

Work-package group 3: Agroforestry for high value tree systems

Specific group: Grazing and intercropping of plantation trees in Spain

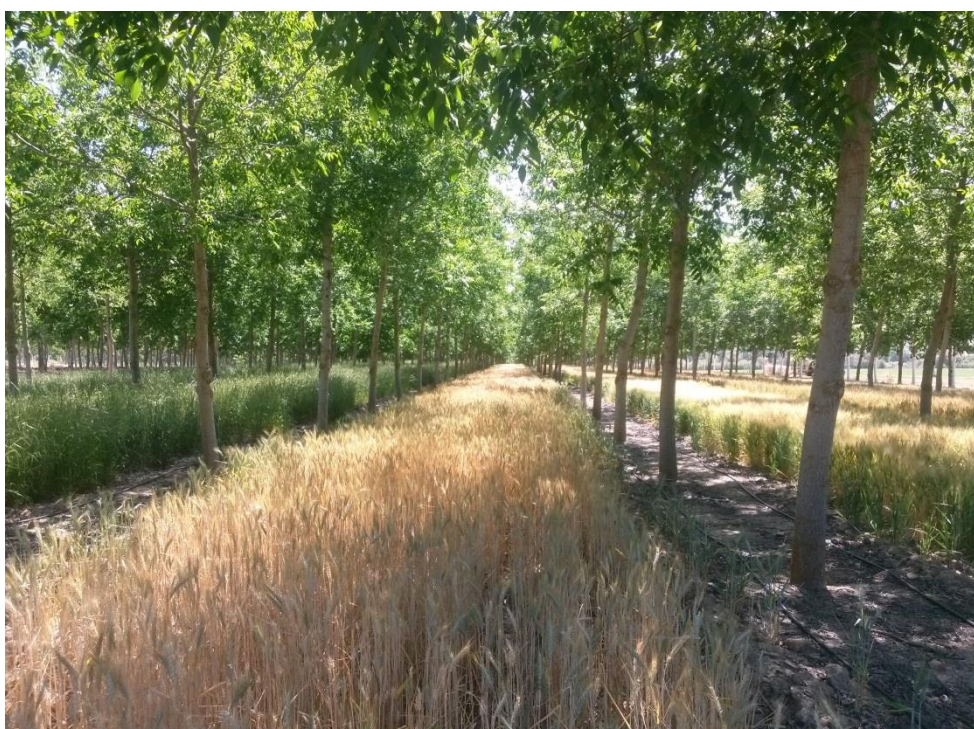
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1. Context

The AGFORWARD research project (January 2014-December 2017), funded by the European Commission, is promoting agroforestry practices in Europe that will advance sustainable rural development. The project has four objectives:

- 1) to understand the context and extent of agroforestry in Europe,
- 2) to identify, develop and field-test innovations (through participatory research) to improve the benefits and viability of agroforestry systems in Europe,
- 3) to evaluate innovative agroforestry designs and practices at a field-, farm- and landscape scale, and
- 4) to promote the wider adoption of appropriate agroforestry systems in Europe through policy development and dissemination.

This report describes one of about 40 initial stakeholder workshops to address objective 2. Further details of the project can be found on the AGFORWARD website: www.agforward.eu

This particular report is focused on agroforestry systems with high value trees (work-package 3 (WP3)) in Spain, although there are links with the use of trees in arable systems (work-package 4 (WP4)). It includes the results of the first project activity undertaken by this stakeholder group: a one-day diagnosis and research planning workshop, complemented with the results of a questionnaires responded by stakeholders.

2. Description of system

In the past, in the Iberian Peninsula under Mediterranean climate, olive, almond and carob orchards were managed under different agroforestry schemes either grazed or intercropped. However, these traditional agroforestry systems have become marginal and new agroforestry practices, based on plantations of quality timber trees (cherry, walnuts and others) are arising. They have commonly been established in former agricultural land and are managed with high levels of inputs (irrigation, fertilizer, herbicides, annual pruning). The adoption of agroforestry practices, such as silvopastoral management or intercropping, has the potential to improve the economic and environmental benefits of these plantations. However, there generally is a lack of knowledge and information on appropriate agroforestry management practices and the benefits, what is constraining the adoption of agroforestry schemes to manage these new afforested farmlands.

