



Project funded by
EUROPEAN UNION



Joint Operational Programme Black Sea Basin 2014-2020

Local Development and Cross Border Cooperation in the area of
Agricultural Products and Traditional Food
(LOC-FOOD)

Report on the Best Practices for the Promotion of Regional Foods and Local Food Systems in Europe

May 2021

Common borders. Common solutions.

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Introduction

This report forms part of the Black Sea Cross Border Cooperation LOC-FOOD project, which aims to strengthen the agricultural and food sectors in the eligible regions. Two means by which this will be achieved are promoting and certifying individual high-quality products that are characteristic of the area, and by supporting the development of localised agri-food systems. The aim of this report is to determine, by means of case studies, the best practices and the main contributing factors to success in the development of local products and food systems in other parts of Europe.

In the European Union, most farms are family-run businesses. However, the number of farms is declining despite the fact that the total area farmed is stable. There is a trend towards fewer, larger farms. Between 2003 and 2013, a quarter of all farms disappeared and the average area per farm increased from 11.7 ha to 16.1 ha (Farm Structure Survey 2013 news release). Small farms often struggle to compete in this increasingly industrialised sector, and must often find innovative ways to increase their revenue. Increasing the value of their basic commodity (by going organic or obtaining a geographical indication (https://ec.europa.eu/info/food-farming-fisheries/food-safety-and-quality/certification/quality-labels/quality-schemes-explained_en)) is one way to achieve this, another is to diversify into value added goods or other activities such as agrotourism.

Consumer demand is also central to the development of local products and local food systems. Increasing interest in high-quality niche products and varieties in the face of globalisation and mass production helps to drive an interest in local products in and less common varieties. Concern about the environmental impact of the globalised food industry, extensive monoculture and the use of pesticides also increases consumer interest in foods from short supply chains and sustainable agriculture (Vittersø et al., 2019). Small local farms and food producers therefore have marketing opportunities that can help them compete despite the dominance of large companies. Local government and non-governmental organisations can contribute by raising awareness of the benefits of local foods and by leading by example.

Some foods that are characteristic of a local area have become widely known beyond the area in question. Such products, especially if protected by a

geographical indication, may become an important source of revenue for the agricultural community and wider society in the areas in which they are produced. The most extreme example of this is Parmigiano-Reggiano PDO cheese (Case Study II), which has a turnover measured in billions of Euros but is still produced by many small dairies scattered throughout the PDO region. Promotion of a particular product and building up its market outside of the production area is another way of improving the economy of an agri-food system.

These two means of boosting the agri-food sector of a region, encouraging short food supply chains and promoting the export of selected products, may seem somewhat contradictory in their philosophy. A prerequisite of successfully exporting a product is of course that the consumers in the destination region do not only buy local goods, but ones from outside their region. The justification for this is based on quality. Although it is somewhat subjective, importing and exporting a few products to and from a region because they are goods of exceptional quality or unique products that can contribute positively to the gastronomic experience of all seems more justifiable than transporting standardised basic commodities over large distances just because they are cheaper to grow in a particular region.

Some definitions are needed before best practices can be analysed. What exactly is meant by 'best practice'? Best from whose point of view? What factors need to be considered when determining whether a practice is beneficial or not? Farming and food production is a process with multiple actors, and these do not operate in isolation but are part of socio-economic systems. In a competitive market, the promotion of one particular food or a certain region may be at the expense of another. For example, if citizens in the Region of Central Macedonia buy more foods from Central Macedonia this would generally be regarded as positive, but farmers in neighbouring Thessaly could lose out. Different regions also compete with one another for the developing agrotourism market. A person's political and economic ideology may also influence their view on the desirability of certain practices. For example, the PDO regulations and management systems governing Comté cheese production are of an interventionist and protectionist nature, with limitations on the size of the individual dairies, production quotas and a system of profit distribution (see Case Study I). This is to maintain the artisanal character of the cheese and ensure the distribution of income throughout the villages and small

communities of the area. However, some may see this as a violation of the principals of the free market and of entrepreneurial freedom.

In this report, best practices are considered those that benefit the product and / or region under study, without considering the impact on the wider geographical area or any ideological opinions that people may hold. Best practices are those which achieve one or both of the following without being detrimental to the other:

1. Increase the producer's profits and/or the income of the local area;
2. Improve the environmental and social benefits arising from the product and/or the agricultural activities of the area.

These two goals must be achieved in an ethical way and not by, for example, using unfair competitive practices or exploitative labour practices.

Structure of the Report

The report begins with the five case studies. At the start of each case study the main points relating to good practices and the factors contributing to the positive outcomes described are listed in a highlights box. Following the case studies, five examples of best practice based on the case studies are analysed in more detail. Links to websites of organisations specific to each case study are given at the end of the individual study, while all other references are provided in the Bibliography at the end of the report. Throughout the report, in-text citation is given when specific facts or data are provided but is kept to a minimum for general descriptive information in order to improve readability.

Case Studies

In this section, five literature-based case studies are presented. They were selected in order to present a range of different scenarios and on the basis of the available information. Case studies I and II are two well established PDO cheeses, Comté from France and Parmigiano-Reggiano from Italy. In case study III a primary product, PDO and other apples from the Val di Non in Italy, is described. The last two studies are not concerned with specific products, but with systems. In case study IV the localised agri-food system of the Garfagnana valley in Italy is studied, while case study V examines diversification in Spanish olive farming.

Case Study I: Comté Cheese

Best practice highlights:

- Cooperative and democratic production system
- Protection of small operators via the PDO rules to maintain the artisanal nature of the cheese and the social benefit to the region
- Strong identification with the *terroir*
- Risk of market fluctuations shared between actors at different stages of production via the payments system
- Collaboration and resource sharing with other PDO cheeses in the region

The cheese

Comté cheese is a raw milk hard cheese that is similar to the Swiss Gruyere. Milk is heated to 32°C in large stirred copper vats and a mesophilic starter culture is added. After a short initial fermentation rennet is added, the milk is curdled, and the curds are cooked at 56°C. Curds and whey are then poured into the wheel moulds and strained overnight, losing around 80% of their volume. The fresh wheels of cheese, which are wider and flatter than those of many other cheeses, then undergo a maturation period of at least four months, more typically 8-10 months and sometimes up to 24 months. During this maturation, and especially in the early stages, the cheese wheels are periodically turned over and the surface is rubbed with cheese smear (Colinet et al., 2006; Anon, 2015).

The finished cheese has a minimum of 45% fat by weight. It has a nutty flavour and a colour that varies somewhat with the season of production, ranging from ivory in the cooler seasons to a more intense yellow in the summer. This variation is primarily due to changes in the diet of the cows throughout the year.



Figure 1. A wedge of Comté cheese showing the rind and the brand label (left). The characteristically wide, flat wheels of Comté cheese maturing on spruce wood shelves (right).

[Image credits: Myrabella / Wikimedia Commons (L), Arnaud 25 / Wikimedia Commons (R).]

The region

Comté cheese is produced in Eastern France in the historic region of Franche-Comté, located between the city of Dijon and the Swiss border. The area mostly consists of rolling hills and pine forests and is bounded by two mountain ranges. Due to the terrain, animal production is an important part of the region's agricultural output while arable agriculture is less significant. Bovine dairy farming is the dominant activity. The defined area for PDO production is made up of most of the Departments of Jura and Doubs and about half of the Department of Ain in the south. Jura is a very rural Department with little industry, whereas Doubs is more industrialized and has about double the population of Jura.

Three other PDO cheeses are also produced within this area: Morbier, Mont D'Or, and Bleu de Haut-Jura. Total cheese production in the Comté PDO area, as measured by milk utilization, is approximately 60% Comté, 10% other PDO cheeses and 30% cheeses with no geographical indication (Colinet et al., 2006). There are also two types of sausage and several wines with geographical indications.

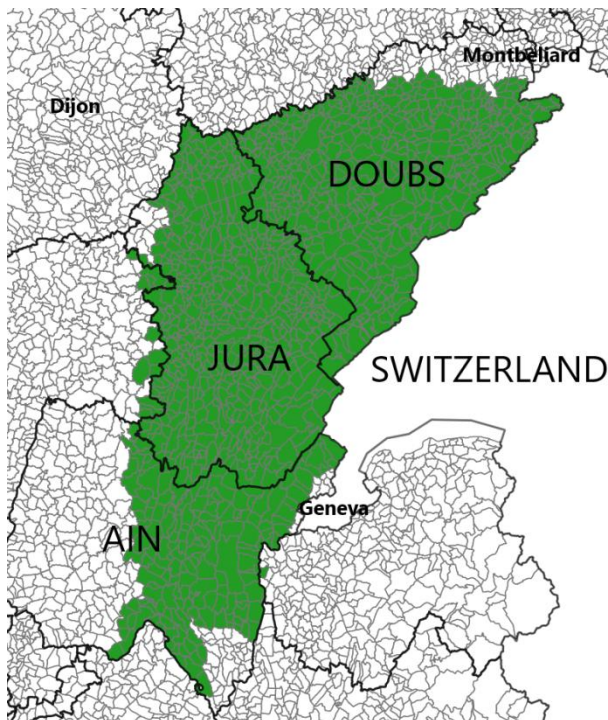


Figure 2. The Comté cheese PDO area (green) in Eastern France.

[Image credit: Chabe01 / Wikimedia Commons, modified by author].

Overview of the production system

Comté cheese production is mostly a co-operative operation, with different organizations undertaking different stages of the production process. Three stages of production can be identified: milk production, conversion to fresh cheese, and ripening. The most commonly used scheme, which accounts for around 85% of total production, is non-integrated, meaning that the three stages are each carried out by agents that are independent of one another. Individual dairy farmers provide their milk to the local cheese-making dairy, or *fruitière*. These cheese-making dairies are mostly run as farmers' co-operatives. Here the milk is converted into cheese and the wheels may be stored for a short time. The fresh cheeses are then sold under a standardized supply contract to one of the sixteen ripening houses for maturing. The ripening houses, all of which are private companies, then sell the finished cheeses to retailers and distributors.

Alternative systems are those in which two or more production stages are integrated. Ripening houses may be integrated with the cheese-making dairies or be subcontracted by them. The small number of private cheese-making dairies buy the milk from the farmers at a price determined by contracts rather than the farmers ultimately being paid by the profit from the cheese as with the co-operative system.

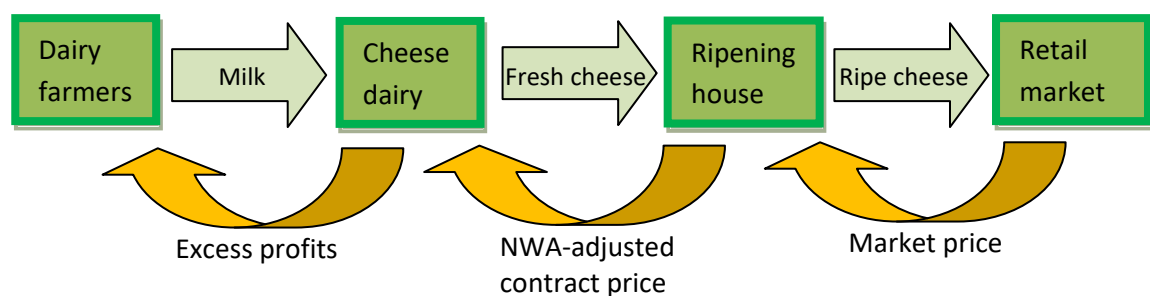


Figure 3. The flow of products and payments in the most common Comté cheese production scheme (NWA: National Weighted Average market price).

The price paid to the dairies for the unripened cheese is determined by the quality grading of the product and free market value of the matured cheese. The latter is applied in the form of a monthly weighted average selling price (national weighted average, NWA) for all Comté cheese, not just that from the ripening house in question. This system is administered by the Interprofessional Comté Management

Committee (CICG), and is designed to ensure that the impact of fluctuations in market price is shared between the different stages of production.

Scale of the production of Comté cheese

In 2019, 68 000 tons of Comté cheese were produced. Production is not evenly distributed throughout the year, but peaks in spring and is lowest in late summer and early autumn. The highest and lowest monthly production figures (May and November respectively) differ by a factor of around 1.6. There are around 3200 farmers and a total of 150 000 cows involved in Comté production, and these produce around 650 million litres of milk per year. The land area used for pasture to produce this milk is 280 000 ha. There are around 190 cheese-making dairies. (Rapport d'Activité, Année 2019. Comité Interprofessionnel de Gestion du Comté)

Although the total production of Comté cheese is quite large, the cooperative nature of the production means that most of the individual operations contributing to the production are on a small scale. The average number of cows per farmer is less than 50, while the average production per dairy is around 360 tons of cheese per year (data extrapolated from the above).

The application of PDO rules to Comté cheese production

Every stage of Comté cheese production is regulated by the PDO certification. Milk for Comté cheese must come from either Montbéliard or French Simmental cows (or hybrids of those two breeds). Over 90% of the milk for Comté comes from Montbéliard cows, and this breed also predominates in supplying milk for many other French PDO cheeses. These two breeds are traditional in the region. In order to maintain a consistent milk quality that is suitable for the cheese, the cattle are required to be mainly pasture-fed. Up to 30% of plant-based concentrates are allowed (equivalent to around 1800 kg / cow / year), but silage is not permitted. The latter restriction is to reduce the risk of introducing butyric acid-producing bacteria to the milk, which can adversely affect the quality of the cheese. Stock density is limited to one cow per hectare of pasture, although most farms in the area are very extensive and stock below this level. All cows must be milked twice per day every day.

These measures are not generally very restrictive on the farmers, although some objections have been made to the ban on the use of silage and the requirement to milk twice per day, which imposes a significant time burden. The regulations on

milk production prevent intensification of dairy farming in the PDO region. The other PDO cheeses in the Franche-Comté region have regulations which are similar or less strict, which means that the Comté farmers can sell their excess milk to the producers of other PDO cheeses without having to change their practices.

The milk used by the cheese dairy for Comté cheese must be collected from farms within a 25 km radius of the dairy. For each batch of cheese, milk from no more than two consecutive milkings may be used and these must come from more than one farm. This effectively enforces the cooperative nature of the cheese production. No heat treatment of the milk is permitted, and the only permitted additives during the cheese making are rennet and a bacterial starter culture. During the fermentation and curd formation, which must be carried out in open copper vats not exceeding 5000 L capacity, the times and temperatures are strictly regulated. Pressing of the curds must also be carried out using specified pressure, time and temperature.

The minimum ripening time is 120 days. Ripening is carried out on shelves made of spruce wood in rooms with a temperature that must fall within a specified range. The rubbing of the cheese surfaces with cheese smear must be carried out a specified minimum number of times. There are specifications for the dimensions and composition of the final product, but these are fairly broad. Each wheel must weigh 32-45 kg, be 55-75 cm across, and have a height of 8-13 cm. Minimum salt and fat contents are 0.6% and 62% respectively, and the fat content must be between 45% and 54%.

