

DINAMO Project: a demonstrative management model for increasing endangered biodiversity in agricultural and semi-natural areas

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Abstract:

The DINAMO project (increasing endangered bioDiversity iN Agricultural and semi-natural areas: a demonstrative Management mOdel) was financed by LIFE + 2008 (Biodiversity) of the European Commission. The overall objective of the project is to set off a management model to protect, conserve, restore, monitor and facilitate the functioning of natural systems, natural habitats, wild flora and fauna outside protected areas. Despite the many projects devoted to wildlife conservation in Europe, the novelty of DINAMO relies in the involvement of farmers who are directly responsible for practical conservation actions both in public and private areas in the coastal areas of Molise region in Southern Italy.

The project intends to contribute to one of the Community objectives related to the conservation of natural resources that is “to develop, in co-operation with Member States, instruments to enhance the conservation and sustainable use of biodiversity across the territory outside protected areas” (Section III on Policy Areas in the Communication from the Commission to the Council and the European Parliament on a European Community Biodiversity Strategy (COM(1998) 42 final). The Institute for European Environmental Policy (IEEP) highlights that “agricultural land makes up the majority of land outside protected areas in most countries. Therefore agricultural landscapes usually make up the habitat matrix through which most species need to move if they are migrating or dispersing between protected areas and other habitat patches” (Kettunen, M, Terry, A., Tucker, G. & Jones A. 2007). Guidance on the maintenance of landscape features of major importance for wild flora and fauna – Guidance on the implementation of Article 3 of the Birds Directive (79/409/EEC) and Article 10 of the Habitat Directive (92/43/EEC). Institute for European Environmental Policy (IEEP), Brussels, 114 pp. & Annexes).

Introduction:

In accordance with the Commission communication COM (2006) 216 of 22/05/2006 “Halting the loss of biodiversity by 2010 – and beyond – sustaining ecosystem services for human wellbeing”, the project refers to the Policy Area 1, “Biodiversity in the EU”, in particular to three of the priority objectives, namely the safeguard of the European most important habitats and species (objective 1 of the Action Plan), the conservation and restoration of biodiversity and ecosystem services in the wider EU countryside (objective 2), the reinforcement of compatibility of regional and territorial development with biodiversity in the EU (objective 4).

Furthermore, this project encompasses and underlines the importance of the ecosystem approach as the primary framework for action under the Convention on Biological Diversity (CBD).

The main objective of the project is in line with the National annual priorities for Italy 2008 which selects the priority areas of action of the European multi annual strategic program for nature and biodiversity (Annex II Reg. Regulation (EC) No 614/2007 of the European Parliament and of the Council) and indicates innovative and demonstrative projects as tools to implement the LIFE+ Regulation.

The above mentioned aims will be achieved through the accomplishment of two specific objectives, linked to each other, that represent the core of this project:

1. Demonstrate the effectiveness of a replicable model of integrated territorial resource management for halting the loss of biodiversity, engaging both public and private subjects.
2. Promote the conservation and increase of endangered target species populations and their habitats in agricultural and semi-natural areas by means of demonstrative practices, favouring integration and complementarity between EU environmental and rural politics.

The synergy between these two objectives constitutes a key for a real conservation which involves not only protected areas under the EU legislation but also areas falling outside, which makes of Natura 2000 a true network of biodiversity.

The only way non protected areas can act as an effective corridor is to be managed in a sustainable perspective, which necessarily implies the involvement of local stakeholders to become part of a sustainable management approach.

The involvement needs a sort of catalyst which enables the stakeholders to start such a different approach in managing their lands, overcoming the usual Italian skepticism towards nature conservation, which is a challenging issue, especially outside protected areas. This catalyst in the DINAMO project is made of two bodies, namely the AgriForum and the Action Net.

Conservation actions will therefore operate on two levels, with a direct effect to preserve target species populations and as a demonstrative tool for stakeholders to show that not only conservation measures do not necessarily affect land productivity, but can also benefit the landowner.

Expected results of the project are to prove that:

- a) private and public cooperation is possible and effective for the implementation of conservation actions;
- b) biodiversity conservation can be economically interesting for private operators;
- c) it is possible start up a virtuous mechanism that allows to link environmental priorities with the agricultural local economic necessities.

From the biodiversity point of view, expected results of the project are the conservation and increase of some endangered target species and habitats. The actions will be implemented by private agricultural operators inside their property and in the surroundings of communal or State properties.

