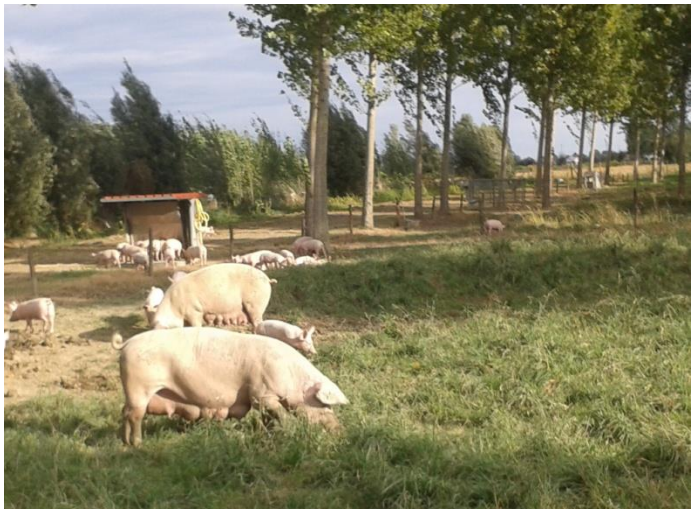


System Report: Agroforestry for Free-Range Pig Production in Veneto Region, Italy

Project name	AGFORWARD (613520)
Work-package	5: Agroforestry for Livestock farmers
Specific group	Agroforestry for free-range pig production in Veneto Region (Italy)
Deliverable	Contribution to Deliverable 5.13 (5.1): Detailed system description of a case study system
Date of report	15 December 2015
Author	Valerio Bondesan, Veneto Agriculture, Division of Research and Agro-Forestry Management, Agripolis, Legnaro (35020 - Padova, Italy)
Contact	valerio.bondesan@venetoagricoltura.org
Approved	John Hermansen (20 January 2016) Paul Burgess (10 April 2016)

Contents

AGFORWARD (Grant Agreement N° 613520) is co-funded by the European Commission, Directorate General for Research & Innovation, within the 7th Framework Programme of RTD. The views and opinions expressed in this report are purely those of the writers and may not in any circumstances be regarded as stating an official position of the European Commission.

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 Objective 2, Deliverable 5.13: "Detailed system description of case study agroforestry systems". The detailed system description includes the key inputs, flows, and outputs of the key ecosystem services of the studied system. It covers the agro-ecology of the site (climate, soil), the components (tree species, crop system, livestock, management system) and key ecosystem services (provisioning, regulating and cultural) and the associated economic values. The data included in this report will also inform the modeling activities which help to address Objective 3.

2 Background

The stakeholder workshop held in Veneto within work-package 5 and further direct contacts with farmers (Bondesan 2014) provide a brief description and background data on free-range pig production systems used in Veneto region (north east of Italy) both with organic and conventional methods. The subsequent research and development protocol (Bondesan, 2015) describes selected demonstration plans.

Integration of trees with crops or livestock production (agroforestry), which were more common 50-60 years ago in the rural areas of Veneto Region, has been rapidly abandoned under the pressure of mechanization and the intensification of agriculture. Crop monocultures, large livestock units and integrated vertical production chains are key features of "*modern agriculture*". These systems have increased productivity, reduced production costs and improved farmers' income. However, negative effects of decades of intensification such as water pollution from nutrient leaching (from organic or mineral fertilizers), increase in the amount of pesticides used, increased weed and pest resistance, reduction of biodiversity, and increase of soil erosion have become more evident. Large-scale livestock units concentrated within the same area can have negative impacts on the environment, can reduce animal welfare, can increase the risk of disease spread (especially for viruses) and the use of veterinary-drugs such as antibiotics which can stimulate new resistant strains. More recently agroforestry seems to have been re-discovered and is being promoted as a more sustainable way to provide ecosystem services, environmental benefits, as well as good level of productivity in temperate regions (Smith et al. 2012).

In the Veneto Region, pig farms, as other livestock productions, are very specialized and vertically integrated intensive systems (e.g. farms with sows-piglets-, fattening units, feed company and abattoirs) and large sized units. The farms are often concentrated in flat areas where crop production is possible (e.g. corn for feed production).

