: “ecological logic having as objective the conservation; agronomic logic that sought to limit the erosion of genetic diversity, for the improvement of plants; commercial logic expressed by adopting the intellectual property principle on the living environment (Uruguay Round), cultural/native logic added in the late 1980s” (INRA, 2008).

The relationship between biodiversity and agriculture has a recent history: after the Conference from Rio new approaches to the synergies between the two fields emerged: two reflections emerged, i.e. one based on the relations between agriculture and biodiversity, which led to the creation of the agro-biodiversity concept, and the other focused on the multifunctionality of agriculture (INRA, 2008).

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## Box 1. Why do we protect biodiversity?

**Economic reasons:** it supplies raw materials for industry, pharmaceutical products, construction materials and materials for household use; it is the basis of agricultural production, both as number of utilised species and in terms of selected varieties; it is indispensable for the improvement of plant species and animal breeds; provides opportunities for biotechnologies, mainly in plant microorganisms and equally in the field of genetic manipulation; it relates to an economic activity in the tourism sector, to wildlife observation in their natural habitat; it plays an important role in regulating the great physical-chemical equilibria of the biosphere, mainly at the level of carbon and oxygen producing and recycling; contributes to soil fertility and soil protection, through water regulation; absorbs and decomposes different organic and mineral pollutants and participates in water treatment.

**Ethical and patrimonial reasons:** it is indispensable for maintaining the evolutionary processes of the living world; people have a moral duty not to eliminate other forms of life; according to the intergenerational equity principle, we must pass on to our children the legacy that we have received; natural ecosystems and their species are real laboratories to understand the evolutionary processes; biodiversity is a carrier of value; what is natural is vulnerable, but at the same time it is good for humans and for the survival of humanity, etc.

Source: INRA, 2008, p. 6-7

Alongside with biodiversity and ecological farming, another key factor is the social actor, with a pro-environmental behaviour/farmer with ecological behaviour who has been the generous subject of multiple integrative theories and models. The social psychology theories have taken over the idea of complex interaction between the environment and the invasive human subject by formulating and adapting concepts and reinterpreting psychological manifestations: a) the theory of activating norms – considers the norms as main activators of behaviours and in this case “the individual/social actor must be aware that his action influences the well-being of others (awareness of consequences) and must be responsible for the pro-social behaviour ... this theory has been used to explain the waste management behaviour” (Le Coent, 2017); b) the theory of planned behaviour – intention is fundamental “intentions are considered motivational factors that influence behaviour”, in other words in a reductionist manner, we might say that intention can overcome the difficulty of people to try, so as to have a certain behaviour. The stronger the intention, the more likely the behaviour will be. Thus, three independent drivers of intention are considered: the first is the attitude towards behaviour and refers to “the degree to which a person has a favourable or unfavourable assessment of the behaviour in question”; the second, the subjective norm, represents the “perceived social pressure to perform or not the behaviour”; the third driver refers to “the perceived ease or difficulty in performing a behaviour” (Le Coent, 2017).

The social theories have generated integrative models: “they include the effects of return to individual behaviours, to social dynamics and dynamics of ecological systems ... they take into account social behaviours and behaviours of ecological systems, different social levels and different types of human intervention” (UNESCO, 2013).

## MATERIAL AND METHOD

The main purpose of the paper is to provide a structured and integrative overview of the existing relationships between ecological agriculture and biodiversity and how these relationships are perceived by farmers – users of environment friendly/sustainable agricultural practices. Our study does not aim at an exhaustive exploration of the relationship between ecological agriculture and biodiversity and of how farmers’ ecological behaviour has been constructed. The scientific vision also oriented a clear, simple and integrating understanding of the functioning mechanism between the two components – ecological farming and biodiversity – starting from the fundamental characteristics, going through the characteristics specific to the territories we focused on, from the quantitative indicators for the statistical, sometimes economic description of the ecological reality, to those adequate to ecological agricultural practices.