Study Area

The area called “Basso Molise” refers to the territory of the Molise Region that stretches from the Adriatic coast inland. This area encompasses ten municipalities: Campomarino, Guglionesi, Larino, Montecilfone, Montenero di Bisaccia, Petacciato, Portocannone, San Giacomo degli Schiavoni, San Martino in Pensilis, Termoli.

Even if the Project is specifically addressed to target sites falling within un-protected areas, the whole coastal district of Basso Molise encompasses thirteen pSCI and SPA that will likely benefit from DINAMO model: 1) Cigno torrent small ponds (IT7222122); 2) Gessaro hills (IT7222212); 3) Montenero badlands (IT7222213); 4) Badlands of Pisciareello Manes Macchia (IT7222214) ; 5) Biferno outlet Campomarino coast line (IT7222216); 6) Saccione outlet Ramitelli reclaimed land (IT7222217); 7) Biferno river (IT7222237); 8) Guardialfiera lake and Peloso hills (IT7222249); 9) Cigno torrent (IT7222254); 10) Trigno outlet- Petacciato coastline (IT7228221); 11) Tanassi Forest (IT7228228); 12) Biferno Valley (IT7228229); 13) Guardialfiera lake – Biferno River outlet (IT7228230).

Basso Molise is in a favourable position in the region for the natural resources availability, infrastructural endowments, and for the diversification of productive systems among industry, commerce, tourism and farming.

Building, notably in the coastal area, and farming, in the inner sectors, are the main land uses. Tourism and industry only characterize specific sites along the coast and some river valley sectors.

Basso Molise has a vital structure and dynamics that are peculiar in the regional frame of marginality. Demographic indicators such as age structure, birth rate and natural increase, age dependency ratio, net migration rate, population density, underline a good situation of the Basso Molise compared to other regional areas.

The good demographic situation is cause and effect of other positive conditions in the socioeconomic and infrastructural spheres. The project area concentrates the more intensive farming, the main tourist attractions and the most important industries of the whole Region.

Along economic development, resources moves from agriculture to other sectors, but Basso Molise still remains the area with the strongest agricultural structure with a relatively high incidence of agricultural land use on the total surface. In fact more than 95% of the surface is covered by different agricultural areas.

The productive structure of the project area is rather fragmented. The farms can mainly be categorized as medium sized households while is marginal the presence of households wider than 50 hectares. The majority of firms are managed directly by owners and their family.

Agriculture is managed intensively, with a strong specialization in monoculture and a wide diffusion of mechanization and irrigated crops, which implies soil overexploitation and widespread use of chemical products (fertilizer, pesticides, fungicide, etc.). Production is mainly oriented towards sown crops and tree cultivations. Pasture and forest, together with livestock rearing is almost negligible. The Basso Molise presents highly specialized production.

The 49% of arable land is covered with a mosaic of crops, annual and permanent. Another important use of land is for irrigated crops, which is possible thanks to a system of artificial water, and for intensive crops (13%). The whole area has a vocation for cereals and vegetables (industrial tomato), sugar beet, some fruits (apple, peach, pear, apricot, plum) and grape-vine, olive tree behind the coastal area. Among cereals, which are spread in a fairly uniform way in the area, durum wheat is the most important crop.

Unlike what occurred on average in the whole province and the region, in Basso Molise household dynamics and irrigated surface had a positive growth rate in the last decades, while the arable land decreased. This land use distribution is of particular relevance because the 2003 CAP reform and the changing in the agricultural policy measures could have produced and will produce variations in land use both in the direction of further intensification and abandonment of land. CAP impacts have to be matched with the pro-biodiversity measures in the reform and with the effect on biodiversity of the incipient application or rural development regulation in the region. A less favourable picture

emerges considering that the general development produces an intensive use of land for the high pressure resulting from many determinants: flat country characterization and water withdrawal from the Guardialfiera lake allow an intensive farming which has negative impacts on land use and water quality; pressures from the infrastructural and transport network (highway, railroad, seaport); impacts from the industrial settlement localized just next the coast inside the Industrial Park of Valle del Biferno; tourism, concentrated in the short Summer season, that increases the natural resources' demand, stimulate second houses construction, makes more complex the management of urban waste and water and of the sewage system.

