France

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# 6.1 Introduction

France has 26.7 million ha of utilised agricultural area (UAA) in 2020, with a 0.8% decrease over the last 10 years. It includes 12.7 million ha of grain crops and 12.7 million ha of grasslands and forage crops. This has been very stable over the last 10 years. The country also has 20 million ha of forests (BSPCA, 2018).

With regard to its geography, mainland France has various climates with a range of influences (oceanic, continental, mountainous and Mediterranean), along with different types of soils. France benefits from a highly diversified agricultural offer due to this combination of pedoclimatic conditions.

As a matter of fact, grasslands and related animal production systems are extremely important for the French agriculture both in practice and in its economic performance, but also as a cornerstone of most French landscapes.

# 6.2 Farming systems

Based on the presence or absence of livestock husbandry, the dominant crop rotation of each region, soil potential and altitude, the main regional farming systems can be divided into eight categories (see Figure 6.1). There is a clear distinction between lowland areas and higher altitude areas. In the lowlands, most areas are dominated by arable crops where ruminant livestock is mostly absent. Intermediate areas, which often have lower grain production potential, have developed mixed cropping and livestock systems. These systems have declined over the last 10 years and those areas increasingly turned towards annual crops.

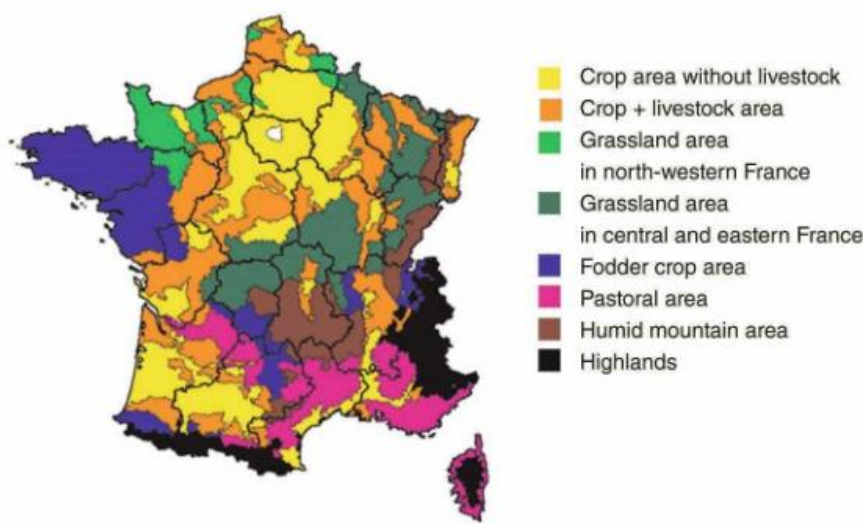


*Figure 6.1. The major livestock rearing areas in France. Source: Jousseins et al, 2011*

The intensive agricultural production areas of western France and Piedmont, where maize silage plays an important role in the farming system, are dominated by dairy farming in general, or suckling veal production in the western Massif Central. Grassland areas (see Figure 6.2) in the lowlands (north-western, eastern and central France) are characterised by a higher proportion of permanent grasslands where dairy and suckler cows are both raised. Finally, the pastoral zones, located at high altitudes, are characterised by a very extensive stocking rate utilising semi-natural grasslands and rangelands with strong cultural value. With regard to the high altitude areas, humid mountain areas located below 2000 m asl have a significant

proportion of permanent grassland areas (+80% of UAA). These areas are specialised in dairy production (with the exception of the Massif Central, where suckling to weanling systems are also important), which is well-known in France for its use in cheesemaking, with PDO productions. In higher altitudes, livestock are transhumant with pastures used for grazing in summer. These areas also often benefit from agro-tourism and high value-added products.

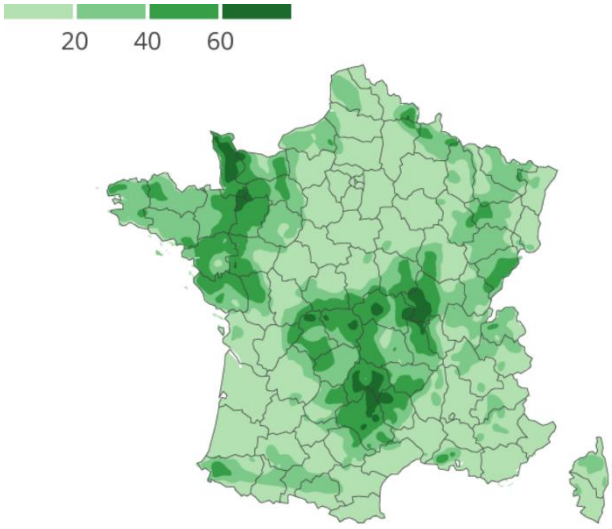


*Figure 6.2: Percentage of the agricultural area occupied by forage crops and grasslands in 2020 (in %). Source: Agreste, 2020*

**Herbivore stocking rate**

In 2010, the average herbivore stocking rate in France was 1.2 LSU/ha of forage area (FA) (see Figure 6.3). Stocking rates are highest in the lowlands and Piedmont regions where milk production is high. This phenomenon is exacerbated when there is competition on arable land with high value-added crops (potatoes, sugar beets etc.), such as in the north of France. Overall, the northern half of France benefits from favourable pedoclimatic conditions and can support above-average stocking rates. Areas where suckler herds thrive have lower stocking rates and are generally located in disadvantaged areas. In the humid mountain regions, the overall stocking rate is about 0.9 LSU/ha in relation to grass growth over a short period. Pastoral and high mountain areas have the lowest stocking rates with less than 0.7 LSU/ha FA.

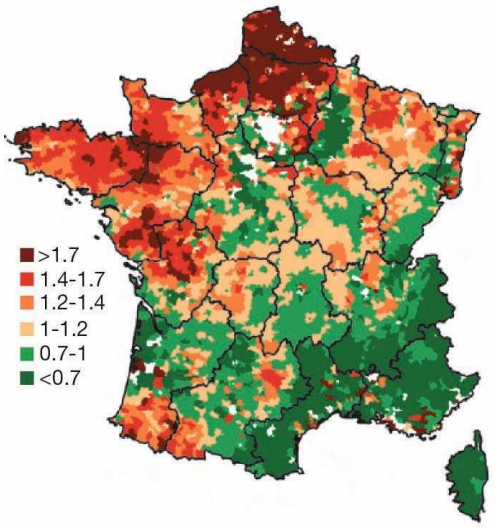


*Figure 6.3. Herbivore stocking rates LSU/ha FA*
*Source: GEB – Institut de l'Elevage (2013)*

### Grassland-based livestock farming systems

The analysis of the diet composition of the different groups of herbivores in France shows very contrasting situations (see Figure 6.4). The highest proportions of grass, either fresh of preserved are met for the sheep and beef cattle, while the goats show the highest proportion of concentrates (cereal grains and dehydrated pellets) and the dairy cattle are characterised by a high proportion of silage maize.

