High Nature Value (HNV) Grazing Systems in Europe: A Link between Biodiversity and Farm Economics

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Abstract: Large tracts of the European rural land, most frequently in the Less Favoured Areas (LFA) are devoted to low-input and Large Scale Grazing Systems (LSGS) under severe environmental constraints. A small part of the rural population strives to make a living under a risk of abandonment. Paradoxically, these areas harbour a great part of the European High Nature Value (HNV) farmland. We argue that government intervention on these LSGS can only be devised after proper knowledge of technical, structural and social constraints. LSGS may deliver environmental and social benefits but current European Union (EU) schemes of support do not fit the requirements and spatial scale of HNV farming systems. A new methodological approach and research agenda is described based on inter-disciplinary environmental and economic research, stakeholders' participation and differential diagnosis. The results summarise the main findings of the EU-funded LACOPE research project in seven study-areas and broadly enlarge the analysis to other European LSGS with the experience of collaborative experts. The LACOPE research project advanced the research agenda in the identification of major LSGS and diagnosis of the seven study-areas. In most of these latter, grazing and biodiversity showed compatible features, but severe structural and social constraints were identified, which require public intervention or enhancement of social cohesion. Delivering of potential environmental assets is linked to economic and social viability of these LSGS. Poor economic performance was more common than social fragility, with some LSGS well entrenched and supported by local social values and cultural traditions. The core objectives of the proposed Rural Development Policy (RDP) of the EU for the years 2007-2013 are compatible with the differential diagnosis proposed in the research agenda. However, the articulation of environmental, economic and social analysis under current schemes of policy support (Natura 2000, LFA, and agri-environment measures), can be questionable. A single space-scale of HNV farmland and system research can be better suited to reach the core objectives of the RDP guidelines for environmental and economic convergence, programming, monitoring and financial controls.

Keywords: European Union, low-input grazing systems, marginal lands, policy support.

1. INTRODUCTION

European low-intensity and Large Scale Grazing Systems (LSGS) are at a crossroad and facing two contrasting threats: intensification and abandonment (the most extreme form of extensification of land use). These grazing systems are mainly located in the Less Favoured Areas (LFA) of the European Union (EU), where the conventional intensification path, through private capital investment is limited by environmental and social constraints. In fact, the LFAs of the EU represent some 56% of the EU total surface area, and contain much of the High Nature Value (HNV) farmland [1]. Young farmers in most of these areas are barely enthused towards the extensive livestock operation and the family business turnover is not assured. Left to their own or under insensitive schemes of policy support, the abandonment threat is currently more apparent than the intensification threat [2, 3]. Both threats, however, may derive similar effects: disappearance of potential economic, environmental and social values [4-10].

From the reindeer herding system of northernmost Fennoscandia to the *dehesa* and *montado* systems of Iberia, these LSGS take up very large tracts of European rural land, where a minority of farmers strive to make a living and maintaining these systems alive. It is widely recognized that a large part of European natural values is concentrated in these areas and, consequently, this function is stressed as main argument in support of government intervention, justifying taxpayers' money [11-13]. But environmental assets are an effect and not a cause of economic and social sustainability [14, 15], and are not the only societal goals that these systems may deliver. Environmental goals depend greatly upon decisions about space and time scales (plot to systems, local to global, short-term to long-term) and the viewpoints of stakeholders [16]. These traditional systems are using biomass resources, which suit hardy and indigenous livestock breeds producing regional products well differentiated from those of more intensive farming systems [17, 18]. European consumers are increasingly appreciating these products and aware of improving animal welfare conditions under outdoor grazing, if labour constraints are addressed [19]. Additionally, sustainable LSGS may bring social cohesion to these LFA, limiting the depopulation trend, supporting off-farm sources of income, such as tourism, and providing wildfire control by limiting shrubby overgrowth.

If current EU schemes of support have shown mixed effects [20-23] or proven as largely ineffective to maintain LSGS [24], a new development path is required suited to

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region-specific structure and functions of LSGS. The first target of a corresponding research agenda would be a proper definition and identification of LSGS across Europe, and the second, a differential diagnosis process for identification of their main assets and constraints. Only after these two phases are completed, can sensible schemes be devised. As working hypotheses, we may presume that LSGS constitute a substantial part of HNV farmland in Europe and that they can provide a common spatial scale to address the interplay of environmental, economic and social problems at the farming system scale. The main objective of this research was to examine this prospective agenda against EU current and prospective legislative framework in the face of methods and findings of the EU-funded LACOPE project [25] and other related EU research and policy initiatives. This review is structured in three parts. In the first, methodology and main findings in the LACOPE project are summarized. In the second, these findings are faced to current EU agricultural policy frameworks. In the third part, a prospective research agenda is devised and discussed.