Extensive systems, such as free-range pig production, were re-introduced in the last 10-15 years, often linked with organic methods. These small size and multiproduct farms (estimated number is 20-25, of which about a third are organic (according to the main official control bodies for organic farming) and produce heavy pigs (180-250 kg live weight) mainly for on-farm traditional salami production.

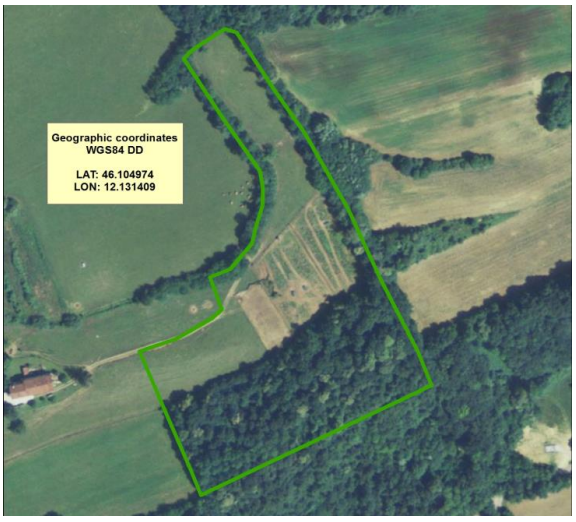
The majority of these farms do not implement specific agroforestry practices but they use the available marginal areas with spontaneous trees and bushes. Others have planted trees (e.g. willow, poplar, black locust, and oak) in row edges outside free-range paddocks to protect trees from pigs (scratching, biting cork and rooting). It is common knowledge among farmers that trees and bushes effectively contributed improved pig welfare, especially during hot summer weather and they could prevent nutrient leaching due to the deep root system. However, few farms have established agroforestry with energy crops in free-range areas. At the moment the great interest for energy crops (woodchip) is discouraged by the inconsistency of local wood-chain in arable areas, with high cost of harvesting-chopping and delivery of final products.

As described in the report of the workshop with the stakeholders (Bondesan 2014), protecting young trees from pig damage, estimating biomass yield for wood-chip production and evaluating the benefits of agroforestry systems (such as better quality of meat from free-range fatted pigs) are the main drivers for the implementation of the system.

3 Update on field measurements

The demonstrative activities described in the research and development protocol (Bondesan, 2015) began in April 2015, and will continue until October 2017, at the free-range organic pig production unit at Sasse-Rami experimental farm (Ceregnano, Rovigo) with sow groups for piglet production and fattening. In addition, others demonstrative actions, only with growing-fattening pigs, will take place at Villiago organic experimental farm in the mountain area (Sedico, Belluno). Outdoor free-range growing-fattening pigs will run in the low mountain area from March to December depending on weather conditions.

Figures 1 and 2. Sasse-Rami experimental farm: view of free-range organic pig production unit (left) and one paddock for pregnant sows, bordered with poplar trees (right).



Figures 3 and 4. Villiago experimental farm: view of free-range paddocks with trees-shrubs area (left) and growing pigs on pasture (right).

4 Description of system

Table 1 provides a general description of the agroforestry systems for free-range pig production in Veneto area (north-east of Italy). The description of case study systems is provided in Table 2a and 2b.

Table 1. General description of the agroforestry system for free-range pig production system

General description of system	
Name of group	Agroforestry for free-range pig production in Veneto
Contact	Valerio Bondesan
Work-package	5: Agroforestry for livestock farmers
Geographical extent	Agroforestry systems for small organic and conventional free-range pig production were found on five farms in Veneto area (three in the plain and two in low mountain areas). A few more farms located in low mountain valleys are using a mix of spontaneous trees-bushes areas and permanent meadow as free-range paddocks.
Estimated area	Farms with free-range pig production in Veneto covers a very small area, of approximately 120-140 ha of which about half are organic. The main production is fattening heavy pig and only few farms raise a small group of sows for piglets.
Typical soil types	Varied
Description	Free range pig production characteristics in Veneto area. Sows (pregnant and lactating) are kept outside in electrical fenced paddocks the whole year; sometimes also fixed net-fences are needed to prevent contacts with wild boars. Pigs have access to huts (made of fibreglass or wood), placed directly on the ground and supplied with straw or other bedding materials. Normally no heating is provided during winter for piglets. Sows are kept in a group (with one boar for natural insemination) and assigned to single paddock 2-3 weeks before farrowing; piglets are weaned at 7-9 weeks of age. However, some farms with small herds, also keep lactating