The production of Comté cheese is tightly regulated with many specifications that must be adhered to. However, these regulations could be considered as a codification of existing traditional practices rather than an imposition of restrictive rules, and so do not substantially change the practices that the dairies were already following. They are also protectionist in nature. Rules preventing intensive milk production, limiting mechanization and restricting the size of dairies help to maintain the small scale, localized character of the cheese production system. Large dairy companies would be unable to use their capital to gain a competitive advantage through economies of scale.

The main regulations applying to Comté PDO cheese are summarized in Table 1.

Table 1. The main regulations applying to Comté PDO cheese.

Production Stage	Regulations
Livestock rearing	Only cows of the Montbéliard or French Simmental breeds (or hybrids of those two breeds) are permitted. Cows must graze naturally as much as possible. Food may be supplemented by up to 1800 kg /cow/year with non-transgenic plants (equivalent to around 30%). Silage is not permitted Maximum loading is 1.3 livestock units per hectare of pasture. Maximum milk production is 4600 L / ha / year.
Milk	The milk must be unpasteurised. Only milk from two consecutive milkings may be used in each batch of cheese. Milk must come from more than one farm. Milk must be produced within 25 km of the dairy.
Cheese making	The cheese must be made in open copper vats not exceeding 5000 L capacity. Before renneting, the milk must not be heated over 40°C. The only permitted additions are starter cultures and rennet. After renneting, the curds must be heated to at least 53°C for at least 30 min. Pressing of the curds must be with at least 100 g / cm ² pressure for at least 6 h at a minimum temperature of 12°C.
Ripening	Minimum ripening time is 120 days. The wheel surfaces must be periodically rubbed with salt and cheese smear (bacterial cultures). The temperature and humidity of the ripening rooms for different stages are specified.
Final product	Wheel dimensions: weight 32-45 kg, diameter 55-75 cm, height 8-13 cm. Analysis: 45-54% fat, minimum dry matter content 62%, minimum salt content 0.6%.

Source: Comté PDO specification file, available from:

<https://ec.europa.eu/geographical-indications-register/eambrosia-public-api/api/v1/attachments/59549>

Management and monitoring

The Interprofessional Comté Management Committee (CICG: Comité Interprofessionnel de Gestion du Comté) is the organisation that oversees the production of Comté cheese by the various independent operators. Its mission statement is 1) to allow producers in the region to carry out a sustained economic activity that supports land settlement and protects the environment, and 2) to ensure that consumers' expectations of environmental protection, non-industrialized production, and authentic products are met.

CICG is a democratic body whose members are elected from four electoral colleges: Farmers, co-operative dairies, ripeners and privately-owned dairies, and

packers and retailers. This ensures that all stages of the Comté cheese production process are represented, and decisions must be agreed by all four colleges. The primary functions of the CIGC are as follows.

1. Representing and defending the interests of the Comté cheese industry.
2. Overseeing (but not officially auditing) the PDO regulations and their application, and agreeing proposed changes to the regulations.
3. Ensuring that the expected standards and the artisanal nature of the product are maintained.
4. Regulating production volume.
5. Determining the price paid by the ripeners to the cheese-making dairies.
6. Resolving disputes.
7. Promoting and advertising Comté cheese in France and abroad.

Production volume is regulated by a system of labels (green plates made from casein) that are affixed to the cheese wheels. Each wheel of cheese must have one of these labels attached in order to be sold as PDO Comté cheese. A certain number of labels are supplied to each cheese-making dairy for a set low price, which corresponds to around 2% of the price of the unripened wheel. Dairies who wish to exceed their allocated production quota may do so, but they must obtain extra green plates either from CIGC or from other dairies, in both cases at a considerably elevated price that acts as an economic disincentive. Revenue from green plates is primarily spent on advertising the product.

Changes in production quotas and the distribution of green plates are influenced by several factors. The CIGC constantly analyses the market and tries to predict how it will evolve, and so may initiate an increase in production. The individual dairies may request a larger allocation of plates, and the CIGC may grant these requests or not based on different criteria. Priority is given to requests from smaller dairies over those from larger ones. In addition, new young farmers who take over an existing farm or start a new one are given a bonus allocation of plates for their dairy. In 2005, a total of 4990 tons of extra production was requested by the dairies, but only 300 tons was granted. Of the extra production requested by dairies of less than 2 million litres annual capacity, 57% was granted, whereas the corresponding figure for larger dairies was <5%. The maturation time for Comté cheese is variable and can be up to 24 months, so the ripening houses can to some

extent act as a buffer in the supply of cheese to the market by retaining stock in times of market saturation (Colinet et al., 2006; Husson et al., 2019).

The right of the CIGC to regulate the supply of the Comté cheese and the price paid to the dairies by the ripening houses would appear to be contrary to the rules ensuring the free operation of the market. It is a special exemption granted to the CIGC by the ministries of agriculture and finance, and CIGC is required to submit its production plans to these ministries each year for approval.

Another organization that plays a role in the production and marketing of Comté cheese is the Union Régionale des Fromages d'Appellation d'Origine Comtois (**URFAC**), or the **Regional Union of Comtois PDO Cheeses**. This is a producers' organization concerned with the joint interests of the four PDO cheeses in the region. Founded in 2007, its first tasks were the founding of a common technical service for the PDO cheeses, the collective implementation of a joint control process, and joint management of non-compliant milk. As a result of URFAC's actions, the Centre Technique des Fromages Comtois (**Technical Centre for Comtois Cheeses**) was founded. It provides services such as microbiological and chemical analysis, equipment calibration, hygiene monitoring, and advice on new equipment to the dairies and ripening houses of the four DOP cheeses. As most of the operations are small, it would not be economical or possible for them to carry out some of these tasks themselves. URFAC collaborates with other organizations in the biodiversity project BiodivAOP, in which several dairies and their associated farmers participate. BiodivAOP programmes include tree and hedgerow planting and increasing farmer awareness of the impact of their practices on bird life.

Marketing

The CIGC budget for 2019 was 7.8 M Euro, of which 65% was spent on advertising and communication via television, radio, social media and the printed press (CIGC Rapport d'Activité, 2019). A more localized marketing scheme is 'Les Routes du Comté', a gastrotourism scheme similar to the 'wine roads' schemes used in many parts of France. Visitors are shown where to find Comté dairies and shops in conjunction with other attractions within the PDO area. Examples of collaborative marketing can be found in the area, for example local dairies and wineries sell each other's products as complementary to their own.

Comté cheese is well established in the French market and is sold through many retail outlets including large supermarket chains. However, the French market is

considered to be saturated, so further expansion must be via exports. In 2019, 9.4% of the cheese was exported. The principal destinations of the exported cheeses were Belgium (25% of total exports), Germany (19%), The United Kingdom (12%), The United States (10%), Spain (5%), and Japan (2%). The CICG is conducting an export advertising campaign that is particularly targeted at five countries: The United States, The United Kingdom, Belgium, Germany and Japan (CICG Rapport d'Activité, 2019).

Conclusions

Although Comté is the largest PDO cheese in France in terms of annual production, it is produced by a large number of small village dairies that are supplied with milk by their own local farmers. Ownership of the production is therefore highly democratized. This characteristic of the production system is maintained by the PDO regulations, which limit the size of dairies, the productivity of farms and the distance from which milk can be collected. The PDO regulations thereby maintain the artisanal character of the cheese, the rural character of the area and ensure that the employment opportunities and financial benefits derived from cheese making are distributed throughout the small rural communities of the region rather than being absorbed by a few large companies. This social benefit is of particular importance in the more rural and mountainous parts of the PDO area.

Several factors contribute to the environmental sustainability of Comté cheese production. For milk production, limits on grazing density and feed concentrates help to maintain the pasture and grasslands of the area. Overgrazing and soil erosion is reduced by the limit on cows per acre, but the requirement that the cows are mostly pasture-fed means that light grazing over a large area prevents the development of scrubland (Bele et al., 2018). Banning long-distance transport of the milk reduces road traffic and vehicle emissions. Partly for this reason, the carbon footprint of Comté cheese is around 15% lower than that of Emmental (Husson et al., 2019). Environmental protection is an aspect that needs to be improved however. Observed problems in the region include river pollution from agricultural run-off and a decrease in wild plant diversity in the grazing areas. Attempts are being made to improve the ecological footprint of Comté milk production by URFAC through their BiodivAOP programme.

Careful design of the PDO regulations has helped to maintain the consistent quality of the cheese. Given the number of dairies and ripening houses, variability could potentially be a serious problem. Consistency of the milk quality and chemical

composition is stabilised as much as possible by limiting the permitted breeds of cow to two and by closely regulating the feeding regime. This latter restriction includes a ban on silage, as fermented feeds may increase the risk of the cheese being contaminated with propionic acid spoilage bacteria. The fairly strict specifications for times, temperatures etc. to be used during the cheese making process help to ensure that the fresh cheeses sold to the ripeners are of consistent quality and with similar characteristics. During the ripening process, the regulations specify ranges of storage temperatures and humidities at different stages of the ripening process, in order to maintain consistency while still allowing the expert ripener to use their judgement and exert some influence over the ripening process. For the most part the regulations are designed to codify existing traditional practices, and so they do not generally impose a significant burden on the companies producing Comté cheese.

The management of the Comté production system by the CICG is democratic and all stages of the production and retail chain are represented. The CIGC also exercises some control over the price paid by the ripening houses to the dairies for the raw cheeses. There are several benefits of this system. Price fluctuations in the market are absorbed by all levels of the production chain rather than falling disproportionately on a particular sector. The ripening houses, which are relatively few in number and much larger than the dairies in terms of turnover, cannot pressure the dairies into accepting lower prices for the unripened cheeses. This in turn means that dairies have no market-driven incentive to change ripening houses, and so long-term and trusting working relationships are established.

The Comté cheese production chain is highly cooperative in structure. It also benefits from external collaboration, largely through the establishment of URFAC. The four PDO cheeses in the region obviously have many common issues, and collaboration to address these is of benefit to all. The most concrete example of this is the joint Technical Centre for Comtois Cheeses.

Comté cheese is one of France's oldest and most successful. This success is due to several factors, including the sensible design of the PDO regulations, the fact that the cheese production is deeply embedded in the community and closely linked to the *terroir*, and the democratic and cooperative production system.

Links

Interprofessional Comté Management Committee: www.comte.com

Case Study II. Parmigiano-Reggiano Cheese

Best practice highlights

- Strong identification with the *terroir*
- Innovative and collaborative marketing by co-branding with other food manufacturers
- Ability to modernize and innovate without losing traditional character

The name

Parmigiano-Reggiano takes its name from two of the provinces in which it is produced, Parma and Reggio Emilia. The name is hyphenated according to the original PDO product specification, but is often written without a hyphen. In English it is commonly referred to as “parmesan” (an equivalent term is found in other languages). However, the name parmesan is often used in a more generic sense outside of the EU (and, informally, within it), sometimes referring to similar very hard cheeses other than Parmigiano-Reggiano PDO.

The cheese

Parmigiano-Reggiano is a very hard raw cows' milk cheese with a moisture content of only 30% and a fat content of at least 32% of the dry matter. It has a grainy, crumbly texture and a strong, salty flavour. The cheese is made of a mixture of whole raw milk and semi-skimmed raw milk from two consecutive deliveries. The milk may come from several breeds, of which Frisian and Brown Swiss predominate. The afternoon milk delivery is left overnight in tanks and the cream, which floats naturally to the surface, is skimmed off. The skimmed milk is then combined with the following morning's delivery of whole milk. Fermentation takes place without the addition of a defined starter culture, although whey containing bacteria and enzymes from the previous day's cheese is added. During production, the curds are broken down into fine grains, heated to around 55°C, allowed to settle, wrapped in cloths and put into moulds. The moulds are then immersed in salted water for up to 4 weeks during which time salt is absorbed into what will become the crust. After this the cheeses are matured for around 12 months and then transferred to a final ripening room to complete the maturation process. The wheels of Parmigiano-Reggiano have a squat, cylindrical shape, slightly convex

sides, and a very hard crust that is usually not eaten. The cheese is eaten by itself, in salads, or grated over other food such as pasta dishes (Cozzi et al., 2019; de Roest, 2000) .

The fact that no defined starter culture is used in the fermentation of the milk helps to establish a link between the cheese and the *terroir*. The soil type and the climate influence the microbial flora of the cows and therefore of the raw milk, which in turn affects the fermentation and flavour development of the cheese. The chemical and microbiological characteristics of the milk are also strongly influenced by the cows' diet, which is based on local fodder crops such as alfalfa and does not contain fermented feed. Cows in mountain areas tend to have a higher percentage of alfalfa in their feed than lowland cows, and this contributes to a small difference in flavour between the cheese produced in these regions and those from lowland areas. In addition to its characteristics, the cheese is also linked to the region by its long history and place in society (Cozzi et al., 2019; de Roest, 2000).



Figure 4. The curd mass being lifted from the copper fermentation vat during Parmigiano-Reggiano production (left). Finished wheels of cheese showing the characteristic shape and the dot printed name around the side of the cheese (right).

[Image credits: Udo Schröter (L), Wittylama (R) / Wikimedia Commons.]

The region

The region covered by the PDO regulations for the production of Parmigiano-Reggiano cheese is found in northern Italy. Covering one million hectares, it includes the provinces of Parma, Reggio-Emilia and Modena, and parts of the provinces of Mantova (south of the River Po) and Bologna (west of the River Reno). Parma, Reggio-Emilia and Modena are the largest cities, and the total population of the PDO area is around two million people. The area is generally well known for its

agri-food sector. The other famous PDO product of the region is Prosciutto di Parma, or Parma ham, and the region is well known for several different types of salami. Apart from PDO products and other high quality local specialities, intensive agriculture and food processing are also an important part of the economy of the region. Around 50% of Italian processed tomatoes are processed in Parma, and the region also produces sugar, flour and pasta. There are several large food companies based in the area, and Parma is the home of the European Food Safety Authority. Other industries in the area include high-end car manufacturers such as Ferrari and Maserati and the well-known producer of comics and trading cards, Panini.

The geography of the region is mixed, and includes forested mountains, rolling hills and plains. The climate is continental, with a large temperature variation between summer and winter. In the city of Parma, the average low temperature in January is -0.4°C and the average high temperature in July is 30.3°C . Rainfall is moderately high, 888 mm per year, ranging from 42 mm in July to 104 mm in November. This distribution of rainfall means that severe drought conditions are rarely encountered even in the driest month. While beneficial for pasture land, the relatively high rainfall in the spring is disadvantageous for hay production. For comparison, Rome has approximately the same annual rainfall but around half the rainfall of Parma in the driest month (data from Climate-Data.org).

Clay is the dominant soil type in the region. This can lead to problems with waterlogging in lowland regions and river plains and erosion in upland regions. The nutritional characteristics of the soil also influence the crops that can be grown. Forage crops for cattle account for a large percentage of the farmed area, and the most important forage crop is alfalfa. This crop is suited to clay soils and requires no irrigation, as the normal rainfall in the region is sufficient. It is also capable of nitrogen fixation, and so does not require nitrogenous fertilizers except in the very early stages of growth. Natural pasture land contributes only a very small percentage of the total nutritional requirements of the cows in the region, and is mostly concentrated in mountain areas.



