Initial Stakeholder Meeting Report
Bocage agroforestry in Brittany, France

Work-package group 2: High Natural and Cultural Value Agroforestry
Specific group: Bocage agroforestry in Brittany, France: "Terres & Bocages" project group
Date of meeting: 26 November 2014
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Location of meeting: Plouguenast Municipality, Brittany, France
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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

2. Description of system

The hedgerow systems of Brittany in France are ancient agroforestry systems largely based on lines of high-stem and medium-stem trees. Even if the presence of hedgerows was practised in the Middle Ages (or even earlier), the main period of expansion of this agroforestry system was from the 18th Century to the end of the 19th Century. This expansion accompanied the successive cutting and redistribution of parcels linked to inheritance processes. In a landscape that was already relatively poor in terms of forests, one of the main purposes of such hedgerows was to have adequate sources of firewood and timber. From the 1950s, the process of agricultural modernization and intensification, accompanied with collective land reallocation programs, led to a general decrease in hedgerows density and a decreased importance of the role of hedgerows in farming objectives and management. In the area, agriculture has tended to evolve toward intensive milk and grain-based meat production (Figure 1).

Figure 1. Dairy cows grazing in a field bordered with a traditional hedgerow made of a line of high-stem trees on a bank, Plouguenast County, Brittany, France.

From the 1990s, successive hedge planting schemes have been implemented but these have not compensated for hedgerow losses over the same period. The objectives were to maintain the cultural landscape but also to regulate nitrate and phosphorus pollution. Since 2000, the situation varies with area. At a regional scale in 2009 (Figure 2), the highest density of hedgerows was found on land in the West-Centre Part of Brittany (shallow soils on granite and shale bedrock) while the lowest density of hedgerows was found in more fertile areas, such as the central part of Brittany, with a higher share of grain-based meat, dairy and crop production. There are also very diverse management objectives and management practices in and between farms even in the same area.

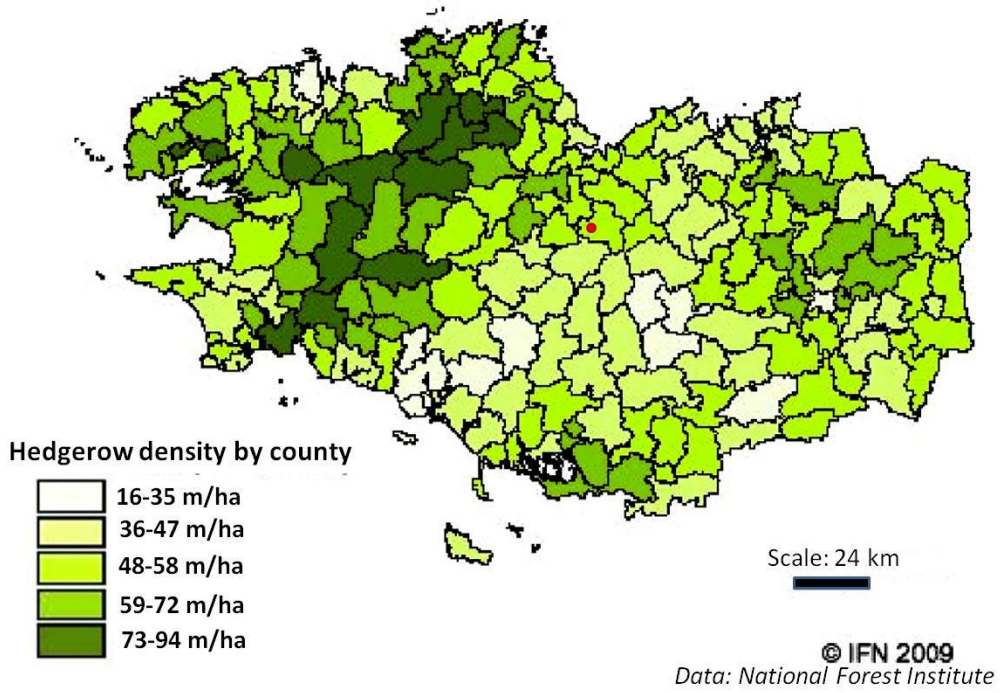

Figure 2. Brittany map of the hedgerows density by county in 2009. The red dot shows the location of meeting (Plouguenast Municipality in Plouguenast County)