	sows in dynamic groups, so that piglets stay within the mother for more time (weaned at 10-11 weeks). Water and feed delivery is provided by pipeline or tractor; feed is distributed daily for pregnant group or 2-3 times a week in lactating sows by using specific *ad libitum* hopper. Growing-fattening phases of heavy pigs, is mainly concentrated between March and December (9-10 months); the number of pigs per group is variable (from 12-14 to 25 or more) and sometimes they have different starting weight (40 to 70 kg). Also slaughter live weight change from one farm to another (from 180 to 250 kg or more) depending on the final products (different type of fermented salami). Pigs are normally restricted and fed daily; the majority of farms use on farm made mix of cereals (mainly corn and barley), bran and legumes (soybeans cake, peas, etc.) integrated with vitamin-minerals. Paddocks are normally used for two years (in the case of sows) and cultivated for one or two, before pigs return on same field. Fattening fields are used in different ways and with several rotation methods (pigs-crops) according to the number of months used per year, crops or cultivation techniques on pasture during winter months. Usually, fields are used for 2-3 years (for 8-9 months each year) and cultivated with cereals for two years before returning with pigs. In a different system pigs stay in the field from May to November and crops (barley or mixed barley and peas) are cultivated for the other part of the year. This system require a specific type of soil (preferable sandy) and a good farming organization for seeding-harvesting crops in a short range of time. The stocking rate depends on production method (conventional or organic) and on specific vulnerability level area towards nitrates (maximum 170 kg of N ha^{-1} from manure per year). Common stocking densities for sows are between 7 and 10 per ha, whereas number of growing pigs vary from 13-17 (organic) to 20-25 animals per ha (conventional, not in vulnerable areas).
Tree species	Mainly poplar (but also willow and back locust) in the plain areas. Hornbeam, chestnut, black locust , maple, and oak in low mountain areas
Tree products	Trees are harvested to produce wood: first or second quality poplar, packaging components and woodchips for energy use (sometime utilized within the farm as bedding-rooting material for pigpens).
Crop species	In the plain areas, winter cereals (barley, triticale with peas) and corn, sorghum in spring-summer cultivation. In mountain pasture with a mix of grass species.
Crop products	Barley, triticale or mix with peas are partially harvested (early stage as silage in balls, late stage as grains or grazed by sows). Summer cereals are normally harvested for grains (on-farm used as feed for pigs).
Animal species	Pigs
Animal products	Pork meat and different types of fermented “salami”
Other provisioning services	Possibility of using trees leaves as fodder.
Regulating services	The trees and bush edges can provide shade during hot summers as well as providing protection from wind in autumn-winter months. Trees and bushes can reduce the risk of nutrient leaching from dung and

	urine in free range pigs. The trees will increase carbon storage.
Habitat services and biodiversity	In the plain, agroforestry systems with free-range pig production, could increase biodiversity and have a positive effect on wildlife. Free range pig production using pasturage and tree-shrubs areas in low mountain valley (between 400-800 m asl) could utilize marginal or less productive meadows and prevent the abandon of agriculture activities in these areas (by offering different income source to farmers). However more investigations are needed to find out medium to long-term effects of pigs rooting and biting on the soil biodiversity, nutrients accumulation and leaching and trees renovation.
Key references	See the end of report

Table 2a. Description of the specific case study system (outdoor free-range sows and growing pigs)