Figure 5. The Parmigiano-Reggiano PDO region in northern Italy.

[Image credit: NordNordWest / Wikimedia Commons]

Overview of the production system

There are three main actors in the Parmigiano-Reggiano production system that each play role before the cheese reaches the retail market. Farmers sell or provide their milk to local dairies. These local dairies, which may be private businesses or farmers' co-operatives, make the cheese and mature the wheels for the first 12 months. They are then sold on to ripeners and wholesalers, who carry out the final maturation step and sell the finished cheeses to retailers. These stages may be carried out by separate operators but in many cases there is integration, such as farms with their own dairies and dairies that complete the ripening process themselves. In some cases the entire production chain may be carried out by a single operation.

Dairies are of three types. The majority, 63%, are farmers' cooperatives that are owned and managed by the local farmers. These dairies process around 68% of the total milk production. These tend to be run to suit the interests of the farmers and as a way of adding value to their milk. As a result, 70% of them sell on the cheeses as soon as the 12-month ripening period has ended, usually to wholesalers. Farmers are normally paid for the milk only once the cheeses are sold rather than with a

down-payment system. Private dairies make up 16% of the total number but process 22% of the total milk production between them. They tend to be larger, take milk mainly from larger farms, and tend to lead in terms of technological and marketing innovations. Some of these dairies sell the cheese on to ripeners, others complete the maturing process and market the cheese under their own name. Private dairies pay farmers down-payments for the milk and settle any differences once the cheeses have been sold. This can result in some farmers who do not wish to wait for payment leaving cooperatives and supplying private dairies, or supplying both. Farm dairies, those in which a farm has a dairy to process its own milk into cheese, tend to be smaller. Around 20% of the dairies are farm dairies, but these account for only 9.5% of the total milk destined for Parmigiano-Reggiano cheese (Cozzi et al., 2019).

The PDO regulations for Parmigiano-Reggiano state that the farmers and dairies must be from within the designated area, but this restriction does not apply to the wholesalers and ripeners, most of which are based outside. Some ripeners and wholesalers are integrated with the dairies, while others purchase 12-month ripened cheeses or fully ripened cheeses from dairies and either finish the ripening process or sell them on immediately. Parmigiano-Reggiano cheeses are a commodity that is sometimes targeted by investors and traders, and these operators may finance ripening and wholesale operations using the cheeses themselves as collateral.

Scale of the production of Parmigiano-Reggiano

In 2020, 3.9 million wheels of Parmigiano-Reggiano cheese were produced, equivalent to about 156 000 tons. Production has been increasing steadily for several years: Production in 2006, 2011 and 2016 was 3.1 million, 3.2 million and 3.5 million wheels respectively. The proportion of the total number of wheels produced within each of the five provinces included in the PDO area were approximately as follows: Parma 35%, Reggio-Emilia 31%, Modena 20%, Mantova 11.5 % and Bologna 2.5% (data from Statista.com for February 2020). The proportion of wheels produced in mountain, hill and plains areas was 21.0%, 35.9% and 43.1% respectively in 2020 (https://www.clal.it/index.php?section=parmigiano_altimetria).

The consortium website lists 319 dairies, distributed as follows: Parma 146, Reggio-Emilia 85, Modena 58, Mantova 21, and Bologna 9. These dairies are supplied with

milk by around 3300 farms with 250 000 cows between them, giving an average of 76 cows per farm.

Regulations applying to the Parmigiano-Reggiano PDO certification

The main regulations applying to Parmigiano-Reggiano PDO cheese are summarized in Table 2. Milk for the cheese must be unpasteurized and derived from two consecutive milkings (the evening of one day and the morning of the following day). Feed for the cows must be 50% hay and derived from a list of approved plant types. Silage is not permitted. At least 50% of the feed must be produced by the dairy farm itself and 75% of the total feed must be from within the PDO area. The cheese must be made in copper vats which are used once per day. The only permitted additives are rennet for coagulation, salt, and a portion of the whey from the previous day's cheese making. Defined exogenous starter cultures are not permitted. The minimum ripening period for the cheese is 12 months. The final cheese wheels must be within the specified dimensions and weigh limits and the cheese must have a minimum 32% fat content of dry matter. Parmigiano-Reggiano may be sold as whole wheels, packaged portions, or grated. Whole wheels must bear the appropriate markings and stamps (Anon, 2018).

Management and monitoring

The body that oversees the production of Parmigiano-Reggiano cheese is the Consorzio del Formaggio Parmigiano-Reggiano (CFPR), or **Parmigiano-Reggiano Cheese Consortium**. Membership of the CFPR board is open to dairy farmers in the PDO area who produce milk for Parmigiano-Reggiano, the dairies that produce the cheese, and the maturers and cutters / packers that have plants within the PDO area. Each of the five provinces within the PDO region has representatives appointed to the CFPR board in proportion to the production of cheese in that province. Parma has 10 representatives, Reggio Emilia nine, Modena five, Mantova three and Bologna one representative.

Table 2. The main regulations applying to Parmigiano-Reggiano PDO cheese

Production Stage	Regulations
Livestock rearing	Several breeds of cow are permitted. Forage for the cows must be at least 50% hay. The dairy farm itself must produce 50% of the forage for its cows, and 75% of the forage must be from within the designated PDO area. There is no natural grazing requirement. Silage and several plant types are banned.
Milk	The milk must be unpasteurised. Only milk from two consecutive milkings may be used in each batch of cheese - the evening milking, and the morning milking of the following day. Milk is partially skimmed.
Cheese making	The cheese must be made in copper vats. The fat:casein ratio of the milk in the vats at the start of production cannot exceed 1.1. No starter culture is permitted, but whey from the previous day's cheese making may be added. The only permitted additions are salt and rennet.
Ripening	Fresh cheeses are soaked in brine then matured for a minimum of 12 months. The 12-month ripening must take place within the designated PDO area. Additional maturation after the 12-month minimum may take place outside the PDO area.
Final product	Wheel dimensions: weight minimum 30 kg, diameter 35-45 cm, height 20-26 cm. Rind thickness approximately 6 mm. Analysis: Minimum 32% fat in dry matter. Cyclopropane fatty acid <22 mg per 100 g fat.
Further processing	The cheese may be sold whole, in portions or grated. Any processing of whole cheeses into packaged products must take place within the PDO area.

Source: Anon. (2018)

The CFPR has the following functions:

- 1) To legally protect the designation of origin of Parmigiano-Reggiano cheese according to Italian and international legislation and treaties. It holds the rights to the special labels and markings that are associated with the PDO cheese. The CFPR may initiate legal action against those who misuse the name or violate the protected rights of the PDO producers in any way.
- 2) To promote the consumption of Parmigiano-Reggiano cheese in Italy and abroad, as well as to develop and support initiatives aimed at promoting Parmigiano-Reggiano and enhancing its image and reputation.

3) To control and monitor the production and sale of Parmigiano-Reggiano cheese, in co-operation with the agri-food product quality protection and anti-fraud office of the Ministry of Agriculture, Food and Forestry.

4) To improve production and quality control by implementing initiatives aimed at the technical, qualitative and economic improvement of the cheese, while preserve its typicality and its specific characteristics, and by providing technical advice and training to the producers. The CFPR collaborates extensively with universities, particularly in northern Italy, in projects investigating technical innovations in cheese production.

5) To mediate in the resolution of conflicts between actors in the supply chain.

An external body, Organismo Controllo Qualità Produzioni Regolamentate (OCQPR; **Quality Control Body for Regulated Products**), is responsible for formally auditing the production of Parmigiano-Reggiano. Farmers, dairies and ripeners who wish to participate in the production of the PDO cheese must register with the OCQPR and obtain permission from the CFPR.

Environmental Sustainability

At the milk production stage, the dairy farms producing milk for Parmigiano-Reggiano perform relatively well on several environmental indicators. Fertilizer use is low due to the nitrogen-fixing ability of alfalfa, and this, together with the lower amount of field work required and subsequently lower fuel consumption, reduces the carbon emissions in fodder production. The cows have a longer than average productive life, which reduces the carbon emissions involved in stock renewal operations. CO₂ emissions for Parmigiano-Reggiano milk are estimated to be 18% lower than those for milk just outside the PDO area (Arfini et al., 2019; Cozzi et al., 2019). Growing alfalfa for fodder also requires less water than other crops used for silage. However, despite the relatively favourable data for the milk, the carbon footprint of the cheese itself is high compared to others because of the large amount of milk used per kg of finished product, about 17 L compared to around 8 for a generic hard cheese.

Innovation

Innovation in food products can be defined as a change in the production method that has economic benefits or improves quality and safety. Parmigiano-Reggiano has a long history and is still made in a largely traditional way. The production

method is now codified in the PDO regulations. This does not mean however that innovation in the production process has been completely stifled. Several aspects must be considered when determining whether an innovation is or would be beneficial or feasible. Firstly, the impact on the quality of the product and its compliance to existing quality schemes and specifications. The latter is of particular importance in the case of PDO products, and two possibilities can be considered: innovations that conform to existing specifications, and those that require an amendment to the specifications. In the second case the benefits of the proposed change would clearly have to be greater for the process of amending PDO regulations to be worthwhile. Secondly, any possible impact on consumer acceptance of the product must be considered, as any perceived difference in appearance or taste may reduce sales. The third aspect, which is particularly important in a product such as Parmigiano-Reggiano in which many independent actors collaborate, is acceptance by the wider producing community, in this case the many dairy farmers and dairies. If an improved process, for example the use of improved milking machines, has a low uptake rate among the dairy farmers it will have little impact on the overall value chain. Finally, any innovation must conform to the relevant legislation at regional, national and international level. This may concern food safety, fair competition rules, animal welfare, trading standards, and rules associated with other relevant certification such as organic farming.

Arfini et al. (2019) list 40 separate innovations that have been implemented since 1990. These include innovations in organization and in the production process, and impact the product quality, competitiveness in the market and rural development. Obtaining PDO status in 1996 was one of the major quality and market related innovations in this period. Other quality-related changes include the introduction of traceability systems, quality specifications, hygienic norms and regular microbiological and chemical analysis. The reduction in number of cheeses failing to meet the quality standard since these measures were introduced is estimated to save around 300 000 Euro per year. A system of quality-based price adjustment for milk was introduced. The efficiency of the production process has been increased by automation and mechanisation at several stages from milking to cheese turning and labelling. Automation has however negatively affected employment in the Parmigiano-Reggiano value chain, thereby adversely impacting rural communities. To counter this and protect rural employment in the PDO area, other changes to the rules have been implemented. Heifers (young cows) must be raised within the

production area, and packaging plants for cheese portions must be in the PDO area (even though this requirement does not apply to ripeners and wholesalers).

For sales and marketing of Parmigiano-Reggiano, a significant innovation was allowing the sale of packed portions of cheese and of grated cheese under the PDO label, so long as the processing was carried out in the PDO area. CFPR also introduced a joint labelling scheme allowing food companies to use the Parmigiano-Reggiano label on processed foods that have the cheese as an ingredient. This co-branding strategy generates additional value from the synergy between two brands. The food company gains added credibility from the association with a well-known and highly regarded PDO product, and the exposure of Parmigiano-Reggiano in the market place is increased.

Marketing

The total turnover generated by Parmigiano-Reggiano at retail level was 2.4 billion Euro in 2018 (data from CFPR). Around 40% of the cheese is exported, the top five importing countries in 2018 being France, USA, Germany, UK, and Canada, although exports to the UK may have since been affected by that country's withdrawal from the European Union. The CFPR operates in partnership with Italian trading companies in order to promote exports of Parmigiano-Reggiano. Companies are invited to submit proposals for co-funding of promotional activities abroad, such as at trade fairs or culinary events. CFPR attends many promotional events itself: in 2019, it presented Parmigiano-Reggiano at 11 Italian events and three international events (Japan, USA, and Germany).

The marketing of Parmigiano-Reggiano trades heavily on the connection with the *terroir* and the long tradition behind the cheese, as well as its organoleptic properties. Despite this emphasis on the uniqueness of the product, there are also sub-categories that have recently been introduced. Cheeses may be labeled according to maturity using one of four different categories: 'Delicate' (12-19 months), 'Balanced' (20-26 months), 'Aromatic' (27-34 months) and 'Intense' (35-45 months). 'Mountain product' was a certification introduced by the EU in 2013 in an attempt to boost the rural economy of often neglected high altitude areas, and the CFPR undertook to award the certification to some dairies with its 'Quality Project - Mountain Product' initiative. The Parmigiano-Reggiano produced at high altitude often has slightly different organoleptic characteristics to the lowland cheeses, mainly because of differences in the cows' diets. Over 110 dairies and over 1200 farmers are located in eligible mountain areas, but the number of

participating dairies was not available from the CFPR website at time of writing. Organic certification has been awarded to some dairies. Lastly, some dairies have been granted the religious certifications Halal or Kosher. These additional descriptors and certifications help consumers make informed choices according to their personal taste, ethical principals or religious beliefs. The religious certifications in particular open up sizeable markets for Parmigiano-Reggiano that would otherwise have been unavailable.

The marketing of Parmigiano-Reggiano is made easier by the fact that there are few very hard cheeses with which to compete, in contrast to hard and semi hard cheeses of which there are hundreds on the market. One close competitor is Grana Padano, a similar very hard cheese with PDO certification that is also from northern Italy. The CFPR clearly takes this competition seriously, as it devotes an entire page of its website to making a favourable comparison between Parmigiano-Reggiano and Grana Padano (<https://www.parmigianoreggiano.com/product-guide-parmigiano-reggiano-grana-padano>). Despite this apparent rivalry, many ripeners and wholesalers handle both cheeses.

Conclusions

Parmigiano-Reggiano has a long history and plays a dominant role in the agricultural economy in the region in which it is produced. It is identified with the *terroir* through the particular geographical and climatic conditions and the dominant fodder crops, all of which play a part in determining the microbiological and chemical composition of the milk and in turn the flavour of the cheese. This tradition and close association with the *terroir* is strongly utilised in the marketing of the cheese. The production system is complex and has many different models in terms of ownership and integration of different production stages, but cooperative dairies are the majority.

Despite its long history and traditional nature, the Parmigiano-Reggiano production chain has been innovative in recent decades and introduced many changes to improve production, quality consistency and consumer choice while maintaining the character of the product and maintaining its socioeconomic role in the community. This has required the consent of all actors in the chain and the coordination of the CFPR. Innovative marketing strategies include co-branding with other companies' products under the "Parmigiano-Reggiano as ingredient" system.

In summary, the success of Parmigiano-Reggiano can be attributed to the unique character and long tradition of the cheese, strong brand recognition, its link to the terroir, the support of the producing community in the PDO region, and innovation in production and marketing.