3. Participants

The meeting on 26 November 2014 was organized by the "Terres & Bocages" association and two facilitators, Thierry Guéhenneuc and Cyrille Menguy, who work with the association. "Terres & Bocages" is an association "of farmers for farmers" (see for instance the video http://www.youtube.com/watch?v=oZaKQR32yuc) that was created in 2008 for maintaining and redeveloping "bocage agroforestry" ("agroforesterie bocagère") for multiple purposes including production, and enhancement the environment and local culture. The workshop was combined with the kick-off meeting of a project called "Integrating Bocage to Farming Systems: a Step toward Agroecology" which is led by Terres & Bocages and is funded by the French Ministry of Agriculture.

The meeting was attended by 42 people (plus the two facilitators and the three researchers working for AGFORWARD Project). The meeting involved 20 farmers (all members of "Terres & Bocages" Association), two technicians specialized in hedgerow management, twelve representatives of local authorities as current or potential partners of the association, and eight representatives of funding

partners (e.g. decentralized State services, and Regional Council). The stakeholders comprised seven women and 35 men.

4. Introduction session

The meeting comprised four open sessions and a last session for the general assembly of "Terres & Bocages" that solely concerned the members of the association. It started at 9.30 a.m. and finished at 16.30 before the general assembly. The questionnaires were completed over lunch and after the field visit (Figure 3).

Figure 3. i) Discussion about the challenges of developing hedgerows in the future, and ii) farmers filling the AGFORWARD questionnaire (opinion about agroforestry) after the field visit.

The first session included a steering meeting for the partners of the Terres & Bocages Association. The session reviewed the objectives and the experience of the Association since 2008. So far, the services offered by the association and facilitators included collective organization of local resources for planting such as labour, equipment, plants, and mulch or sown covers. They also provided advice and support related to the shaping of young hedgerows according to objectives and the management and use of older hedgerows. The main issue of the discussion was about the renewed interests but also constraints for "keeping the linkage between bocage and farmers". It was felt that former top-down planting schemes were insufficient; the participants' main concern was about organizational issues for promoting bottom-up innovations and synergies between the different local and regional stakeholders and the farmers of the association. To achieve this, it was proposed that the association try to build-up and disseminate a "cooperative machine and skill pool" to provide long-term support for farmers.

The second session was dedicated to a presentation of AGFORWARD. It started with existing results and experiences in bocage research (agricultural, soil, water and biodiversity topics), and then included a description of the AGFORWARD project and a proposal for its implementation in Brittany with a partnership with "Terres & Bocages". The use of the AGFORWARD questionnaires was explained. One main point of the discussion (already raised by the participants during the first session), was that optimizing hedgerow management for a single objective such as firewood or pollution control was very risky in terms of sustainability of the hedgerows (both the 100-200 year-old trees and the younger hedgerows). Instead the participants were in favor of adapting the

hedgerows installation and management in its agricultural and environmental context for multiple objectives. To achieve this, they also pointed their lack of tools to get a global vision i) of the environmental impacts of hedgerows presence and management, and ii) of the usefulness of hedgerows presence and management in farming, for instance: how biodiversity could give indicators to better work in farms?.

5. Field visit

After lunch, the participants joined a field visit to an experimental area where hedgerows were being used in a farming system and a water catchment site. The 18 ha water intake site had been bought and put back in service by the Inter-municipalities Water-Supply Association of Trévé and La Motte (near to the Plouguenast Municipality). An experimental area of hedgerow in double lines was planted in 2005 and the management of the open land (14 ha) is undertaken by a local farmer (Figure 4). Before this rehabilitation, the land was used in annual crop and grassland rotations without hedgerows. The specification for the farmers stipulates that the land shall be used in grassland, without any fertilization except from cattle grazing (which is allowed between March and October only), with possible mowing (with exportation), and punctual chemical clearing if required. The system comprises about 1 km of double-line hedgerows and 0.7 km of single-line hedgerows. The measured values at the monitoring points in the fields have shown that the concentration of nitrate in the soil has decreased from 100 mg kg^{-1} to less than 50 mg kg^{-1}.

