A Social-Ecological Systems approach to enhance sustainable farming and forestry in the EU

Introduction

Agriculture and forestry are characterised by the simultaneous, often joint provision of multiple outputs, some of which are marketable products, like food, fibre and construction materials, while others are environmental services and contributions towards the vitality of rural communities, all of which affect public welfare. Two concepts have been much used in policy discussions to promote more sustainable agriculture and forestry systems: **public goods** and **ecosystem services**, with different institutions and stakeholders favouring one or the other, to argue their respective case and offer potential policy responses. But we consider that a more holistic conceptual approach – Social-Ecological Systems – enables us to understand more fully how sustainable agricultural and forestry systems can best be characterised and beneficial change promoted, through policy and practical action.

The terms 'public goods' and 'ecosystem services' often describe the same characteristics, but they originate from different perspectives. Public goods comes from economics – specifically from welfare economics and public policy - and ecosystem services comes from ecological science, particularly describing the dependence of many human activities upon underlying ecological processes. Consequently, each concept explains only a part of the complexity of the relationships between farming and forestry and the environmental and social benefits that they can generate.

The **Public Goods** (PG) approach explains why environmental and social goods and services tend to be under-provided through market mechanisms. This is because individuals cannot be prevented from benefiting from their consumption and use (non-excludability), and consumption by one individual does not reduce the availability of these benefits to others (non-rivalry), so they cannot normally be priced and traded. This is often the premise upon which a case for public policies to stimulate such provision – whether by incentive (e.g. payments) or obligation (e.g. standards or conditions) - is founded. Figure 1 gives a classic illustration of these points with relevant examples.

FIGURE 1: Public goods in economic theory

	Non-rival goods and services (indivisible)	**Rival goods and services (divisible)**
Practical impossibility of exclusion	**1. Pure public goods** stable climate, cultural heritage, access to clean air, rural vitality	**2. Common pool resources** ground and surface waters, wildlife on land and some water ecosystems
Possibility of exclusion	**3. Quasi-public / club goods** nature reserves, beautiful landscapes, historic sites, forests	**4. Pure private goods** agri-food products, timber, tourist attractions, hunting

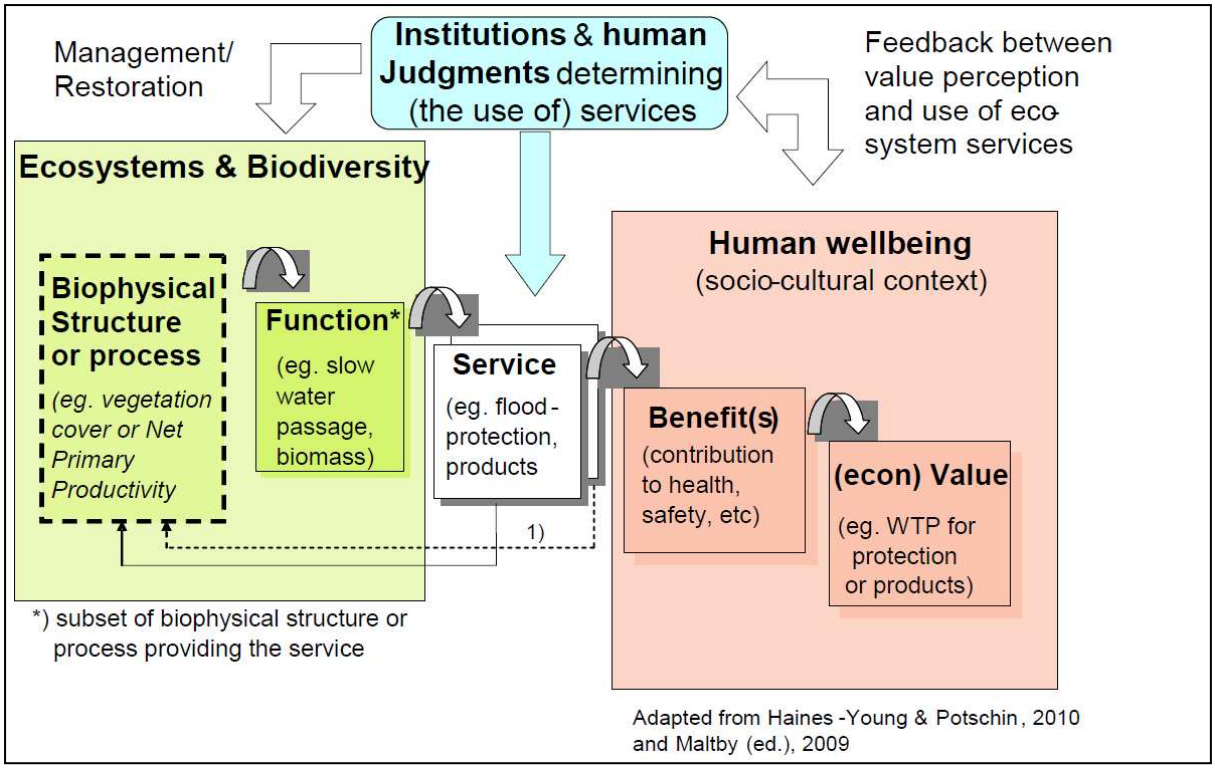
Source: Authors, adapted from Dwyer et al, 2015