2. THE LACOPE STUDY AREAS

The research project identified and conducted combined ecological and economic (ECOL-ECON) job on seven European LSGS:

- The boreo-artic and alpine regions of Scandinavia with reindeer herding (traditional Sámiland). Northern Sapmi, Fennoscandia.
- The crofting system in Connemara (West of Ireland).
- The sheep grazing system under forests' clearings in the Carpathian mountains (Tatra, Poland).
- The *Allmende* system in Upper Bavaria with heifers' rearing in Alpine pastures.
- The upland grazing system in the UNESCO Biosphere Reserve Entlebuch (Swiss Alps).
- The cereal-sheep farming system in the southern Castilian Plain (Spain).
- The mixed grazing system in the *montado* and open fields of Baixo Alentejo (Portugal).

These LSGS were selected in the LACOPE project on the basis of representing a wide range of biogeographical regions across Europe. The ECOL-ECON convergence was addressed by devising management alternatives and scenarios, which effects were assessed from both disciplinary approaches. Management Units (MU) of grazing were identified within study areas and whether these MUs are differentiated in more than one farming unit from seasonal or intensity of use as it is the case in Northern Sami, Tatra, Entlebuch and Bavaria. One example of relationship between vegetation types and functions for the Connemara case-study area is shown on Table **1** and one example of convergence between biodiversity and farm economics for the cereal-sheep system of the Castilian Plain is depicted in Fig. (**1**).

Two main issues were at the stake. From the ECOL point of view, whether or not extensive grazing is detrimental to biodiversity. From the ECON point of view, whether or not adjustments in labor-intensive forms of production can be achieved through capital investment without losing the main assets of LSGS, or say otherwise whether or not LSGS are intrinsically uneconomic. The global conclusion emerging from most of the LACOPE study areas was that extensive grazing is neutral at is worst and helpful at its best for the maintenance of European level of biodiversity [26]. The ECON studies showed low level of profitability and common economic and social constraints [27]. From the ECOL-ECON interface, however, some management alternatives and policy scenarios emerged in favor of both natural values and sustainable agricultural production [28].

The analyses in LACOPE showed that not only the biodiversity of rough grazing is at risk, but also the human capacity to run farms which integrate rough fodder pastures in their management system. Distinct signals for this are the increasing ratio of open habitats managed artificially by nature conservation organisations (i.e., NGOs), the increasing number of concerned farms which give up and the increasing area with abandonment.

Hardy livestock breeds fit to use the fodder resources of unimproved pastures and are adapted to seasonal though conditions. In husbandry systems, which use rough grazing, rare and endangered livestock species can be integrated. The old regional breeds are optimally suitable. The European goal to maintain the genetic resources of European livestock species could automatically be an important side effect. The same can be said on the possibility of producing regional livestock products differentiated from modern systems. These products are linked to the use of land based resources by indigenous livestock breeds. This is the case of reindeer meat in Northern Sapmi, Alpine cheese in Entlebuch, *oszczypek* and *bundz* cheeses in Tatra, *Manchego* cheese in the southern Castilian Plain and *Alentejano* black pig, finished on acorns, in Baixo Alentejo.

Research conducted within LACOPE reveals that these systems face different land-use problems. For most study areas, only a small percentage of the potential LSGS is utilised. On the one hand, for economic reasons, the interest of farmers for using these systems is declining throughout the LACOPE study areas. The productivity of the land is not fully exploited leading to problems of shrubby encroachment. On the other side, these same study areas showed some parcels of land where competition between stakeholders occurs, leading to land erosion. If these trends continue, the LSGS could be threatened on the long run. These trends are mostly influenced by external factors like market and price policy (competitiveness), technical innovations (productivity, workload, losses of grazing area), agricultural support measures (increase of revenues), improved standard of living (workload, indebtedness), and changes in farmers' choices and behaviour (conflict of interests, free riding). In the Northern Sapmi study area (Fennoscandia), however, land-use remains as continual reindeer herding, but threatened by competing land-use and insufficient assurance of grazing rights [29, 30].