The environmental characteristics of the Basso Molise are quite heterogeneous giving rise to particularly varied landscape with high potentialities for natural biodiversity and for many land use and economic activities. The project area presents a good hydrographical system that includes the low sectors of the rivers Trigno, Biferno and the torrents Mergolo, Tecchio, Saccione and Sinarca. The climate is Mediterranean sub humid and the altitudes are compressed between the seashore to 400 m.asl. Only the 2,3 % of the project area is represented by forests and semi natural areas. Even if in natural conditions the *Quercus pubescens* oak forests would cover the majority of the project area, the actual distribution of these forests is reduced to few small relict patches on marginal sectors where intensive agriculture cannot be practiced (Blasi *et al.*, 2008). These deciduous oak forests (3112 CORINE land cover category) that occupy the half of semi natural areas, belong to *Quercus pubescens* and *Rosa sempervirentis* community type. Associate to hornbeam oak in these forests, others deciduous tree species such as *Carpinus orientalis*, *Fraxinus ornus* and *Acer campestre*, and some evergreen shrubs and lianas such as *Juniperus oxycedrus*, *Rubia peregrina*, *Rosa sempervirens*, *Smilax aspera* e *Lonicera implexa* also occur.

Almost the thirty percent of the semi natural areas are covered by shrublands (3.2.2.) and sclerophyllous vegetation (3.2.3.) usually in abandoned agricultural areas and relict parcels located on foredunes. Except of foredunes Juniper bushes, the shrublands in the project area represents successional stages of different woodland natural series. Many scrub vegetation categories are present in the project area. On young soils the dominant shrublands are *Pistacia lentiscus* and *Paliurus spina-christi* community, on strips of eroded soils' *Cistus creticus* and *Osyris alba* shrublands intermingled with anthropogenic steppe prairies with *Sideris syriaca* and *Stipa austroitalica* occur. In deep soil of old fields, shrublands with *Spartium junceum* and *Cytisus sessilifolius* are common.

Small patches are also covered by holm oak relict forests (3.1.1.1) belonging to *Quercus ilex* and *Cyclamen hederifolium* community. Very reduced strips of residual hygrophilous forest (CORINE class 3116) with *Salix alba* and *Populus alba* can be found while is almost completely disappeared flood plain vegetation with *Quercus robur* and *Quercus cerris*.

On the fore-dunes, important areas covered by pine plantations occur (3121). This old plantations are typical of Mediterranean foredunes and contain good values of biodiversity (Stanisci *et al.*, 2008). Finally, as regards coastal ecosystems, many psammophilous communities are still present along the Molise coastline (Carranza *et al.*, 2008). On the other hand, the presence of water bodies is mainly due to the most important water body (512) of the Molise region, the Guardialfiera dike.

The area hosts many species of Vertebrates characteristic of lowland fresh water, shrublands and woodland habitats that are endangered or endemic of the Italian peninsula. Among these are the endemic amphibians Apennine yellow bellied toad *Bombina pachypus* and the Italian crested newt *Triturus carnifex*, the endangered reptiles European pond terrapin *Emys orbicularis* and Herman tortoise *Eurotestudo hermanni*, and many nesting species of raptors and larks listed in the Annex 1 of the Habitat directive, such as the Red Kite *Milvus milvus*, the Calandra Lark (*Melanocorypha calandra*), the

Tawny pipit (*Anthus campestris*), and the Greater short-toed lark (*Calandrella brachydactyla*). The area is also home of the European roller *Coracias garrulus*.

Basso Molise is representative of the agro-ecosystems of the Mediterranean regions and present habitats and species of European interest in the Mediterranean coast.

The Basso Molise area has been selected in the whole region since it represents a paradigm of the Mediterranean lowland and hilly agro-ecosystems, where characteristic and intensity of socio-economic growth have negative tradeoffs with environment and biodiversity. This area is considered of special interest for the fulfilment of the project objectives because, in a relatively small territory, some conditions are well present:

- biodiversity richness, inside and outside protected areas;
- conditions of relatively good socio-economic development;
- potential risks of worsening natural and economic situations and emerging social conflict on the use of resources because of future growth paths (new hard transportation infrastructure, intensification of tourism, industrial development).

The relatively small dimensions of the project area, for the above mentioned conditions, is considered a strength point in that it gives the possibility to accomplish project objectives at a relatively low cost, by pursuing efficacy and efficiency of the project actions.

The areas in Basso Molise that are interested in the DINAMO project by direct conservation actions are distributed in 24 locations contiguous to the 13 sites of the Natura 2000 territory. The choice of considering areas outside the sites of European interest is aimed to improve the biodiversity in a wider area and to increase the functionality of the Natura 2000 conservation network. The chosen areas for conservation actions are representative from the environmental and functional point of view of the larger area (Basso Molise).