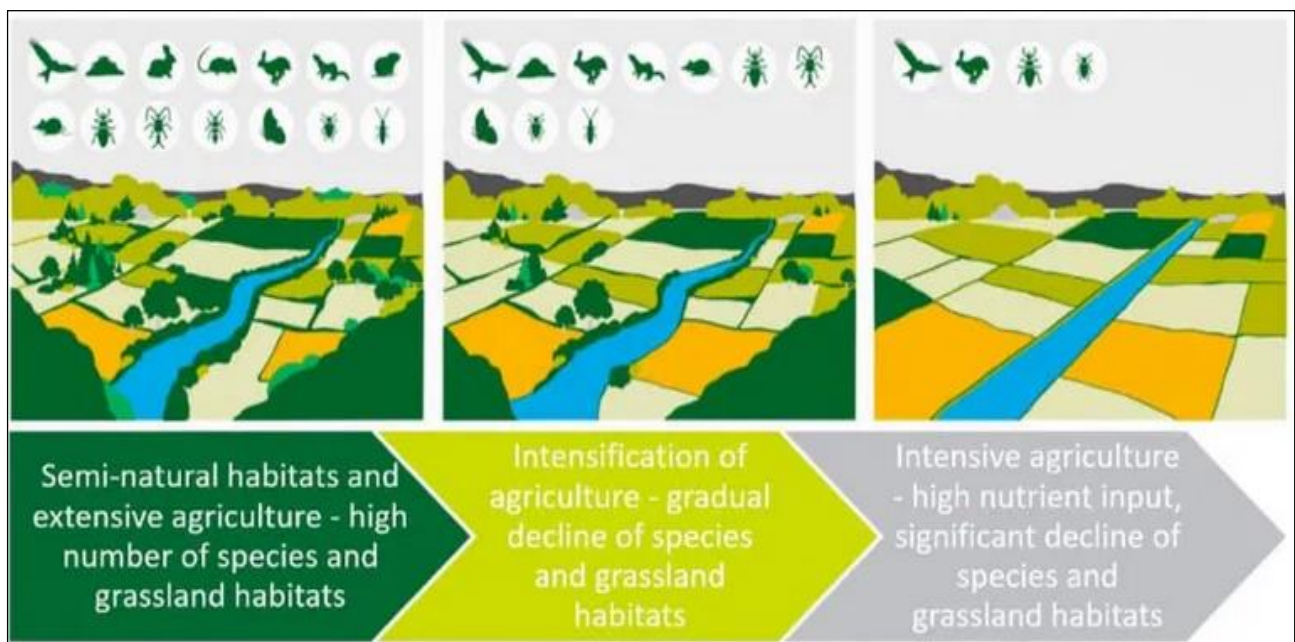
Two qualitative research methods have been used: Hybrid Forum method and in-depth-interviews. The Hybrid Forum – applied in Cluj – can be described as a public discussion meant to build the coherence of diversities of opinions around a defined issue. During the in-depth-interviews – applied in Suceava – sociological information and data were obtained on the opinions of farmers/social actors, generated by the relationships between biodiversity and ecological agriculture (environmentally friendly farming practices).

## RESULTS AND DISCUSSIONS

### 1. Agriculture and biodiversity: a mutually beneficial relationship

In the European Union, according to the European Environment Agency (EEA), agriculture intensification is considered one of the main causes for biodiversity loss and eco-system degradation (EEA, 2019). This trend is associated with the decline in number and diversity of plants and animals (IPBES, 2018). For instance, the bird and butterfly populations, which are considered significant indicators of changes in farmland biodiversity, have experienced an alarming decline since 1990: the bird populations on the farmland declined by 34% in the case of 39 common species; as for the butterfly population, there was a 39% decline in 17 butterfly species (ECA, 2020).

Figure 1. Decline of farmland biodiversity due to intensive farming



Source: ECA, 2020, p.7

The situation of biodiversity significantly varies across the European Union (EU) Member States, and therefore these are facing different challenges. Romania is considered to have a rich biodiversity (due, among other things, to the persistence of traditional non-intensive farming practices and small-sized farms) (Sutcliffe et al., 2015). The ecological structure of Romania's natural capital comprises 53% natural and semi-natural ecosystems that maintain their multifunctionality and 45% predominantly mono-functional agricultural ecosystems (GR-MMDD, 2008).