3. Work-plan

The formation of this stakeholder group is part of a participatory research and development networks focused on agroforestry with high values trees (work-package 3 in AGFORWARD). The overall objectives of work-package 3 are to:

- i. Identify the main constraints and challenges for the promotion of agroforestry practices with high value tree systems.
- ii. Propose management innovations to improve the productivity, sustainability, marketing of the products, and governance of agroforestry with high value trees.
- iii. Identify ongoing innovation practices initiated by individuals, associations, or organisations.
- iv. Establish a network of sites to test the proposed innovations. Ideally the network should include both experimental and demonstration sites to test scientific hypothesis at the former and to evaluate the feasibility and profitability of proposed innovations at the later.

- v. Organization of dissemination activities that would include field visit to experimental and demonstration sites.

Although this stakeholder group is located in work-package 3, there are overlaps with the participatory research and development network focused on agroforestry for arable systems.

The initial workshop formed the first stage of a number of activities (Fig 1) to create a stakeholder group to discuss the main concerns, challenges and innovations for i) high value timber plantations and agroforestry for arable systems. The workshop was design to determine stakeholders' worries, thoughts, needs and proposals, and to identify stakeholders willing to contribute with sites for testing innovations. The semi-structured questionnaire, once adapted to the national and system-specific context, was used to compile information from a broader collective of stakeholders.

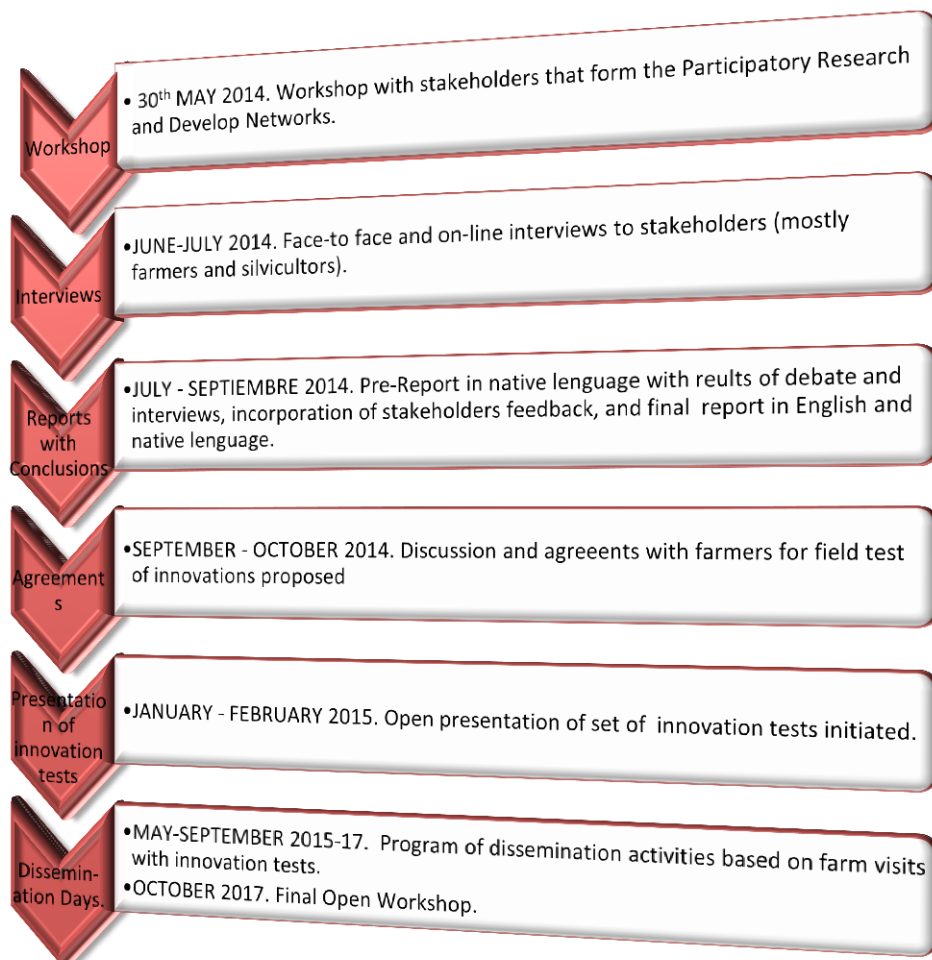


Figure 1. The time-line activity calendar for the work-package 3 (WP3) stakeholder group in the Extremadura region of Spain