However, the concept of public goods does not explain the conditions and context of production, which affect the degree of under-provision that occurs in any particular situation and also the range of options and scope for enhancing delivery, which depend upon such factors as societal 'norms' (or "reference levels") in respect of public and private property rights. It also does not explain the complex dynamic interactions - including jointness (generating public and private goods simultaneously – Cahill, 2001), system-dependence and feedback conditions - that exist between natural and socio-economic assets within farming or forestry processes. These interactions, as well as the only 'partial' non-rivalry and non-excludability of many environmental and social goods and services, mean that markets *can* play a role in supporting PG provision, which can also be influenced by wider policies that set the general framework within which markets and businesses operate. Because of these factors, policy makers may need to look beyond the PG concept to identify the most cost-effective options for policy to deliver sufficient environmental and social benefits from farming and forestry.

The **Ecosystem Services** (ESS) approach (De Groot et al, 2010), on the other hand, captures well the notion of dynamic inter-dependence between natural and socio-economic spheres (see Figure 2).

Coming as it does from an ecological perspective, its main purpose is to show how certain resources valued by society (e.g. clean water) depend upon natural functions which require understanding and protection (e.g. the hydrological cycle).

FIGURE 2: Ecosystem Services



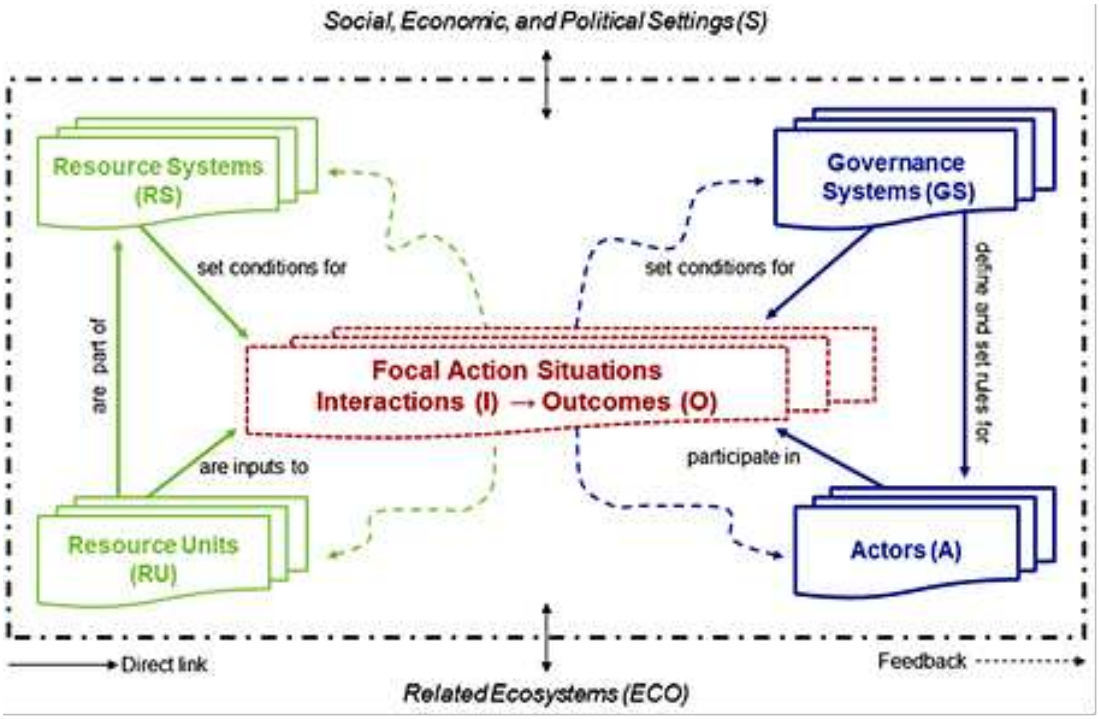
Source: De Groot et al. (2010)