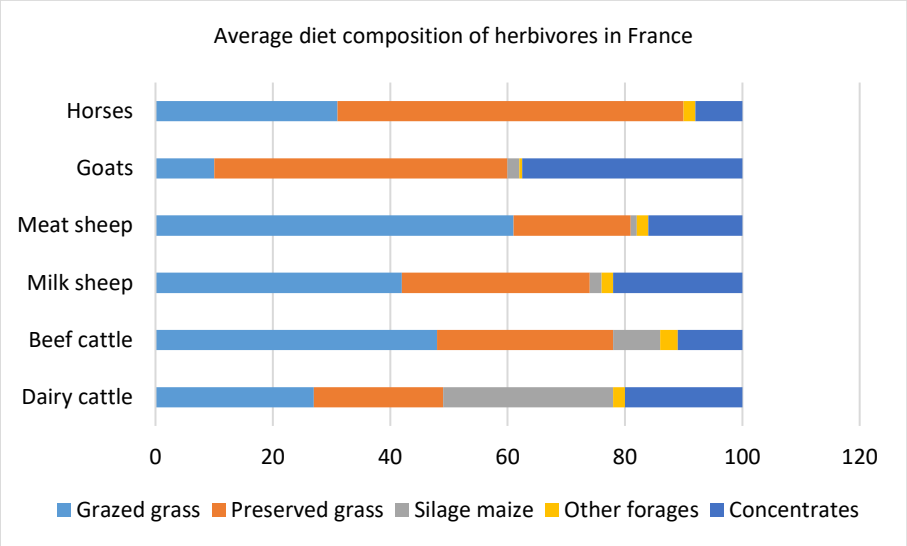


*Figure 6.4. Average diet composition of herbivores in France*
*Source: Cordier et al. (2020)*

### Dairy herds

The geographic distribution of dairy farms is very heterogeneous (see Figure 6.5). In the West (Britany and Normandy), the density is the highest, in specialised farms. In North of France and in the eastern part, the dairy herds are predominantly in mixed crop-livestock farms. Eventually, in the hilly and mountainous regions of Franche-Comté (Eastern Region), Massif Central and the Alps, the dairy farms are specialized, often delivering the milk for PDO cheese production, such as Comté in Franche-Comté, Cantal in Massif Central or Beaufort and Abondance in the Alps.

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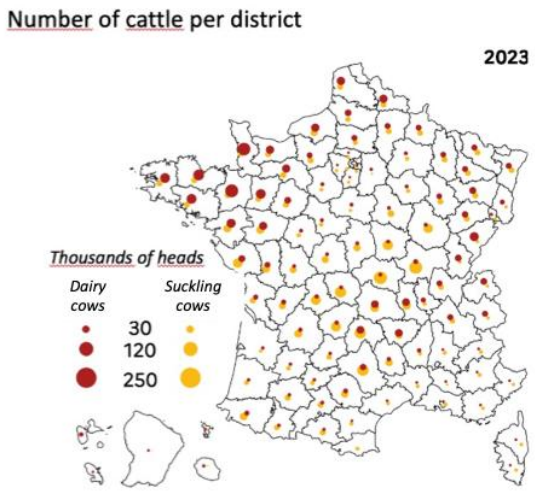


*Figure 6.5. Classification of French dairy systems*
*Source: Agreste, 2020. Analysis by the author.*

**Milk production**

For 2021/2022, the cow milk was collected from 46,300 farms for a total of 23.4 billion litres (see Figure 6.6). The number of delivering farms has dropped by 3.7% in one year. This is a very high rate of decline, despite very high milk prices. The average milk delivery to industry reached 504 000 l/farm. This shows a very quick increase, as it may be compared with the average of 383,000 l of milk per farm in 2013/2014.

Over a long period of time, i.e. since 1980, the milk production in France showed first a very high peak before the quota period. Then, once the quotas were established, the production dropped a lot before a stable period before raising again, once the end of the quotas was announced. However, the increasing volumes led to a sharp decrease in milk prices and a subsequent stabilisation of the volumes.

The seasonal variation in production is about 20% between the highest and lowest collection periods (i.e. May and September, respectively) (GEB - Institut de l'Elevage, 2018). This feature, with an overall stable monthly delivery, is the result of a long-lasting strategy whose the objective was to support the dairy industries, and thus to avoid underuse of their industrial capacities.

Most milk collected comes from lowland areas (51.6%) and mixed-livestock areas (31%) compared to only 15% from mountain and Piedmont areas (see Figure 6.7).

The processing of the cow milk leads to a wide range of products (See Figure 6.8). Most of them appear to be stable, especially the cow cheese, where the high value-added products play a key role. 87% of PDOs come from mountain and Piedmont regions. In 2017, France has 28 cheeses, two creams and three butters registered as dairy cattle PDOs, along with PGIs for nine cheeses and one cream. In 2017, about 11% of the milk collected was used for PDO and PGI products (10.3% and 0.9%, respectively). The only significant variation in quantity over the last two decades is related to yoghurts and fermented products whose the tonnage is decreasing after a peak in the early 2010s.

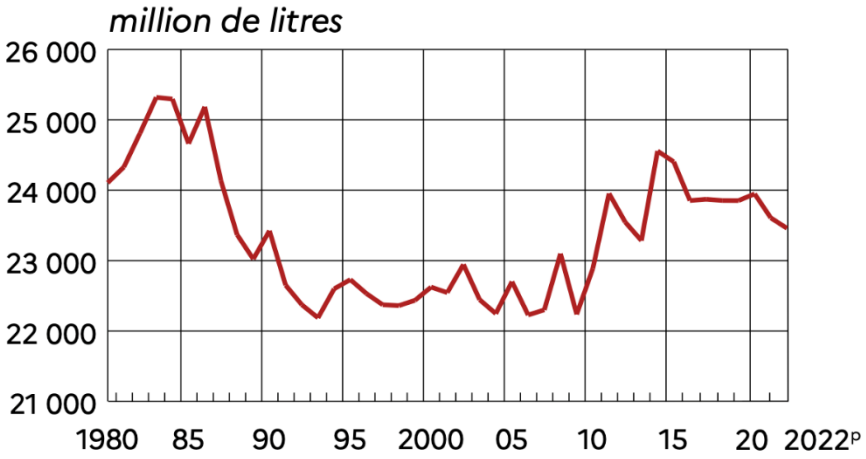


*Figure 6.6 Milk collected by industry in France from 1980 to 2022. Source: Agreste, 2020*