Our results in the LACOPE study areas showed that both the intensification and the abandonment threats are operating, and both probably detrimental for biodiversity [4]. Frequently, the intensification of more accessible grazing grounds in the lowland farming units is paralleled with the abandonment of far-reaching, more labour intensive and more extensively managed farming units (Fennoscandia,

Table1. Farming and Nature Conservation in Large Grazing Blocks in Connemara

Landscape Elements and Typical Vegetation Types	Function in the Holistic Farm Approach Nature Conservation Value
Improved grassland: areas on mineral soils and/or drained fens, normally near of the farm; vegetation type: *Lolio-Cynosuretum*	essential part for feeding balance; low conservation value but high value for stabilizing the system in critical periods
Blanket bog, Wet and dry secondary heath, calcareous grass land, fens, dune grass land, dune slacks, Machair	target of nature conservation policies; current schemes requiring fixed management rules lead to destabilisation; low feeding (economic) value in husbandry systems; holistic approach requires flexibility and close co-operation to reconcile management options
Not Grazed Elements	
Rocks, cliffs, bare sand Ponds, lakes or parts of them	current nature conservation schemes aim to exclude the areas from roaming and trampling of animals; The holistic approach includes this resources as an intrinsic part of the husbandry system
Disturbed Patches, Structures Produced by Roaming Animals Intrinsic Part of Pasturing Systems	
Tracks, gathering and resting places, trampling effect, access to drinking places	Grazing and trampling is often evaluated negatively; actual research results demonstrate that biodiversity and even some rare species profit from disturbance regimes, necessary in the husbandry system

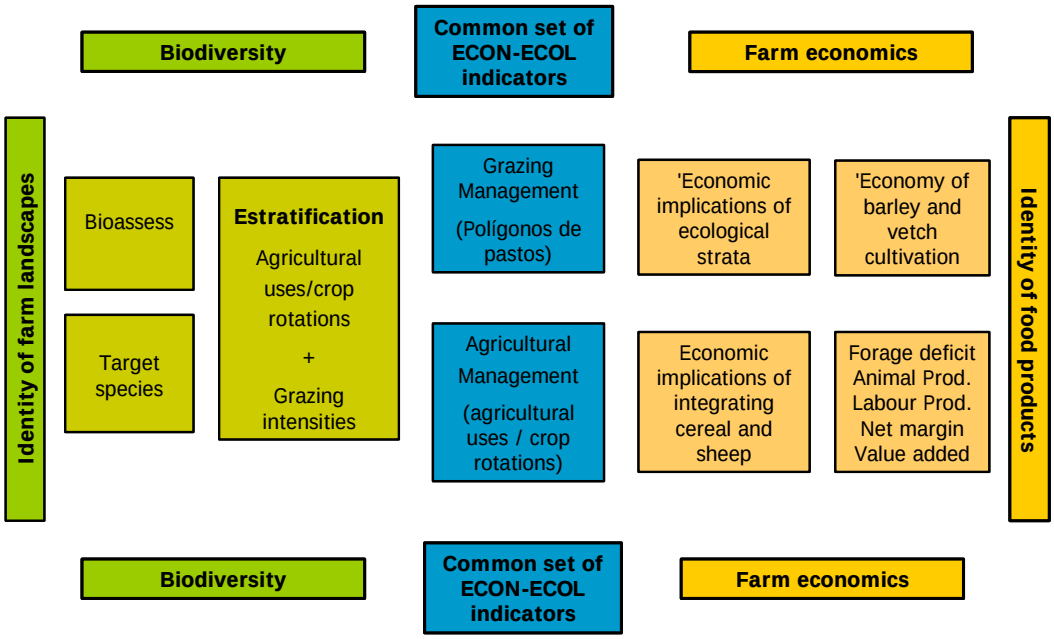

Fig. (1). Connectivity between biodiversity and farm economics in the cereal-sheep farming system of Castile-La Mancha (south-central Spain).

Swiss and Bavarian Alps). In other cases (Tatra), the abandonment of far-reaching summer clearings is related more to poor road and lack of grazing infrastructures, but this process is unrelated to intensification of lowland farming units. In the case of Castile-La Mancha, intensification of arable farming by habitat homogenisation and cultivation intensity is reducing opportunities of landless sheep farmers to use pastoral resources in arable land (stubble and fallow) and also the habitat suitability for steppe birds such as great bustard (*Otis tarda*). Sheep farmers are reacting with less grazing days and progressively more in-door feeding operations. Lack of grazing infrastructures and diverging interest between arable and sheep farmers also play a role. In the case of Fennoscandia, the geographical location (isolation), generosity of public handouts, and strong attachment to cultural traditions can play a role on social stability of the reindeer system [31].