However, the cascade as illustrated in Figure 2 does little to clarify the two-way nature of this relationship, i.e. how also, natural assets and functions (e.g. upland biodiversity) can in turn be dependent on the maintenance of certain socio-economic activities (e.g. extensive grazing). This two-way relationship is critical to considering how human and societal resources, capacities and values influence the provision of environmental and social benefits from farming and forestry. The Ecosystem Services approach alone offers us few insights into the behaviour of markets and institutions, from which we could generate appropriate policy responses. Some effort has been devoted to cataloguing and valuing ESS in money terms but the policy applications and impact of this work – as with many other attempts to 'price' non-marketed goods- remain contested (Fisher et al., 2009). So, while the ESS approach can help us better understand the complex relationships between natural and socio-economic features of farming and forestry, it cannot readily prescribe the scale or nature of policies and actions to meet societal demand because it does not analyse the socio-economic system.

Applying the Social-Ecological System approach

We introduce the Social-Ecological Systems (SES) framework as a conceptual approach that appears capable of bridging the disciplinary gap between public goods and ecosystem services, in the context of agri-rural policy. The SES framework (Berkes and Folke, 1998; McGinnis and Ostrom, 2014) addresses the relations between social and ecological systems by analysing the social mechanisms and broader settings behind the state of different cultural environments and ecosystems, as well as the linkages between their assets and features, both natural and social. Figure 3 offers one approach for conceptualising a SES.

FIGURE 3



Authors' note: A social-ecological system (SES) framework with multiple first-tier components. Solid boxes denote first-tier categories. Resource Systems, Resource Units, Governance Systems, and Actors are the highest-tier variables that contain multiple variables at lower tiers. Action Situations are where all the action takes place as inputs are transformed by the actions of multiple actors into outcomes. Dashed arrows denote feedback from action situations to each of the top-tier categories. The dotted-and-dashed line that surrounds the interior elements of the figure indicates that the focal SES can be considered as a logical whole, but that exogenous influences from related ecological systems or social-economic-political settings can affect any component of the SES. These exogenous influences might emerge from the dynamic operation of processes at larger or smaller scales than that of the focal SES.

Source: McGinnis and Ostrom (2014).