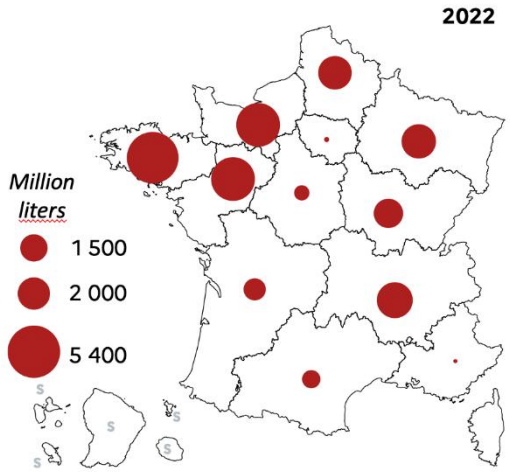


*Figure 6.7. Spatial distribution of milk delivery to industries, in 2022. Source: CNIEL, 2024*

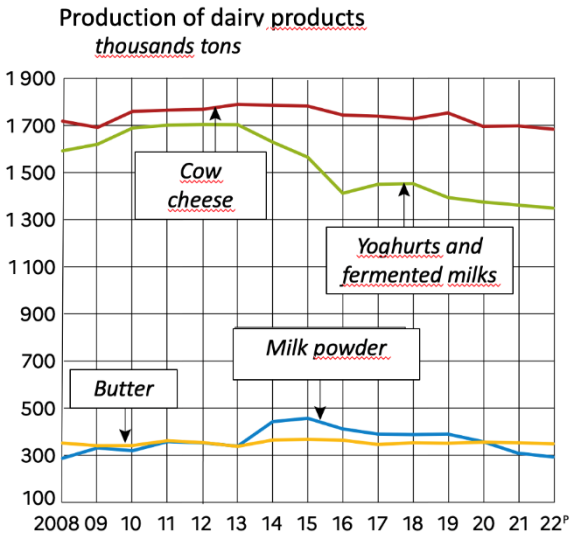


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*Figure 6.8. Tonnage of the various dairy products produced in France from 2008 to 2022. Source: CNIEL 2024*

**Dairy cows**

Before the introduction of milk quotas (1983), France had 7.2 million dairy cows versus 3.8 million in 2017 and only 3.2 million in 2023. Over this 40 years period, the decline was a slow and continuous process. The mountain and Piedmont areas have been less affected than lowlands near crop areas. This is explained by the presence of higher value-added products in these regions that allows for a less competitive and more robust situation for farmers. The decrease in the number of dairy cows did not affect the overall volume of milk collected thanks to improved individual performances.

Holstein Friesian is by far the most common breed in France, followed by Montbeliarde and Normande breeds. These three breeds represented, in 2024, 89.4% of all French dairy cows. Holstein Friesians produce more milk per cow and show a continuous genetic gain for the milk production. However, the other two breeds provide greater added value, being compulsory in some PDO cheese certifications. Crossbreeds are still uncommon in France, despite research to show the benefits of some crossbreeds.

In 2023, nearly 70% of French farms have fewer than 70 dairy cows but 65% of dairy cows are owned by farms with more than 70 dairy cows., 15% of dairy farms had more than 100 dairy cows, contributing 40% of the total number of animals.

**Milk production per cow**

In 2024, according to the national survey system (Contrôle Laitier) carried out on 27 000 farms, the average milk yield per cow was 8993 kg milk, for a mean lactation duration of 346 days (see Figure 6.9). This average milk yield has regularly increased over the last decade, due to the continuous genetic improvement of the main breeds and due to the diet composition, where the share of grazing is regularly decreasing.

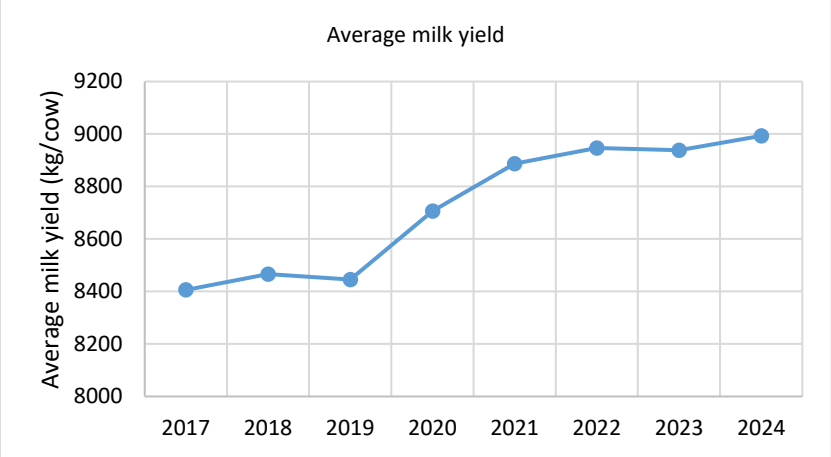


*Figure 6.9. Average milk yield of French dairy cows. Source: Contrôle Laitier, Institut de l'Elevage*

Depending on the feeding systems, production per cow varies, with 6,000 l/cow in lowland grazing systems with one tonne of concentrate to up to 8,500 l/cow with 1.6 tonnes of concentrate and 44% maize silage in the annual ration for integrated cropping and livestock systems. Mountain and Piedmont areas have a per-cow milk yield that is slightly higher than the lowland grassland system but with a higher proportion of concentrates in the diet (225 g/l vs 166 g/l). These averages per cow hide large variations in production within these groups (Centre d'Etudes et de Prospective, 2017).

**Organic dairy farming**

As in most European countries, the trajectory of organic dairy production showed a strong inflexion. Till 2022, France experienced a steady increase of the number of dairy cows in organic farming. This was explained by the contrasting milk prices between conventional and organic milk. The location of the organic

farms was mainly associated with the possibility of grazing. For instance, in 2016, 2,500 farms were organic, mostly located in western France and in humid mountain areas where the grass growth period is longer. With an average of 48 cows per farm, the milk volume was estimated to be 230,000 litres per farm.

However, after the very strong inflation in 2022 and 2023 and a mean food price increase of more than 20%, which is approximately the willingness to pay for organic products, the price gap between conventional and organic milk paid to farmers became very small. This led to a stop in the dynamics and even some farmers leaving the organic production.

The volumes of organic milk collected by industries reached a maximum of 1.29 billion litres in 2022 and declined to 1.12 billion litres in 2024 (see Figure 6.10).

