From silvopastoral to silvoarable systems in Europe: sharing concepts, unifying policies

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ABSTRACT

Silvopastoral and silvoarable systems are often considered separately, with distinct management schemes, research approaches, and policy-making perspectives. However, both are multi-species agroecosystems with a tree component. While the motto in agriculture and forestry has been for decades to reduce complexity for simplifying management and efficiency, multi-species systems are now sometimes considered as more dependable in production and more sustainable in terms of resource conservation than simple ones. In spite of many enthusiastic papers, evidence is however not yet that conclusive. Recent findings on silvoarable systems help to understand how some functional aspects of trees like their root opportunism or phenology may result in very efficient tree-crop systems in some climate and soil conditions. We present here the approach by the SAFE (Silvoarable Agroforestry For Europe) consortium to biophysical modelling and policy-making for silvoarable systems. Integrated models of tree-crop interactions are linked to an economic model and predict the efficiency of tree-based systems. Some concepts of precision agriculture may be applied to silvopastoral and silvoarable systems in the near future. The integration of such findings up to farm and regional levels, and the consequences on policy-making within the current reform of the Common Agriculture Policy are discussed. We advocate for a unified policy scheme for both silvopastoral and silvoarable systems.
INTRODUCTION

Silvoarable and silvopastoral systems share many common features, both for biophysical (low density tree stands and herbaceous plants interactions) and socio-economic aspects (combining short term and long term revenues). Silvoarable agroforestry (SAF) comprises widely-spaced trees intercropped with arable crops. Most research on agroforestry systems was concentrated in the tropics until the early 90s (Van Noordwijk et al, 2003), but recent findings (Burgess et al. 2003, Dupraz et al. 2003, Gillespie et al. 2003, Zhu, 1991) indicate that modern temperate silvoarable production systems are very efficient in terms of resource use, and can be compatible with modern machinery. Dupraz and Newman (1997) suggested that agroforestry could be an innovative agricultural production system that will be both environment-friendly and economically profitable for Europe. Growing high quality trees in association with arable crops in European fields may improve the sustainability of farming systems, diversify farmers incomes, provide new products to the wood industry, and create novel landscapes of high value (SAFE, 2004).

However, during the late twentieth century, the advantages of agroforestry systems have been overlooked. Even traditional silvoarable landscapes, whose benefits are widely recognised, have received little attention from policy makers and research organisations. Across Europe the integration of trees and arable agriculture is currently unattractive to farmers, simply because the available grant or subsidy schemes are designed for forestry or agriculture, and don't permit agroforestry. In some countries, agroforestry systems can actually be declared illegal, because they are a category that is not recognised for taxation purposes. This preposterous situation has had unfortunate consequences with some EU-funded silvoarable
agroforestry experiments being closed prematurely because local agencies deemed that they were not eligible for agricultural or forestry grants. A mixed or combined status of agroforestry plots is currently not available, neither at the European level nor at the National level preventing both forest and agricultural grant policies to be applied to agroforestry systems.

WHAT FUTURE FOR AGROFORESTRY SYSTEMS IN EUROPE?

In recent years, the European Union has introduced a series of measures to promote the integration of trees within existing farm businesses. The ‘Silvoarable Agroforestry for Europe’ (SAFE) project, funded under Key Action 5\(^1\) of the Fifth Framework Programme\(^2\) is one example. The SAFE project will provide up to date appraisals of the productivity of tree-crop mixtures, based on extant experiments and progress in modelling of tree-crop interactions at the field scale (Dupraz et al., 2004). It will develop a computer model to compare the economics of silvoarable agroforestry with arable and forestry systems, so that the financial implications of silvoarable agroforestry for European farmers can be examined (Graves et al., 2004). The Hi-SAFE process-based biophysical model includes unique features such as a 3D dynamic simulator of tree-crop root interactions. Most research was so far focussing on aboveground tree management options, but recent findings indicate that belowground tree management options such as root control or precision fertilisation should now be considered for managing tree-based systems. Annual and perennial crops, including fodder crops, can be powerful tools to monitor tree roots in agroforestry systems. A major finding so far is that the productivity of such silvoarable systems, as measured by their Land...
Equivalent Ratio (Willey and Rao, 1983, adapted to agroforestry systems by Dupraz, 1998), is very attractive: silvoarable systems with winter cereals and deciduous tree species would be above 1.3 (Figure 1), which mean that the overall productivity of agroforestry exceeds those of separated farm and forest systems by 30% (Dupraz et al, 2004).