A process of differentiated diagnosis in LACOPE study areas unveiled the main constraints of the husbandry systems. It was also shown how the implementation of some management alternatives would render these LSGS more sustainable. In the LACOPE project, the concept of sustainability was related to a multi-criteria analysis of ECOL-ECON-SOCIAL interfaces. The combined effects of management alternatives within systems were assessed. By this way, connectivity of the main criteria is assured. In any case,

the implementation of management alternatives or correction of structural deficiencies should not be identified with an intensification path. Most of these LSGS are located in the LFA of the EU, where severe environmental constraints limit the applicability and thus, the impact of intensification. In the case study of Castile-La Mancha, integrating annual forage legumes into the traditional cereal-fallow rotation, and a mixed cereal and sheep operation were chosen as management alternatives on the basis of previous job [32]. Their effects on the ECON criteria are recorded in Table **2**.

Our results in LACOPE indicated that LSGS are, however, at a crossroad and partially responding to incentives of intensification by cutting intensive-herding labour costs and less labour demanding operations (cases of Fennoscandia, Swiss and Bavarian Alps and Castile-La Mancha). In these cases, a conventional intensification path was broadly incompatible with the maintenance of land-based pastoral systems in the less favourable grazing grounds [27].

If LSGS are to be maintained, a new development paradigm is required based on a differentiated diagnosis process at the European scale. The objective of this process would be to integrate these systems in the general path of economic development, turning inwards for reforms and outwards for development, without losing their main assets. Currently, LSGS can only be maintained by beneficiaries paying an extra price for their regional products and/or by public support. In this latter case, government intervention should be regionally targeted, once the main constraints are disentangled.

Table 2. Additional Profit Per ha Due to Changing of Rotation and Integration of Sheep in the Cereal-Sheep Farming System of Castile-La Mancha (€/ha)

Management Alternative	Rotation	
	Cereal-Fallow	Cereal-Vetch
Without livestock	0	+57
Meat sheep indoor	-4	+38
Meat sheep outdoor	+101	+185
Milk sheep indoor	+134	+269
Milk sheep outdoor	+300	+417

3. THE LACOPE STUDY AT THE EUROPEAN SCALE

The research job conducted on the seven LACOPE study areas was further expanded for the European setting under an open scale up methodology. In this case, the objective was only to identify other potential LSGS and relate their main management practices, production objectives, and main assets and constraints on individual systems' profiles. This was done with help of external collaborative experts and using survey guidelines and fact-sheets as survey tools [33]. Up to 120 additional European LSGS were identified and described. Additionally, a sustainability questionnaire was devised within LACOPE under a multi-criteria concept. The questionnaire encompassed 20 conceptual-scored questions within five tiers: land-use, environmental, economic, social, and marketing criteria. The survey tool was sent to 50 collaborative experts and 27 valid questionnaires were received. The responses corresponded to 27 case-study areas across very different biogeographical regions (Boreal, Atlantic, Continental and Mediterranean) and production sectors [34].

At the European level, it is common wisdom that the abandonment trend observed in many LSGS is unavoidable under the intensification pressure of modern agriculture and poor economic performance of many LSGS. The analyses in LACOPE at the European scale, showed that European experts are more concerned with economic and social constraints than with environmental threats. It was also apparent from the individual profiles of many European LSGS, the many environmental and economic assets (marketing capabilities of indigenous livestock products, side-income from tourism) of these systems. At the study area scale, our analyses showed that these systems are not intrinsically uneconomic. In some cases, when sensible management alternatives were introduced, the economic situation was reversed [35].

The sustainability exercise across 27 European LSGS can only be considered as a first step in the diagnosis process. Any attempt to classify LSGS may be recognised as a simplification of a dynamic set of biophysical and social processes of which experts can just perceive/quantify a limited sub-set. Within this context, however, an important and broad conclusion and some common grounds were disentangled: affinity between case-study systems, as judged by collaborative-experts' responses to indicators-proposals, was not related to bio-geographical location, operating livestock sectors or population density in the area. Particular clusters included LSGS with very different environmental and management conditions. These systems shared some common ground:

- The abandonment threat was more important than the intensification threat although, in some cases, both were related.
- Young farmers are barely enthused towards the extensive, labour-demanding operations, and the family business turnover is not assured. A labour constraint is widespread.
- The overall stocking level is less of a problem than the spatial-temporal distribution of grazing. Due to different environmental constraints (dry season, cold season), most LSGS shared a structural non-grazing season. Strategies to meet the corresponding forage deficit are not always operative. At the same time, occasional overgrazing may occur in more accessible grazing units, while far-reaching plots are, more frequently, under-used or abandoned.
- The economic and social constraints were more important for European experts than the environmental concerns. In fact, most experts indicated potential environmental assets. The requirement for improving grazing infrastructures was broadly shared. Our ECON studies in LACOPE areas, illustrated that economic performance of extensive farming units was poorer than of the more intensive ones. This comparison, however, can be misleading if it is carried out at the derelict state of many pastoral units. Our model-

ling studies in particular systems showed that, once sensible management alternatives were introduced, the situation could be reversed (Table **2**).