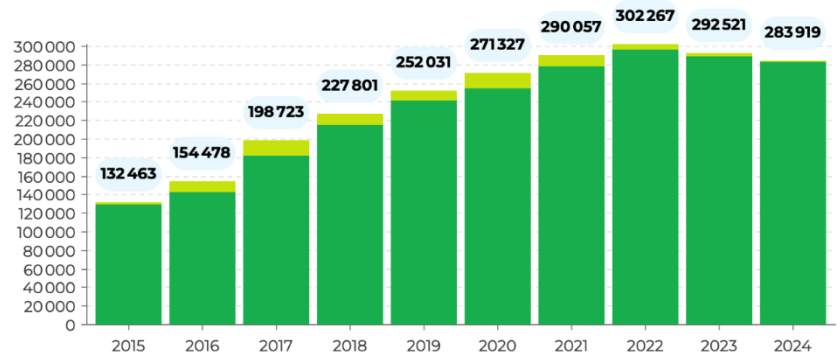


*Figure 6.10. Tonnage of milk collected from farms in organic production (dark green) and in transition (light green) to organic production. Source: Agence Bio*

**Suckler herd**

The suckler herd in France is associated with the two main breeds: Charolais and Limousin. Suckler cows are located in the traditional Charolais and Limousin breeding area, which comprises the grassland area of the northern Massif Central with 1.01 million suckler cows. The intensive agricultural area of western France (530,000 cows) also has a high density of suckler cows, as does the Piedmont area of the south-western Massif Central and the Pyrenees. Suckler cows are spread throughout grassland and forage areas.

**Herd size and variation**

Before the milk quotas were established, France has 2.9 million suckler cows. Growth was strong until the 2000s, when it levelled off to a plateau of about 4 million suckler cows, before a slow decline to reach 3.7 Million suckler cows in 2023. All regions have been affected by this trajectory. Half of this growth was in the dairy zones and half in the traditional areas. In 2018, Charolais was the most common breed with 1.45 million dams, followed by Limousin with 1.1 million cows, Blonde d'Aquitaine with 0.48, and finally the more rustic Salers and Aubrac breeds, which together account for 0.4 million cows.

In 2023, there were about 113,000 farms with suckler cows; this figure has dropped from 144,000 just 10 years ago. Similarly to the situation in dairy cattle, an increasing proportion of animals is in farms with increasingly large herds.

**Characteristics of production**

Meat production systems in France are mainly breeders and not finishers. Living animals are exported while France is importing meat, mainly from European countries. This reflects the fact that the vast majority of farmers hold herds of breeding cows, whose main purpose is to produce late-weanlings and cull cows. The most common system, found on about two thirds of farms, produces lean animals to be fattened in specialised systems. Such fattening systems do exist in France, but most are located in neighbouring countries, namely Italy and Spain. These breeders also sell weanlings for the store market and cull cows for butchery. In the

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Charolais area, some weanlings are kept longer and fed with cut grass and cereals to sell heavier weights for the store market. Traditionally in this region, a lean young bull is grazed until the end of its second spring before being sold to a finisher.

About 20% producers, mainly in lowland area, have developed suckling to beef systems. By creating a fattening system, breeders increase the amount of meat sold per LSU on the farm, thus creating added value. These workshops go hand in hand with the introduction of maize silage used for fattening bulls born from the suckler cow herd. They have come to replace the more traditional suckling-to-steer beef systems because they are faster to finish.

Steers are no longer common in France. They rely on grassland systems. Maize is almost never used, especially for the image of the final product. These systems are not very demanding in terms of labour because pasture is predominant in the diet. They are usually found on large farms with pastures dispersed and far away from the farm.

Finally we have the system for producing suckling veal. This system is mainly found in south-western France, the traditional region for this product. Calves are housed while cows are grazed or fed separately, with suckling twice a day. The practice lasts three to 5.5 months to obtain a carcass weight of 85 to 170 kg. Economic margins are the highest of all beef production systems with equivalent stocking rates, but the system is very time consuming, and this leads to a slow decline of this production system, which also faces questions regarding animal welfare. This system of production is well-suited for producers who, having a limited forage acreage, cannot move into weanling production.

**Sheep dairy**

The number of dairy sheep is regularly decreasing, with 1.2 million ewes in 2023, to be compared with 1.29 million ewes in 2013 and 1.38 in 2000.

Sheep production is regionalised and consistent with the local environment and animal production. Sheep farms specialised in dairy production are mainly located in Roquefort area, with a high added-value PDO and in the western Pyrenees, namely the Ossau-Irraty PDO. There are also flocks in south-eastern France which create value from cheese-making on the farm, and mainly marketed locally.

In the Roquefort area, farms have an average of 81 ha of UAA, 80% of which is dedicated to forage production. Permanent grassland areas account for 19% of the forage area, while temporary grasslands, mainly grass-legume with high lucerne con- tent, accounts for 79% of the FA. The non-forage area is dedicated to growing cereals for energy concentrate and straw for the flock. The flock is growing steadily on these farms and the average stocking rate is 1.3 LSU/ha, which comes out to about 300 ewes per farm on average. In this region, gross margins are highly dependent on milk production per ewe, with an average of 261 litres per ewe.

In the western Pyrenees, farms are smaller, with an average of 33 ha. Forage area represents 98% of the UAA. Permanent grasslands account for 59% of the FA and temporary grasslands account for 36%. Maize is grown on every other farm and occupies less than 10% of the FA. The average flock is 63 LSU (about 225 ewes) for an average stocking rate of 2 LSU/ha. These high stocking rates are consistent with the local pedoclimatic conditions, which make it possible to ensure strong forage production that is well distributed throughout the year.

**Sheep meat**

Farms that produce sheep meat are concentrated in the southern part of the country, mainly located in regions with poor soil and climates conditions for grass production. In contrast to dairy production, lamb production has suffered since 1980 with a sharp drop in the number of both farmers and ewes. The number of ewes for meat production was 2.97 million in 2023 to be compared with 3.54 million in 2013, 5.2 million in 2000 and 6.5 million in 1988. This large decrease is partly explained by the specialisation of farms, which gave up mixed farming to concentrate on either cropping, milking or increasing suckler cow herds.

As a consequence and despite a low sheep meat consumption, France is a massive importer of sheep for covering the internal markets, either as living animals or as meat. Imported products represent 59% of the

sheep meat consumed in France. This situation leads to high and steadily increasing prices. But this despite of this economic viability, only a limited number of farmers are entering this production. Two major characteristics are essential for the economic viability of sheep production. The first is the importance of lamb mortality, and there are very large differences between farms. In 2009, the median value was 16%. The second characteristic is the strong relationship between the margin of feed cost per ewe and productivity, expressed in kilograms of lamb per ewe. It clear shows that the management of grasslands for increasing the production of large quantities of high-quality grass is essential.

