Research and Development Protocol for Agroforestry for Free-Range Pig Production in Veneto Region, Italy

Project name	AGFORWARD (613520)
Work-package	5: Agroforestry for Livestock farmers
Specific group	Agroforestry for free-range pig production systems in Veneto Region (Italy)
Milestone	Milestone 22 (5.3) Part of experimental protocol for WP5
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Contents

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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 contributes to the second objective. It contributes to the initial research and development protocol (Milestone 22 (5.3)) for the participative research and development network focused on the use of agroforestry in free-range pig production systems.

2 Background

Integration of trees with crops and/or livestock production (agroforestry) has been identified as a sustainable way to increase the productivity of land and additional ecosystem services compared to disaggregated agricultural and woodland systems. Compared to conventional livestock production, it is expected to improve animal welfare, because the crops provide the pigs a more natural and stimuli-rich environment with good possibilities for shadow seeking in hot seasons as well as shelter in cold seasons (Horsted *et al*., 2012; Kongsted, 2014).

Agroforestry for livestock production is still very rare in Veneto Region in north east Italy, which is dominated by conventional crop and animal production. Agroforestry has started to become relatively common in organic free-range egg production and is presumed to have high potential for development with increasing demand. Similar systems, but related to the use of existing trees are found in organic goat farming in low Alpine areas. On the other hand free-range pork production in Veneto Region, as well in other Italian regions, is very limited. However interesting examples exist in central and southern regions (such as Tuscany, Calabria, and Sardinia) where the presence of local pig breeds are used in less intensive agriculture, marginal land and traditional woodland-grazing areas. This "*Mediterranean pigs production system*" with a local "black breed" is more similar to the traditional Spanish "*iberico-dehesa*" than the free range system with selected commercial "white pigs" hybrids of central-north Europe.

In Veneto Region free-range pork production is very limited (about 20-25 farms of which a quarter are organic). Nonetheless, the number of small farms interested in this production is increasing, due to the good market trend for traditional home-made processed salami (Bondesan, 2012). Even if those farmers have not implemented well-designed agroforestry with their free-range pigs, they acknowledge (Bondesan, 2014) that trees are important for assuring better welfare, by reducing discomfort during hot weather (from May to October), providing more natural and rich stimuli environment, and possibly reducing nutrient leaching to ground water. Existing systems are commonly of two types: poplar plantations (mainly commercial clones, in rows along the border of

ranging areas) or mix of tree and shrub species (such as poplar, willows, black locust, and hornbeam) which have naturally grown or have been planted mainly in low mountain areas.

One of the major concerns of producers, highlighted during the stakeholder workshop (Bondersan, 2014) was the damage caused by pigs such as rooting, biting and dragging to the trees, especially in new plantations. This problem requires specific protection (electric or barbed wire fence, individual shelter) or restrictions on using the area until the trees are well developed. Against this background, two activities will be implemented:

1- synthesizing knowledge of best practices used;
2- testing the effectiveness of different protection shelter on young trees.

3 Synthesise existing knowledge of 'best practices'

3.1 Objective

The objective is to identify and communicate 'best practices' in order to design and manage agroforestry for free-range pig production. Guidelines on integrating trees and/or shrubs in free-range pig production systems will be produced, e.g. with regards to tree species, tree density, animal density and design of the system.

3.2 Materials and methods

Data, information and experience gathered at commercial farms and research plots will be combined with theoretical knowledge. Three steps will be carried out as shown in Table 1.

Table 1. Collection of data, information and experience

Step	Activity	Time
Literature review	Literature from Italy and abroad will be reviewed. Existing knowledge will be analysed and discussed.	Until May 2016
Interviews	Interviews of pork producers, consultants and forestry/organic experts will be carried out	Jan-April 2016
WP5 skype meeting	Meeting with project partners from USC and AU	May 2016
WP5 workshop	Workshop with project partners from USC and AU to compile collected knowledge from Italy, Denmark and Spain	May 2016 (General Assembly)
Publication	Producing joint report	August 2016

4 Trees protection demonstration

4.1 Objective and hypothesis

Hypothesis: integrated production of free-range pigs and trees will improve animal welfare and reduce risk of nutrient leaching with an adequate number of trees per ranging area.