Links

Parmigiano-Reggiano Cheese Consortium (CFPR):

<https://www.parmigianoreggiano.com/>

Quality Control Body for Regulated Products: <https://www.ocqpr.it/>

Case Study III. Val di Non Apples

Best practice highlights

- Collective action to protect the Val di Non name from fraudulent use
- Unified marketing under a common brand
- Collaborative product development and marketing with other local businesses
- Investment to reduce environmental impact of operations

The product

Apples from the Val di Non are considered to be of high quality because of the soil quality and climatic conditions of the growing region. Several varieties are cultivated, the most important being Golden Delicious, Red Delicious, Gala, Fuji, Evelina, Renetta, Enjoy, Sweetango and Morgana. Other varieties cultivated in smaller quantities are Pinova, Morganduft, Gloster, Stayman, Jonagold, Granny Smith, Braeburn and the ancient variety Bella di Boskoop (<https://melinda.it/en/>).

The region

The growing area for the Val di Non apples is the hydrographic basin of the river Noce and lake Santa Giustina, and consists of two valleys, the Val di Non and the Val di Sole. It is located in the Trentino-Alto Adige (Trentino-Südtirol) autonomous region of northern Italy in the Dolomite Mountains. The nearest cities are Bolzano (Bozen) to the north east and Trento to the south.



Figure 6. The locations of Trentino within Italy and the Val di Non within Trentino.

[Image credits: TUBS (L), Hanno (R) / Wikimedia Commons]

The climate is strongly influenced by the mountain location and is characterised by cold winters with heavy snowfall and warm summers. In Bolzano (altitude 266 m above sea level) the average minimum temperature in January and the average maximum in July are -7.1°C and 22.4°C respectively. Water is abundant, both from melting snow in the spring and from high annual rainfall (1111 mm in Bolzano). These climatic conditions, together with the local Dolomite limestone bedrock and soil type, are the main contributing factors to the high quality of the region's apples and help to establish a strong link between the product and the *terroir*. There is a long history of apple growing in the region, as attested by many historical documents and even the etymology of some local place names. Apple cultivation is strongly embedded in the local community both economically and culturally. According to the PDO product specification, in 2003 15 000 of the 35 000 working inhabitants of the region (43%) were involved in the apple value chain in some way (Anon., 2003). The agri-food system in the Val di Non could therefore be considered to be close to a monoculture system with a very low degree of diversity. Local festivals celebrate the apple and are often linked to different phases in the cultivation cycle such as harvest or the blossoming of the trees.

The Protected Designation of Origin

For many years, apples from the Val de Non have had a reputation for exceptional quality and the use of the name is a marketing asset. The PDO application was primarily a response to widespread fraudulent use of the Val di Non name: at one point, the volume of sales of apples as Val di Non apples was estimated to be three times the production of the valley (World Intellectual Property Organization, <https://www.wipo.int/ipadvantage/en/details.jsp?id=908>).



Figure 7. Apple orchards in the Val di Non overlooking the River Noce

[Image credit: Vincenzo / Wikimedia Commons]

The PDO specification covers 3 varieties only: Golden Delicious, Renetta Canada, and Red Delicious. These must conform to minimum quality specifications as shown in Table 3.

Table 3. Minimum quality standards for Val di Non PDO apples

Variety	Colour	Sugar content (° Brix)	Acidity (meq NaOH/100g)	Hardness (kg/cm ²)
Golden Delicious	Green to yellow, sometimes pinkish	12	5	5
Renetta Canada	Greenish-yellow, rusty	9	8	5
Red Delicious	Red on a green background	9	3.5	5.5

Source: Anon. (2003)

The production area is defined by a list of 55 municipalities. Other regulations are relatively few, as might be expected for a primary crop.

Organization of the production chain

Production of Val di Non apples, both PDO and non-certified varieties, is organised at three levels. At the base level are 3636 individual farms, many of which are family-run operations. These farms are organised into 16 local cooperatives that have between 97 and 388 members (mean value 227 members; data from Melinda Consortium). Each cooperative has washing, packing and storage facilities for the apples produced by its farmers, so the individual farmers do no further work on their apples once they are harvested and delivered to the cooperative. These 16 cooperatives collaborated to form the **Melinda consortium** in 1989. Its primary function was to create a unified brand identity for the apples from the Val di Non in order to facilitate marketing and to protect against fraudulent claims of origin .

Governance of the Melinda consortium is by the farmers cooperatives - the 16 presidents of the cooperatives form the board of directors of the consortium. In addition to marketing the apples, the Melinda consortium has several other spheres of activity. It aims to constantly improve the quality of the products and processing by improving growing and handling techniques, while striving to reduce production costs. It also works to reduce the environmental impact of apple cultivation, with particular reference to water use, waste production, phytochemical use and biodiversity.

Scale of apple production

The total farmed area is 6752 ha and the average farm size is around 2 ha (data extrapolated from <https://melinda.it/en/>). Total production is around 400 000 tons per year, which represents around 10% of the total Italian apple production. Productivity is therefore around 60 tons per hectare. For comparison, yield for Golden Delicious apples from several orchards in Spain was between 19 and 60 tons per hectare (Jiménez & Royo Díaz, 2004). Around 25-30% of production is exported (<https://www.greenplanner.it/2019/05/10/melinda-consorzio-trentino/>).

Environmental issues

The Melinda consortium and the regional government promote an integrated approach to apple farming, in which attention to detail, modern technology and traditional methods are combined to increase environmental sustainability. As with all agriculture, water usage is a significant environmental issue in apple production. In areas with high rainfall water consumption is reduced as less irrigation is needed, but water consumption in crop production is rarely zero. In

the PDO area, rainfall is fairly significant but irrigation is still required. The Melinda consortium promoted the use of drip irrigators on its members' farms, thereby saving around 50% of the water required for irrigation.

Energy consumption and the associated CO₂ emissions are an area in which the Melinda consortium performs well. According to the project report *Bilancio di Sostenibilità* (Anon., 2016), the CO₂ equivalent produced during post-harvest processing of Val di Non apples is about one quarter of the Italian national average. There are two main reasons for this efficiency. Firstly, the consortium and the individual cooperatives have invested heavily in renewable energy (photovoltaic), reducing their dependency on the grid electricity supply, and in the wider Trentino area most electricity is produced by hydroelectric plants. Secondly, the Melinda consortium has converted a disused mine into a large underground storage facility. The naturally cool subterranean environment substantially reduces the power needed to refrigerate the apples and also greatly cuts down on the requirement for insulation materials, which have their own CO₂ emissions cost and waste disposal issues. The use of underground facilities also removes the need for warehouses on the surface, with their associated environmental impact and unsightliness.

The consortium is working to increase the proportion of its produce that is certified organic, and, according to their website, hope to reach 500 ha (7.5% of the total) of organic production within the next five years. Although the farming method is fairly intensive in terms of tree density, the cooperatives' farmers are committed to minimising agrochemical use. Pesticides are used as a last resort, and have been largely replaced over the last 15 years with the 'sexual confusion' method, pheromone sprays that inhibit mating activity. Other sustainable methods include the recycling of cuttings from the grass strips between the rows of trees as compost.

Despite the efforts and apparent desire for environmental sustainability, there are still some environmental issues with the apple farming in the Val di Non that need attention. The area has become close to a monoculture, with around 75% of the land covered by orchards in some areas. As a result, wild or semi-wild land is limited and often in isolated patches. This has an impact on biodiversity in parts of the region. Soil exhaustion is also a problem that can affect the growth rate and fruit yield of the trees.

Scientific and technical support

Scientific support for the agri-food sector in the Trentino area is provided by the Fondazione Edmund Mach (FEM), which is located at the end of the valley near where the River Noce joins the Adige. FEM is involved with research and innovation, education and training, and technology transfer in the fields of agriculture, nutrition and the environment. Research departments include Food Quality and Nutrition, Genomics and Biology of Fruit Crops, and Sustainable Ecosystems and Bioresources.



Figure 8. Fondazione Edmund Mach, agricultural and nutritional research centre, San Michele all'Adige, Trentino, Italy.

[Image credit: Yerpo / Wikimedia Commons]

Marketing

The formation of the Melinda consortium itself was in part a marketing initiative, which was followed up with the design of a distinctive logo and label to be used on all the apples. The larger market presence of the consortium as opposed to the smaller individual cooperatives builds stronger brand recognition. Eligible apples also bear the PDO logo. The integrity of the well-known Melinda blue label is protected by imposing high quality standards on the apple selection procedure, in terms of aesthetic appeal, taste and nutritional value. As a result, many apples fail to meet these standards and could potentially make little or no profit. These apples are valorised as much as possible by inventive marketing strategies. Apples

that are of sound quality but have superficial blemishes on the skin (usually as a result of extreme weather phenomena) are sold at discount prices under the related brand name 'Melasi'. Other label variations include 'Melinda fresh', which are apples that have lower sugar content and are sold as having a fresh taste and lower calories.

Melinda also sells a range of products made from its apples. These include dried apple slices as a healthy snack, apple-based mousse desserts, an apple pulp dessert in which the skins are included to add fibre, and apple-based snack bars. These products, while sold under the Melinda brand name, are made by another local company in a partnership agreement. Arrangements such as this benefit both parties: the manufacturing company benefits from association with a well known brand name, and the consortium extends its market reach without needing to diversify its own operations into the manufacture of processed foods.

Agrotourism also plays a part in the marketing of Val di Non apples together with many other local products. Although apples are the area's most renowned product, there are also producers of cheese, wine, other fruits, herbs and medicinal plants in the region. Tourists with an interest in gastronomy can therefore be offered a 'basket' of goods which, together with the natural mountain beauty of the region, can make it an attractive place to visit. To promote agrotourism, the 'Val di Non and Val di Sole Apples and Flavours Route' was formed in 2004. This is a public-private partnership between the state tourist office and local companies and institutions. Companies pay a small annual fee to be included. The Route is a guide to the gastronomic and historical heritage of the region and acts as a visitor guide to local farms, wineries, dairies, hotels, natural attractions etc. The scheme also organises or contributes to events and festivals such as the apple blossom festivals and harvest festivals. The overall strategy is to promote the territory as a whole in an integrated way, using the main products of the region (apples) as a key attraction to help market both the primary and secondary products (wine, cheese etc.).

Conclusions

Apple growing has a long tradition in the Val di Non and the wider Trentino area. Apples from the Val di Non have an excellent reputation due to the geological and climatic characteristics of the valley, but this led to fraudulent use of the name being widespread. The cooperatives then acted collectively to counter this problem by creating a powerful consortium with a unified brand identity,

successfully obtaining PDO status for three of their apple varieties. The consortium has more marketing power than the individual cooperatives as it has created a single brand for the entire production of the valley. This helps to establish brand familiarity among consumers and enables advertising budgets to be spent more effectively.

Val di Non apples have also shown innovation in marketing and valorisation of produce through creating a discount brand for blemished apples and special labels for apples with low sugar content. The formation of partnerships with other local companies also helps to extend the reach of the Melinda brand through the creation of apple-based products.

The success of the Melinda consortium demonstrates the power of unified collective action in marketing, brand protection, infrastructure development and product innovation.

Links

Apples and Flavours Route: <https://www.tastetrentino.it/en/the-three-routes/the-val-di-non-and-val-di-sole-apples-and-flavours-route/the-val-di-non-and-val-di-sole-apples-and-flavours-route/>

Melinda consortium: <https://melinda.it/en/>

Oppla case study: <https://oppla.eu/casestudy/19801>

Fondazione Edmund Mach: <https://www.fmach.it/>

Case Study IV. The Garfagnana Localised Agri-Food System

Best practice highlights

- Active local authorities and institutions with a clear strategy
- Farmers willing to adapt and diversify
- Strong social capital
- Diversified farms: value-added products and agrotourism
- Environmental sustainability

Characteristics of a well-developed localised agri-food system

Any region can be described as having an agri-food system due to the ubiquity of food and agriculture. The term localised agri-food system (LAS) usually refers to an area that has several characteristic products that are traditionally produced and consumed in the region and in which the agriculture and food industries are an integral part of the fabric of the local community. A key feature is mutually beneficial cooperation between the different private and public actors in the system. A well-developed LAS has many or all of the following characteristics (Adapted from Treacle, 2019).

- 1) Diverse agricultural production and food processing industries that are dominated by fairly small-scale enterprises and provide income for a significant percentage of the community.
- 2) Low intensification and a high degree of environmental sustainability in the farming sector.
- 3) A range of products that are known to be specialities of the area (although not necessarily exclusive to the area).
- 4) Collaboration and interrelationships between producers of different products within the LAS. This can be at different stages of the process, from production to marketing. For example, producers of Parmigiano-Reggiano cheese sell excess whey as pig feed to producers of Parma ham. At the retail level, a cheese dairy with its own on-site shop might also sell wine from a local producer to accompany its cheese.
- 5) A degree of cooperation between different producers of the same product in the LAS, often mediated by consortia or cooperatives. Producers within the LAS may reduce competition with each other and focus on protecting their industry from outside competitors.
- 6) Local authorities, in the form of local government and state-run research and consultancy organisations, that are active in their support of the local agri-food sector. These ultimately require support from central government and the European Union in the form of favourable legislation and regional development funds.

7) A local population that has a high degree of awareness of and pride in the local agricultural and food products and a willingness to support the local agri-food economy with its spending power.

The Garfagnana region

Garfagnana is a mountainous region in northern Italy located northwest of Florence and south of Parma, in the province of Lucca and the region of Tuscany. It comprises the upper basin of the River Serchio. It is bordered in the west by the Apuan Alps and to the east and north by the Apennines. Temperatures in Castelnuovo di Garfagnana, the principal town, range from an average low of 0.2 °C in January to an average high of 24.2 °C in August. However, Castelnuovo is located on the valley floor at an altitude of 270 m above sea level, so most of the Garfagnana is higher and colder and many parts are snow-covered in the winter. Average annual precipitation in Castelnuovo is 1356 mm, ranging from 53 mm in August to 179 in November. For comparison, average annual rainfall is 888 mm in Parma and 935 mm in Florence (data from Climate-Data.org).

Garfagnana has an area of 620 km² and is made up of 14 municipalities (Garfagnana Municipalities Union). It has a low population density of around 54 people per square km, about a third of the regional average (Mantino & Vanni, 2018). Due to its mountainous geography and limited access to transport networks, it has always been somewhat isolated from the rest of Tuscany. It has no cities, the main towns are Castelnuovo di Garfagnana and Barga with populations of around 6000 and 9000 respectively. The city of Lucca is just outside the area. The remaining population is dispersed in small villages, hamlets and isolated dwellings. There is some light industry near the river but the area is generally very rural and heavily dependent on agriculture. The population of the Garfagnana has declined by around a third since the 1960s and the area of actively farmed land has also decreased significantly since World War II. This in part was due to new industrial employment opportunities in other parts of Tuscany. The population has stabilised in recent years (Treakle, 2019).



Figure 9. The Province of Lucca (red).

Image credit: TUBS / Wikimedia Commons



Figure 10. Castelnuovo di Garfagnana.