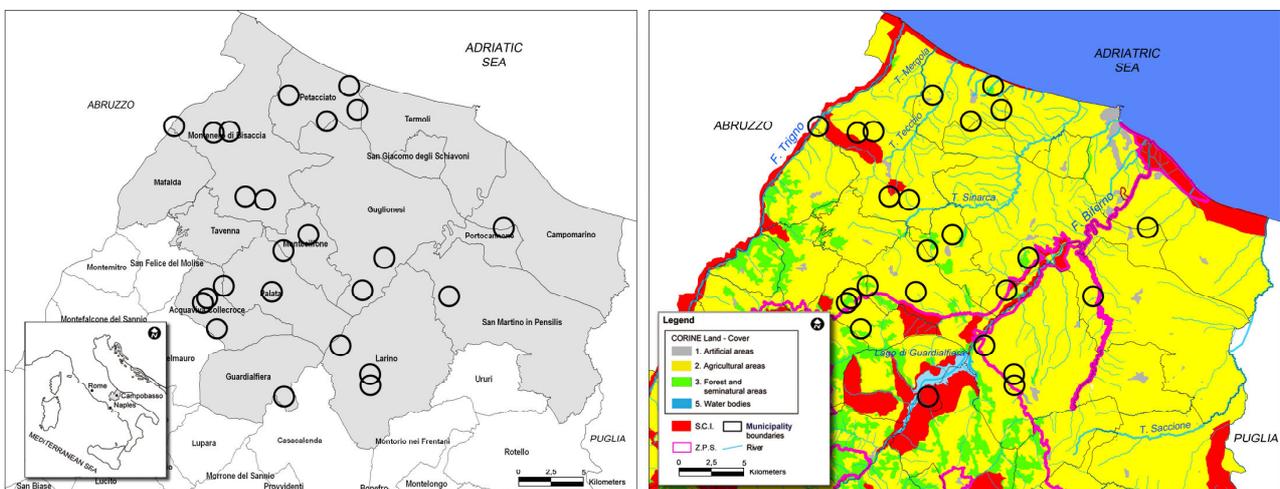


Figure 1: Location of the project area in Italy. On the left: Basso Molise municipalities. On the right: land cover categories (first level of Corine2000 mapped at 1.250000 scale), S.C.I. boundaries and the river network present in the project area (data source <http://www.pcn.minambiente.it/PCN/>). Circles indicate the location of the direct conservation actions proposed by the DINAMO project.

Methods:

In the selected zones of the Basso Molise, 17 farmers and 4 Municipalities were chosen based on the interest in implementing the conservative actions targeted on some relevant species and on natural and semi-natural vegetation recover.

Agriculture can generate both benefits and pressures on biodiversity, often depending on agricultural practices. Nevertheless agricultural lands may represent important habitats for wildlife. Therefore, the quality of agricultural habitats and their external impacts on other

habitats is of profound importance in terms of maintaining and enhancing connectivity in the landscape (Donald & Evans 2006). More specifically, the DINAMO project will enhance the recovery of riparian habitats and oak-dominated habitats, increasing connectivity of suitable habitats for the Hermann tortoises and the European pond terrapin; increase reproductive rate and reproduction success for the Red Kite, the European roller, the European pond terrapin, the Tawny pipit, the Calandra lark, and the Greater short-toed lark; increase of suitable habitat for the Italian crested newt and the Apennine yellow bellied toad. Forest plantations will likely increase overall bird diversity and abundance in adjacent farmland (Reino *et al*, 2009).

Even if a detailed description of conservation actions is beyond the scope of this paper, it is important to underline that each conservation action will be done according to specific protocols schematically listed as follows.

1. Artificial nests for Red Kite (*Milvus milvus*).
2. Artificial nest setting for the European roller (*Coracias garrulus*).
3. Protection of Calandra lark (*Melanocorypha calandra*) and Tawny pipit (*Anthus campestris*) nests and nestlings in cereal crops and lucerne and grass seed parcels through flushing bars.
4. Restoration of troughs to increase availability of suitable habitats for the Apennine Yellow-bellied Toad (*Bombina pachypus*) and the Italian crested newt (*Triturus carnifex*).
5. Planting trench and river edges with native trees and shrubs.
6. Forested patches planting.
7. Native vegetation recover in marginal areas and along farm boundaries.
8. Ex-situ conservation and propagation of native shrubs and trees ecotypes.