Many farms have small flocks. For example, 66% of all ewes are held by 16% of farms with flocks of more than 200 ewes. In 2017, only 3.6 million ewes remain in the national flock, a decline from 6.5 million in 1988. To be able to address future needs, the meat sheep sector faces a number of challenges, including the post-Brexit context, lower consumption, increased supply of the domestic market (45% today), difficulty attracting young farmers, maintaining natural areas for habitat conservation through grazing. When looking at the numbers of sheep farms,

Between regions, stocking rates vary from 1.1 LSU/ha FA in grassland areas in the Charolais area to 2.5 LSU/ha FA in integrated cropping and livestock areas, thanks to higher content in the diet. The latter system may also use cover crops to feed ewes at times when there is no commercial crop being grown. Hay is the main form of forage preservation, except in mixed systems where silage is available. There is a strong contrast between grassland specialists with very little grass stock, sheep production relying heavily on grazing, and those in high mountain areas with large stocks.

## 6.3 Grass-based systems

**Accessibility of grazing areas**

According to a survey run in 2016, in France, 92% of dairy cows have access to grazing, with 87% grazing more than 170 days per year and 71% of farms offering more than 0.2 ha of pasture per cow. The contribution of grazing in the annual ration of dairy cows varies from 10% or 700 kg DM for systems maximising maize silage versus 31% or 1,800 kg DM for grassland-based systems. French dairy farms have on average 31 ha of permanent grassland and 22 ha of temporary grassland. There are, however, significant disparities within and between dairy areas. While the tendency is for herd expansion (+2 dairy cows/year/farm on average), accessibility of grazing areas does not follow the same path (see Figure 6.11). Land expansion is needed for growing home forage, but it is often far from the milking parlour and the accessible grazing area per dairy cow generally decreases over the years. As a result, the larger the herd, the lower the contribution of grazing to the diet. Meanwhile, grassland systems with more than 0.8 ha accessible grazing area per cow have increased, which could be related to the increase in organic dairy farming. It is worth noticing that the organic dairy farming showed a stability since 2021 in France.

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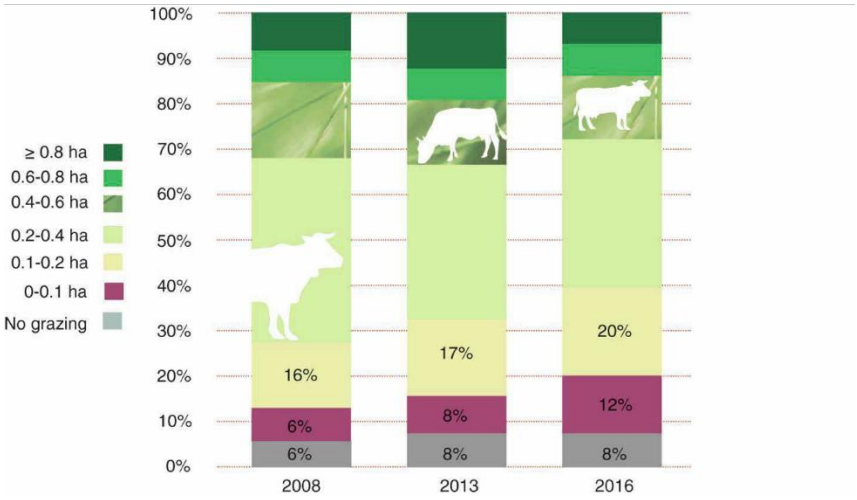


*Figure 6.11. Changes in accessible grazing area per dairy cow*
*Source: Observatoire des élevages laitiers, 2018.*

**Rise in automatic milking systems**

As in other dairy countries, the use of AMS in France is growing. In 2023, there were 14 000 robots in France, while they were 8000 in 2019 and only 4,800 in 2015. For every new milking parlour built since 2011, half use milking robots. Installing a robot often leads to a decrease in or even stop of grazing, even though many studies have shown the ability to keep grazing sustainably with a milking robot. In 2017/18, 34% of AMS were fully housed.

Automatic milking systems are often associated with other automated machines. Thus, in 2023, the records are 2800 robots for cleaning the stable and 1000 robots for distributing forages.

**The acreage of grasslands in France**

When analysing a long time period, it may be seen that the acreage and the land share dedicated to grasslands increased a lot from the middle of the 19$^{th}$ century till the 70'ies (see Figure 6.12). During this century, France experienced a thorough transformation of its agriculture, with more ruminants and grazing animals, more production and consumption of animal products. This was also facilitated by the progress in logistics with in particular the possibility to ship fresh dairy products to the town centres. After a peak in 1970, the situation has dramatically changed, especially because of the emergence of a new source of feed energy, the silage maize and an imported source of protein feed, the soyabean cakes.

As a consequence, the last five decades showed a different pattern (see Figure 6.13). There has been a regular erosion of the acreage of permanent grasslands, even if they remain the predominant source of feed for the ruminants. The fodder crops, mainly fodder beets, nearly disappeared. While their acreage was 400 Kha in 1979, only 15 000 ha remained in 2024. After an initial decline, the acreage of temporary grasslands remained stable, while the acreage of annual forages was very stable over the whole period with on average 1.7 Mha. An interesting trajectory may be identified for perennial legumes. While the acreage dropped between 1979 and 2010, a strong increase was observed over the last 15 years. This is likely due to the increasing cost of proteins and the increasing cost of the nitrogen fertilizers.