4. Stakeholders' meeting

4.1 Identification of stakeholders and invitation to join AGFORWARD

Two months before the proposed date for the stakeholders' meeting and workshop the AGFORWARD research team at the University of Extremadura (UEX) compiled a list of up to 50 stakeholders, including farmers, foresters or representatives of their regional and national associations, agricultural service companies, extension services, local action groups, and policy makers. Some were collaborators in former projects and others were contacted from a web search.

Each person was contacted either by phone or by e-mail and invited to participate in a 1-day stakeholders' meeting and workshop to be held on 30 May 2014 at the Forestry School of the University of Extremadura in Plasencia. A few weeks before the workshop, a flyer with information about AGFORWARD was also sent to each of the identified stakeholders.

4.2 Stakeholders' meeting and workshop

The workshop was animated with techniques of social participation, such as diagnosis exercises (the Ishikawa or fishbone diagrams), focused group discussions (FGD), and a semi-structure questionnaire to identify opportunities and constraints to agroforestry establishment and management. A total of 20 stakeholders joined the whole-day meeting. All the members of this PRDN group were male. Around 35% of the participants were between 20 to 30 years old; 30% were 30 to 50 years old; and 35% were 50-65 years old. Twelve were technicians and eight were farmers (both involved in plantation management). Almost all (95% of the members) reported that they know what agroforestry is whereas 87% had experience with agroforestry management.

The stakeholders meeting and workshop started with a short seminar entitled "The Future of Timber Plantation" (Table 1). Although focused on timber plantation, the seminar was intended to serve as an open discussion to explore the opportunities of agroforestry practices for new timber plantations and to the current challenges faced by traditional agroforestry systems.

Table 1. Schedule for the day

10:00 - 10:30	Reception
10:30 - 12:00	The future of timber plantations: open discussion in three small groups animated by Fundación Entretantos (experts on participatory dynamics).
12:00 - 12:30	Coffee break: face to face introductions
12:30 - 13:00	Presentation of AGFORWARD project: Gerardo Moreno (Team coordinator)
13:00 - 14:30	Proposals of innovations: animated open discussion in a single large group to define main lines, ideas and proposals for participatory research to innovate.
14:30 - 16:30	Lunch
16:30 - 18:00	Participation in AGFORWARD: how each farmer can help and benefit from the participatory research and steps to become an experimental farm.
18:00 - 18:30	Conclusions and appointments

Then the AGFORWARD project was presented in detail to the plenary, emphasizing the scope, objectives and the expected outcomes and impact of the project and suggesting how stakeholders could become involved in it (Figure 2). This was followed by a brainstorming session to propose agroforestry innovations to address the constraints identified, followed by a prioritization exercise.



Figure 2. The initial stakeholder meeting was held at the University of Extremadura

After the presentation, participants were given a semi-structured questionnaire intended to compile information from the broader collective of stakeholders. The questionnaire included some open questions about agroforestry and a list of items (related to productivity, management, environment and socio-economy context) to be prioritized. Following the Spanish grading system (student grading is commonly done on the scale 1 to 10), respondents were asked to rate from 0 to 10 each item, with 5 being qualified as negative and above 5 as positive (0 means very negative and 10 very positive). Face to face questionnaires were filled during the workshop whereas few others were filled later on-line. For this purpose different stakeholders were contacted by e-mail. Questionnaires also allowed us to identify cases of ongoing innovative practices being conducted by farmers, and to “recruit” other possible collaborators.

Finally, the workshop continued with a meeting of the plenary to plan future collaboration, deciding on the role and level of involvement in the project of each stakeholder and proposing an initial plan for future research activities. The workshop ended with a wrap-up discussion and the creation of a mailing list for the exchange of information. Participants formally became established at the end of the day, as a stakeholder group for WP3 of the AGFORWARD project. A mailing list has been created (agf_plantaciones@googlegroups.com) and used to disseminate results of the workshop and questionnaires and to ask for voluntary revision of this report. The mail list will be used for further actions and dissemination. It has also been agreed that a set of Dissemination Days will be done in some of the farms participating in the innovations tests, during years 2015-2017.