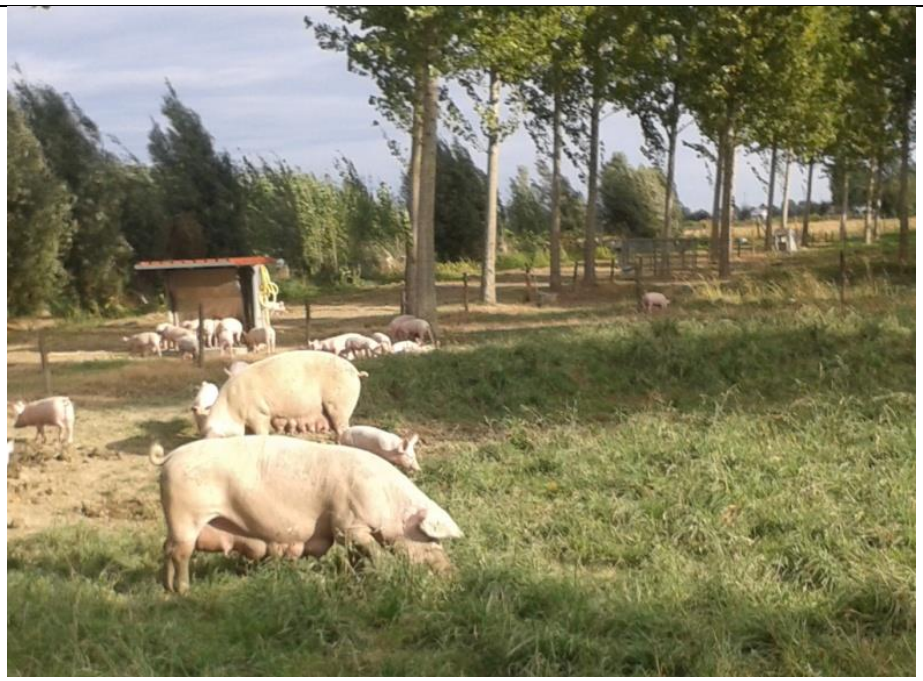
Specific description of site	
Area	The case study includes 3.5 ha, divided in eight main areas with different type of trees density and species (each area comprises different paddocks for sows or growing pigs).
Address and coordinates	Veneto Agricoltura Azienda Sasse-Rami, Via G. Verdi, 876 45010 Ceregnano – Rovigo (Italy) 45.050760° N; 11.880257° E
Site contact	Valerio Bondesan
Site contact email	valerio.bondesan@venetoagricoltura.org
Example photographs	 Figure 5. Sows grazing in a farrowing paddock bordered with poplar trees (low density, planted in 2008); specific hopper for piglets feeding outside the fence (left).

Figure 6. Paddock for a group of pregnant sows, bordered with poplars and willows (plated in 2004); trees are outside the fence to protect them from sows biting.

Figure 7. Group of growing pigs (June 2015) in a paddock with high density poplar, planted in spring 2014) to test different types of shelters (see the circle)

<table>
<tr><td></td><td> 
Figure 8. Different types of protection-shelters tested</td></tr>
<tr><td>Map of system</td><td> 

Figure 9. Free range areas: colors and letters indicated different type of plantations (trees, density-spacing, age, etc.).
A1 and A2: high density poplars planted in spring 2014;
B1 and B2: high density willows, poplars, black locust, planted in spring 2014;
C1 an C2: row edges of poplars bordering the paddocks (planted in 2004);
D1 and D2: low density poplars within the paddocks (planted in 2008);
E: low density poplars (plated in 2008).</td></tr>
<tr><td colspan="2">Possible modeling scenarios</td></tr>
<tr><td>Comparison</td><td>Technical analysis of different shelters for trees protection in new as well developed plantations, and effects of different stocking rate (growing pigs) on trees (damage and plant development).</td></tr>
<tr><td colspan="2">Climate characteristics (average of last five years)</td></tr>
<tr><td>Mean monthly temperature</td><td>Mean monthly temperature is 13.7°C</td></tr>
</table>