- Most collaborative-experts shared the opinion that current EU policy support schemes, under the Common Agricultural Policy (CAP) are not suitable to maintain LSGS. This proposition requires a more in-depth analysis under the policy section. Generally speaking, a differential diagnosis process is precedent to the devise of sensible policy schemes.
- Marketing opportunities for regional products are an important asset for many European LSGS, according to experts' opinion. However, they were less enthused when asked if this opportunity is currently operative. Quality assurance in the processing of raw products and lack of co-operative strategies for marketing were main concerns with some exceptions (reindeer meat processing and marketing in Scandinavia or alpine cheese in Switzerland).
- As a consequence of particular previous threats, social fragility is more common than social cohesion. Overhauling of the legal and institutional frameworks can be considered a common ground. Again, Scandinavian and Swiss systems were the exception, although in these cases, generosity of public handouts may play a role.

LSGS are complex systems emerging from interaction of human behaviour and natural resources. Further research is required on the identification of which, we may presume different, particular social dynamics has led to similar common grounds. Implications can be derived for intervention towards more sustainable LSGS. In short, common solutions cannot be derived from common grounds, but a common policy framework can be derived and further adapted to the structure and social dynamic of particular LSGS. This adaptation would require a differential diagnosis research effort at the European scale with the objective of untangling the economic, environmental and social assets, as well as hazards, of the main European LSGS. Agriculture-specific policies should further reflect the diversity of regional LSGS across Europe, although in compliance with the general criteria for policy reform under supranational institutions. A short-cut route in devising policy schemes may deliver a never-ending process of CAP reforms (Fig. **2**).

4. POLICY ANALYSIS AND HNV FARMLAND

Which policy measures are under way and what are their effectiveness and impact? Measures targeting the sustainable use of agricultural land in mountain and handicapped areas (LFA) or agri-environment schemes showed a limited efficiency as indicated by recent research [24, 36, 37] and the continuous decline of LSGS. The main reason is that agri-environment schemes are mainly focussed to counteract the negative effects of modern agriculture on the environment