The two counties of the case studies, i.e. Cluj and Suceava, concentrate significant biodiversity resources. Thus, in the county Cluj, 24 protected areas of national importance have been designated<sup>4</sup>, with a total area of 31195 ha (4.7% of the county's area). The subsequently designated

<sup>4</sup> Law 5/2000 on approving the national land-use planning, Section III – protected areas, Government's Decision 2151/2004 on establishing the natural protected area regime for new areas, Government's Decision 1581/2005 on establishing the natural protected area regime for new areas and Government's Decision 1143/2007 on establishing new natural protected areas.

Natura 2000 sites are overlapping the already designated natural protected areas, so that there are 35 Natura 2000 sites in the county, out of which 30 are Sites of Community Importance (SCI), with a total area of 82049 ha and 5 Special Avifaunistic Protection Areas (SPA) totalling 68388 ha. Since the implementation of Natura 2000 Network to present, the areas under these sites have doubled (APM Cluj, 2019). In the county Suceava, 29 natural protected areas of national importance have been designated, with a total area of 16197 ha. These add to the natural protected area of international importance *Tinovul Mare Poiana Stampei* (the largest natural peat reserve in Romania, of 681 ha, which was declared Wetland of International Importance in the year 2011). There are 30 Natura 2000 sites, out of which 24 Sites of Community Importance (SCI), with a total area of 222311 ha on the county's territory and 6 Special Avifaunistic Protection Areas (SPA), with a total area of 123279 ha. These natural protected areas of Community importance that make up Natura 2000 Network cover 17% of this county's territory (APM Suceava, 2019).

In both counties, significant areas are under various protection forms, thus preventing the degradation of ecosystems and contributing to biodiversity conservation.

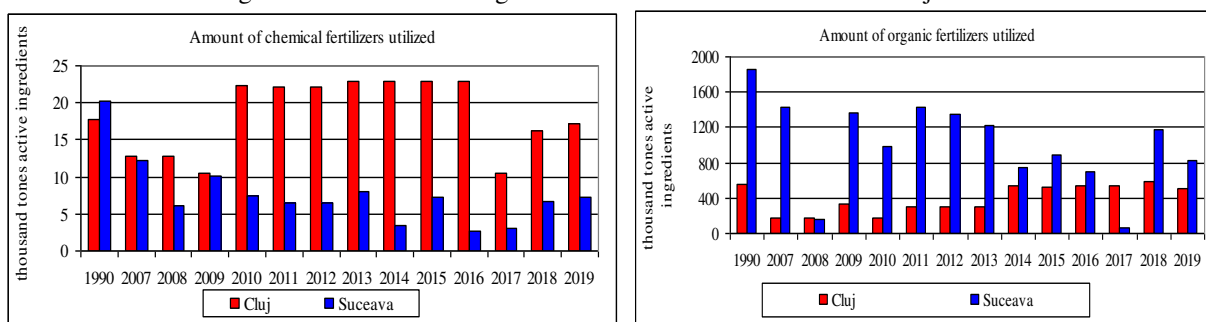
## 2. Ecological agriculture – role in biodiversity preservation

In the areas where farming activities are practiced, biodiversity conservation and improvement can act positively both on the natural heritage conservation and on the increase of farm production profitability (Barret et al., 2009).

Agricultural ecosystems, as part of natural heritage, can be protected through environmentally friendly farming practices, through ecological farming, which implies a rational use of chemical fertilizers, their replacement by organic fertilizers, giving up the use of pesticides as much as possible, which are harmful to the environment. The investigated counties have a significant ecological orientation, being among the top ten counties with organically cultivated areas in Romania: in the year 2018, in Cluj county 2% of the farmland area was cultivated under organic farming system, 3% in the county Suceava (APM Cluj, APM Suceava, 2019). At the same time, a large number of livestock herds are raised under organic system in these two counties: cattle in Suceava county (39074 heads in the year 2016) and sheep in Cluj county (11354 in the year 2016) (RDA N-V, 2017).