<table>
<tr><td>Mean monthly precipitation</td><td>Mean monthly precipitation is 60.5 mm.</td></tr>
<tr><td>Details of weather station (and data)</td><td>Weather station (ARPAV) located approximately 3 km from the farm; data are available on web at: http://www.arpa.veneto.it/bollettini/storico/Mappa_2015_PREC.htm?t=RO</td></tr>
<tr><td colspan="2">Soil type</td></tr>
<tr><td>Soil type</td><td>Endogleyic Cambisol (Calcaric, Hypereutric, Episiltic)</td></tr>
<tr><td>Soil depth</td><td>150 cm (potential root exploration layer)</td></tr>
<tr><td>Soil texture</td><td>28 – 51 – 21 % of sand-silt-clay (average; significant values might occur between near ranging areas, due to alluvial origin)</td></tr>
<tr><td colspan="2">Tree characteristics</td></tr>
<tr><td>Species and variety</td><td>Varied (see Figure 9)</td></tr>
<tr><td>Date of planting and intra-inter row spacing</td><td>
<table>
<tr><th>Areas (see Figure 9)</th><th>A1-A2</th><th>B1-B2</th><th>C1-C2</th><th>D1-D2</th><th>E</th></tr>
<tr><td>Date of planting</td><td>2014</td><td>2014</td><td>2004</td><td>2008</td><td>2008</td></tr>
<tr><td>Intra rows spacing</td><td>3</td><td>1.5-3.0</td><td>24</td><td>20</td><td>40</td></tr>
<tr><td>Inter row spacing</td><td>1.5</td><td>1</td><td>3</td><td>8</td><td>4</td></tr>
<tr><td>Rotation (years to harvest)</td><td>3</td><td>3-4</td><td>10-12</td><td>10-12</td><td>10-12</td></tr>
</table>
</td></tr>
<tr><td>Tree protection</td><td>Poplar in rows outside the paddock are protected by electrical fence (only piglets could interact with them).
For trees inside the paddocks, different types of shelters are tested.</td></tr>
<tr><td>Typical increase in tree biomass</td><td>To be evaluated</td></tr>
<tr><td colspan="2">Crop/understorey characteristics</td></tr>
<tr><td>Species</td><td>Mix grass species and cereals (barley and triticale, or sorghum for spring-summer seeding)</td></tr>
<tr><td>Management</td><td>Paddock are used for two years (not continually, depending on sward deterioration) and rest for one.
In the low density plantations in the year of rest, winter or spring-summer cereals are sown.
In the high density plantation paddocks mix of grass species (including Lolium perenne, Lolium Italicum, Dactylis glomerata, Festuca arudeinacea, and Poa pratensis) sown in autumn.</td></tr>
<tr><td>Grassland and crops yield</td><td>Varied; average may be 4000-6000 kg per hectare.</td></tr>
<tr><td colspan="2">Fertilizer, pesticide, machinery and labor management</td></tr>
<tr><td>Fertilizers</td><td>None (except manure from the free-range pigs)</td></tr>
<tr><td>Pesticides</td><td>None (organic production)</td></tr>
<tr><td>Machinery</td><td>Feed is provided by tractor and water by pipeline</td></tr>
<tr><td>Manure handling</td><td>Not necessary in the field except for bedding spread when huts are moved from one paddock to another</td></tr>
<tr><td>Labor</td><td>The sows (pregnant and lactating) are fed-checked once daily.
Growing and fattening groups are checked every day and fed once daily (ad libitum for growing pigs between 35 to 80 kg live weight, and restricted until</td></tr>
</table>