One of the added values of the DINAMO project is to put forward a strategy plan that takes into account the impacts of farmlands on territories outside protected areas by enhancing biodiversity's conservation and sustainable use, particularly by recognizing and supporting the farmers' role in the creation and maintenance of semi-natural habitats. This could be achieved also by fostering the use of further ecological agricultural practices, such as the promotion of traditional methods in extensive agriculture - sometimes in marginal areas – as well as the limited use of agrochemicals or the use of particular tools (flushing bars) for heavy machinery, furthermore considering farmers' increasing awareness of a personal profit coming from sustainable land use practices.

A further added value of the project is to provide a replicable model aimed at implementing sustainable management activities carried out outside protected areas that are significant to achieve the objectives indicated in the Natura 2000 network.

The DINAMO model consists of two bodies: the **AgriForum** and the **Action Net**.

The **AgriForum** acts as a planning and organizing body by defining the operational guidelines that enable the Action Net to carry out practical actions to safeguard biodiversity. Such actions have a threefold scope: 1) to demonstrate that the involvement of farmers in land management can have a real, positive spin-off on biodiversity's conservation; 2) to recover and preserve the State areas pointed out by the local government; 3) to improve biodiversity conservation at local level through sustainable management of farming in private areas.

The **Action Net** operates as a network, directly supporting Nature 2000 network, with the aim to protect local biodiversity and improving the connectivity among areas.

The aim of the two above mentioned bodies is to coordinate administrations, scientific institutes and organizations with farmers, who are provided with an immediate access to their own lands.

Another added value of the project can be found also in fostering the increase of public awareness, information and education, as called by the EU Biodiversity Strategy (EUBS). EUBS encourages the development of programs by ensuring that training is required for the human resources involved in the implementation of the strategy, also at local level. In the light of the above, this project and its model give concreteness to the idea of the ecological network, not only as a physical/territorial space at the local level (by spotting the involved areas and shifting from the virtual to the real level) but also as an organizational/managerial network (by identifying who does what).

A model that implements the ecological network, needs a practical testing of the difficulties and limits, as well as possibilities, faced in order to point out the definitive model of management.

Discussion:

The DINAMO project started in January 2010. The first meetings (Launching Conference and kick-off meeting) experienced a broad participation of key local actors. Twenty-four farmers were initially involved and 17 of them made their farms available for the implementation of the project's practical activities.

The municipalities of Guglionesi, Termoli, Petacciato and Campomarino are already involved and other public administrations (e.g. Montenero di Bisaccia) and farmers have shown their interest to join the project. The beginning of the project also arose the interest of associations and other local stakeholders: this is a good omen for the continuation of the project and its settlement at the local level.

The awareness that conservation approaches based on protected areas are necessary but not sufficient for biodiversity conservation is increasing among scientists and conservationists. In fact, it is widely recognized, on the basis of the text of the Convention on Biological Diversity, that conservation should be pursued together with sustainable use and equitable sharing of benefits. Thus, the important role that biodiversity (particularly ecosystem) has for the production of ecological services, its commercial value (particularly genetic and specific resources), and the value linked to biodiversity fruition, became relevant for human communities (Padovani *et al.*, 2009).

One of the strength of the project is to take into account not only the environmental but also the social and economic aspects of the local reality while carrying out actions for biodiversity, fully in accordance with the principles of Sustainable Development and Ecosystem Approach (Padovani *et al.*, 2003) as defined and endorsed by the United Nations Convention on Biological Diversity.

The DINAMO model is a tool that enables the integration of nature conservation's strategies (such as Nature 2000) with agricultural policies (such as Less Favoured Areas - LFA and agro-environmental measures) and structural funds. The implementation of the model can also favour the agricultural income, in alternative or in addition to the EC funds to LFA and lead to a more effective performance of the ecological network in Europe as well as to a better conservation of biodiversity within and outside the NATURA 2000 areas. This model guarantee a fee to those farmers who carry out environmental recovery, restoration and maintenance activities also outside their own farms and suggests an operative approach to implement and preserve the ecological network which can be easily replicated in the EU, in the presence of farmers, besides the environmental characteristics of the concerned areas.

The issue of biodiversity's conservation has been highlighted in the EU Biodiversity Strategy since 1998, with particular reference to those areas that are wider than the protected areas. Furthermore, in May 2003, the Biodiversity Working Group of the European Environmental Bureau (EEB) drew up a Special Report on "Protecting nature in rural areas outside Nature 2000 – The role of agriculture" in which was stressed the need to promote farming strategies and land use systems that support important nature values, for instance, by enhancing rural development support for farmers with environmentally friendly "innovative strategies"; shifting present support mechanism for "traditionalist farming strategies" towards training and co-operation; providing incentives to "support optimizing strategies". The subject is, therefore, highly perceived.