In Cluj county, the use of chemical fertilizers had a sinuous trajectory, in the period 2010-2016 being higher than that in the year 1990. At the opposite pole, in Suceava county, the amount of applied chemical fertilizers steadily decreased, in the year 2019 representing one-third of the amount applied in the year 1990. Nitrogen fertilizers were mainly used in both counties.

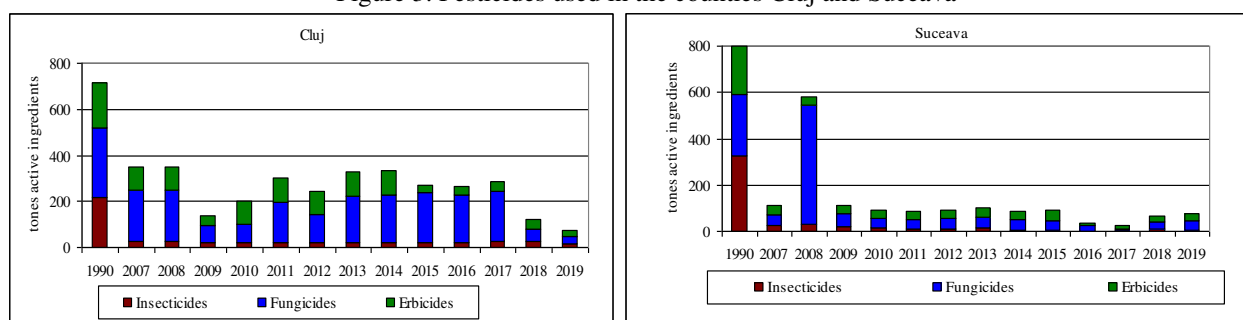
Figure 2. Chemical and organic fertilizers used in the counties Cluj and Suceava



Source: NIS, tempo-online database

In both counties, the use of organic fertilizer fluctuated, in accordance with the evolution of livestock herds. In the year 2019, in the county Cluj the amount of organic fertilizers used was almost equal to that used in the year 1990 (more than 500 thousand tons active ingredients). In Suceava county, the amount of natural fertilizers used was significantly higher than that used in Cluj county, throughout the investigated period, yet the amount used in the year 2019 was twice lower than in 1990.

Figure 3. Pesticides used in the counties Cluj and Suceava



Source: NIS, tempo-online database

The application of pesticides, toxic substances with high environmental degradation potential, significantly declined in both counties. In the year 1990, quite equal amounts for pest control were used in the two counties (715 tons active ingredients in Cluj county and 799 tons active ingredients in Suceava county), aiming at obtaining very high yields, which is a main characteristic of intensive farming. Throughout the investigated period, the decline of the amount of pesticides applied was much higher in Suceava county.

In both counties, the largest amounts of pesticides used were fungicides, followed by herbicides. It is worth noting that in the year 2019 compared to 1990, in both counties, the amounts of pesticides used decreased about 10 times.

### 3. Opinions and evaluations of social actors

*The human-environment relation* is generated by the positive valorisation of biodiversity, as multitude of natural resources provided to human activities; it is the perception of a space rich in material opportunities, approachable only in friendly terms: “... as what you give to the environment, the environment can take away from you when you don’t expect, and can be unpleasant” (M.S., member in an inter-community organization, Suceava county). The moral value assigned to human actions is: “respect for the environment that offers a respect for us” (D.Ş., member in a professional association, Suceava county). From a theoretical perspective, farmers with this type of moral relations “are more likely to adopt soil conservation measures to participate in the voluntary conservation of forests or in wetland restoration. The moral concern affects farmers’ behaviours, such as adopting practices that increase animal welfare” (Dessart, F., Barreiro- Hurlé, J., van Bavel, R., 2019)