[Image credit: LigaDue / Wikimedia Commons]

Products and farming

Several agricultural products in Garfagnana are considered specialties of the region. There are two products with protected geographical status, Farina di Neccio della Garfagnana PDO (flour made from chestnuts) and Farro della Garfagnana PGI, wheat (spelt) of the emmer variety (*Triticum dicoccum*) that is cooked and eaten as whole grains. Other notable crops and products include other types of wheat and corn, honey, a variety of fruit, sheep and trout. A wide variety of other crops are also grown to meet the needs of the local population. The livestock raised in the region includes three endangered indigenous varieties, the Garfagnina Bianca sheep, Garfagnina beef cattle and Garfagnina goats.



Figure 11. Typical dishes of the Garfagnana: Chestnut flour pancakes from PDO *Farina di Neccio* (left) and spelt soup from PGI *Farro della Garfagnana* (right).

[Image credits: fugzu / Wikimedia Commons]

Farming is mostly carried out on a small scale with each farm growing a variety of crops. Arable land and pastures are interspersed with woodland, either naturally growing woods with different species or cultivated chestnut trees. This mosaic-like pattern of cultivation is partly a result of the local geography, as the mountainous terrain does not favour large-scale monoculture. This serves to protect the small farmers of the region from competition from large scale enterprises, but on the other hand it can make scaling up a successful operation more difficult. Farming techniques are traditional and sustainable. While not necessarily certified as organic, farmers employ crop rotation and natural manure to minimise or eliminate the use of artificial fertilisers and pesticides (Treakle, 2019).

Organisations and institutions

Local government consists of 14 small individual municipalities in the Garfagnana, which are united under an umbrella organisation, the **Unione Comuni Garfagnana**, or **Garfagnana Municipalities Union (GMU)** ([link below](#)). It is part of the Province of Lucca, which in turn is under the authority of the Region of Tuscany. The GMU has actively promoted cooperation between actors in the Garfagnana LAS, promoted the region and its products, and been successful in securing funding from national and EU regional development programmes. It is involved in or manages several specific projects. A recent project of the GMU is the **Comunità del Cibo della Garfagnana** (Garfagnana food community). A food community is a community of growers, producers, consumers (private, commercial and institutional), interest groups such as environmental organisations, and universities and research institutes. The objective of the Garfagnana food community is to improve

production, biodiversity and sustainability, based on three basic principles: 1) The food must be of good quality; 2) it must be ethical, meaning that the producers are paid a fair price and there must be no discrimination in the supply chain; 3) the production must be environmentally sustainable.

The **La Piana Centre** nursery has been managed by the GMU since 1976, having been established as a forest nursery by the state forestry authority in 1957. In 2008 a local branch of the **regional seed bank** was incorporated into the Centre. The overall function of the Centre is to preserve the genetic heritage and agricultural varieties of the area and to improve agricultural production in sustainable ways. More specifically, it carries out the following functions.

- 1) Production and distribution of tree seedlings. In keeping with its origins as a forestry institute, the Centre grows seedlings of defined local varieties for planting in cultivated or managed forests. In this way it helps protect the genetic heritage of the region's woodlands from outside invasive varieties.
- 2) Conservation and enhancement of the plant genetic heritage. The many varieties of crop plants and grapes for viticulture have been catalogued and characterised genetically and phenotypically. A collection of ancient fruit trees has been established that can be used for propagation and there is a seed bank in which seeds of local varieties are held and the genetic lines maintained. Part of this conservation effort involves the local farmers directly via the system of "custodian growers", farmers who agree to cultivate and maintain particular cultivars and preserve the purity of the stock. The Centre investigates sustainable ways to improve cultivation and yield of the local varieties.
- 3) Promotion and dissemination activity. The Centre and the seed bank collaborate with nearby universities in research activities. They promote the local varieties to the Garfagnana population by providing access to knowledge and plant material to farmers and amateur gardeners, hosting seminars and training sessions, and holding educational events for children. The overall objective is to increase awareness of and interest in the local varieties among the residents of Garfagnana and to ensure that this knowledge is passed on to the next generation.
- 4) Social farming activities. The Centre runs programs focused on the use of farming and agricultural laboratory work for the social integration of people with disabilities.

Local Action Groups (LAG) are public-private partnerships that were first established in rural areas under the EU Leader programme in 1991 (https://enrd.ec.europa.eu/leader-clld_en) . The idea was to revitalise declining rural areas by allowing local actors to lead and initiate programmes using their local knowledge and EU funds. The approach continued after the end of the Leader programme under the title Community-led Local Development, which also includes coastal areas. Throughout the 1990s and 2000s, the Garfagnana LAG worked with the GMU to promote collaboration between a broad range of rural stakeholders such as farmers, small businesses, and various consortia and cooperatives. The LAG and the GMU between them were thus able to secure significant funding for development projects. However, the Garfagnana LAG was disbanded in 2015 following a series of corruption scandals and accusations of misappropriation of EU funds (<https://www.lagazzettadelserchio.it/garfagnana/2015/10/luigi-favari-chi-e-costui/> and https://www.europarl.europa.eu/doceo/document/E-8-2016-003777_EN.html). Garfagnana is now covered by the much larger LAG Montagna Appennino.

The **Garfagnana Coop** is a farmers' cooperative that is involved in processing basic agricultural products to add value and then marketing those products. It has its own solar-powered mill that is used to produce flour from the various wheat and corn varieties that are grown in the region and from chestnuts to make the PDO chestnut flour. The PGI Farro della Garfagnana is also processed and marketed by the Coop. Other value-added products include pickles, table olives, vegetables in oil, and fruit jams. The Coop is also involved in collaborative projects with regional authorities, universities, and the LAG Montagna Appennino to improve the production of Farro della Garfagnana and upgrade its status to PDO, to investigate local supply chains, and to improve farms and productivity in high-altitude areas.

The **Garfagnana Produce Consortium** integrates the promotion of local food and agriculture with other tourist activities. Its website has listings of food producers, restaurants, farms offering accommodation, other accommodation, and outdoor activities. It also lists events such as the weekly market, guided tours and tastings in dairies and wineries, and guided outdoor activities such as hikes.

Apart from these organisations that are specific to Garfagnana, the area is also influenced by higher levels of regional government, notably the Regional Council of Tuscany. Agricultural research activities in Garfagnana are often carried out in

collaboration with universities in the region, such as the Universities of Pisa and Florence.

Diversification and multifunctionality

The tendency in modern agriculture over the past few decades has been towards industrialisation and economies of scale supported by large capital investments. Many small-scale and family-run farms have not managed to survive in this economic environment which is primarily based on price competition. Many of those that managed to keep operating have had to find new approaches to running a viable business and supporting their families. One such approach is for the farm to diversify, both in terms of the farming itself and of other activities that are indirectly connected to agricultural production. Diversified farms are characterised by many of the following characteristics (Treacle, 2019):

1. A management philosophy that sees the function of a farm as more than just the production of crops and/or livestock
2. Strong social capital: The farm interacts with and is valued by the local community.
3. A diverse range of products with emphasis on those that are characteristic of the area.
4. A market focus on the local agri-food chain.
5. Low intensity farming and consequently low productivity.
6. A high degree of environmental sustainability, often using organic, biodynamic or other alternative farming methods.
7. Diversification of activities beyond farming itself.

Many farms in the Garfagnana conform to many points on this list and so can be classed as diversified and multifunctional. They produce a variety of different products throughout the year and may have both animals and plant crops. In part this is a result of the mountainous terrain, as even a small farm may contain different land types that are suitable for different uses, but a major driving force is the need to maintain income throughout the year as a small farm cannot live from a single crop harvest for an extended period. Farms in the region tend to be traditional and use sustainable low-input agricultural methods with minimal artificial fertilizers and pesticides. Natural manure and crop rotation with nitrogen-fixing crops are used to maintain soil fertility.

Social capital is a somewhat more intangible concept that can exist in many forms, some of which may be more apparent than others. An individual farm can develop positive interactions with other farmers, other members of the community, local institutions and consortia, and local government. Informal interaction can lead to more formal agreements. All of these can help in the operation of the farm and the marketing of the products. In the Garfagnana, communities are mostly very small, which means that good relations are important.

Social capital may be obtained actively or passively. Examples of both are found in Treacle (2019) in a case study of a small (1 ha) fruit farm located in the Apuan Alps Park. It was started in 2012 by three men from Lucca on land that had previously been agricultural but had long since been abandoned. The clearing of the land and creation of the farm was met with approval by the local inhabitants as it was seen as protecting the village from the encroaching wilderness and restoring the land to its former managed state. This could be considered to be passive social capital as it is inherent to the farm's existence and not a result of active interaction. This general good will felt towards the new farm led to help in the form of favours and word-of-mouth marketing of their products. It also helped in the second, more active example of the benefits of social capital: the farm struck a deal with the local Park authority in which, in exchange for the farm providing agrotourism services (lectures on sustainable agriculture etc.) for the Park's visitors, the Park would lend some of its buildings to the farm to use for making jam and other processed fruit products. Such non-monetary, mutually-beneficial trades between actors can open up possibilities for small enterprises that lack financial capital for investment but have social capital in the local community and with local institutions.

The third example concerned the farm's biodynamic approach to agriculture. The three men were enthusiastic about this method of farming for environmental and philosophical reasons. They considered applying for certification for their produce as biodynamic or organic, which would allow them to sell for higher prices. However, they realised that this would be perceived negatively by many of the older farmers and agronomists, damage their good relations with the community and reduce access to the LAS. They therefore decided to continue farming organically and using biodynamic methods, but not label their products as such, thereby sacrificing extra profit for the sake of their social capital and local market access.

Perhaps the most important of the characteristics of the multifunctional farms in the Garfagnana is the diversification of activities beyond basic farming. This can be divided into two categories: The further processing of farm produce into value-added products, and the use of the farm and its facilities for activities not directly related to food production. In the Garfagnana, the further processing of farm produce is carried out by the individual farms themselves, by separate local processors or by the Garfagnana Coop. Food processing requires specific knowledge, capital investment, and on-farm infrastructure facilities and may require the enterprise to conform to additional regulations and legislation. Not all small farmers are able to meet these requirements, and so the Garfagnana Coop plays an important role in valorising the members' produce. Individual farms that produce value-added products themselves include the fruit farm mentioned above that produces wine, jam, pickles and spreads from their own crops, several dairy farms that produce yogurt or cheese, and many other examples. Those farms that do not further process their crops but sell them to local processors do not benefit directly from the added value but the profit is generated within the LAS, thereby benefitting the local community indirectly.

Agrotourism constitutes a significant income stream for many diversified farms in the Garfagnana. The characteristics of the region itself plays an important role. The natural beauty of the valley and mountains, the low level of industrialisation, and the mosaic of small fields, orchards and woods give the area a high degree of aesthetic appeal to visitors. This is further enhanced by the many traditional buildings such as the 'metato', a low stone building used for drying chestnuts. The wide variety of traditional food products associated with the area together with the environmentally sustainable farming methods gives the area an additional appeal to visitors with an interest in gastronomy, slow food and healthy living. The Garfagnana Produce Consortium helps to boost agrotourism through its website listings. The GMU and LAG also contributed significantly by securing or providing grants for the conversion or upgrading of farm facilities for the purpose of agrotourism. The active promotion of agrotourism in the Garfagnana has had positive results: from only four agrotourism enterprises in 1995, the number had grown to 130 in 2016, corresponding to over 1200 beds and an annual turnover of 4-5 million Euro (Mantino & Vanni, 2018). Apart from offering accommodation, many enterprises participate in agrotourism by offering activities such as cookery classes, talks on sustainable farming and tours of processing facilities such as wineries and dairies. Such activities may be offered for a fee or provided without charge as a

marketing tool for selling the farm's produce. Some enterprises provide tours and lectures for educational purposes to schools and others in order to make a positive contribution to the community and build social capital.

Preservation of biodiversity and traditional breeds

Many indigenous plant varieties and animal breeds in the Garfagnana were in decline in the decades following World War II, and some were in danger of disappearing. The EU Common Agricultural Policy (CAP) and its application by the Italian government encouraged a productionist approach, and this attitude became entrenched in the farming community. As a result, traditional breeds and varieties were abandoned in favour of more common commercial types with higher yields such as Swiss brown cows. The successful reversal of this trend was a result of several factors. From 2000 the CAP moved away from pure production and towards multifunctionality, with associated changes in subsidies available to farmers. The GMU and LAG were successful in obtaining and coordinating funding for the restoration and maintenance of traditional breeds and varieties and were active in promoting their rearing in preference to non-traditional types. For example, in 2004 the GMU decided to promote the repopulation of the Garfagnina sheep, which was in severe decline. Funds were made available to selected farms to convert to sustainable practices if required and to restock with Garfagnina sheep. A subsidy was introduced for those farms stocking the breed (80 Euro per head per year in 2015).



Figure 12. Garfagnina bianca sheep

Image credit: Justlettersandnumbers / Wikimedia Commons

The La Piana Centre and the seed bank play a central role in the preservation of local varieties as described above. They maintain stocks of defined local varieties, distribute seedlings and give technical help on the best growing techniques, collaborate with local universities in research, and carry out activities to promote and raise awareness of local varieties among the local population.

The attitude of the local population and more specifically the local farmers towards the indigenous varieties is a key factor in their preservation. The shift in emphasis from production volume to sustainability, localism and tradition and the

general pride of the local population in their agricultural heritage greatly facilitates the preservation of local varieties. An important practical manifestation of this is the custodian growers scheme administered by the seed bank.

Most local varieties and breeds had been declining since the 50s and 60s and have still not returned to anything approaching their previous levels of production. However, the decline has been reversed in most cases and so the conservation and restoration efforts can be considered at least partially successful. The custodian growers cultivate 55 plant varieties (2016 data). Garfagnana spelt (Farro della Garfagnana PGI) was in danger of extinction in the 1980s as only 5-10 ha were being cultivated. This has since increased to 200 ha, helped in part by the award of PGI status in 1996. Cultivated chestnut woods declined from 15 000 ha in 1978 to a low of 300 ha in 2008, but have since increased to around 3000 ha, again helped by the PDO certification of chestnut flour in 2008. The white Garfagnina sheep, of which there were around 60 000 head in the 1950s, declined to just 70 in 2003. The GMU-led intervention has increased this number to about 800 (2014). Garfagnina beef cattle declined from 6000 head in the 1950s to 400 in 1998, and have since recovered slightly to 800 (Data from Matino & Vanni, 2018 and Treakle, 2019).

Conclusions

The Garfagnana LAS is based on diversified small-scale production. A range of high-quality foods are produced, including two with geographical indication, many of which are characteristic of the area. Agricultural methods are generally sustainable and of low intensity. Large agricultural enterprises are absent from the Garfagnana, in part because the difficult terrain does not facilitate economies of scale. Cooperative processing and marketing of the products of many individual small farmers plays an important role in the agricultural economy. The Garfagnana was an undeveloped area that had been in decline for many decades. This decline was halted and partially reversed by several factors working in concert.