The objective of this demonstration is to test different type of tree protections, by evaluating effectiveness (reducing damages) considering technical and economical sustainability for farming.

4.2 Materials and methods

Different types of trees protection will be used to avoid damage caused by pigs in integrated free-range production system. A demonstrative activity will be carried out in Veneto Agricoltura Sasse-Rami pilot farm (Ceregnano-Rovigo, Veneto Region, Italy) from March 2015 to December 2016 (Figure 1; Table 2).

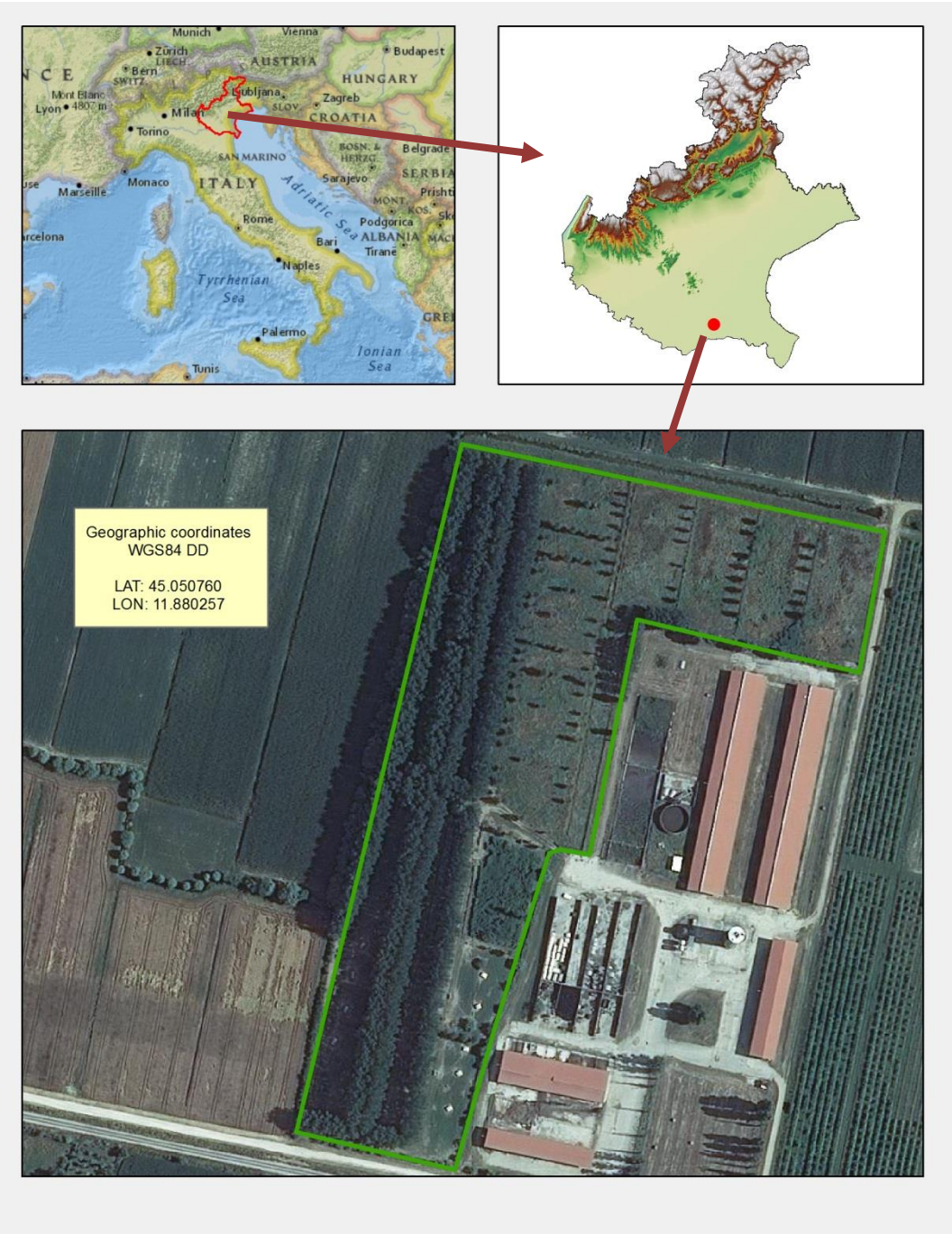

Figure 1. View of free-range integrated organic pig production unit at Sasse-Rami pilot farm (green bordered) with different type of trees density, spatial distribution and species.

