

Agriculture, Forestry and Land Use (AFLU)

The interactions of Agriculture, Forestry and Land Use activities with climate change, the natural environment, and economic/social conditions are very complex. Their analysis requires input from a wide range of disciplines and of a wide variety of analytical tools. The overall objective of the AFLU case study was to develop and apply a methodology for carrying out integrated policy assessment in the AFLU sector. While keeping AFLU as the focal point both in terms of policies and objectives, this work also addressed wider concerns in the fields of the economy, the environment, ecosystems and sustainable energy provision.

What was done?

The objectives of this case study were to develop and apply a methodology for carrying out an ISA in the AFLU sector, to examine the sustainability issues affecting the AFLU sector, and to identify quantifiable objectives and policies for promoting them. The study also explored possibilities for improving the chances of attaining a number of sustainable development objectives simultaneously.

The stages of the ISA cycle were:

1) Scoping Stage

The scoping stage involved the development of the conceptual framework for performing integrated policy exploration in the AFLU field, where a thorough analysis of the Agriculture and Forest system in Europe was made,



the historical evolution of sustainability in Agriculture and Forestry was presented, and the different dimensions of the unsustainability 'problematique' from the different perspectives of involved actors – both institutional and individual – were explained. At the end of this stage a conceptual model of each of the two systems (agriculture and forestry) was formulated. This model integrated the following aspects: the actors involved, objectives, functions and the overall governance.

A stakeholder meeting was organised with the aim of broadening the range of sustainability concerns addressed in the case study and

ensuring that the work is relevant to stakeholders. It also aimed to prepare the ground for the active involvement of stakeholders in the policy exploration exercises at the end of the project.

Several stakeholders agreed that alongside traditional concerns (such as food security, food safety, environmental protection and health), agriculture has to respond to evolving concerns, such as the quality of the environment, sustaining rural communities and territories, poverty alleviation in developing countries and trade liberalisation issues. Stakeholders voiced strong concerns on unsustainability aspects of the AFLU

sector: e.g. human health, environmental and socio-economic issues.

2) Envisioning Stage

This task involved the identification of measurable sustainable development indicators in relevant domains (agriculture, forestry, land use, economy, environment, climate change, social cohesion, ecosystems) and the definition of appropriate policy instruments for influencing the selected sustainable development indicators. It aimed to provide a set of key sustainable development indicators for the AFLU case study. The indicators cover

- general agro-economic indicators (e.g. agricultural output, sectoral employment or income),
- agricultural land uses (e.g. changes in the share of crop range type, amount of fallow),
- environmental indicators (e.g. excess nitrogen use, or sales of pesticides),
- energy use (net energy use by each agricultural sector, energy use deriving from fertilizer use), and
- R&D issues (expenditures on agri-environmental management research).

With input from stakeholders, visions of the future AFLU sector were developed. These clearly showed that agriculture is moving from a single functional activity, namely food production, to a multifunctional activity

(produce healthy food, maintain landscapes, enhance biodiversity, secure a clean environment, provide employment, produce energy, sequester carbon, maintain rural areas). Some of these functions are marketable in the sense that they can be remunerated through existing or future markets (e.g. carbon trading).

Stakeholders also supported the identification of possible policy instruments for influencing



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sustainability in the AFLU sector. Potential policy instruments were evaluated on the basis of data availability, modelling potential, cost estimation potential and impact on a wider range of diverse sustainability indicators (possible synergies, conflicts or trade-offs). The list included financial/economic instruments (e.g. direct subsidies to planting, silviculture operations, harvesting, energy production), legal/regulatory frameworks (maximum discharge of polluting chemicals), the implementation of climate policies (carbon taxes), and expenditures on agri-environmental research.

3) Experimenting Stage

Having thus identified measurable targets and instruments, the complete path from instrument application to impact on the sustainability indicators was modelled. For this purpose large-scale models were used in order to maintain consistency with other sustainability impacts via the detailed treatment of a large number of key factors incorporated in these models.

Modelling work consisted of substantial extensions and re-fashioning of existing models and the construction of new ones in order to create the capability for carrying out the detailed policy impact analysis necessary. A considerable amount of the modelling effort was concentrated on partial equilibri-

um models in the AFLU sector covering Europe and the world. A specific task consisted of devising direct and indirect ways of measuring costs of implementation of sustainable development policies. For this purpose new and extended large-scale general and partial equilibrium models were used.