State and non-governmental organisations have played key roles in the development of the Garfagnana LAS. The GMU and the LAG were very active in securing funds for regional development. They operated according to an overall development strategy based on place-based agriculture, by encouraging and financially supporting the cultivation or rearing of local varieties and breeds in a sustainable way. This led to two products obtaining geographical indication status. The expansion of the La Piana Centre and the incorporation of the seed bank was another manifestation of this overall policy. The Gafagnana Coop undertakes food

processing operations such as milling on behalf of many farmers, thereby removing the need for each individual farm to have the capacity to carry out further processing itself. It also markets the products via a shop and accompanying website (although it does not yet have an e-shop), again carrying out collectively an important function that may be difficult for small individual farms. The Garfagnana Produce Consortium is active in promoting more diverse activities in the agrotourism sector as well as the agricultural and food products themselves, encouraging tourists with an interest in quality food and rural activities to visit the region.

While the activity and efficacy of the organisations above are of great importance, the receptiveness of the farmers to new ideas and the level of engagement of community in general are also paramount. A shift in farming practice from productivism to multifunctionalism and environmental sustainability was led by local government policy. Market forces also played a role, as the general industrialisation and scaling up of agriculture throughout Europe made it more difficult for small farms to compete in the mass produce market and obliged them to find a niche. However, such policy changes cannot be implemented effectively if the farmers are not willing to adapt and show flexibility as many farms in the Garfagnana did. Many farmers actively support the conservation of local varieties by participating in the custodian growers scheme. Some producers have shown innovation in the production of value-added foodstuffs such as jams, cheeses and salami from their crops and livestock. Apart from the farmers themselves, the attitude of the community is important. Many people in the Garfagnana have pride in their region and its products and so are keen to spend their money on local produce and support the local growers. Institutions such as La Piana Centre help to nurture this positive attitude.

Social capital can be of considerable benefit to a small farm that is part of a rural LAS. Small enterprises that cultivate a good standing in the community may benefit from favours, informal exchange deals for equipment and facilities, and word-of-mouth marketing. Offering something to the community such as educational activities for school children or the use of farm facilities for community activities may therefore bring tangible rewards in addition to the intangible benefits of philanthropy. On the other hand, bad social relationships in a close-knit community can be disastrous for a small farm that is largely dependent on the LAS as a market. An example was given above in which the extra profit that could be gained

by labelling products as organic was forgone in order to maintain good community relations, which was judged to be more important for the long-term viability of the farm.

The Garfagnana valley already had considerable environmental capital due to its natural beauty. This was enhanced by local government policies encouraging the restoration of traditional buildings etc. The promotion of traditional varieties and breeds and of foods characteristic of the region increased the cultural capital of the Garfagnana. The environmental and cultural capital was then valorised by the promotion of agrotourism, which has grown from almost nothing in the mid 1990s to become a 4-5 million Euro per year income stream today. This growth has been a result of local government policies (either directly concerned with agrotourism via subsidies for conversions or indirectly by increasing the attractiveness of the area through biodiversity projects etc.) and the willingness of the local population to adapt to new challenges.

The Garfagnana over the last four decades, while not without problems, has generally been a success in terms of reversing regional decline and promoting local foods and agricultural varieties. This success is largely attributable to active local government and NGOs, adaptability of the farmers, community cohesion and an engaged and interested local population.

Links

Garfagnana Municipalities Union: <https://www.ucgarfagnana.lu.it/>

Garfagnana Coop: <http://www.garfagnanacoop.com/>

Garfagnana Produce Consortium: <http://www.ingarfagnana.com/en>

Montagna Appennino LAG: <https://www.montagnappennino.it/>

Case Study V. Diversified Olive Farming in Spain

Best practice highlights

- Production of added-value products by individual producers and cooperatives
- Development of agrotourism in collaboration with other food producers and the local administration

Spain is the world's leading producer of olives and olive oil. Spanish commercial olive plantations cover 2.5 million ha, around 55% of the total in the European Union. Other major producers in the EU are Italy (1.1 M Ha), Greece (0.7 M Ha) and Portugal (0.3 M Ha). The intensiveness of olive farming varies. In Spain, 1.3 M Ha are planted with less than 140 trees per hectare, 1.1 M ha with 140-399 trees per ha, and 0.15 M ha with 400 or more trees per ha. Average annual production of all types of olive oil except pomace oil from 2015-19 in Spain was 1.4 million tons, 67% of the EU total. Domestic consumption of olive oil in Spain is around 500 000 tons per year. Spanish table olive production averaged 588 000 tons over the same period, also 67% of the EU total (all data from 2017, Eurostat). Olive plantations in Spain are concentrated in the south: the region of Andalusia has around 50% of the country's trees.



Figure 13. Olive plantations in Andalusia, Spain.

[Image credit: Kallerna / Wikimedia Commons]

There are over 20 varieties of olive cultivated in Spain, some of which are suitable for oil production and some for table olives. The use of different olive varieties together with the particular climate and geography of the growing area result in oils that differ from region to region in their appearance and flavour. Olive oil is graded according to quality and production technique. The highest quality available at retail is extra virgin olive oil (EVOO), followed by virgin olive oil, olive oil (refined and blended), and lastly pomace oil which is chemically extracted from the leftover pulp after pressing. Some other grades exist which are available only to processors. Spain has 34 EVOO with PDO or PGI designation, second only to Italy. Sales of EVOO with geographical indications throughout the EU was worth 301 million Euro in 2017 (<https://www.oliveoiltimes.com/business/european-geographical-indicators-valued-at-more-than-80-billion/81276>), of which the 34 Spanish oils accounted for around 25%.

Although the overall scale of Spanish olive production is extremely large, much of the initial production is still carried out by small farmers and local cooperatively-run oil presses, and this stage of the value chain is extremely fragmented. In 2009 there were 362 782 olive farms in Spain with an average area of 5.46 ha. However, in 1999 there were 571 155 farms with an average size of 3.65 ha, suggesting that a fairly rapid process of consolidation of smaller farms into larger ones was taking place in that period. In 2010, 54% of the 814 presses were cooperatives (Iliopoulos et al., 2012b). Most presses sell their oil in bulk to processors and packers. Beyond the cultivating and pressing stages of the oil production, the fragmented, cooperative nature of production is lost and large companies dominate the refining and marketing. The added value of the product is mostly in this latter stage, so the farmers and local cooperatives have an incentive to try to capture some of this part of the value chain.

Cooperatives can be divided into two categories. First tier cooperatives are made up of local farmers who use the cooperative's presses to process their olives, and usually (but not always) sell the oil they produce in bulk to other entities for packaging and marketing. Second tier cooperatives are consortia of local cooperatives that are set up to further process, package and market the oil. Joining or forming consortia is one way in which local cooperatives can increase their market presence, increase efficiency, obtain greater negotiating power with buyers and service suppliers, and more easily produce value-added products such as bottled rather than bulk oil. However, consortia are in a minority in the olive oil

market, which is strongly dominated by private companies. Of the top ten olive oil marketing companies in Spain, only one was a cooperative consortium in 2010 (Iliopoulos et al., 2012b). This study will focus on ways in which first tier cooperatives and individual farms and estates increase the economic sustainability of their operations.

Adding value

As mentioned above, the majority of the first tier cooperatives sell their oil in bulk straight after pressing, thereby failing to benefit from the added value further down the value chain. Increasing vertical integration in first-tier cooperatives has been shown to increase the members' income (Iliopoulos et al., 2012b). There may be several reasons for this reluctance on the part of cooperatives to undertake added value processes. A significant obstacle is often the will of the members to take the initiative and make the required investments in bottling machinery etc. Many olive growers have other occupations to which they may give priority, so they are unwilling to put extra effort into the valorisation of their olive crop. Capital investment and space is required for additional processing equipment. This may require loans to be secured and cooperatives may be reluctant to take this risk given that the success of any new business venture cannot be guaranteed. It can be difficult for a small cooperative to enter a market that is crowded with big companies and be able to secure distribution deals with established retail outlets, so alternative means of selling may be required such as on-site shops, markets and via the internet.

Despite these challenges, some first-tier cooperatives have successfully launched retail businesses or retail supply businesses and are able to compete with the large commercial companies. Many cooperatives operate a mixed system in which some of their olive oil is bottled and sold under their own brand and some is sold in bulk to other companies. This has the advantage of providing two income streams and spreading the risk of market fluctuations. For their own bottled products, cooperatives often rely heavily on internet sales as they often struggle to obtain supply deals with major supermarkets. Many sell primarily in their own region and distribution is often limited to Spain only.

Organic certification can add additional value to bottled EVOO. Throughout the EU, 8.5% of the total utilised agricultural land area is certified as organic or under conversion to organic farming. Between 2012 and 2019, this land area increased by 46%. The equivalent percentage in Spain is 9.7% of utilised agricultural land area,

and the area increased by 34% from 2012 to 2019 (data from Eurostat). Organic farming is supported by EU conversion subsidies and the Andalusian regional government launched three Plans for Ecological Agriculture between 2002 and 2016 (Jiménez-Díaz & Collado-Campaña, 2021). However, the Spanish people have among the smallest expenditures in Europe on organic produce, and people do not generally view organic certification as important when choosing EVOO (Torres-Ruiz et al., 2018). The additional value of organic certification may therefore be limited in the domestic market.

Two examples of first-tier cooperatives from Andalusia that have successfully broken into the retail market are San Isidro Deifontes SCA and Nuestra Señora del Rosario. San Isidro Deifontes SCA (<https://www.sanisidrodeifontes.com/index.asp>) was founded in 1960 in the province of Granada and now has 650 growers as members. It has an Integrated Agriculture certification from the Andalusian Committee of Ecological Agriculture and collaborates with university research projects on organic olive growing. They sell a selection of EVOO and other olive oils with PGI status under three different brand names. Nuestra Señora del Rosario cooperative (<https://aceitedelrosario.es/>) was founded in 1944 by 58 farmers, and now has more than 1200 members. They produce organic and conventional EVOO which is sold under four different brand names, three of which bear the Baena PDO certification. Organic EVOO is sold for 33% more than the equivalent non-organic brand. The company makes reference to its history as a marketing tool by naming one of its brands “58 Agricultores”. Both companies have an e-shop with free shipping to mainland Spain. An example of a single olive estate that retails its own products is Soler Romero in the province of Jaen, Andalusia (<http://www.soler-romero.com/inicio>). Previously a member of a cooperative, they decided to abandon mass production and diversify their business, leaving the cooperative in 2001. They have their own mill which is exclusively for their own olives. The 600 hectare estate is fully organic, and is certified as such not only by the EU but by the United States, Japan and China, which is indicative of an export-orientated business strategy. The oil production and bottling is certified by ISO 9001 and 14001 for environmental and quality standards. One novel marketing tactic is the sale of oil from the first day of each annual harvest as a ‘special edition’ product.

Agrotourism

Tourism is an important source of income in Mediterranean countries, and is mainly based on the beaches and major cities. Over the past few decades these countries

have placed increasing emphasis on alternative forms of tourism and attempted to valorize the environmental and social capital in other parts of the country. This has led to a growth in agrotourism, which is based on quality products, environmental sustainability, and local heritage and character. In Spain, particularly in the south, the olive is the most important crop, so agrotourism is centred on the olive groves, mills and the production of oil. EVOO is a product that has a cultural role beyond the mere need for food, it is a product of particular interest to those with a love of gastronomy and, a little like wine, may attract “connoisseurs” who enjoy sampling different varieties. The landscape of the olive groves is generally attractive and evocative of a long history and tradition. Olive oil tourism activities give a sense and an appreciation of the product itself, its origins and connection to the territory, how it arrives at the table from the tree, and the role it plays in the local cuisine. Loyalty to a particular brand of oil or to oil from a particular region may help to maintain future sales.

Olive-based agrotourism, sometimes known as oleotourism, can bring many benefits to individual farms and cooperatives and to the region in general. The typical tourist visiting olive-related agrotourist facilities is middle-aged, well-educated and with above-average spending power. They therefore bring greater economic benefit to the region per head than tourists on cheap package holidays. In addition, olive oil tourism can bring visitors to rural regions that have little by way of more conventional tourism and may generally be lacking in economic vitality.

In a survey in the agricultural territory of La Serena, Extremadura in southwest Spain, 208 visitors to the town of Monterrubio de la Serena were interviewed about their motivations for visiting the area (Folgado-Fernández et al., 2019). Of the interviewees, 90.7% were Spanish, 71.2% were over 40 years old, and 65.4% had a university-level education. The most important motivations for visiting the area were the local cuisine and the olive oil culture, i.e. motivations directly related to quality local agrifood products. Closely following were motivations related to the general environment and ambience of the place: rest and relaxation, the historical and cultural heritage, and enjoying nature. Another survey by Orgaz Agüera et al. (2017) interviewed around 400 visitors that were engaging in olive oil tourism in Andalucía. Of these, 43.1% were Spanish and 28.2% French, 80.3% were 40 years old or over and 52.3% had a university-level education. The features of a holiday destination that they considered the most important were hospitality, good quality

food and the conservation of the environment. When asked what they were most satisfied with during their visits, the leading responses were the visits to the oil mills, hospitality, and the availability and quality of information.

These survey results make clear that, while olive oil may be the primary attraction for the gastrotourist, it cannot be the only one. Visitors need to eat and those that are interested in the oil are also highly likely to be interested in local high-quality foods. This raises the possibility of collaboration between olive oil producers and other food producers in presenting the discerning visitor with a complete gastronomic experience. In this way the visitor will leave with a more complete impression of the gastronomic heritage of the area and the producers of other foods will also benefit from extra sales and marketing of their products. Tours of farms and presses often end with a tasting session and refreshments, which is an opportunity for other local foods and wine to be offered.

Visitors with an interest in gastrotourism are often sensitized to environmental issues, as noted in the surveys cited above, and so the environmental sustainability of the farming operation can play an important role in the overall impression with which the visitors leave. Visitors do not want to feel that they are contributing to an environmentally damaging operation, and the aesthetic appeal of the environment contributes to a general feeling of well-being and overall experience of the visit. Farms which are certified organic have an advantage in this aspect, but organic certification is not strictly necessary. Many Spanish olive growers use integrated farming methods and are conscious of the potential impact of their operations on the environment. Organic EVOO can sell to visitors at a premium price if the farm has a retail outlet, despite the relatively small importance given to organic certification by the Spanish people.

The successful development of agrotourism requires a coordinated campaign involving the individual businesses together with national and local government and other institutions. The Spanish government's official tourism website has a page dedicated to olive oil tourism in different parts of the country (<https://www.spain.info/en/discover-spain/best-olive-oil-tourism-plans/>). Many towns and cities, particularly in the south, have local ethnographic museums that are wholly or partly dedicated to olive farming (<https://www.internationaloliveoil.org/olive-world/olive-museums-routes/>). Urban museum displays help to raise awareness of olive oil and may encourage tourists in the cities to visit the surrounding countryside. Olive oil routes are a significant

development in agrotourism. These are often based in PDO areas, and connect olive oil estates and cooperatives, other products of the local gastronomic tradition, areas of natural beauty, and other cultural activities. The olive oil estates themselves offer a range of organised activities such as tours of the estate, the chance to see the mill in action, EVOO tasting sessions, participation in the harvest etc. Some estates also offer their facilities for events such as wedding receptions, thereby valorising the generally pleasant and evocative environment of the olive grove.