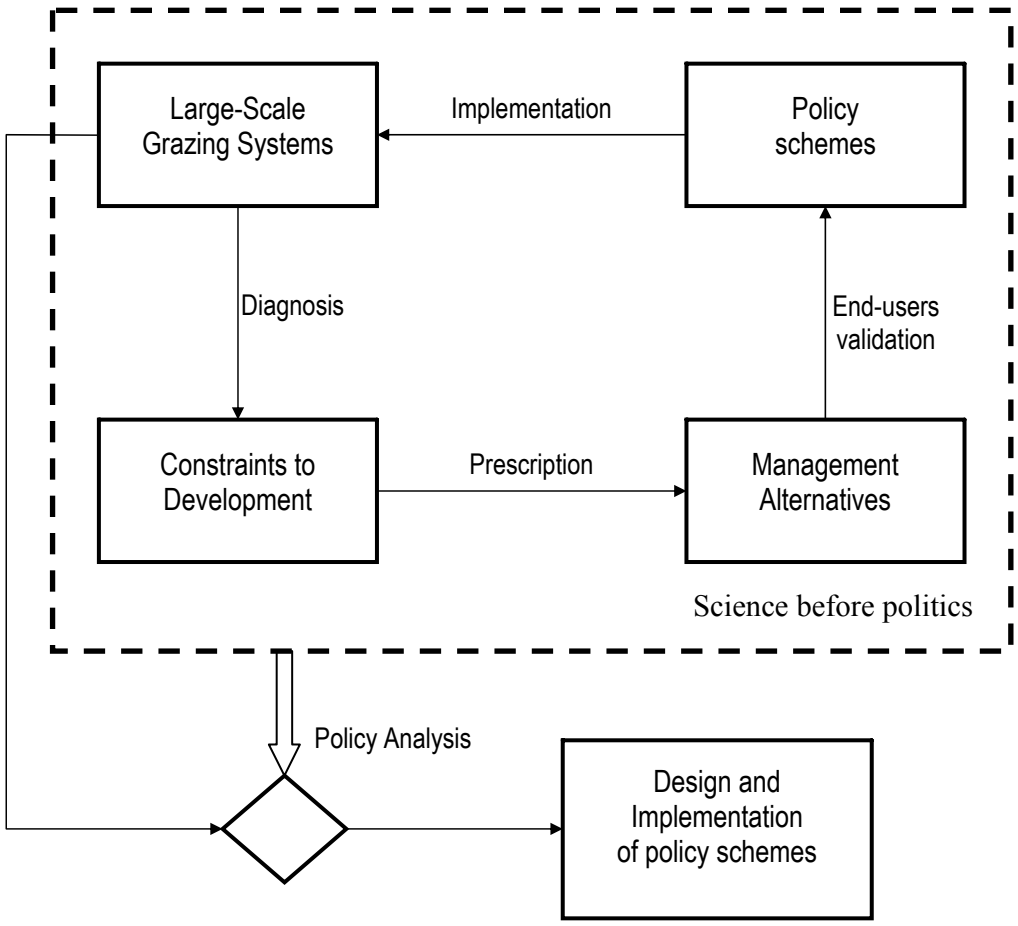

Fig. (2). Representation of short-cut *vs* long-term knowledge-based approach to policy analysis in LSGS.

and not to address the problems of extensive LSGS. In England, for example, it is often the areas cut for hay that are very important for biodiversity. The meadows are under threat from exactly the same pressure of abandonment as the grazing areas on mountain slopes but the lower fields in HNV farmland are under extreme threat from intensification and silage production in particular. In these cases, agri-environment schemes did have positive effects [38, 39]. Paradoxically, the attractiveness of the measures are low for intensive farms, as they remain, at present time, mostly outside the agri-environment schemes, even though they are often the most problematical ones from an environmental point of view [23]. Their spatial scale is either too wide (LFA) or too short (farming units or plots in agri-environment), and the latter do not match the home range of potential target species [40]. These schemes are unable to disentangle the main structural and social constraints that can only be showed at the system scale. In Spain, for example, some regional agri-environment framework [41], encompass up to 18 measures overlapping on the same area, at the plot scale. The area involved is only 5% of Total Agricultural Land (TAL). Under these conditions, is difficult to assess the outcome of particular schemes at the landscape scale [37]. Additional constraints are the frequent absence of baseline data, the voluntary basis for farmers' participation, and short commitment periods of 5-6 years [24]. Spain represented a case of unbalanced situation with some 35% of potential HNV farmland but only some 5% of the TAL under agri-environment schemes [42].

Regarding the compensatory allowances under the LFA scheme, Spain may have more than 80% of TAL under LFA. However, the allowance per Livestock Unit (LU) is the lowest of the EU 12 [1]. Sheep farmers received 7 €/ewe as top-up compensatory payment for LFA and 21 €/ewe as headage direct payment. Our results in the LACOPE project showed that Castilian sheep farmers received the lowest handouts of the seven study areas, when rated as percentage of value of production farming [27].

The recent Rural Development Policy (RDP) guidelines for the years 2007-2013 are better focussed on HNV farming systems [43]. It is assumed that this common space scale would allows for a single set of programming, financing, monitoring and auditing rules for the three axes of Rural Development (RD): competitiveness (ECON), environment and land management (ECOL), and economic diversification and quality of life (SOCIO-ECON). However, the proposed RDP still focused on agri-environment schemes and LFA payments as the main elements for conservation of HNV farmland, either or not entrenched within Natura 2000. It is clear that the functions and corresponding spatial scales of these latter schemes do no couple with the three main axes stressed in the RDP. A common spatial scale is required for assessing the combined effects on the three axes and making effective the simplification process proposed in the RD guidelines. HNV farming systems can be this common spatial scale, providing that HNV can be clearly identified and a new development path and research programme devised in support of the core objectives of the RDP. Furthermore, the Leader axis can only be considered as an approach in support of regional development strategies, but not as a methodological tool in support of the other three axes, as stressed in the RDP.

The initial proposal of the EU Commission for the Rural Development Policy (RDP) allocated near € 100 billion (at 2004 prices) for the period 2007-2013. Further, this budget was slashed for Member States (MS) in December 2005 to be set at € 77.6 billion. This means that certain MS or regions will have less money now for RD than they had during the period 2000-2006. Whether or not this amount will be fixed is not the main question. The main points are how this amount has been estimated and how will be distributed. Additional funds can be available from voluntary modulation (moving up to 20% of funds from CAP Pillar 1 to Pillar 2), but so far only the UK has shown interest on this possibility [44].