	slaughter, at 180-200 kg).
Fencing	External fixed net fence and with iron wire between paddocks
Livestock management	
Species and breed	Pigs. A commercial crossbred multi lines hybrid (Large White-Landrace and Duroc: sows PIC Camborough and boar Goland C21); genetic line of boars for heavy pig production are tested and approved (Italian PDO typical dray cured ham and processed salami).
Description of livestock system	Pregnant and lactating sows are outdoor all year round on pasture (grass or winter cereals) in group of 8-10 (pregnant) and 3-4 (farrowing). The group of sows moved into farrowing paddock about 2-3 weeks before farrow in individual hut, in which they remain for 7-9 weeks (long lactating time for more natural weaning of piglets). The same paddock is used twice per year; after 2 years it has a resting time of one year; during this time is cultivated with winter (barley) or summer (mix of different varieties of sorghum) crops. Male piglets castration is made previous anesthesia-analgesia within the first week of age. Weaned piglets (average age of 55 days) are grouped, controlled and marked (a tattoo with specific code is placed on both thighs); after post weaning period (40-50 days) large part of growing pigs are sold to organic farms for fattening; others are fattened within the unit. Growing and fattening groups (average of 12-15 pigs each) are assigned to paddocks of 0.8 ha divided in 2 areas used in rotation (in/out every 30-40 days). None of the pigs are nose ringed; that assures better welfare, however, it allows pigs to root deeply into soil and make more damages on sward-crop.
Period of demonstrative actions	April 2015 to October 2017
Stocking density	For sows, stocking density is about 6 animals/ha. For grooving and fattening pigs, stocking density is between 12 to 20 animals/ha, on yearly basis.
Animal health and welfare issues	The free-range system is generally characterized by a higher piglet mortality compared to indoor systems, especially during cold and rainy months. During the summer, potential issues include sunburn and heat stress. Severe sunburn could induce spontaneous abortion in sows and summer infertility in boars. During winter months freezing temperature could reduce watering availability and warm water supplementation is needed to prevent pigs thirsty. Outdoor free range could increase intestinal worm contamination of pigs; Analysis of dung (to guide vet therapy) and correct rotation of paddocks (may increasing resting period over years) are essential to minimize these problems.
Requirement for supplementary feed	The farrowing sows are fed *ad libitum* with a commercial organic concentrate; pregnant sows are restricted (2.5 kg of concentrated in warm season and 3.5-4 kg during winter). Post weaned piglets and growing pigs are fed *ad libitum*; fattening pigs are restricted.

	Crops and grass constitute only a small proportion of total nutrient intakes.
Technical data, livestock	
Production volume	Unit accounted 16-18 sows and 2 boars, for an average production of 240-280 piglets (of which about 200 are sold as growing pigs and the other part as heavy fattened pigs).
Litter performance	*Per litter (average)* Live- and dead born piglets: 10.8 and 0.7 Weaned piglets: 9.1 Total piglet mortality: 22 % Weaned piglets: 122 kg
Feed consumption	2,540 kg concentrate per sow per year (including litter piglets starter concentrate before weaning)
Financial and economic characteristics	
Costs	To be calculated further (2016), while part of poplar (10 and 12 year cycle) will be harvested and processed.

Table 3b. Description of the specific case study system (outdoor free-range growing pigs in mountain area)

Specific description of site	
Area	The case study includes 2.5 ha, divided in 2 areas with part of meadow (about 60-70%) and trees-shrubs area (30-40%), utilized for growing-fattening organic free-range pigs.
Address and coordinates	Veneto Agricoltura Azienda Villiago, Via Villiago 5, Sedico -Belluno (Italy) 46.104974° N; 12.131409° E
Site contact	Valerio Bondesan
Site contact email	valerio.bondesan@venetoagricoltura.org
Example photographs	 Figure 10. Area for growing-fattening pigs in low mountain valley (450 m. asl); approximately 60% permanent meadow and 40% trees-shrubs, used 8-9 months/year (usually April-December).

Figures 11 and 12. Group of growing pigs in the meadow and in the tree-shrub-bushes part of paddock.

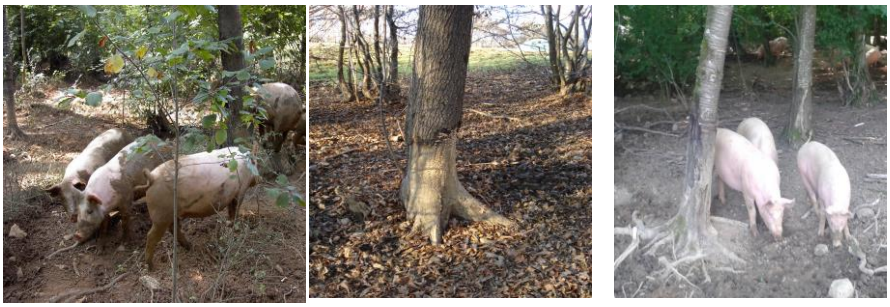


Figure 13 . Deep rooting and biting bark may cause serious damage to the trees.