Farms and local cooperatives that are considering an agrotourism venture may have several difficulties to overcome. Offering hospitality requires a particular skill set that may not exist within the operation, so staff must be hired and/or trained. Substantial infrastructure investments may be required, such as converting the working olive mill to receive visitors, providing food preparation and serving areas, installing toilet facilities etc. There may also be legislative issues if a business starts admitting visitors and serving food, and health and safety regulations that must be adhered to.

Conclusions

Spain has the world's largest olive oil industry, but this is fragmented at the production end of the value chain and dominated by small to medium sized farms. These are mostly organised into cooperatives which press the olives and in some cases bottle it, but the majority of oil is sold in bulk to other actors in the chain. Farmers and first-tier cooperatives therefore lose out on much of the added value of the oil they produce. Cooperatives and larger farms can adopt a multifunctional approach in order to increase their revenue. Bottling and selling their oil allows them to capture more of the added value, although barriers to entry into the market due to the dominance of large companies need to be overcome. Many successful operations rely significantly on sales via the internet as deals with supermarkets can be difficult to obtain.

Agrotourism is another potential revenue source, and can benefit the wider community as well as just the olive producers themselves. Collaboration with other agricultural enterprises and the organisation of agrotourism routes can provide a more complete and attractive visitor experience. The state and local tourist office and other local institutions play an important role in the development of agrotourism. Potential barriers are the lack of appropriate skills and infrastructure on the farms.

Links

San Isidro Deifontes SCA: <https://www.sanisidrodeifontes.com/index.asp>

Nuestra Señora del Rosario cooperative: <https://aceitedelrosario.es/>

Soler Romero: <http://www.soler-romero.com/inicio>

Spanish official tourism website olive oil tourism page:

<https://www.spain.info/en/discover-spain/best-olive-oil-tourism-plans/>

List of local ethnographic museums that are wholly or partly dedicated to olive farming: <https://www.internationaloliveoil.org/olive-world/olive-museums-routes/>.

Factors Contributing to the Success of Local Products and Local Agri-food Systems

Introduction

From the case studies above, it can be seen that there are several factors that contribute to the successful development of a product or a localised agri-food system. Some of these, such as regulations and collaborative action, can be defined and implemented as best practices. Others are somewhat less tangible and hard to implement as a policy, for example the development of supportive social networks and community good will. In the following sections five different factors for successful development are discussed, with an emphasis on those that can be implemented as best practices. The list is not intended to be exhaustive, and the factors discussed are not all universally applicable.

Local Government and Institutions

Active local government that is sensitive to food and agricultural issues can play an important role in the development of a localized agri-food system (LAS) and in the support of individual food and farming businesses. The competence of local authorities to decide on and implement food and agriculture policies within their own area varies from country to country. In some cases more power over policy may rest with regional or even national government, or power to make decisions and allot funding may be spread across different tiers of government. Another important factor is whether the country is a European Union member state or not, as this affects both policy and funding opportunities. For the oversight and governance of sustainable agriculture and food systems, coherence in policy across different levels of government and different departments is needed and is sometimes lacking (Šumane et al., 2021).

Development strategy

An important key to the development of an area and its agriculture and food systems is an overall strategy into which individual policies, grants and projects then fit. In the Garfagnana, the head of the Garfagnana Municipalities Union described the strategy of the GMU thus: *“since early 2000s, the strategy of the territory has been based on three focal points, which form the vertices of a triangle and complement and reinforce each other: multifunctionality, quality and*

identity. In this model, we tried to work on activities that could justify the presence of farmers in the area and at the same time that could make farming activities sustainable from the economic point of view. The farm is the most important element in strengthening this system. Farming diversification and especially agro-tourism is a key factor to improve the economic viability of local agriculture together with the enhancement of biodiversity, quality and landscape” (Mantino & Vanni, 2018). Development strategies will obviously vary depending on the characteristics of the area, but encouraging farm diversity and the pursuit of quality are likely to be common to many.

Securing funding

For a local or regional development strategy to succeed, the responsible authorities must secure funding. For members of the EU, the Common Agricultural Policy (CAP) plays a major role both in determining policy and in funding. The CAP has three pillars: support for farmers through direct payments, market measures to combat large price fluctuations, and rural development

(https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/cap-glance_en) . Part of the income support budget may be

effectively redistributed to small farms by subsidising the first few hectares of a farm at a premium rate. In this way the smaller the farm, the larger the proportion of its area that receives extra subsidies. This particular pillar of the CAP is administered by central government, but regional governments play an important role in the third pillar, rural development. The CAP contributes to Rural Development Projects (RDP) through the European Agricultural Fund for Rural Development (EAFRD). RDP are co-funded by the EAFRD and the member state, and are often administered by regions, so a dynamic and informed regional government is of paramount importance. Notable features of RDP are as follows

(https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/rural-development_en):

1. Spending on environmental sustainability, mostly through grants to farmers to convert to more sustainable practices.
2. Developing and supporting Local Action Groups, in which state and private sector actors unite to formulate development strategies for the region.
3. Promoting technological innovation in rural areas (‘smart villages’).
4. Creating financial instruments to provide small loans and guarantees to producers.

Other funding opportunities from the EU or from national governments may not be specifically for rural development or food, but can be applied to this sector. Local and regional governments must be alert to funding opportunities from a variety of sources in order to pass the benefits on to the local community. For example, the success of the Garfagnana Municipalities Union, together with the Local Action Group, in securing funding played a central role in the restoration and development of the region.

Environmental stewardship

Agricultural land is a vital physical resource for food production and must be protected from degradation or loss. Local authorities play a role in ensuring that land usage registers are maintained and that unauthorized change of use from agriculture to non-agricultural activities is prevented in accordance with local legislation. Water resources must also be carefully monitored, especially in cases where the source of the water used for agriculture is within the area governed by the local authority. This requires monitoring of river flows, lake levels and ground water, together with control of rates of abstraction for irrigation. Such monitoring may often be carried out by another body in coordination with the local council.

Apart from supporting and protecting agriculture itself, the local authority can also help to shape the landscape in accordance with its overall development strategy. Conservation projects such as tree planting, re-wilding, hedgerow planting, and forest maintenance all contribute to the overall desirability of the area as a place to live and visit and help prevent environmental degradation from soil erosion, encroachment of scrub land etc.

The local food market

The local authority can play a part in the promotion of local products in the market. Space can be provided for farmers markets in urban areas to allow farmers from the surrounding countryside to sell their products directly to citizens in the city. This increases the farmers' revenue as they are not obliged to sell to distributors at lower prices, and helps to foster an appreciation of local food among the city's residents. Farmers' markets in the towns and cities can also help to boost agrotourism in the area, as they can become attractions for visitors as well as serving their role in the local community.

In addition to providing opportunities to sell, the local authority can itself become a buyer, either directly or indirectly. Institutions such as schools, hospitals, care

homes and prisons may spend substantial sums on food. Those under direct local authority control can adopt a policy of buying local foods and make deals with local suppliers, while institutions not directly under local control may be encouraged or incentivized to do so with discount schemes, local tax waivers etc. Welfare benefit payments to the unemployed and economically vulnerable can be tailored to encourage spending on local foods, for example by issuing coupons that can be redeemed in farmers' markets in exchange for produce. Such schemes operate in several US cities (Martinez et al., 2010).



Figure 14. A farmers' market in Amsterdam

[Image: Elekes Andor / Wikimedia Commons]

Financing

Subsidies for agriculture are often in the remit of central government, but local government can provide financial assistance to local farmers in order to work towards the objectives of the development strategy. Financial assistance can be offered in the form of grants, subsidies or low-cost guaranteed loans. In the case studies there are examples of local government spending to maintain the character and economic vitality of the area and improve environmental sustainability. In the Garfagnana the GMU spends public money to allow the area to develop according to the strategic plan. Local biodiversity is maintained by funding the La Piana Centre and the seed bank and by paying subsidies to farmers rearing rare indigenous breeds. Grants were given to farms wishing to convert to more environmentally sustainable methods. Subsidising the restoration of traditional buildings such as the metato for drying chestnuts and giving grants for the upgrading of farm facilities helped to build a successful agrotourism industry. These were examples of targeted investment and support which, while often minor

individually, were given with the overall strategy of the development of the valley very much at the centre of the decision making process.

Cooperation and coordination

A local government does not operate in isolation, but must cooperate with other bodies. The chain of governance may have several links, so a municipality may have a regional government above it in the chain and parish or village councils below it. In addition there are many non-governmental organisations that have a role in the local agri-food system, such as farmers' cooperatives and consortia, private companies, advocacy groups, and research institutions and universities. All of these bodies have their own priorities, but can act together to achieve the common objectives of the region. Two examples of successful cooperation by the local authority with different interest groups were seen in the Garfagnana. The GMU worked together with the Garfagnana Local Action Group to secure funding from RDP that played a significant part in diversifying and increasing the economic activity of the valley. The GMU also launched the Garfagnana Food Community initiative, bringing together producers and consumers in a united effort to improve food quality and farming sustainability. The development of agrotourism, such as gastronomic 'routes', often requires the local government to coordinate the various producers, restaurants, and other local attractions and act as a bridge with the regional or national tourist office.

Cooperative Action

Throughout the world, family-run farms are the majority in terms of number of operations. A family-run farm is defined by the United Nations Food and Agriculture Organization as *'an agricultural holding which is managed and operated by a household and where farm labour is largely supplied by that household'* In the European Union, 95.2% of the 10.5 million registered farms were classified as family farms, and between them these accounted for around 60% of the agricultural output. The average size of family farms throughout the EU was around 11 ha, but this average varied considerably from country to country, from <2 ha in Malta to around 68 ha in the United Kingdom (data from 2016, Eurostat, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Agriculture_statistics_-_family_farming_in_the_EU#Structural_profile_of_farms_-_analysis_for_the_EU).

The size of family farms is limited by the labour available to work the farm in the absence of permanent employees, although temporary labour may be contracted for harvests etc. This has two consequences for the operation of the farm: 1) it cannot benefit from economies of scale, and 2) it lacks the economic and market power to deal with larger companies such as suppliers or distributors on an equal footing (Tortia et al., 2013). One possible solution is to expand the operation by taking on employees, assuming other considerations such as land availability allow this. However, many farms are reluctant to do this. Becoming an employer brings with it bureaucracy and legal obligations such as conformity to health and safety regulations. Employees in a farm setting can be difficult to monitor and supervise, and unsuitable employees may be difficult to dismiss. The other solution to the family farm problem is to form or join a cooperative.

Agricultural cooperatives are responsible for a significant part of total agricultural production in both the developed and in the developing world. Many different types exist according to their specialization, governance model, degree of vertical integration, the obligations placed on their members and the services they provide. Cooperatives may be product based, dealing only with a particular product or closely-related products, for example the apple cooperatives in the Val di Non or olive cooperatives in many Mediterranean countries. Some of these cooperatives have a single activity, for example the cooperative dairies making Comté and Parmigiano-Reggiano cheeses. Alternatively they may be area based, dealing with diverse products from a defined area such as the Garfagnana Coop.

Advantages of cooperative membership

Membership of a cooperative effectively solves the two problems associated with family farms described above. Economies of scale are provided by the sharing of capital equipment and facilities (Tortia et al., 2013). Large quantities of product can be efficiently processed at a single site using one piece of equipment such as an olive press or a fruit packing line, rather than each individual farm investing in equipment that would possibly be under-used or performing the necessary operations by hand. Equipment that is used on the farm such as harvesting machinery, ploughs, tractor-fitted pesticide sprayers etc. may be purchased cooperatively and shared. This is particularly useful for items that are needed at some point in the production process but spend most of the time idle and taking up storage space. Purchases of consumables such as seeds and fertilizers can be made in bulk, often for more favourable prices.

The other problem of family farms, the lack of marketing power, is solved if the cooperative acts as a single entity in the market place. Large down-stream companies such as supermarkets and food processors can no longer exploit the fragmented nature of the farming community and apply downward pressure on prices so effectively if they are dealing with a single much larger supplier (Tortia et al., 2013). Cooperatives that sell under a unified brand name, either primary produce or value-added products, are much more likely to successfully arrange distribution deals with retailers, many of which are not interested in very small suppliers. Some cooperatives with a diversified range may spread the risk of market fluctuations of particular product. For example, if the market price of potatoes is low one year, this decrease in revenue is borne by all the members and not just the potato farmers.

There are other less tangible benefits of cooperative membership. In isolated rural communities, cooperatives may act as a point of contact for farmers, allowing them to build social networks which can lead to mutual support and assistance beyond the formal support of the cooperative itself. Information about the crops and markets can be exchanged. Studies have shown that farms that are members of cooperatives are more likely to change towards more environmentally sustainable production practices, due to the availability of information and technical support from the cooperative (Candemir et al., 2021). Cooperatives can impose quality standards on their members and help provide technical support and training for the farms to achieve them, thereby raising the quality of the product or products as a whole. Cooperatives may also have advantages over private companies in the perception of consumers. They are more likely to be seen as ethical and as supporting the local small producers rather than as exploitative organisations (Seipel & Heffernan, 1997).

Disadvantages of cooperative membership

The disadvantages associated with membership of a cooperative depend to a large extent on the rules applying to members and the extent to which these rules restrict the freedom of producers to act independently. The farmer may be unable to implement innovations unless they can persuade the cooperative as a whole to adopt them. When a small farmer joins a cooperative, they trade a degree of operational freedom for the benefits of cooperative membership. How much freedom they sacrifice depends on the cooperative. For example, Comté cheese dairy farmers, once they have fulfilled their obligation to the dairy, are free to do

as they wish with their surplus milk, and the Garfagnana Coop is primarily a processing and marketing cooperative that does not prevent its members pursuing other economic activities. On the other hand, the Melinda cooperative in the Val di Non is a compulsory cooperative that does not allow its members to sell apples through other routes.

Delays in dividend payments can also be problematic in some cases. Farmers selling goods via the cooperative may not receive payment until the cooperative has sold them on or the products of those goods has been sold. This is a particular problem for certain goods in which there is a substantial time between the farmer supplying the cooperative and the final product being sold. Some farmers supplying milk for Parmigiano-Reggiano have switched from cooperative to private dairies for this reason (Cozzi et al., 2019).

Intrinsic factors contributing to the success or failure of cooperatives

Several factors are required for cooperatives to succeed in addition to external factors such as a favourable market. The most important is the active participation of the members, who must be willing to invest capital, to participate in decision making, to suggest ways to improve performance, and to work to expand the cooperative by promoting it to new potential members. Members must have a cooperative mindset and sometimes be willing to set aside their own short-term interests. The cooperative, like any other business operation, requires competent leadership from people with the appropriate skills in management, finance, and marketing as well as knowledge of farming. A board of directors is usually appointed by member vote and must take charge of strategic planning. Some larger cooperatives employ non-members as managers to take over the day-to-day running of the enterprise. Other non-member employees may include sales and marketing staff and administration staff, and it is important that these have a good understanding of the cooperative's objectives and operation (Burt, 2004).