![Image of silvoarable system]

**Figure 1: The first estimates of the Land Equivalent Ratio of this poplar-wheat silvoarable system in Southern France are above 1.3.**

The environmental aspects of silvoarable systems in Europe are only starting to be explored. Such impacts may further favour the adoption of SAF, if their financial value is recognised through ‘shadow’ payments to farmers for environmental services. However, even if silvoarable systems are more productive than monocultures farmers will not adopt them if subsidy schemes distort totally the ‘level playing field’.
INCORPORATING AGROFORESTRY IN THE REGULATIONS: THE FRENCH CASE

Agroforestry has been permitted since 2002 as a standard practice for French landowners and farmers. Agroforestry is advertised by the French Ministry of Agriculture to French Farmers and Landowners in a 4 pages pamphlet. Both silvoarable and silvopastoral options are included. Grants are available for planting the trees, and the usual crop payments are available for intercrops, on a “cropped area basis”. The policies are valid throughout France (including overseas tropical departments), but some Provinces may add additional grants for planting trees.

For planting new agroforestry plots, the landowner can apply for a grant for planting the trees. This grant is the same as for a forest plantation: it is a percentage of the total cost of planting and tending the trees during the first 3 years (the usual rate is 40%). Crops planted between the trees are eligible for CAP payments, but it is not possible to get these on a silvoarable plot obtained from clearing a forest, or planted on a parcel that was not eligible for CAP payments prior to tree planting.

In addition, a farmer who manages an agroforestry plot may apply to a specific agri-environmental scheme (second pillar of the CAP). The reason for this scheme is to promote agroforestry by compensating additional costs compared to a standard agriculture plot. The measure is contracted on a 5-year term, and two options are available: one for creating a new agroforestry plot (240 to 360 €uros/hectare/year during five years), and one for tending an existing silvoarable plot (100 to 140 €uros/hectare/year during five years). The value depends on the agricultural activity on the plot, because tree protection costs are different for annual crops, grazing by small animals or grazing by cattle.
However, the current reform of the CAP will induce large changes to this regulation. Will agroforestry still be allowed to farmers after January 1\textsuperscript{st} 2005?

\textbf{AGROFORESTRY AND THE NEW EUROPEAN CAP}

A crucial debate for the future of agroforestry in Europe is now on. Recent European regulations define the conditions for the Single Payment Scheme (SPS) that will be in force in the European Union as of January 1\textsuperscript{st} 2005. Will agroforestry finally be an option for European farmers with the reformed CAP, after January 2005?

\textbf{How to incorporate agroforestry in the CAP?}

Two possibilities are explored:

- Either AF could be considered as a normal agricultural practice, and AF plots could be fully included in the SPS (provided they meet some criterions)

- Or AF plots could be considered as a mixture of agriculture and forestry, and only the agricultural part would be included in the SPS

A third possibility would be that AF is not included in the SPS at all, which would mean that AF has no future in Europe for the next decades.

Regulation 1782-2003 includes a provision that areas of 'woodland' should be excluded from the area of the farm eligible for SPS. This may incite farmers to remove trees from farmed landscapes, which would not only induce landscape and environmental damage, but also prevent farmers from investing in new agroforestry systems. In addition, a recent Guidance Document (AGRI/2254/2003) recommends that the threshold of 'woodland' is 50 stems per ha, which would classify most agroforestry plots as woodlands, and exclude them from the SPS. This would prevent any agroforestry system with scattered trees from existing in
Europe. However, Article 5 of Regulation 2419/2001 indicates that: 'a parcel that both contains trees and is used for crop production shall be considered an agricultural parcel provided that the production envisaged can be carried out in a similar way as on parcels without trees in the same area'. This is perfectly suited for agroforestry: in a carefully designed and managed agroforestry system, crop production can effectively be carried out in good conditions. Fortunately, this wording was retained in the most recent regulation (R796-2004 of 21 April 2004, Article 8), which details how the SPS will be enforced.