5. A NEW RESEARCH AGENDA

Main guidelines for a prospective agenda, taking into account the core objectives of the RDP 2007-2013, are proposed in Table **3**. The agenda can be considered as an expansion of previous proposals [45], and may encompass diagnostic, analytical and prescriptive capabilities [32]. The research agenda included five time-sequenced phases, with main core objectives and broad guidelines for methodological support. Regarding this latter issue, it should be stressed that the general methodological framework should be based on a community-based research approach [46] and take into account the social and institutional fabric of particular HNV farming systems. Local stakeholders and institutions are to be contacted by experts and scientists from the early stage of any research initiative. Access to local socio-economic and environmental data is not less important as GIS mapping capabilities (CAP subsidy in data bases may help). Other regional institutions regulating grazing management or processing agricultural products may provide data on grazing units and marketing capabilities. Farming units should be defined and whether there can be more than one within one management unit.

The LACOPE collaborative research at the European scale has contributed to the first phase of the agenda by identifying HNV farming systems across Europe, providing that LSGS can be considered as a large an important part of HNV farmland [36, 47]. LACOPE research at the study area level has advanced the proposed agenda into the diagnosis phase by contacting livestock farmers, unveiling the main socio-structural and environmental constraints, and devising management alternatives with their corresponding environmental and economic effects. In some cases, such as in Castile-La Mancha, proposals of reform were submitted to stakeholders for consideration [48]. This research was carried out under the main assumption that one main weapon for the maintenance of LSGS is to prove that these systems are not intrinsically uneconomic, when sensible management alternatives are devised [35].

Is there money to be made by linking regional products to HNV farmland? A tracking system would be required to distinguish these products from the bulk of modern agriculture and intensive systems. That, in turn, would provide ecologically minded farmers with easier access to market and win it higher prices. To prove this theory, farmers and governments alike should edge for sensible financial incentives, which turns on the research agenda over the third phase: policy design. Further, support for implementation

and clear monitoring and auditing rules are required. For these phases, implication of regional institutions and local stakeholders are crucial issues. They should be aware of the economic advantages with proper managerial and technical support (Table **3**).

6. DISCUSSION

The LACOPE project, and other related research initiatives at the European scale [49-52], has advanced the proposed research agenda in the first phases. These related projects, however, have not shared common objectives and methodologies. We probably need some touchstone at a local and national level as to what HNV farmland really means [53], since it was firstly introduced [54, 55]. One big question is whether LACOPE (LSGS) can be integrated into HNV farming systems (as we presume they can be), and how HNV can compare with other operating schemes (Natura 2000, LFA, agri-environment), which do not share the same functions and spatial scales. A co-ordination effort is required if we want to achieve the objectives of reversing biodiversity decline by 2010 and preserving HNV farming and forestry systems (RDP, 2005). Additionally, the RDP guideline stressed the LFA and agri-environment as measures in support of HNV, neglecting other relevant instruments of the first pillar of the CAP (cross-compliance). This instrument can be of help in support of HNV farmland areas, and can contribute to the stated co-ordination between the two pillars of the CAP.

If environmental, economic and social axes are at the stake, a common spatial scale for proper analysis is required to combine the three axes of sustainable development. This report was drafted under the assumptions that current EU schemes of support are unbalanced towards more intensive farming systems, in less need of handouts [56], and that those schemes, more focussed towards LSGS (Natura 2000, agri-environmental measures, support for LFA), lack of a common spatial scale. Under these conditions it will be difficult to assess the combined effects of prospective objectives and management alternatives under the three axes of the RD guidelines. Thus, HNV farming systems may represent this common spatial scale focussing on the link between biodiversity and farm economics [57]. This report also argued that direct government intervention is not the only way to amend LSGS. If we presume that LSGS are not intrinsically uneconomic and they may deliver potential environmental assets, then a system research approach may untangle the main constraints and deliver sensible alternatives for land use and grazing management. Proper policy schemes and rural development plans can be further devised in support of the management alternatives (science before politics).

The recent Wildlife and Sustainable Farming and Forest Initiative [58] launched by the DG Environment of the EU under the RDP framework, offers sensible opportunities for integrating biodiversity of target species and farming practices. However, it takes for granted the spatial scales of agri-environment and LFA schemes as main policy instruments. In a recent meeting of the WSFFI Project, one proposal for adapting LFA schemes to the HNV scale was considered [59]. But, for example in Spain, LFA takes up some 80% of TAL, while crude estimation of HNV farmland represents some 35% of TAL. Ceiling of LFA payments varied from 2000 € per holding in Spain to some 20,000 € per holding in Scotland [44]. HNV farmland should be defined at much finer scale than LFA and taking a strategic level approach to maintaining low intensity farming systems over wide areas. For this reason, identification and location of LSGS is a primary focus of our prospective research agenda.