5. Stakeholders’ perception of agroforestry

The questionnaires completed by the participants (n=27) provided insights to the stakeholders’ view of agroforestry. Most of the definitions included terms such as mixed system, integrated biosystem, production system, ecological system, agrosystem, and diversity (Table 2). At a first glance, respondents had the perception that agroforestry combines different components within the farm, but rarely mentioned any degree of interaction among components.

Table 2. Definitions of agroforestry given by the members of the stakeholder group.

- Integration of crops, animals and trees which is economically and ecologically sustainable
- Compatibility between tree conservation and sustainable grazing
- Forest plantations on agricultural land with the objective of biomass production
- Interaction between trees and cattle on agricultural land
- Integration of trees and crops on farms
- Combined system of producing trees and crops.
- System that combines forestry, agriculture and cattle ranching
- Productive systems with integrated management of agricultural and pastoral activities
- Natural resource management methods integrated with cattle rearing and agriculture
- Land from which we try to obtain the maximum yield
- Productive and economic system that combines agriculture, forestry and cattle rearing
- A method of using the land between two lines of trees
- A way of increasing the benefits from farming
- A way using land with trees and other plants, together with crops and animals

The survey responses rarely included terms concerning nature conservation or biodiversity in the definition, though later in the specific questions these values are rated as very positive (Figure 3). Landscape aesthetics, soil conservation, climate buffering, biodiversity, carbon sequestration, water quality and climate moderation were also highly rate features of agroforestry systems. Other aspects, such as animal health and welfare, tree survival and farmer image also received very positive rates. By contrast, respondents had a more negative perception for aspects concerning the daily management and economics of the agroforestry systems. There were negative perceptions about the administrative burden, subsidy and grant eligibility, difficulties for mechanization and complexity of works.

6. Diagnosis: constraints to agroforestry adoption and management

The open discussion (focused group discussion) held in the morning of the stakeholder meeting also raised a number of concerns on management, productivity and profitability of agroforestry systems with high value trees and/or arable crops. Each participant noted on a card the two main difficulties or challenges that he/she found in the farm or from his/her expertise field. Cards were discussed one by one and grouped and sorted on a poster. The ideas were then organized in an Ishikawa Diagram (Figure 4).