Figure 4. View of 17 ha of the water intake site with double-lines contour hedgerows.

The first reason for planting was a proposal of the farmer in charge of the land, who considered that hedgerows would be relevant to shelter the grazing cattle from wind and inclement weather. The facilitator of “Terres & Bocages” Association proposed planting 1 km of double-lines hedgerows to protect the cattle in the most exposed part of the land and to facilitate tree growth. The contour hedgerows in double line without any bank were perceived to provide better regulation of surface and sub-surface water fluxes, than a single-line hedgerow on a bank. The hedgerows were planted in connection with other hedgerows and nearby woodlots. The final decision was to include in the double-lines hedgerows one high-stem tree (e.g. *Castanea sativa*, *Fagus sylvatica*, *Pinus sylvestris*,

Quercus pedonculata, *Quercus sessiliflora*) for every 2 or 3 medium-stem accompanying trees (e.g. *Carpinus betulus*, *Coryllus avellana*, *Acer campestre*, or trimmed *Fagus sylvatica*). This led to an overall density of about 40 high-stem trees per hectare of land. The choice of the trees density in the double line was supposed to help the growth of the high stem trees and give the opportunity to harvest timber later on. In addition the choice of tree density was supposed to help reduce the time needed for hedgerow maintenance: even if one tree is lost, others can compensate.

The facilitator of the "Terres & Bocages" Association has started working with the farmer to help the management of the hedgerows. The plan is to implement light management during the first 10 years of the hedgerow, with the logic of adapting the shape of the different trees according to their relative role (the configuration and density of plantation being the first "tool" of management). In detail, two management interventions have been conducted. The first one, 4 years after the plantation, coppiced the medium-stem accompanying trees, and the chestnut trees with inappropriate shapes. The second intervention sought to control the expansion of medium-stem trees as regards the growth of the high-stem trees. This thinning process led to a remaining density of 30 high-stem trees per hectare of land. When very few branches were cut, they were entire left within the hedgerows on the ground to contribute to habitats; when more branches were collected, they were cut to get "Ramial Chipped Wood" (RCW) and used on the same hedgerow ground or used elsewhere by other farmers for mulch and compost making. This light cutting and local use of residues for mulch and compost can be done by the farmer. The tools are saws and chainsaws; the same tools adapted on poles will be used later on. The facilitator considers that no heavy collective field work and equipment is required until 15 years after planting. This principle of progressive, light work on trees to avoid unbalanced growth supposes close monitoring by the farmer and an understanding of the relationship to farm and water catchment objectives.

Figure 5. The participants listen to the facilitator in front of the double-line hedgerows which include high-stem and medium-stem trees.

6. Ranking of positive and negative aspects of hedgerows

The participants were asked to complete a questionnaire which sought to highlight the key positive and negative aspects of hedgerow systems. A total of nine participants could fill the questionnaire during the meeting; others did not have the time for it and ask for sending the filled questionnaire later on. Among the respondents to the questionnaire, six were farmers (five in animal and crop production, one in arboriculture production), one was a hedgerow technician from a local authority, and two were facilitators and coordinators from decentralized government services. The farmers all considered they managed an agroforestry system and understood the implications of i) new planting, and/or ii) pollarding for firework, iii) shaping the hedgerows, and/or iv) shrub clearing, and/or v) making and using Ramial Chipped Wood (RCW), and/or vi) building up shelters for wild fauna.

Four participants completed the form with using the proposed ranking system: they chose ten aspects (or items) and ranked them from 1 to 10 (see Tables 4 and 5). The other five participants just selected some important aspects without ranking. Here we present the results in separate tables. Table 2 presents the response of the nine participants without the ranking system. The most positive aspects, identified by all the 9 respondents, were biodiversity and wildlife habitat, carbon sequestration, runoff and flood control, and soil conservation. All of these were selected 7 times out of 9 respondents (Table 2).

Table 2 Positive aspects (+) aspects of hedgerow system as identified by nine respondents.