The Integrated Policy Assessment (IPA) methodology applied in the AFLU case study placed considerable stress on uncertainties associated with different policy impacts and their interconnections. In order to quantify the risks attached to the efficacy of the application of instruments, purpose-built stochastic models capable of producing joint distributions of such impacts were used. The IPA was carried out using a decision support tool

capable of exploring policy priorities in order to minimise risks, hedge against uncertainty, and maximise the economic, social, environmental, energy, and infrastructural benefits of their implementation. The tool integrated the results of the large-scale partial and general equilibrium models and incorporated the risk information derived from the stochastic models.

Results

Several versions of the Integrated Policy Assessment Tool have been constructed using the methodology outlined above covering different scales of sustainability policy exploration ('macro' and 'meso' levels). The most interesting outcomes concerned exploration of policy instruments in the broad area

of reform of the Common Agricultural Policy (CAP) of the EU and a variety of measures supporting the use of biomass/bio-fuels as a means of promoting climate change mitigation. These exercises have revealed many areas of conflict and synergy and have provided indications about the conditions under which robustness of conclusions and stability of policy recommendations can be achieved.

The CAP has been a cornerstone of European integration from the beginning and has absorbed historically very large shares of the 'common' budget. Its main aim has been to ensure a viable European agricultural sector in view of food security, social cohesion and land management and maintenance. Starting in the 1990s it has been undergoing profound reform with the aim of increasing its effectiveness (the achievement of its aims at lower cost). The most notable transformation so far has involved a shift from market support (guaranteed prices) towards direct payments to farmers (on a land utilisation basis). In recent years there was a gradual emergence of 'Rural Development' as an alternative form of support. The process of CAP reform is still ongoing: it is highly dependent on the pressures of existing lobbies and power structures (strong stakes of beneficiaries). But it is also subject to considerable pressures from agents promoting agri-environmental policies, the World Trade Organisation, taxpayers, consu-



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mers, and the need for operational simplification in order to ease the administrative burden. At this stage, however, CAP reform is still in a state of flux with many alternative courses yet to be determined. In recent years the promotion of bio-energy sourcing acquired considerable momentum as a means for increasing renewable energy shares to support energy security and climate mitigation. In promoting bio-energy it is often assumed implicitly that some of the aims concerning a viable agricultural sector will also be served. The extent of commitment to this option is still under considerable debate, due to the effects it may have on the AFLU sector, biodiversity and ecosystems, as well as the high costs of implementation (especially with regard to bio-fuels).

The main findings from the analysis carried out in the case study concern the potential conflicts and synergies between these two categories of policies as well as the high risks and opportunities involved in terms of their impact on the global agricultural system. Alternative policies differentially affect EU farm welfare, vulnerable farmers in developing countries, food prices to consumers and global nutrition prospects. The key appears to be the evolution of yields in food production: in the past few decades they have improved sufficiently to ensure a constant if unspectacular improvement in levels

of food supply. This pace may be slowing down and its future course is more uncertain than is often assumed. The promotion of better practices together with R&D could go some way in alleviating possible bottlenecks.

The policy exploration has been carried out using the IPA tool which is designed to take uncertainty and its structure explicitly into account. In this tool minimising the risk of unsustainability is the policy objective. Under certain conditions, broadly corresponding to what in probability theory is considered to be 'normality', the IPA has produced results involving balanced mixes of policy characteristic of hedging stances. Policy mixes change as ambition of achieving sustainability is increased but at the same time the risk of failure also increases. Two versions of policy mixes have been considered: one involving small shifts in policy (nudging towards sustainability) and another involving much larger scale policy doses. The latter necessitated an explicit incorporation of nonlinearities (a more complex model) but in general did not affect greatly the results (often even enhancing their robustness). Thus, the main characteristic of results from these policy exploration exercises is their great stability over large stretches of sustainability ambition followed by radical shifts at particular thresholds. This means that the pay-offs between different

sustainability objectives are not smooth. They constitute a set of distinct policy clusters with distinct characteristics. This in itself does not pose particular problems for stakeholder interaction: it may even be advantageous in that it enables a focus on a limited set of distinct policy stances.