It is interesting to observe that regulation 2254-2003 considers that border hedges of up to 4m wide that serve as boundaries between agricultural parcels and are traditionally part of good agricultural practices in the region concerned, and will be considered as being included in the SPS area. A 2m width will be attributed to each adjacent agricultural parcel. Internal features will be, under the same conditions, accepted as forming part of the agricultural parcel where their width is less than or equal to 2m. Member States may, however, after prior notification to the Commission, allow a width greater than 2 metres if those areas were taken into account for the fixing of the yields of the regions concerned. This could be a circuitous way of including agroforestry in the SPS (tree lines are often less than 2 m wide), but a more direct approach would be more appropriate.

The project of a new European Regulation on support for Rural Development was published in July 2004 and includes for the first time in history a full article on agroforestry systems (http://europa.eu.int/comm/agriculture/capreform/rurdevprop_en.pdf). The introduction section of the document states that "Agri-forestry systems have a high ecological and social value by combining extensive agriculture and forestry systems, aimed at the production of high-quality wood and other forest products. Their establishment should be supported". A new area for agroforestry systems in Europe is about to start.
Defining agroforestry systems at the European level

When designing regulations, definitions of forest or forestland are often required, to circumvent the domain of each regulation. There are internationally accepted definitions of ‘forest’ or ‘forest land’ used by the UN-ECE/FAO and the UNFCCC which use threshold values of crown cover, tree height at maturity, minimum area and bounding areas. However ‘woodland’ as used in EU Regulation (1782/03) is less well defined. If agroforestry is to be recognized as an accepted land use, a clear definition of an agroforestry plot should be introduced. The SAFE project is currently suggesting that agroforestry systems could be defined by a tree plantation design and management that allow significant crop or grass production (at least 50% of the reference yield without trees), and with a tree density of less than 200 trees/ha (only trees with a diameter at breast height above 15 cm are included). Hedge trees should be included in the calculation. This suggestion is conflicting with Guidance Document AGRI/2254/03 that states that any plot with more than 50 trees/ha (irrespective of their size) would be ‘woodland’, and therefore excluded from the SPS system. But the Guidance Document also states “the Commission services take the view that wood within this meaning should be interpreted as meaning areas within an agricultural parcel with tree-cover (including bushes etc.) preventing growth of vegetative under-storey suitable for grazing.” If this approach is extended to silvoarable systems, agroforestry is clearly not ‘woodland’.

The Integrated Control System (IACS) and the Land Parcel Identification System (LPIS) should be designed to allow agroforestry systems to operate. Some countries (such as France) declare for taxation purposes parcels as partially covered by one ‘activity’ (e.g. farming) and partially covered by another ‘activity’ (e.g. tree growing). If agroforestry is not recognised as an agricultural system in the SPS; the EU should make clear to all EU countries that they have the flexibility to allow multiple activities within parcels in their national IACS systems (e.g.
for agroforestry, ‘forestry’ and ‘cropping’ in the same parcel), and define fair rules for these plots in the SPS scheme.

Finally, agroforestry should now be recognized as a distinct land use system, and all European countries should be allowed to define a niche for agroforestry in their own taxation system. This would probably favour the mixed activity status of the plot, as land taxes paid on woodland or agricultural land are often very different.

CONCLUSION

There is a need for a special 'agroforestry status' to be designed for the countries where tax policy and grant availability is dictated by land-use classes. Policies for agriculture and forestry grants should recognise that both silvoarable and silvopastoral systems are 'legal' forms of land-use which should be permitted and placed on a 'level playing-field' with conventional agriculture or forestry.

From these elements, we can conclude that the adoption of a very new system of land use like modern agroforestry can simply be impossible if the rules for agriculture support ignore intercrops. This is true even if their productivity or environmental advantages are demonstrated and significant. In a world were subsidies may represent half the revenue of the farmer, agroforestry has no future if the crops are not included in the subsidy schemes, even if agroforestry is an excellent system for productivity and environmental benefits. On the contrary, in a world where the crops get NO subsidy, agroforestry would be a very attractive system to all farmers. This is a clear example of legal and policy regulations exercising an unforeseen constraint on the implementation of innovative options for rural development and landscape enhancement.
ACKNOWLEDGEMENTS

This research was carried out as part of the SAFE (Silvoarable Agroforestry for Europe) collaborative research project. The EU under its Quality of Life programme funds SAFE, contract number QLK5-CT-2001-00560, and the support is gratefully acknowledged.

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