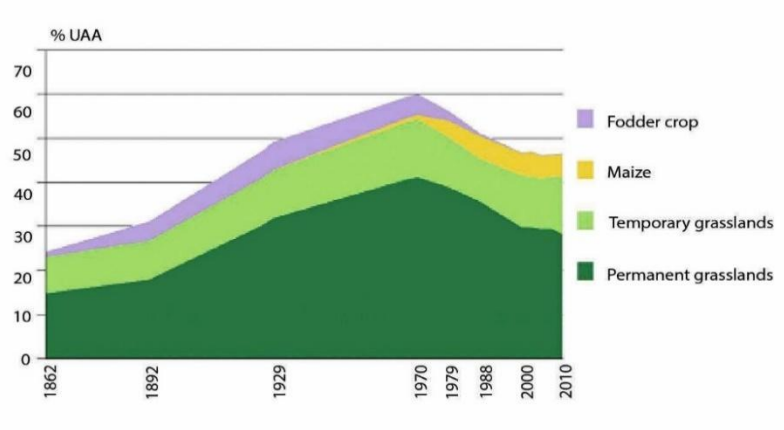


*Figure 6.12. Change of the forage area in France as a percentage of agricultural area. Source: GEB – Institut de l'Elevage, 2013*

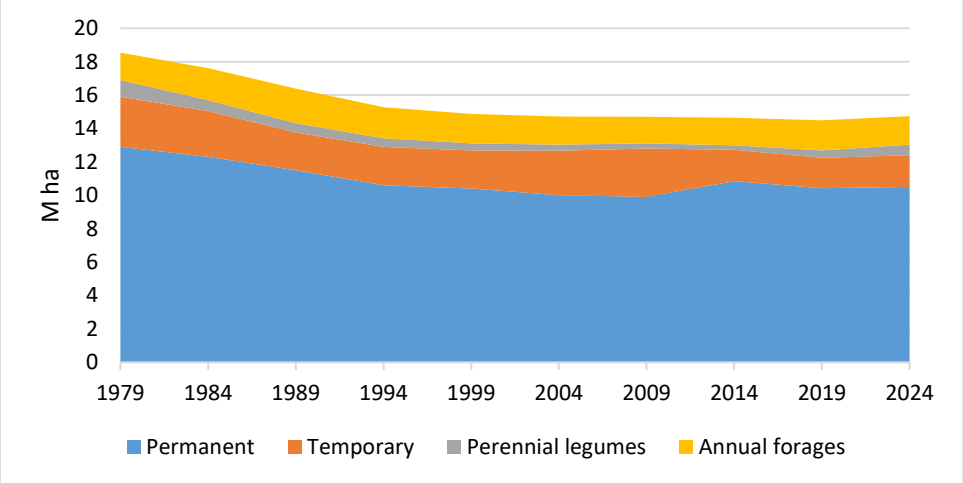


*Figure 6.13. Acreage of the various sources of forage feed in France over the last 45 years. Source: Data.gouv*

The French territory appears very heterogeneous with regard to the different types of grasslands that are cultivated. In the western and central-western regions, annual forages and temporary grasslands predominate. In mountain regions, it is mostly productive permanent grasslands that support the many herds of cattle. Finally, in the south-east, the rangelands (low productive permanent grasslands) constitute the bulk of the grasslands.

**Temporary grasslands**

An adequate indicator of the temporary grasslands acreage and of their botanical composition is provided by the seed market (Table 6.1). Compared with the situation one decade before, the main features are

- The large market of forage small-seeded legumes. It is presently close to the market of forage grasses. This is due to the increase of grasslands sown with species mixtures, and especially grass-legumes mixtures. Mixtures are making it possible to produce forage with high protein contents. It also reduces the need of mineral nitrogen fertilizers. These fertilizers are expensive, and are sources of water pollution.
- The large diversity of small-seeded legumes. A market is large for crimson clover or for berseem clover. These species, where an increasing number of varieties are available, are offering more possibilities to adapt to shortage of forages.
- A stable market of grain legumes, i.e. fodder peas and vetches. They used as annual forages, either alone or in mixtures with cereals. Often inserted as intercrops in rotations with grain crops, they make it possible to rapidly produce feed stocks.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101059626.

*Table 6.1 Seeds of forage grasses, forage small-seeded legumes and forage grain legumes sold in France, from 2019 to 2023 (in tons). Source: Semae, 2025*

| | 2019/20 | 2020/21 | 2021/22 | 2022/23 | 2023/24 |
|---|---|---|---|---|---|
| Cocksfoot | 1975 | 1941 | 1815 | 1583 | 1808 |
| Timothy | 286 | 344 | 242 | 321 | 266 |
| Tall fescue | 1763 | 2216 | 2110 | 1430 | 2005 |
| Perennial RG | 3920 | 4395 | 3907 | 3496 | 3039 |
| Italian RG | 10774 | 10376 | 9549 | 8604 | 6559 |
| Hybrid RG | 2127 | 2419 | 2043 | 1894 | 1682 |
| Total forage grasses | 21835 | 22777 | 20616 | 17934 | 16470 |
| Trefoil | 134 | 148 | 120 | 133 | 144 |
| Alfalfa | 4362 | 3952 | 3124 | 2842 | 3350 |
| Sainfoin | 708 | 761 | 472 | 565 | 608 |
| Red clover | 1746 | 2380 | 1839 | 2191 | 2020 |
| White clover | 1068 | 944 | 919 | 628 | 943 |
| Crimson clover | 2735 | 2085 | 2966 | 3196 | 3090 |
| Other clovers | 3355 | 3244 | 3808 | 2900 | 3196 |
| Total forage legumes | 13236 | 12272 | 12559 | 11798 | 11441 |
| Annual forage grain legumes | 13236 | 12272 | 12559 | 11798 | 11441 |

Grass-legume mixtures contribute an increasing share of the area sown on temporary grasslands, supported by the yield benefits offered by mixtures in all conditions (see Figure 6.14). Part of the mixtures are made by the farmers themselves who buy the components separately, while mixtures are also sold. Perennial ryegrass and white clover mixtures alone accounted for 28% of the temporary grassland area. White clover is sown in temporary grasslands dedicated to grazing. Multi-species swards with a minimum of two grass species and two legumes accounted for 18% of these grasslands with a very large regional disparity: they cover 3% of temporary pastures in Brittany and 56% in Limousin. This means that their presence increases in regions where the risk of climatic hazards, especially summer droughts, is higher.

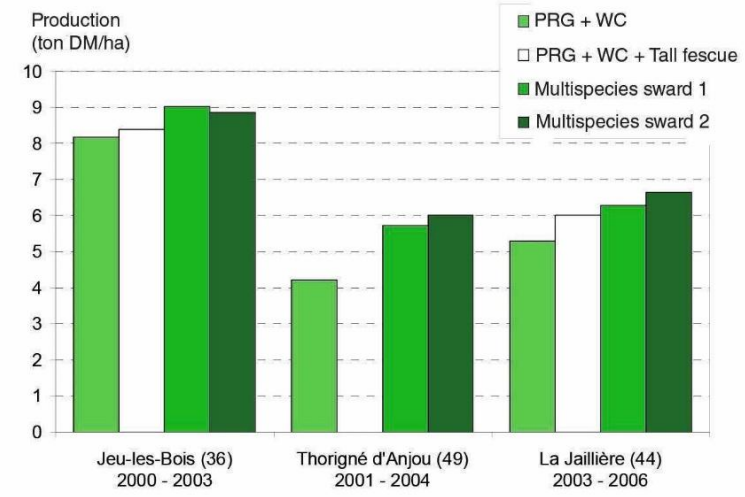


*Figure 6.14. Yield comparison of multi-species swards versus a grass-legume mixture. PRG: perennial rye-grass, WC: White clover. Source: Protin et al., 2014.*

Over the last 20 years, the proportion of temporary grasslands sown with mixtures has steadily increased, exceeding 75% of sown grasslands today. They are predominantly sown with grass-legume mixtures. Perennial ryegrass and white clover mixtures dominate in the north-west (Brittany, Normandy). In the other regions, the situation is more diverse, especially when the proportion of hay and silage increases. In such cases, Italian ryegrass, cocksfoot and tall fescue may contribute a significant share of the grasses. Lucerne is

also increasingly being sown in mixtures along with cocksfoot and tall fescue and then harvested as hay. Such a mixture is of high feeding value for sheep and goats.