The originality of the DINAMO Model is to assess the effectiveness of applying well defined methods of social participation to the environmental management at the local level. The strategic, social and economic drive will be to obtain positive results not only in the biodiversity's conservation field but also in reinforcing the local, agricultural area, both from the economic and social point of view.

The power of this participative model is the direct and responsible involvement of local population in the management of their own territory, by starting a process of adaptive "empowerment" with a cross-sectoral stakeholder engagement; this, therefore encourages a wider implementation of methods for fostering biodiversity. Some signs of interest in biodiversity conservation actions from single agents in the local area require to set up a new way of working together, joining synergies, problems and opportunities.

This model suggests a new way to organize the chain of command for the solution of problems related to biodiversity's conservation with the aim of enabling a more effective achievement of the ecological network at the Regional level.

Each component (environmental, social, economics) takes part in and contributes to the attainment of the final objective: a correct environmental management prior to an increase of local biodiversity. **This model could be widely applied in the EU** also because all the involved actors (Local Authorities, scientists, Labour Unions, Farmers and other stakeholders) have a definite and institutional role that is potentially replicable at the European level, as well as the related methodologies. The project is demonstrative in all the practical actions because it proposes procedures and techniques already applied at local scale that could have high advantages compared to the actual lack of any kind of biodiversity practices and to the incipient threats on the environmental local situation. Conservation actions, that are commonly used to increase biodiversity, in this specific case are applied for the first time in Southern Italy in cooperation with farmers and local authorities.

During this project the effectiveness of the Model will be demonstrated, both from a land management's point of view and the ability to work together, since each partner (Local Authorities, Farmers, Labour Unions, Researchers) will carry out a clear and specific role in making available the useful mechanisms for land management, initially within a specific timeframe of three years. Later on, as a result of the project activities, the implemented Model is expected to carry out its practical actions for more years. As for the financial resources, the model activities could benefit from the Common Agricultural Policy (CAP) funds and other Programs that finance biodiversity conservation.

In fact, after the end of the project, Parties who participate in the model (Local Authorities, Stakeholders (CIA), Farmers, Scientific body) will consort themselves to continue to carry out the activities of the project throughout the utilization of the Leader approach (Rural Development Program – IV Axe "Leader"). The Leader approach ensures in 2007-2013

“the enforcement of networks through strong, representative and coherent partnerships, capable to seize the territorial needs and transform them into high profile projects”.

The effectiveness of the DINAMO model, namely the ability to involve farmers in the land management, increasing their environmental sensibility and representing, at the same time, a new source of income, will act as incentive for local communities to take over all the practical actions of the project as a sort of “DINAMO interventions system”, under the direct control of the AgriForum. Therefore, it’s expected that both the typologies of actions (already financed during the project, as Action 1., 2., 3. and those that need other financial resources) will be carried out after the end of the project. The Actions that require more financial resources after the end of the project, will be sustained with the following financial resources, coming from the Rural Development Program of the Molise Region for the years 2007-2013 (Measure 323 – Conservation and requalification of rural heritage; Measure 214 – Agro-environmental payment; Measure 216 – Non-productive investment support (agricultural land); Measure 223 – First afforestation of non agricultural land; Measure 227 – Non-productive investment support (forestry land).

Finally, the project will increment the protection status of the territories in Molise. In fact, farmlands (in particular hedges or underutilized parts of agricultural land) and the public areas included in the project activities could be considered as part of the Regional Ecological Network, because of their importance in preserving local biodiversity and connectivity between natural places and Nature 2000 sites. Also, the Farmers’ involvement and their awareness’ growth on biodiversity conservation, caused by their participation in the project, will favour the assignment of these private and public lands to a biodiversity conservation status although this will not necessarily imply the acquisition of a specific protection status.

This is mainly for private areas whereas some of the public areas could be included, at the end of the project, in the Natura 2000 network, particularly if the project achieves an environmental re-qualification which will, effectively and in a measurable way, increase biodiversity and the habitats of EC interest. The participation of Local Authorities in the project will influence the destination of other public areas that are next to those areas that are directly involved for biodiversity conservation purposes in the definition of their use.

The results of the project, once demonstrating the applicability of the DINAMO model in territories characterized by a strong agricultural presence, will be the starting point for tackling the problem of biodiversity’s conservation as well as the realization and maintenance of the regional Ecological Network in comparable European areas.

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