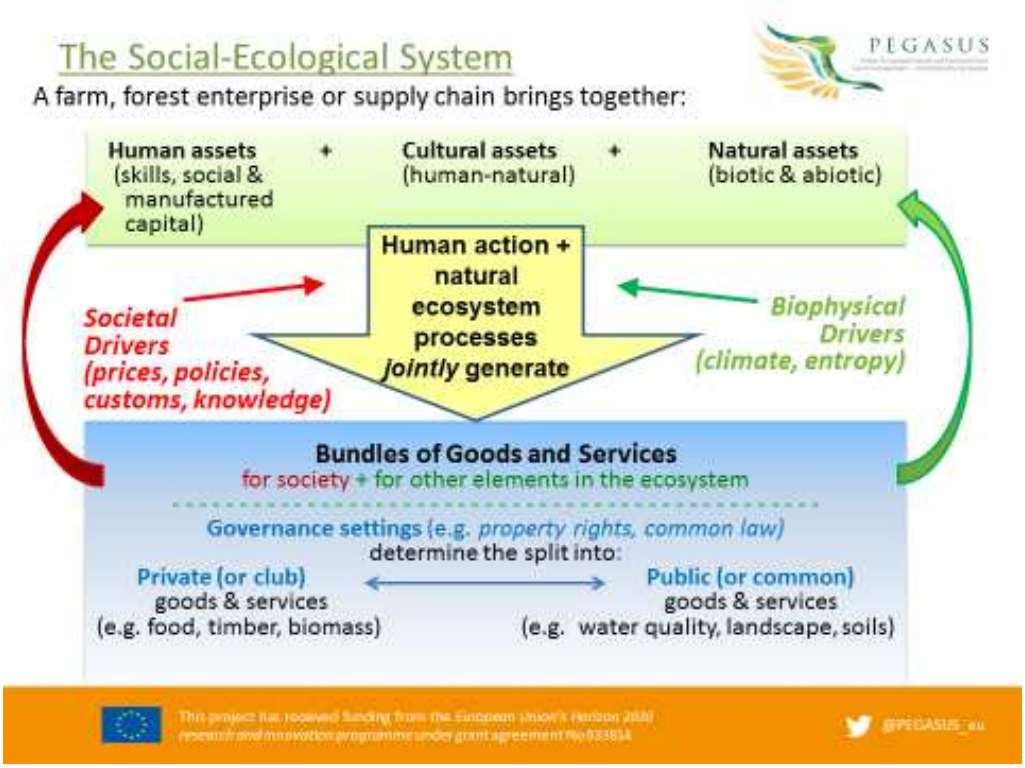
SES analysis places great significance on **actors** and **governance systems** (both private and public), as they determine the relations shaping the management of natural resources. This includes the special meaning that different formal and informal rules have for the provision of environmental and social benefits – including property rights, social norms and natural or institutional capacities and their 'tipping points'; which influence the resilience of a system and indicate areas most susceptible to be influenced by either private or public actors. For instance, the nature of property rights may be a key element determining how decisions concerning resource use will be made, and thus how they might be changed to better reflect societal values.

It is also important to assess the level of public awareness and appreciation of the environmental and social impacts of different farming or forestry systems, when identifying the scope to improve provision of beneficial impacts (or reduce negative impacts). Depending upon these factors, options for enhancing provision could include using market mechanisms (e.g. a price premium or market niche) instead of policy actions (regulations, incentive payments, information campaigns), or a mix of both. The characteristics of each different SES will determine which options are best suited for that system.

In the PEGASUS 3-year project[1] the SES framework was used to analyse 34 case studies across Europe. From this experience, it was clear that the approach needed some adjustment in order adequately to capture information on public appreciation, policy and institutional factors and the role of market mechanisms. Thus the SES framework (see Figure 4) was modified to introduce:

- a dynamic aspect, enabling the health and resilience of resource systems over time to be assessed, including the impact of current and previous governance;
- an ability to deal with systems not defined by territory, but by a particular supply chain or type of service, such as processed tomatoes in northern Italy, or social farming in the UK;
- a clearer analysis of communication links between actors involved in governance of the system, to pinpoint scope for change; and
- measurable details of the extent and nature of economic, environmental and social benefits represented within the SES framework.