Map of system

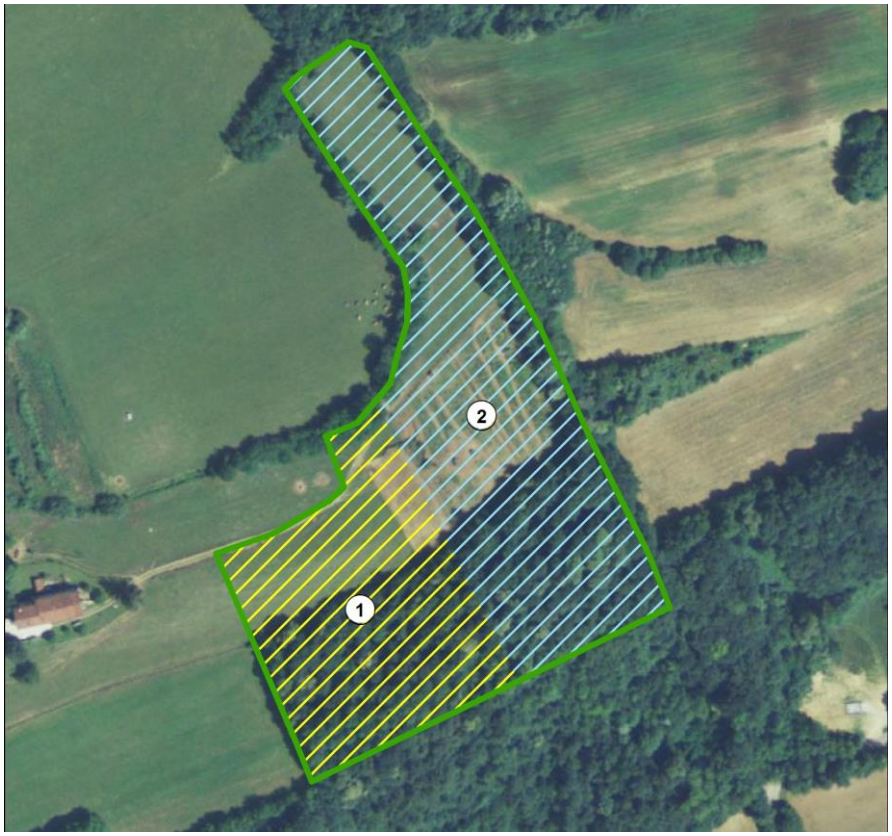


Figure 14. Free range areas (1 and 2) used alternatively for growing and fattening pigs

Possible modeling scenarios	
Comparison	Demonstration activities for farmers in low mountain area who intend to implement agroforestry system with marginal meadows and bush fields for free range organic pork production. Managing systems, interactions between pigs and trees (type of damages) meadow deterioration, performance and carcass quality are monitored.
Climate characteristics	
Mean monthly temperature	Mean monthly temperature is 11.2 °C

Mean monthly precipitation	Mean monthly precipitation is 127 mm.
Details of weather station (and data)	Weather station (ARPAV-Belluno) is located approximately 6 km from the site; data are available on web at: http://www.arpa.veneto.it/bollettini/storico/Mappa_2015_PREC.htm?t=BL
Soil type	
Soil type	Calcaric cambisol
Soil depth	40-60 cm
Soil texture	35 – 52 – 13 % of sand-silt-clay (average; significant values might occur between fields, due to glacial and alluvial origin)
Tree characteristics	
Species and variety	Coppice trees and shrubs are spontaneous with a different estimated age (15-30 years) Main trees species included (in order of major presence) white hornbeam (*Carpinus betulus)*, chestnut (*Castanea sativa*) black locust (*Robinia pseudoacacia*), ash (*Fraxinus excelsior*), maple (*Acer campestre*). Shrubs: hawthorn (*Crataegus monogyna*), hazelnut (*Corylus avellana*), and blackberry bush (*Robus fructicosus*).
Date of planting and intra-inter row spacing	Spontaneous
Tree protection	None
Typical increase in tree biomass	Difference of biomass yield will be estimated between the areas used for free range pig production (over five and ten years of use) and the control areas nearby.
Crop/understorey characteristics	
Species	Mix grass species
Management	Paddocks are used in rotation by pigs, depending on sward deterioration, from April to beginning of December.
Grassland yield	Varied; average may be 2000-3000 kg per hectare.
Fertilizer, pesticide, machinery and labour management	
Fertilizers	None (except manure from the free-range pigs)
Pesticides	None (organic production)
Machinery	Feed is provided by tractor and water by pipeline
Manure handling	Not necessary in the field except for bedding spread when huts are moved from one paddock to another
Labor	Growing-fattening group are checked every day and fed once daily, *ad libitum* between 35 to 80 kg live weight, and restricted until slaughter (180-200 kg).
Fencing	External fixed net to prevent interaction with wild boar (present in the area) and electrical fence with iron wire between the paddocks
Livestock management	
Species and breed	Pigs. A commercial crossbred multi lines hybrid (Large White-Landrace and Duroc: sows PIC Camborough and boar Goland C21); genetic line of boars for heavy pig production are tested and approved (Italian PDO typical dray cured ham and processed salami).
Description of livestock system	Growing piglets, about 25-30 animals, (stoking rate of 12-15 per hectare) arrive to the farm normally in April at an average weight of 35-40 kg. After a 2-3 weeks of acclimation in a small paddock, the group is moved to a bigger paddock with trees-shrubs area; every 30-40 days, depending on sward