Positive aspects	**Selection by 9 respondents**									**Sum**
Biodiversity and wildlife habitat	+	+		+		+	+	+	+	7
Carbon sequestration	+	+	+	+			+	+	+	7
Runoff and flood control		+	+		+	+	+	+	+	7
Soil conservation	+	+		+	+		+	+	+	7
Water quality	+		+		+		+	+	+	6
General environment	+					+	+	+	+	5
Landscape aesthetics		+	+		+		+	+		5
Animal production	+		+	+	+					4
Diversity of products	+	+			+			+		4
Farmer image	+	+			+				+	4
Animal health and welfare	+				+		+			3
Timber/wood/fruit/nut production		+						+	+	3
Originality and interest		+	+			+				3
Tree regeneration/survival		+			+			+		3
Crop or pasture production			+	+						2
Rural employment			+						+	2
Tourism			+						+	2
Timber/wood/fruit/nut quality								+		1
Project feasibility				+						1
Climate moderation				+						1
Control of manure/noise/odour								+		1
Reduced groundwater recharge					+					1
Cash flow								+		1
Relationship between farmer/hunter			+							1
Subsidy and grant eligibility				+						1

Negative aspects: the most negative issue were labour (8 times out of 9 respondents), management cost (6 times out of 9 respondents), followed by cash flow and regulation (5 times out of 9 respondents) (Table 2).

Table 2 Negative aspects (-) aspects of hedgerow system as identified by 9 respondents.

Negative aspects	**Selection by 9 respondents**									**Sum**
Labour	-	-		-	-	-	-	-	-	8
Management costs		-	-		-	-	-	-		6
Comple-ity of work			-		-		-	-	-	5
Cash flow	-		-		-	-		-		5
Regulation		-		-	-	-		-		5
Income diversity								-		4
Mechanisation					-	-	-			3
Administrative burden					-	-		-		3
Losses by predation								-	-	2
Change in fire risk					-	-				2
Diversity of products			-							1
Inspection of animals					-					1
Project feasibility								-		1
Business opportunities								-		1
Profit								-		1
Subsidy and grant eligibility					-					1

Tables 3 and 4 provides the ranking of the positive and negative aspects of agroforestry for four respondents.

Table 3. Positive aspects of hedgerow system as ranked by four respondents

Aspect	Ranking by 4 respondents			
Soil conservation	2		1	8
Animal production		1	4	
Landscape aesthetics	1	4		
General environment				1
Biodiversity and wildlife habitat	6		7	2
Originality and interest	8	2		
Climate moderation			2	
Carbon sequestration	5	3	6	3
Farmer image	3			7
Crop or pasture production		8	3	
Runoff and flood control	4	5		4
Project feasibility			5	
Relationship between farmer/hunter		6		
Water quality		9		6
Tourism		7		9
Tree regeneration/survival	7			
Subsidy and grant eligibility			8	
Rural employment		10		8
Timber/wood/fruit/nut production	9			10
Diversity of products	10			

Table 4. Negative aspects of hedgerow system as ranked by four respondents

Aspect	Ranking by 4 respondents			
Labour	3	1		1
Management costs		3	1	
Regulation		2		2
Cash flow	2		4	
Diversity of products			2	
Comple-ity of work			3	

7. Potential innovations

From the first sessions in the meeting room and the field visit, three broad areas of innovation were identified based on the experience of the association (Table 5).

Table 5. Potential innovations based on the experience of Terres & Bocages.

Area	Some examples identified from the experience of the association
Individual technical innovations:	• Use of a forest plough to facilitate the bank making if required. • Use of different local mulch, sown cover, or Ramial Chipped Wood (RCW) for covering the ground under the trees • Choice of the number of lines and density of trees to get both shelterbelt and timber functions in the same hedgerow.
Systemic technical innovations	• Developing a model of hedgerow to fit multi-purpose objectives, and to be adapted to the agricultural and environmental context, with continuous management by farmers. This adaptive approach considers both: the installation sequence, the shaping and maintenance, the type of ground and vegetation structure, mixing of species and of trees of high and medium stems, number of lines, connections between hedgerows, use of the residues, etc.
Organizational innovation	• Building-up a principle for a cooperative machine and skill pool.

The members of Terres & Bocages Association and the participants at the meeting indicated that were interested to work with the Brittany research team of AGFORWARD. The main research topics will be about the evaluation of such hedgerows agroforestry systems and innovations in terms of ecosystem services, and sustainability in farms.

8. References

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9. Acknowledgements

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