FIGURE 4



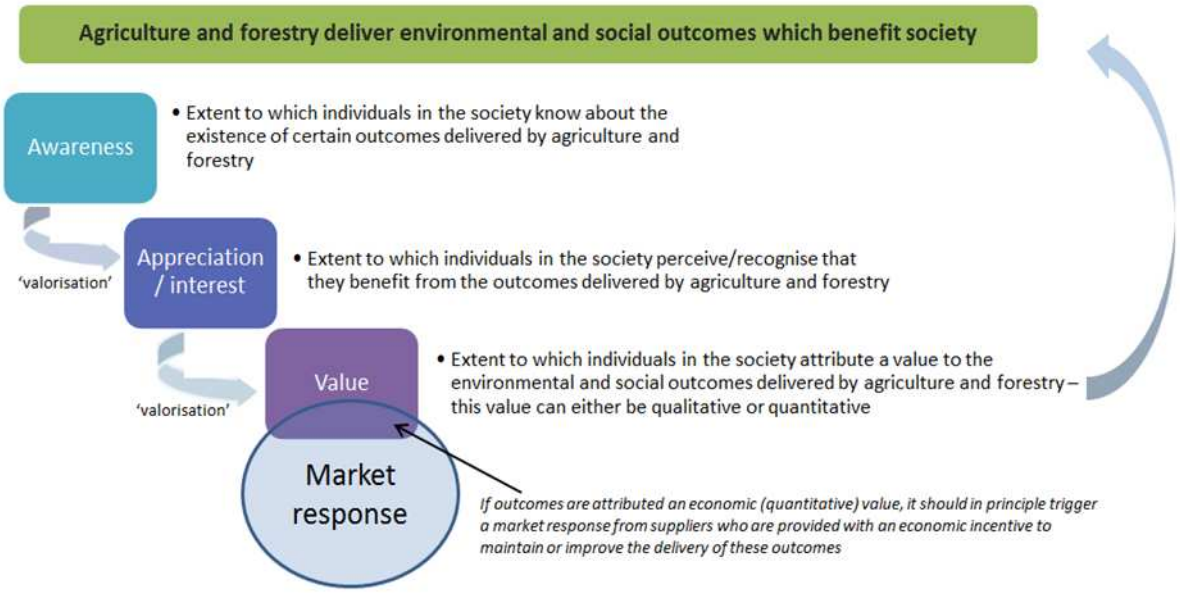
Source: Authors' own

An important and novel part of the description of a SES, as developed under PEGASUS, is the assessment of its 'valorisation cascade', ranging from "Awareness' and 'Appreciation' through 'Interest' to 'Value" of the environmental and social outputs from agriculture and forestry (Maréchal et al, 2016). *Awareness* denotes the extent of understanding that local actors and/or the public have for the environmental and social benefits provided by agriculture and forestry, in a certain area or context. Awareness of these benefits is a precondition for societal *appreciation* or *interest* in such things (you have to know they exist to recognise their importance). Societal recognition of these benefits is made more or less explicit through a process that assigns them some tangible *value*, or 'valorisation'. This value may be either implicit (acknowledged by institutions, inherent in legislation or embedded in

[1] PEGASUS – Public Ecosystem Goods and Services from farming and forestry: Unlocking Synergies. See www.pegasus-ieep.eu for more details, including partners and outputs.

behavioural norms) or economically explicit (e.g. where it has monetary value in marketed products using explicit branding associated with these attributes). Economically explicit value reflects societal demand, as expressed in a market or in a quasi-market such as in government expenditure decisions. By assessing the valorisation cascade (Figure 5) – its state of development, for the particular environmental or social benefits that the SES can generate – it is possible to identify a range of actions to improve provision.

FIGURE 5



Source: Maréchal et al, 2016

What are the implications of using a modified SES for policy making? The PG approach suggests that public intervention to correct market failure may be justified. Thus, governments may offer direct payments to encourage farmers and foresters to provide a socially desirable level of environmental and social benefits, beyond the production of marketed goods. In the ES approach, a similar tendency is fostered by monetary valuation – once a 'price' is calculated for the provision of a service, a public or private institution is tasked with harnessing funds to secure it. And whilst both approaches could also be used to argue for alternative policy and/or market solutions (e.g. Hodge, 1998), in practice, payment schemes funded by governments or corporate actors (as with PES schemes – Wunder, 2015) have dominated the policy response. Perhaps because these approaches can too easily take market conditions and property rights as 'given', relatively little attention is devoted to the potential to develop or re-shape market conditions, or to foster the common stewardship of assets, enhancing the capacity of producers, consumers and citizens collectively to improve environmental and social outcomes. By contrast, these considerations, including the balance of transaction costs and potential transaction benefits (Dwyer and Powell, 2017), come readily to the fore in SES analysis.

In particular, the SES approach encourages multi-actor approaches and social processes to foster beneficial change. These include collective action and co-learning between different actors, also experimentation and innovation, developing public and/or consumer awareness and identifying new valorisation options, as well as harnessing private sector involvement where needed.

New ideas for policy and practice

By applying the SES approach to analyse 34 cases across 10 countries, it was possible to understand how successful policy responses evolve at local level. The project team developed an online toolkit designed to help local actors who are setting up or considering this type of initiative, linked to a

knowledge-sharing platform to enable different actors across Europe to learn from one another's experience. The toolkit emphasises the roles of knowledge exchange and social processes, as well as the creative use of institutional change, in a step-wise process:

- *Initiation,* sharing ideas and spreading enthusiasm among actors for doing something to achieve a change, to analyse the system within which they operate and to decide what would be the measure(s) of success or key goals to achieve;
- *Preparation,* planning, involving and understanding all relevant actors, drivers and constraints, identifying and overcoming barriers to involvement as far as possible;
- *Implementation,* active multi-actor implementation which requires reciprocity, transparency, growing trust and respect between actors and clear leadership, plus the possible formation of new institutions; and
- *Review and adjustment* to keep the initiative relevant, effective and engaging, despite external changes.