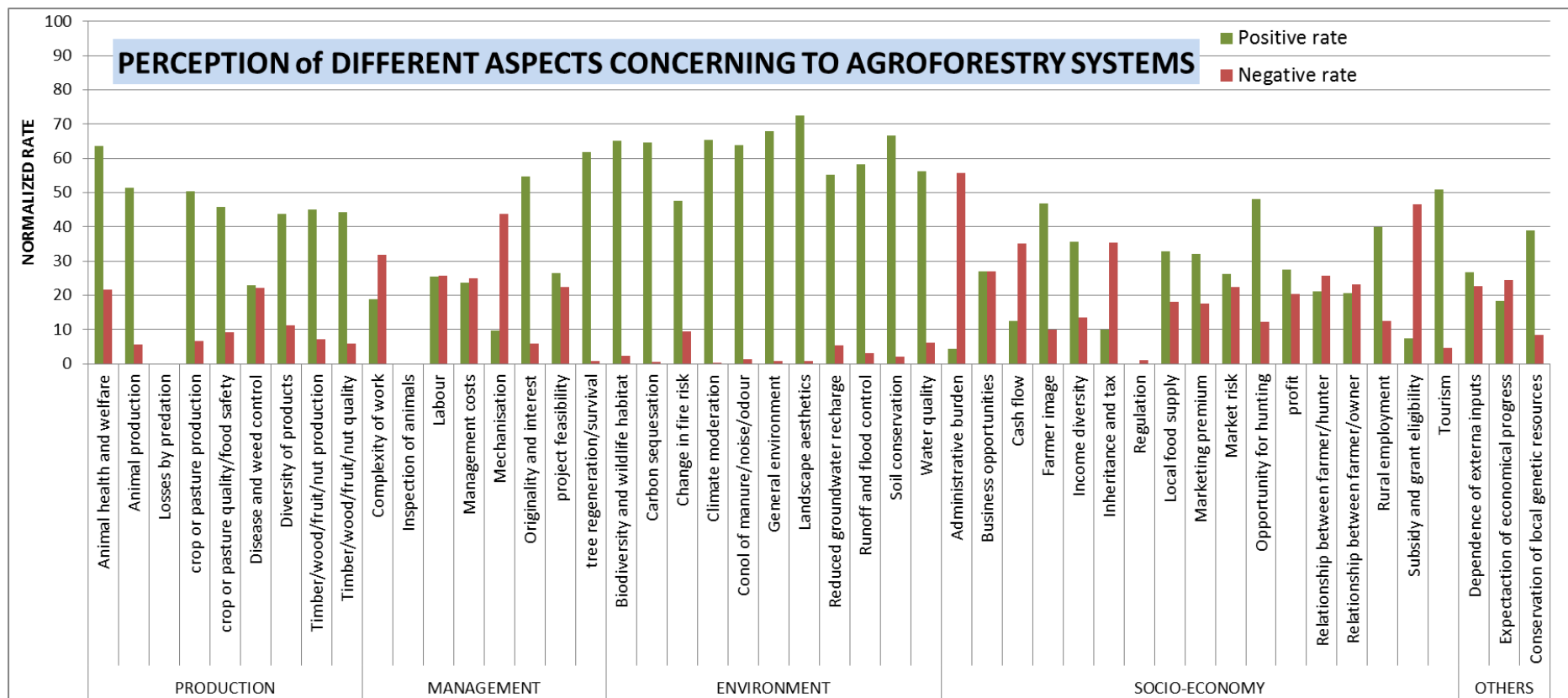


Figure 3. Positive and negative rates given by respondents (n= 78) to 48 aspects concerning agroforestry systems, grouped in 5 fields, production, management, environment, socio-economy and others. Each respondent prioritized the negative and the positive aspects (up to 5 in each case). From here a final score was computed and normalized to the scale 0-100.