Table 2. Description of the site, soil, tree, livestock, and climate characteristics.

Site characteristics	
Area (ha): Co-ordinates: Site contact e-mail address	3.5 45.050760° N; 11.880257° E valerio.bondesan@venetoagricoltura.org info@venetoagricoltura.org

Soil characteristics	
Soil type (WRB classification) Soil depth (cm) Soil texture (sand%, silt%, clay%)	Endogleyic Cambisol (Calcaric, Hypereutric, Episiltic) 150-170 (potential root exploration layer) 28 – 51 – 21 (average; significant values might occur between near ranging areas, due to alluvial origin)

Tree and understorey characteristics	
Treatment 1	High density (3 m x 1.5 m) poplar (*Populus* spp.) (planted Spring 2014)
Treatment 2	High density mixed species of poplar, willow and mulberry (planted Spring 2014)
Treatment 3	Low density poplar (planted 2008)
Treatment 4	Poplar (planted 2004) in rows bordering the ranging areas

Livestock characteristics	
Livestock species and breed	Pig: commercial hybrid PIC-gilts and Goland C21-boars

Climate data *	
Mean monthly temperature Mean annual precipitation Details of weather station	14.8°C 826 mm An on-site weather station records air temperature (2 m above the soil), rainfall, relative humidity, wind speed, wind direction and sun radiation.

* average of last 3 years

The pig unit typically consists of 15-17 sows and 2 boars (commercial hybrid PIC and Goland C21). The piglets are normally sold at a weight of 35-40 kg to organic farms for heavy pig production. Only a small number of piglets (20-30 per year) are fattened on the unit for experimental reasons. According to organic regulation, none of the pigs are nose ringed.

The demonstration will include eight different ranging areas used for sows and growing pigs (from 40 to 180 kg):

- 2 areas with new plantation (spring 2014) of high density poplar, (3 m between rows and 1.5 m between trees on the row);
- 2 areas with new plantation (spring 2014) of high density mix species (poplar, willow, mulberry);
- 2 areas with 6 year-old plantation of poplar (low density);
- 2 areas with 10 year-old plantation of poplar (in rows bordering the areas).

Different types of shelters (available on the market or other on farm produced solutions) will be used to protect the trees from damage by pigs, according to the indications and experience of stakeholders who agreed to be involved in this activity (Figure 3).

Figure 2. Treatment 3: 6-year-old low density poplar in the ranging area

Figure 3. Examples of the tree protection being tested

During the two years of activity, a series of data will be recorded (Table 3).

Table 3. List of measurements

Variable	Measurements
Shelter characteristics	Material characteristics, resistance, and labor required to install it will be recorded for each type of shelter.
Trees and crop damages	Visual evaluation of crop damage (trees and grass sward) will be carried out regularly
Animal behaviour and welfare	Behavioural observations of sows, piglets and fattening pigs (such as biting off, rooting, chewing plant materials, general activity, resting, exploration, interaction with the shelter, etc.) will be recorded regularly. Clinical observations and general health condition of pigs
Trees biomass growth	Stem growth: estimated by stem diameter changes on selected trees
Climate	Local weather (including air temperature and precipitation, etc.) will be automatically recorded daily at an adjacent meteorological station (by ARPAV-regional weather and environment agency)

5 Acknowledgements

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6 References

Bondesan, V. (2012). L'allevamento biologico dei suini all'aperto: qualità della carne e dei salumi Report attività Progetto Biodemo-Bioveneto (Eds. Veneto Agricoltura, Padova -I)

Bondesan, V. (2014). Free-range Pigs with Energy Crops in Veneto. Veneto Agricultura, Italy. http://www.agforward.eu/index.php/en/free-range-pigs-with-energy-crops-italy.html

Horsted, K., Kongsted, AG, Jørgensen, U., Sørensen, J. (2012). Combined production of free-range pigs and energy crops – animal behavior and crop damages. Livestock Science 150: 200-208.

Kongsted, A.G. (2014). Free-range pigs integrated with energy crops. Aarhus University, DK. http://www.agforward.eu/index.php/en/agroforestry-for-organic-poultry-and-pig-production-in-denmark-583.html