Two brief examples illustrate how the SES approach added value to the research. Hope Farm case study concerned an arable farm purchased by a UK environmental NGO almost 20 years ago with the aim to test and demonstrate management practices to benefit wildlife, and persuade policy-makers to include these in public-funded, national agri-environment measures. After 10 years, the farm had accumulated notable practical experience but its policy influence was limited by the inability of the national schemes to attract widespread uptake.

By considering the SES within which the farm was set, the research team identified scope for considerable synergies and positive learning and experiment, between the managers of Hope farm and their immediate farming neighbours, many of whom recognised a need to look at longer-term sustainable management because of persistent problems with resistant weeds and extreme weather events. Barriers to joint working include mistrust and a lack of understanding of the NGO's motives among farmers, as well as a lack of institutional flexibility for local managers to innovate in building new relationships with their wide variety of farming neighbours. Overcoming these barriers could be an important step in increasing the impact of the practical work and knowledge gained on the farm. Also, the co-existence in the SES of a commercial certification scheme for products from 'conservation-friendly' farming, as well as a major farm/estate-based visitor attraction, may provide additional potential to develop market drivers to encourage wider provision of environmental benefits.

In a contrasting case, the production of Bergamot oil in southern Italy depends upon specific growing conditions, which ensure high quality oil to supply the perfume industry. However, around 20 years ago production had almost disappeared from the area because of competition from cheaper, synthetic aromas produced from petroleum by-products. Recognising the uniqueness of the local traditional system and culture, one farmer conceived of the possibility to develop organic production for a specific market niche, and persuaded neighbours to convert to organic farming, with policy assistance, in order to offer a significant quantity of product to organic buyers in the international market. Securing one strong and successful supply contract via an EU trade fair, the group was able to gain market access and, over time, to increase market demand and expand the area of production. This change in circumstances had a positive spillover effect on the appreciation of conventional production in the same territory, enabling the revival of the larger Bergamot producers' co-operative via renewed interest from international buyers and renewed optimism among local people. Today, both organic and conventional supply are secure and growing and the distinctive cultural landscape, community and traditions of the Bergamot cultivation in Calabria have been sustained. SES analysis showed how a combination of unique assets, innovation among actors and a high level of trust between organic and conventional producers and their institutions enabled the effective spread of benefits across the territory and community.

As well as generating guidance and ideas for local initiatives, the project generated a list of recommendations and lessons for policy, which is the focus of Hart et al's article, also in this edition.

Concluding comments

In a context where EU agri-environmental policy has perhaps become hide-bound by theories and concepts that inadequately reflect the dynamism and complexity of real-world conditions, so missing important potential for action, we suggest that systems approaches offer significant advantages for more creative and resilient policy and practice, in future. PEGASUS's use of the SES framework has generated new ideas for policies, as well as a compendium of transferable good practice, to enhance the environmental and social benefits of EU farming and forestry.

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Summary

The two concepts of public goods and ecosystem services are often used to describe the same welfare benefits potentially generated by agriculture and forestry, but they originate from different

perspectives and each offer only partial analysis of these relationships. A more holistic approach – Social-Ecological Systems (SES) – has been adapted and applied in new research to understand more fully how the relationships can best be characterised, and beneficial change promoted, through policy reforms and practical action. An important and novel part of the description of a SES, as developed under the PEGASUS project, is the assessment of its 'valorisation cascade'. Through the mapping and consideration of assets, actors, interactions, drivers and the nature of the valorisation cascade in 34 diverse case studies, the project highlighted the importance of multi-actor approaches and social processes to foster beneficial change. These include collective action, co-learning and trust between actors, promoting experimentation and innovation, developing public and/or consumer awareness and identifying new valorisation options, including via commercial supply chains and enhanced community involvement.

(168 words)