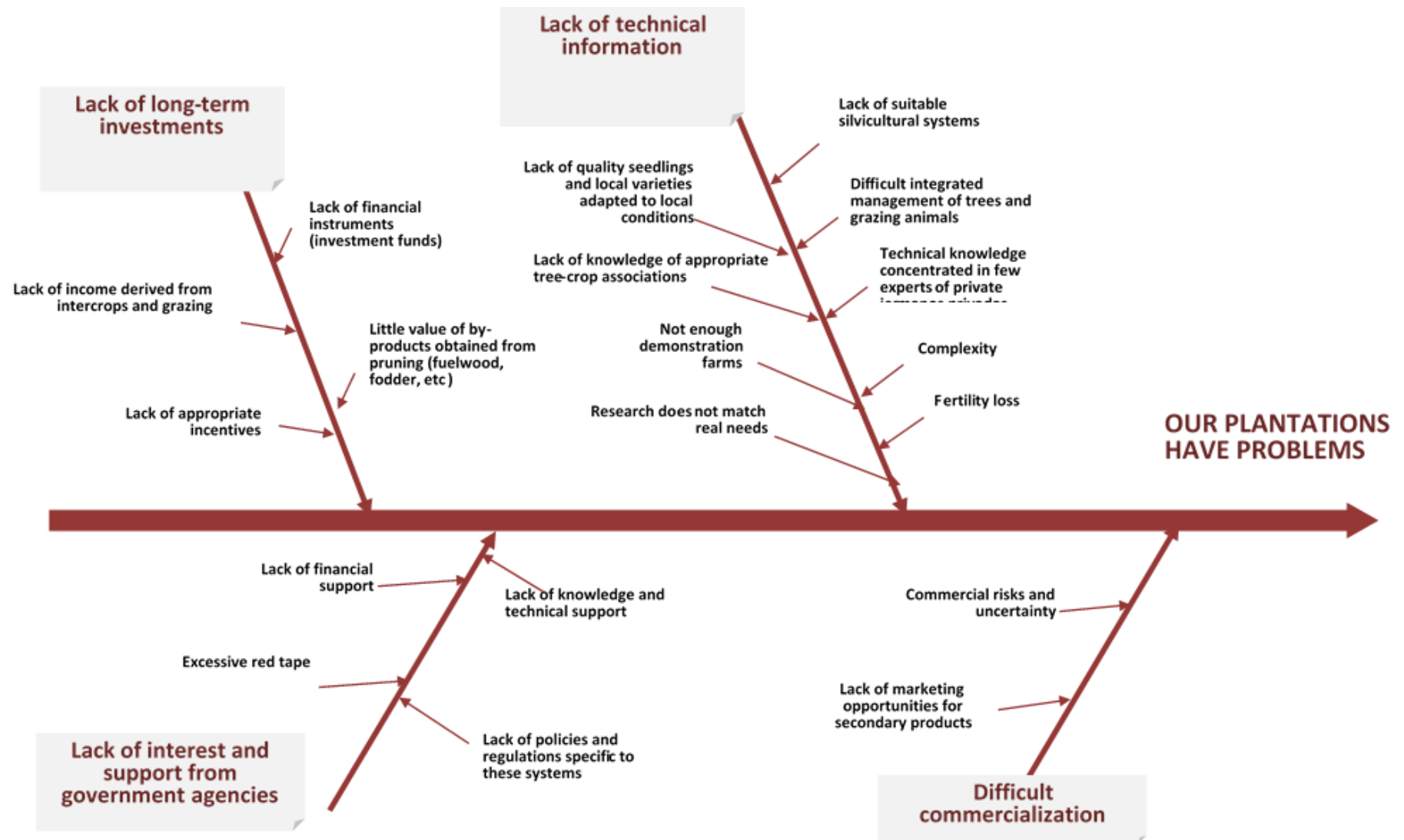


Figure 4. Fishbone or Ishikawa diagram that summarizes main constraints identified by stakeholders for Spanish agroforestry systems with high value trees

The main constraints identified by the stakeholder group for agroforestry systems based on high value trees are listed below:

- Technical problems: lack of research on management systems and on tree-crop interactions; lack of demonstration plots and of information regarding management practices appropriate for these systems.
- Pasture improvement and compatibility of trees and grazing animals.
- Tree health and decay
- Lack of interest and support from government agencies: excessive bureaucracy and red tape; lack of financial, technical and policy support.
- Lack of long-term investments: lack of financial instruments, incentives and low value of by-products e.g. small-size wood and thinning.
- Lack of interested technicians and forest managers
- Lack of marketing opportunities and risks

7. Potential innovations and improvements

Once identified and analyzed the main constraints, in the second part of the morning a brainstorming session was conducted to come up with a list of ideas and innovations to widen the opportunities for agroforestry economy and to address perceived constraints to agroforestry practices with high value trees and/or arable crops. Figure 5 depicts a conceptual map with the most repeated ideas raised by the workshop participants.



Figure 5. Conceptual “tree map” showing topics, aspects and potential innovations for improving management of agroforestry systems with high value trees, including the use of crops. Note that size of the terms shown in relation to the perception of importance.

Most participants stressed the need for studies to explore new opportunities for agroforestry systems, and expressed their willingness to collaborate with the University of Extremadura within the AGFORWARD Project. In addition, farmers claimed for support training and a platform for knowledge-sharing and dissemination of experiences and ideas, for best adapted measures to support agroforestry systems, and for grants according to the provision of public ecosystems services.

Most of the participants acknowledged the importance of ecosystems services provided by agroforestry systems, however they demanded mostly research focused to solve their daily management problems and to increase the profitability of the system.