	condition, the group is moved to another paddock. Pigs are slaughtered from November to middle of December (also earlier in case of heavy snows). None of the pigs are nose ringed.
Period of demonstration	April 2015 to November 2017
Stocking density	Average of 12-15 growing pigs per ha.
Animal health and welfare issues	Outdoor free range could increase intestinal worm contamination of pigs; Analysis of dung samples (to guide vet therapy) and correct rotation period of paddocks (one rest year every two) are essential to minimize this problem. Also serious skin contamination from dung or mud, as well interaction with wild animals, in free range fattened pigs, could increase the risk of carcass bacterial contamination at slaughterhouse (Rampin et al. 2010).
Requirement for supplementary feed	Growing pigs (feed *ad libitum* until 80 kg live weight) received an average of 2.5 kg/head/day of commercial concentrated. After, feed restriction consist on 2.7-3-3.5 kg/head/day at an average weight of 90-120-150 kg of live weight.
Technical data, livestock	
Production volume	Small scale pig farm oriented to typical salami production, produce an average of 25-30 growing pigs (according to the present Regional law on farm meat processing and selling). In this case 30 growing pigs are fattened.
Group performance	Free range growing pigs with a good health standard and born in the same system, are normally stronger and more resistant to major enteric and respiratory diseases, compared with indoor grown pigs. Daily gain is about 800-850 g while feed *ad libitum* and decreased to 650-700 g when restricted, during latest fattening weeks or in case of low autumn temperatures
Feed consumption	Three types of commercial concentrate are used for growing (1st and 2nd period) and for fattening, with different composition of raw materials such as corn, barley, bran soybean cake or peas (Tagliapietra et al. 2007). Feed conversion rate (FCR kg of concentrate per 1 kg gain) is between 3.5 to 4.3 (average of 3.9). A minor amount of chestnuts, tuber and grass are also eaten by pigs; however their nutritive value is not clear at the moment, and need to be investigated as well as the trees leaves as fodder for fattening pigs.
Financial and economic characteristics	
Costs	This type of pig production is allowed to use marginal land and use semi abandoned meadow and shrubs areas, that do not have other practical usage, due to reduction of dairy cows and other ruminants (sheep and goat) in low mountain area. The cost of 1 kg of organic pork carcass from free range heavy pig, is between 2.5 to 2.9 euro (including the cost of the piglet). Market price for pork carcass of this type of pig, is quite variable from one area to another in the winter season (the most common time for processing meat at farm level). Average price in the last five year were between 3.7 to 4.5 € per kg of carcass; that means a gross income of 130-150 € per/pig. Income will be much higher when carcass is processed at farm level and traditional fermented salami are sold directly after maturing.

5 Acknowledgements

The AGFORWARD project (Grant Agreement N° 613520) is co-funded by the European Commission, Directorate General for Research & Innovation, within the 7th Framework Programme of RTD, Theme 2 - Biotechnologies, Agriculture & Food. The views and opinions expressed in this report are purely those of the writers and may not in any circumstances be regarded as stating an official position of the European Commission.

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