The EU Commission has taken first steps for identification and mapping of HNV farmland in Europe [60], but interplay with the Natura 2000 network should be clarified. Approximately 53 of the 234 habitat types in the Habitat Directive require some form of agricultural management and, in these cases, farming is crucial to the maintenance of large areas of the Natura 2000 network. The HNV approach is better suited to address the interplay in the RD axes of development (ECOL-ECON interfaces), and especially socio-economic issues [27].

According to a commissioned pilot study by the European Environment Agency [36], HNV farmland comprises hot spots of biodiversity in rural areas and is usually characterised by extensive farming practices. A related alternative [53] defined HNV farmland as "those areas in Europe where agriculture is the major (usually the dominant) land use and where that agriculture support or is associated with either a

Table 3. A Research Agenda to Developing of LSGS in Europe

Phase	Objective	Methodology
1. Identification	Areas with presence of LSGS with potential High Nature Value (HNV). Baseline data.	Collaborative local experts. LACOPE individual profiles. Other related EU projects. Co-ordination effort. GIS mapping capabilities.
2. Diagnosis	Unveiling main assets and constraints. Devising management alternatives. Valuing environmental and socio-economic effects. Proposals of reform.	Common matrix-headings of criteria and indicators. Pattern of land use, grazing management and marketing capabilities. Environmental, economic and social indicators.
3. Policy intervention	Devising regionally-tailored schemes. Constraints to implementation. First reaction of stakeholders to management alternatives and policy schemes.	Analysis of current EU policy schemes and their potential adaptation to particular LSGS. Affinity of LSGS across Europe for potential supranational frameworks.
4. Implementation	Devising of proper legal and institutional frameworks in support of the implementation. Technical and managerial support. Financial support.	Implication of local and regional institutions. Transference of technical tools to potential users. Management guidelines. Rating stakeholders' opinion to proposals of reform.
5. Monitoring and farm auditing	System for technical and managerial support and financial control.	Indicators of potential improvements in farm income marketing capabilities and biodiversity.

high species and habitat diversity or the presence of species of European conservation concern or both". According with these definitions, it is apparent that a first phase for a new research agenda is the identification of HNV farmland in Europe. Further, HNV can be a substantial part of the Natura 2000 network with the clear objective of maintaining low-inputs and LSGS in Europe under an interplay of environmental and economic functions.

CONCLUSIONS

The juxtaposition described in this review of prospective environmental and economic assets with policy fractiousness can lead to the wrong conclusion that HNV farmland will be maintained irrespective of policy intervention. Our research agenda is drafted under the assumption that policy intervention is required, but support schemes should be devised on the basis of findings in the previous two phases. We have described some controversial issues on the debate between intensification and abandonment, stressing that development of HNV husbandry systems cannot follow the conventional intensification path. A related debate, shedding light in the next future, would be to place the focus between openness and isolation, the latter being the currently dominating trend. HNV husbandry systems and their goods should be open to market forces. But opening has a corresponding cost that justify the intervention, and policy-makers may halt the process if they feel that the costs of openness exceed the costs of isolation. These latter costs, however, would not be easily valued as they encompass the lost of environmental, economic and social assets.

This research is about the future of marginal land in Europe. The report reveals that financial resources should be allocated only after identification of HNV farmland and devising regional strategies for production and landscape management. The near optimistic message of this review is that, armed with a detailed system-based analysis of a livestock system, it is possible to come up with practicable policy solutions that may maintain viability and the nature conservation value. But there are a wide variety of regional livestock systems in Europe, and policy makers may not wait for each and every one of these systems to be analysed and evaluated in detail. In this sense, a short-cut route may deliver a never-ending process of CAP policy reforms.

Affluent European consumers and taxpayers are prone to the fancies of fad diets and prepared foods. However, they relate this trend to the new alquemist of food and cuisine, as well as fancy restaurants, not to primary food production on the cultural rooting of rural life. There is a need to reintroduce people to their foods and where it comes from, which is becoming a more popular trend but is still very much a minority view in Europe. This is the connection that is lacking in the chain of food to people. This connection can only be apparent if urbanites get deep into the subtleties of rural systems, where original food ingredients are produced.

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