Studies comparing multi-species swards to mixtures of perennial ryegrass and white clover have shown yield advantage for the multi-species swards of about one tonne of DM per ha. This advantage tends to be even greater during drought periods. From a nutritive point of view, they have slightly lower overall energy (-0.05 UFL) and crude protein values (-1% CP). This effect is greater during heading because grass species head at different time, therefore making the optimum stage harder to obtain for the whole sward.

It is essential to support the farmers when choosing the species and varieties that are the most adapted to their soil and climate conditions and to their production objectives. It is even more critical to support them when defining mixtures. As a lot of knowledge is available, an expert system was designed which is available online. The website https://herbe-book.org/ is giving a free access to all this information.

When the farmer is designing his/her seed mixture, he/she is invited to document a limited number of key elements (see below).

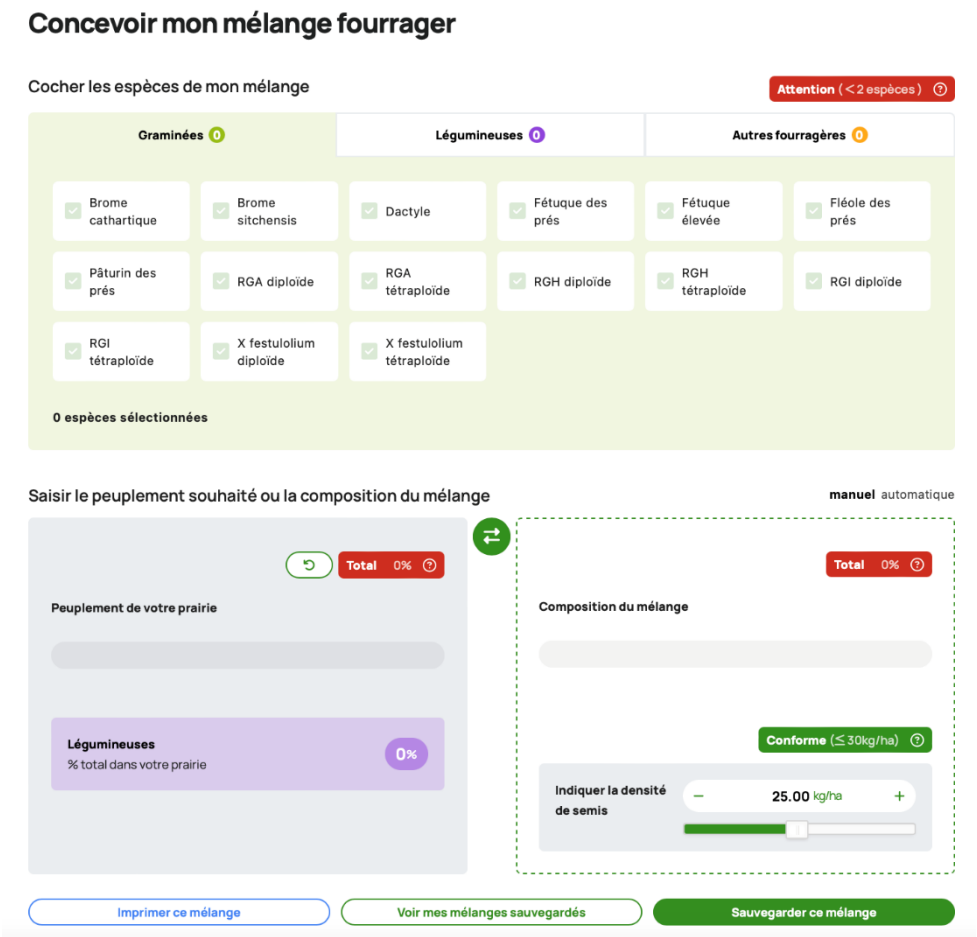


*Figure 6.15. Screenshot of the online service available to farmers when designing his/her own seed mixture to meet his/her objective and conditions. Source: Herbe-book website: https://herbe-book.org*

**Permanent grasslands**

Permanent grasslands are an important part of forage areas in France. However, although it is known that they are favourable for biodiversity and that are generally high in species richness, their actual botanical composition is not well understood. In 2009 and 2010, Launay *et al.* (2011) studied a network of 190 permanent grasslands. These permanent grasslands were used in different livestock systems (beef, lamb, dairy cattle) and on a wide range of pedoclimatic conditions, from the Atlantic coast to highland meadows, up to 1,200 m asl. Annual production, based on late spring, summer and autumn cuts, was estimated at 6.2

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101059626.

t/ha/year, with very large variations: 25% of meadows produced less than 4.2 t/ha/year and 25% produced more than 8.1 t/ha/year. Spring production provided 75% of average annual production on these permanent grasslands. Summer and autumn productions show a greater contrast between regions. In fact, over the two years of the study, regrowth was too weak to justify a harvest in more than 25% of the grasslands.

For all of the permanent grasslands studied, organic matter digestibility averaged 77% at the beginning of spring and 64% at the end of spring, which corresponds to the pasture stage for the first and the end of heading for the second. The average protein content was 17% at the beginning of spring, while it was 9% at the end of spring.

The combined analysis of dry matter production, its distribution throughout the cycles and the feed value confirmed the negative relationship between production and nutritive value, which declines more rapidly on the most productive grasslands.

As a result, five main characteristics differentiate feed value on permanent grasslands (Baumont *et al.*, 2012):

- The ability to have strong spring production and total production for the year. These permanent grasslands can provide forage stocks and/or be an excellent source for spring grazing.
- The ability to grow in the summer and fall, which is partially independent of the spring production potential.
- The ability to produce high-quality forage for early harvest and regrowth. These grasslands, which are rich in legumes, then become a source of quality forage, provided they are grazed at fairly early stages.
- he ability to produce quality forage in late spring. These grasslands, rich in legumes and broadleaf, have few grasses and low productivity.
- Stability of quality throughout the spring. This has been encountered in the case of grasslands with low dry matter production with a significant presence of non- leguminous dicotyledonous. These grasslands can then be utilised for long periods without a large variation in quality.