*The rational relation with the biodiversity-ecological farming system* is materialised in multi-dimensional opinions: a) understanding ways to protect nature through the use of friendly agricultural practices and development of ecological farming, conservation and low-input agriculture: “The ecological practice is the practice that uses and develops natural resources in a sustainable manner” (D.A., farmer Cluj county); “... use of traditional practices, avoiding chemical fertilizers and pesticides (with certain exceptions), use of local varieties/animal breeds respectively, well adapted to the living environment” (T.S., farmer, Suceava county); b) changing the way of understanding the biodiversity – agriculture system and rebuilding the way we relate to this binomial – can start with an education pathway by accumulating basic knowledge and information on the concordance between agricultural activities and natural cycles: “you have to start with schoolchildren, to know when the agricultural products are available and that’s what you can teach them if they come to the farm” (farmer, Cluj county); c) valorisation of ecological products: “In my opinion, to promote ecological products or let’s say low-input farm products, could start from the change of conception on these products that should begin from basic education, that is to change a little bit the vision of how young people perceive basic life starting from food, from foodstuffs...it’s a problem of the society” (A.D., farmer, Cluj county); d) formulating and supporting the educational path based on ecological values: “... let us start with children, with their education, with the change of the education system, continuing with the vocational training in this field, from the most serious,

*most professional level, if we must be competitive; ...this shows we can move forward, starting from zero, with children, schoolchildren, students and further on with farmers”* (A.D., farmer, Cluj county).

As an empirical hypothesis, we are tempted to formulate the following statement: farmers’ opinions, as users of ecological practices, are influenced by the rules they have to obey to protect the environment. In the case of interviewed farmers, the regulatory/ legal norms work together with the descriptive and injunctive norms. As regards the former, “farmers’ decisions to adopt sustainable agricultural practices seem to be influenced by neighbours’ behaviour. The spatial data suggest that farmers who live next to each other have similar models for adopting ecological farming” (Dessart, F., Barreiro- Hurlé, J., van Bavel, R., 2019).

The normative process appeared, in the case of investigated farmers, by exemplifying the good ecological practices existing outside the communities they belonged to; knowledge and internalisation of descriptive norms were facilitated by the channels of professional associations: “*We, Bioterra Association, from the years 2000 to 2010, made very many projects and in these projects we tried to help them to see how organic farming is done and to bring a type of model to steal some ideas from it and get started....and I know that many started like this*” (A.I., member in professional association, Cluj county). The adoption of ecological practices, maintaining the balance between biodiversity and ecological farming implies the functioning of the information system; regarding this information system and dissemination of information on ecological practices, it can be noticed that accessibility of reliable and relevant information is partially covered: “*At present I consider that the main reason for the very slow development of this farming system...is the lack of information on these practices. To this end, I consider that efforts should be made to get farmers aware of the benefits of this system as well as of the difficulties they will have to face, it is necessary to present alternative crop technologies and provide advice throughout the period of land conversion to organic farming*” (D.A., farmer, Cluj county). The theoretical and empirical studies converge on the need for a coherent and functional information process: “Those who adopt organic farming use more information and have significantly better attitudes towards gathering information than the others. Acquiring knowledge and information on sustainable practices is an extremely dynamic social process” (Dessart, F., Barreiro- Hurlé, J., van Bavel, R., 2019).

***The opinions and evaluations referring to organic farming are generally negative, based on negative assessments***, on experiences on the verge of economic failure; in general, there is a reductionist perception of organic farming starting from the difficulties in practicing it and continuing to the obstacles to maintaining the farms with this profile, by emphasizing the factors with negative impact (absence of organizational climate, low and prolix/confusing political involvement, legislative ambiguity, insufficient financial support). To this argument, based on pragmatic factors, a theoretical explanation can be added: “*The literature on farmers’ behaviour is quite consistent in showing that the adoption of sustainable practices negatively correlates with the economic objectives and positively correlates with life objectives*” (Dessart, F., Barreiro- Hurlé, J., van Bavel, R., 2019).

***The opinions on the motivations/mechanisms of the emergence of farms on which ecological practices are used*** are divergent: a) opinions focused on explanations of financial nature, more exactly on the precarious resources combined with zonal peculiarities: “*In our area ... they don’t have money to buy fertilisers, many don’t have anything to carry their garbage with, there are some people who have some equipment, those who have equipment are more skillful, ...lack of money leads to subsistence farming, ...I don’t know anybody who has applied nitrogen*” (M.F., farmer, Suceava county); b) opinions that take into account farmers’ desire/passion to grow organically, to raise animals in organic system: “*We have a farm, in Mureş county, a former state farm, they used to grow hops before, then we have dairy cows, we thought to go green...we managed to make low-input agriculture*” ( A.A., farmer, Cluj county).