To be successful, there are several internal obstacles that a cooperative must overcome. Although all the members may have the same profession, they are all individuals that differ in age and personality. Some have more drive and desire to innovate than others, some are more risk averse, some have more capital available to invest. This heterogeneity can hinder the decision making process and tends to cause inertia and the preservation of the status quo. Related to this is the 'horizon problem': members who are close to retirement may not wish to invest in long-term development plans from which they personally will not benefit (Tortia et al.,

2013). The individual farms also differ: some may be at higher altitude or in poorer soil or have less access to water. As a result the crops given by the members may vary in quality, quantity, and cost of production. A phenomenon that is partly caused by the disparities in individual farms is the so called 'free rider' problem. Increasing product quality often results in higher production costs which are borne by the individual farmer, but the extra income gained is spread throughout the cooperative. This acts as a disincentive to individual farmers to try to increase their product quality, and so the output of the cooperative as a whole can suffer. All three of these problems become greater as the cooperative expands and adds more members (Candemir et al., 2021).

Another difficulty for many cooperatives is the lack of specific skills and knowledge among the member farmers. A cooperative requires somebody to undertake the day-to-day management, a treasurer / accountant, people with knowledge of contracts, marketing and sales. For those that process farm produce into value added products expertise in food processing, food safety and regulatory compliance are required. These capabilities may not all be found within the membership, and so money must be spent on external consultants or on hiring staff.

Conclusions

Despite the fact that the cooperative system is not without its disadvantages and difficulties, it can bring many benefits to small farms and uniting with others is often the only way they can gain a foothold in an agri-food market that is dominated by larger, more powerful companies. Cooperatives that have forward-thinking members who are willing to innovate to improve their business can be successful in the food market. The processing of primary produce to value-added produce by the cooperative increases the income of the members in a way that is often not possible for single farms. To be successful, cooperatives that operate in the free market must be dynamic and use innovative marketing strategies, which require the governing body to have the appropriate motivations and skills. There are many examples of successful cooperatives that have integrated vertically into the value chain, such as olive oil cooperatives that market their own extra virgin olive oil rather than selling oil in bulk (Ilioupoulos et al., 2012a) and dairy cooperatives that produce their own butter and cheese (Bijman, 2018).

Collaborative Production and Marketing

Collaboration in production in marketing occurs when two or more businesses work together to achieve a specific common objective for the mutual benefit of all parties. This differs from cooperativism in that the individual actors remain completely independent and are not bound together into a separate legal entity (a cooperative). Whatever legally binding contracts may exist refer only to the specific joint operation that the collaborating businesses have agreed to perform together. In the agri-food sector, collaborative agreements may be formed between farmers, cooperatives and private companies. They may have varying degrees of legal formality.

There are a variety of reasons for entering into collaborative agreements. In some cases collaboration can fulfil some of the functions of a cooperative by giving the collaborating partners a larger market share or by increasing their supply capacity. If a distributor or retailer expects to be supplied with a certain product in quantities that exceed the capacity of individual farms, a collaboration agreement in which each partner agrees to supply a certain proportion of the total can be devised. Similarly, individual farms may collaborate to supply the variety of goods that a customer wants. For example, a restaurant or residential institution may want to be supplied with a selection of vegetables and eggs each week. If local farms collaborate to offer the customer a single supply contract for all the products this is likely to be viewed favourably as the customer will not have to deal with multiple suppliers. The availability of a single product may be extended if collaborating farms stagger their planting and harvesting times (Ochterski, 2012).

Farms may also operate joint retail outlets, either shops or market stalls, on a collaborative basis. Costs are shared and the shop is more attractive to customers as it has a wider variety of goods on offer. This also applies to alternative retail routes such as home delivery vegetable box schemes and sales via websites.

Products that naturally complement one another can be marketed together, or even sold together as a combined package. On obvious example is cheese and wine: many of the Comté cheese dairies also sell local wines, so the local wine makers get sales and product exposure by harnessing themselves to the marketing power of the PDO cheese. This concept can be further developed in agrotourism, in which visitor centres of olive presses, cheese dairies, wineries, salami producers etc. can offer each other's products to complement their own.



Figure 15. Collaborative marketing: Wine for sale at an Italian cheese festival.

Image: Dr. Blofeld / Wikimedia Commons

In some cases food producers and processors may collaborate to produce food products that promote one of the ingredients. An example is the 'Parmigiano-Reggiano as an ingredient' scheme, in which the consortium has an agreement with processed food manufacturers to co-brand products containing Parmigiano-Reggiano. Examples range from ravioli and ready-made pasta sauces to a McDonalds Parmigiano-Reggiano burger that was launched in 2007. In this way the Parmigiano-Reggiano consortium benefits from the exposure of a global brand, while McDonalds benefits from the reputation and territorial association of the PDO cheese (Mancini and Consiglieri, 2016). Another example is the manufacture of apple 'crisps' and cereal bars by a small local private company in collaboration with the Melinda consortium of Val di Non PDO apple growers (<https://melinda.it/en/products-and-snacks-with-a-great-apple-heart/>). This partnership gives brand exposure to the consortium, and enables it to participate in the market of products that it does not have the technical means to make itself. The private company benefits from association with the larger and better known Melinda consortium.

In conclusion, collaborative operations are a good way of increasing market presence and reducing costs for small farms and companies that do not wish to or cannot join a cooperative. They enable food producers to reach a wider market, to

benefit from association with other trusted brands, and to co-produce particular products that they would otherwise be unable to make.

Diversification and Multifunctionality

The terms diversification and multifunctionality are used to describe two related but different concepts in farming. Diversification itself can refer to two sub-categories: crop diversification, in which the portfolio of crops grown on the farm is widened, and non-agricultural diversification, in which the farm engages in activities other than primary production. These activities could be not directly related to farming, such as providing hospitality to tourists, or concerned with vertical integration in the value chain, for example producing yogurt and cheese from the farm's milk. Multifunctionality was defined by the Organisation for Economic Cooperation and Development as follows: *"Beyond its primary function of producing food and fibre, agricultural activity can also shape the landscape, provide environmental benefits such as land conservation, the sustainable management of renewable natural resources and the preservation of biodiversity, and contribute to the socio-economic viability of many rural areas. Agriculture is multifunctional when it has one or several functions in addition to its primary role of producing food and fibre"* (van Huylenbroek et al., 2007). According to this definition even a monocultural farm can be multifunctional. For example, a hillside olive grove, in addition to producing olives, may also provide a haven for wildlife, prevent soil erosion, and form part of the cultural heritage of the area. It is apparent that some of these functions are inherent to the existence of the farm, while others can be enhanced by the farmer that is mindful of multifunctionality. In the above example, the prevention of soil erosion is simply due to the presence of trees and is inherent to the existence of the grove. In contrast, the function of the farm as a wildlife haven can be actively enhanced by minimising or eliminating the use of pesticides.

Reasons for farms to diversify are usually financial, but may include many other factors, for example a desire to use land and resources more efficiently, for ecological reasons (e.g. planting a nitrogen-fixing crop) or to give gainful employment to family members (Bachev, 2012). The profit margins on primary produce tend to be small and subject to fluctuations in supply and in the market price. Diversification into other activities is therefore a means of both increasing

farm income and making it more resistant to market forces. The main diversification activities are the processing of primary produce into value-added products, agrotourism activities, production of renewable energy, and other contract work (Salvioni et al., 2020). In 2013, 5.2% of EU farms were diversified. Rates of diversification were higher in larger farms, and consequently higher in countries with larger average farm sizes such as the Germanic and Scandinavian countries (Thomson, 2019).

Farming at its most basic level is the production of commodities, basic goods that are bought and sold at a price determined primarily by supply and demand. There is a value chain that begins at or before the agricultural commodity, then passes through different stages and different business entities before the final product reaches the consumer. For example, wheat produced by a farmer may pass through a flour mill, industrial baker, and supermarket before being consumed as bread by the customer. Value (profit) is added at each stage, and more value tends to be added at the later stages.

A farmer wishing to increase the value gained from the crops therefore has two options (Lu & Dudensing, 2015):

1. Increase the intrinsic value of the commodity.
2. Vertical integration into the value chain.

The first can be achieved by adding a desirable characteristic to the commodity, e.g. organic certification, integrated farming certification, or a geographical indication. The success of this depends on the value the market places on such characteristics and this varies from country to country. Organic certification gives greater added value in Germany than in Spain, for example (Torres-Ruiz, 2018). It is therefore important for a farm considering applying for certification to investigate whether it will bring sufficient increased returns to justify the required investment. Other factors may occasionally play a role, such as the example from the Garfagnana given above in which the farmers decided not to apply the Biodynamic label to their products in order to avoid conflict with the local community (Treakle, 2019).



Figure 16. European Union PDO, PGI, TSG and Organic Farming labels.

[Images from European Commission, ec.europa.eu]

The feasibility of the second option depends on the product, the facilities on the farm, the potential for capital investment, the access of the farm to the market, and the skills and knowledge of the farmer and other members of the business. Forward, or downstream, vertical integration begins from the farm and can include some or all of the value chain. For example, an olive farmer may have a press but not a bottling plant, so the olives can be processed into bulk oil and sold to a packaging company. Another olive farmer may have all the equipment necessary to produce retail-ready bottles and cans of olive oil, thereby capturing more of the value chain. Upstream vertical integration can also take place: a food processor may invest in primary production of their raw materials, such as a cheese company buying their own dairy farms (Demirbas et al., 2004).

A producer wishing to add value to their raw produce must consider whether there is a market for the processed goods they plan to produce. This applies as much to partly processed goods as to retail ready goods. In the first case the market is made up of food processing and packaging companies, in the second the market is composed of retailers and consumers. The retail market is competitive and may be dominated by big companies, so a small enterprise may struggle to get a distribution deal and may face intense downward pressure on prices. Direct sales require a shop or market stall and are limited in the number of potential customers that can be reached, although whether this latter point is a problem depends on the scale of the production. Internet sales, if they are suitable for the product, can reach a wider market, but require a deal with a courier company and a certain level of technical knowledge to run the website.

There are several examples of vertical integration and the production of added value goods from the case studies. In the Garfagnana, a small fruit farm produces wine, jams and pickles from their own produce while several dairy farms produce cheese and yogurt from their own milk, (Treacle, 2019). In the production systems for both Comté and Parmigiano-Reggiano cheese there are dairy farms that have

their own integrated dairies to produce the cheese, although this is not the most common model (Colinet et al., 2006; Cozzi et al., 2019). Vertical integration is also common in the olive oil industry, as many farmers' cooperatives and some of the larger individual olive oil estates have their own presses and bottling plants and sell their oil either directly to customers or via a distributor (Iliopoulos et al., 2012b).



Figure 17. Value-added products for sale at a market in Budapest.

[Image: Jorge Franganillo / Wikimedia Commons]

The other form of diversification apart from vertical integration is into non-farm activities not directly related to agriculture. Agrotourism can bring a significant additional income to an individual farm and to the area in general. Agrotourism was discussed in more detail in the fifth case study on the Spanish olive oil industry. Although this discussion was specifically in the context of olive oil tourism, most of the points raised are generally applicable so will not be repeated here. Agrotourism is very much dependent on the traditional nature of the product and on the desirability of the wider area as a destination for visitors. Most successful agrotourism ventures therefore require coordination between many different actors, including individual commercial enterprises, cooperatives, institutions and local government. Agrotourism played a role in all five of the case studies presented in this report.



Figure 18. Agrotourism and educational activities. An olive oil museum in Albania (left), and educational farm tours (right).

[Image credits: Klejdi Shtrepi (L), Tori Sepulveda (R) / Wikimedia Commons]

In conclusion, diversification and multifunctionality can bring many benefits to a food producer and to the rural area in which it is located. A multifunctional approach to farming recognises that the farm is not solely for producing crops, but plays a part in biodiversity preservation, environmental resources management, and in the character and heritage of the local area. A farm owner who is mindful of this can bring additional environmental and social benefits to the local area. Diversification is a means of increasing the farm's income and financial security. Vertical integration into the value chain helps to keep more of the money generated by the crops in the local economic system, while agrotourism brings income not only to the individual enterprise but to the wider area.

Design of geographical indication regulations for environmental and social benefits

The European Union's geographical indications (GI) scheme "protects the names of products that originate from specific regions and have specific qualities or enjoy a reputation linked to the production territory" (https://ec.europa.eu/info/food-farming-fisheries/food-safety-and-quality/certification/quality-labels/quality-schemes-explained_en#howareproductsprotected). As such the specifications associated with the GI certification are primarily concerned with maintaining the quality and character of the product and defining the geographical area in which it is made. However, regulations that convey environmental and social benefits can also be incorporated in the GI specifications.

Many GI specifications contain regulations that affect the environment in the production area. In the case of Comté cheese, the cows that produce the milk must obtain around 70% of their annual food intake from natural pasture. The regulations also specify a maximum stocking density. (Colinet et al., 2020) These two regulations together mean that low-intensity grazing takes place over a large area of the PDO region. This affects the development of the plant life, avoiding both overgrazing and reversion to scrubland. Genetically modified feed is also banned. The PDO specifications for Val di Non apples contain references to integrated agriculture with natural fertilization and minimal use of pesticides (Anon., 2003). There are also animal welfare implications of some of these regulations. The feeding requirements for Comté cows means they have a more free-range life rather than being intensively reared indoors.

In rural areas in which a network of villages cooperates to produce a product such as Comté cheese, each individual farmer or cooperative dairy may be small and economically weak even if their combined output is a successful product with a significant turnover. Such a fragmented cooperative system would be vulnerable to competition from larger companies with the capacity for large capital investment. The PDO regulations for Comté cheese are designed to prevent this and to protect the artisanal nature of the product. Each dairy has a maximum output, they may only take milk from within 25 km, and the dairy farms also have a maximum productivity. Financially powerful firms can therefore gain no advantage as they cannot rely on economies of scale to outcompete small farms and dairies (Colinet et al., 2020). This means that traditional village life is maintained and the profits from the production of the cheese is spread throughout the region's small communities. The regulations for Parmigiano-Reggiano PDO, although somewhat less restrictive than those for Comté, also contain measures designed to keep the socioeconomic benefits of the cheese within the producing region. Some of these are later amendments. When the PDO regulations were amended to allow the sale of grated cheese under the PDO name, a proviso was added that the cheese processing had to be carried out in the PDO area (Anon, 2018). This may seem a little anomalous in light of the fact that the final maturation of the cheese does not have to take place within the PDO area, but it helps retain the profit from the cheese in the communities that produce it.

Well-designed GI specifications can bring benefits not directly associated with the product itself, by enhancing environmental protection, improving animal welfare, and protecting small rural enterprises from big business. It is important that the GI specifications conform as much as possible to existing practices in order to not impose a significant burden on the producers and processors involved in producing the product.

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Europe

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May 2021

Joint Operational Programme Black Sea Basin 2014-2020 is co-financed by the European Union through the European Neighbourhood Instrument and by the participating countries: Armenia, Bulgaria, Georgia, Greece, Republic of Moldova, Romania, Turkey and Ukraine.

This publication was produced with the financial assistance of the European Union. Its contents are the sole responsibility of Dr. J. Rhoades and do not necessarily reflect the views of the European Union.

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