The innovations and improvements proposed to generate benefits in the short and medium-term can be summarized as follows:

Management of agroforestry systems and their components

- To design tree plantations adapted to the intercrop and test a range of intercrops and crop rotations, fodder grasses, shrubs and mixed tree plantations.
- To study tree-crop interactions, aiming to find shade tolerant crops and fodder crops, and low-competitive combinations.
- To look for (local) tree varieties appropriate for production of high-quality timber under agroforestry conditions e.g. with manageable branching.
- To develop appropriate silvicultural models to include issues such as tree density and management intensity.
- To enhance tree root growth in order to better resist adverse environmental conditions
- Testing a range of designs and agroforestry management practices (such as adapted farm machinery, reduction of machinery use, weeds and shrubs control by grazing, and legume intercrop as fertilizer) to reduce costs and to maintain soil fertility in the long term.
- To promote the use of grazing animals for plantation management, developing dynamic models of grazing throughout the year and based on the environmental conditions.
- To test and analyze different irrigation regimes in terms of issues such as frequency, depth, and water use.
- To assess the potential of alley crops for food production as a way to adapt to climate warming.
- To assess trade-offs among components.

Improve transfer of knowledge and information

- Training of extension staff.
- Support knowledge-sharing and training activities
- Creation of a web portal as a repository of knowledge.
- To improve transfer of technology.
- The need of a public research program and a permanent school for agroforestry managers.

Support for long-term investments

- To promote new financial models that minimize investors' risks.
- To develop financial instruments for the long-term.

- To promote practices that provide annual and short-term income such as grazing, intercropping, and harvest of by-products.
- To reduce production cost through the development of new technologies.
- To value by-products, specifically small-size wood obtained from branch pruning and thinning.
- Improvements in the logistics and mechanization.

To improve the role of government agencies

- To demand more flexibility from the existing regulations (for instance, matching permits for tree management with crop management activities).
- To improve technical assistance from government agencies.
- To propose subsidies and financial support for plantations with quality timber trees.
- Full eligibility of intercropped plots for Pillar I payment.
- Public payment for ecosystem services of dehesa

To improve diversity of products and marketing

- To develop management models for the integration of different products such as wood, nuts, fruits, honey, crops, and essential oils.
- Look for opportunities for marketing two or more products including timber, fruits, and nuts.
- Enhancing the value of secondary products and by-products.
- Evaluation of ecosystem services associated to different silvopastoral systems and practices through cost-benefit analysis, what requires pricing ecosystem services such as carbon sequestration, biodiversity, water quality, and landscape aesthetics.

8. Research proposals

After producing the long list of proposals, during the afternoon debate, all together again discussed which proposals could be afforded by the AGFORWARD project and the stakeholder group. Five potential ideas were developed in the context of agroforestry based on high value trees, and there were three ideas related to agroforestry for arable systems.

For WP3 (Agroforestry based on high value trees)

1. Grazing high quality timber plantation: to study the productive and ecological consequences of managing walnut and poplar plantations with grazing compared to intensive management (tillage and chemical inputs).
2. Legumes as fertilizers: to study the culture of different fodder legumes species and varieties to reinforce the N nutrition of the trees.
3. Growth and branching attitude of walnut clones under different tree density plantation.
4. Potential of wild cherry pollarding to reduce stem cavitation during the summer drought.
5. Growth and survival of ash trees newly planted in irrigated grasslands.

For WP4 (Agroforestry for arable systems)

1. Shade-adapted cereals: selection of cereal cultivars best adapted to growth under shade conditions and assessing yields under walnuts planted for timber production.
2. Intercropped legumes: selection of legume crops and pasture species best adapted to growth under shade conditions and assessing yields under oaks and walnuts.

3. Alley cropping as adaptation to climate warming: to compare yield and physiological behavior of cereal crops cultivated in open fields and among tree lines in dry regions.

9. Conclusions

In this first phase of the project we aimed to compile a prioritized list of innovations and agroforestry practices that could help to the adoption of agroforestry for the production of high quality timber, and to create a stakeholder group to test the proposed innovations and to disseminate the results. This has been achieved thanks to the large and active participation of stakeholders in the first open meeting, to the responses to the questionnaires and to the comments back by stakeholder members to the first draft of this report.

The discussion showed that the lack of knowledge on the management practices and on the costs and benefits of agroforestry prevents wider adoption of agroforestry schemes for timber production and arable crops. To overcome these difficulties the stakeholder group identified a large list of innovations that could eventually reinforce the economic, ecological and social sustainability of agroforestry systems with high value trees and/or arable crops. Lastly up to eight areas of innovation were prioritized and proposals are being developed to test and economically evaluate them with cooperating farmers and companies.

10. Acknowledgement

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