***Evaluation of social recognition.*** The need for the social valorisation of farmer status is formulated in virtual terms, by the actors involved in the system promoting ecological products: “*as far as I could notice, both in urban and rural areas, propagating an idea online has a much greater*

power ... the idea is put into value, the product is supported with a different force, there is another approach to the product” (academic researcher, Cluj county).

**The opinions on the costs and benefits of organic farming** are influenced by the mixed perception of economic and financial factors, by the desire to obtain immediate benefits. This type of reasoning is generated by farmers’ financial precariousness, by the impossibility to survive financially without the immediate coverage of costs. *“One of the problems I have to face is of financial nature ... as a strawberry farmer, organic strawberries, and not only, ... it is normal for the price of my product to increase, but unfortunately consumers won’t like it, they would buy this product, but at the price of the conventional product ... we are often in difficulty and we think as farmers, why should we produce organic products when consumers are not aware of how much effort we put in as producers, and how high the costs are compared to conventional ones ... the profit is not the desired one”* (M.C., farmer, Cluj county); *“we have 100 hectares in conversion, we want to shift to organic milk and meat production, and milk is sold at 1.57 RON, and I, as producer of both milk and meat, cannot close the circuit with 1.57 RON”* (farmer, Cluj county).

The content of this type of opinion can vary, materializing in broader formulations: *“Of course, one of the main motivating factors for farmers is represented by the potential financial advantage obtained from selling high quality products. However, it should be also noted that the operating costs are higher, due to the limited use of fertilizers and pesticides compared to conventional farming. In order to make up for the production differences, the subsidies provided to farmers who use organic farming practices are significantly higher than those for conventional farming”*. (D.S, farmer, Suceava county). In the literature, the term *“current prejudice”* is used, suggesting that the immediate costs and benefits have a disproportionate weight in decisions compared to future benefits and costs. *The relevance of this prejudice for decision making by farmers is recognised, and it can be extremely strong in the context of sustainable farming practices, as the adoption of these practices often involves an immediate cost (for instance, investments in machinery, low yields on short term), while the benefits (i.e. higher soil fertility, climate change attenuation) are likely to appear in the future”* (Dessart, F., Barreiro- Hurlé, J., van Bavel, R., 2019).

#### **Opinions on the spatialization of farms with ecological practices**

**a) proximity to conventional farms** is a negative factor with implications in the normal development of ecological production processes: *“Unfortunately it is difficult for us as our land is scattered in very many places, we have many neighbors who are all conventional, but we managed to do low input agriculture, that is we use much less chemical inputs, crop rotation”*(A.A., farmer, Cluj county).

**b) zoning as favourable factor.** An element of zonal selection is considered to be the geographical one, combined with the traditional ability to practice an environmentally friendly agriculture: *“I consider that the agricultural holdings from the plain area are less motivated to develop ecological practices on medium term. In such areas, the agricultural strategy relies on the quantitative improvement of productions with the lowest possible costs and on the largest possible areas and livestock herds. In the hill and mountain areas ... farmers are more receptive to ecological farming practices”* (D.A., farmer, Suceava county).

## **CONCLUSIONS**

The opinions on biodiversity are based on a good understanding of diversity, of the abundance of natural resources, which can provide a viable framework for agricultural activities. The moral values start from the respect for the environment, from which the construction of a pro-ecological behaviour begins. The biodiversity – ecological farming relationships are perceived in terms of a social process in which the main vector is education and training. The opinions on ecological agriculture focus on the mechanisms of emergence of ecological farms, on their spatialization, on the recognition of the social status of producers/users of friendly practices, on the costs and benefits of this farming activity. In general, there is a convergence of opinions in the two



investigated areas, reflecting the perception on this issue, the inhibiting factors and those favourable to ecological agriculture.

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