### Grazing strategy

In France, as in the rest of Europe, there is a wide range of terminology to describe the types of grazing practised. The most frequently uses are set-stocking and rotational grazing.

Key figures to keep in mind for set-stocking are a residual grass height between 6 cm and 8 cm and between 0.3 and 0.8 ha of available area per animal. The advantages perceived by the French farmers are the limited requirements in terms of infrastructure (fences, pathways, water trough), low labour intensity, and high animal performance. However, this requires more land per animal because of a lower production per ha and more herbage losses. These systems also show a high sensitivity to dry periods, that have to be compensated by more available area.

Rotational grazing is based on the principle of a relatively short grazing time per paddock and a long pasture resting time depending on the season to offer a greater quantity of and higher quality grass. There must be multiple fenced paddocks. The duration between two grazing periods is from 18 to 21 days in spring and 28 to 35 days in summer when growth slows. The entrance height is between 8 cm and 15 cm while the residual height is between 3 cm and 6 cm. The farmers perceive that the rotational grazing is increasing the pasture utilisation and the quantity of feed harvested per paddock and makes it possible to better adapt to the grass growth. However, it means more infrastructure, more work and requires high levels of skills for a good paddock management.

In France, up to now, the virtual grazing is not implemented.

Good grazing management is possible regardless of grazing strategy, but good observation and adaptation to grass growth is necessary.

As a consequence of the grazing strategies, of the animal production and of the soil and climate conditions, there are large variations among regions regarding the quantity of grazed herbage per cow and per day. A survey on dairy cows, made in the context of the Res'alim® initiative and based on 8 578 farms of the Eliance network was analysed by Cniel (2024) (Figure 6.16). West of France (Britany and Normandy) and mountain regions (Massif Central, Jura, Alps, Pyrenees) are showing the highest share of grazed grass in the animal diet.

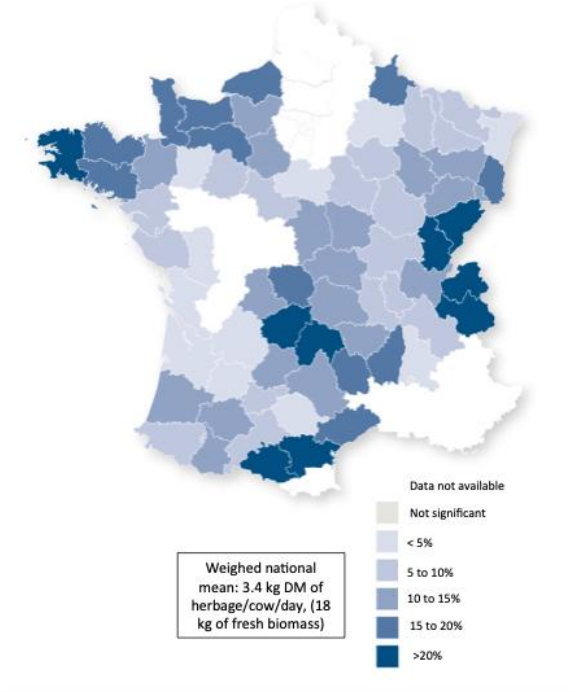


*Figure 6.16. Share of fresh herbage in the diet of dairy cows in France in 2023. Source: Observatoire CNIEL based on data of Res'alim® network with 8 578 dairy farms of Eliance network. Cniel, 2024.*

**Grazing, grasslands and climate change**

Climate change is becoming an increasing reality for farmers, for animal production and for grassland management.

Effect on grasslands

The main features of climate change are the increasing temperatures, in winter and summer, with heat peaks in summer times, a slight change in the rainfall regimes with more water in the winter period and less in the summer periods. Higher temperatures and associated higher evapotranspiration and lower rainfalls lead to a severe grass growth in summer times, possibly leading to a destruction of the swards. It induces a need for resowing temporary grasslands, possible renovation with over-seeding of permanent grasslands. However, overseeding is not always feasible. In such a case, this may lead to modification of the botanical composition, with effects on biomass production and quality during the following seasons.

One more effect of the climate change is the increasing variation among the years, and up to now, this effect is the prevalent one for the farmers. It leads to the need of increasing the forage stock to feed the animals during the winter, but also during the summer. Feeding the animals during the summer is compulsory to preserve the animal production but also to reduce the risk of over-grazing, with the negative impact on the autumn regrowth and possibly the botanical composition of grasslands

Other impacts

Climate change has a direct impact on animal health and welfare. It implies to set new equipments in the animal housing, to limit the incidence of high temperature.

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The climate change also has an impact on animal diseases and especially the vectorised diseases. Over the last 5 years, France experienced several disease outbreaks that are severely affected the production of herbivores. It is the case of blue tongue disease, which is due to the blue tongue virus. This virus in mainly transmitted by biting midges, especially Culicoides species, such as *C. imicola*, *C. oxystoma* and *C. variipennis*. Because of the climate change, the dynamics of the midge populations has been modified. Their earlier occurrence has increased the threat for animal health. Similarly, the resurgence of bluetongue serotype 8 in ruminants and the emergence, then explosion of serotype 3 and epizootic haemorrhagic disease in 2023 and 2024 triggered a new health crisis linked to arboviruses transmitted by midges.

**Barriers and drivers to grazing (also based on G4AE outcomes)**

A survey run during the G4AE project, focusing on young farmers, identified the barriers and the drivers for more grazing in the French animal farms, with a prevalence of the dairy and beef cattle farms in the answers.

The data summarized in Figure 6.17 showed that the on-going climate change is perceived as the first barriers for more grazing in the use of temporary and permanent grasslands. The concern related to climate change may be related to the large variability in quality and volume and the lack of grass production that are also mentioned by the farmers. These elements are fully in line with the effects of the climate change explained in the previous section.

The other main barriers quoted by the farmers are first the land fragmentation and as a consequence the limited access to grazing areas. This is especially true for the dairy production in areas with a high density of dairy farms with very fragmented landscapes, as it may be met in Britanny and Normandy. The next barriers that are mentioned are access to knowledge and adapted technical advice. This is a permanent concern and the adapted answers are i) the initial training of the young farmers with more space being dedicated to grazing management and ii) the farmers groups dedicated to grazing management.

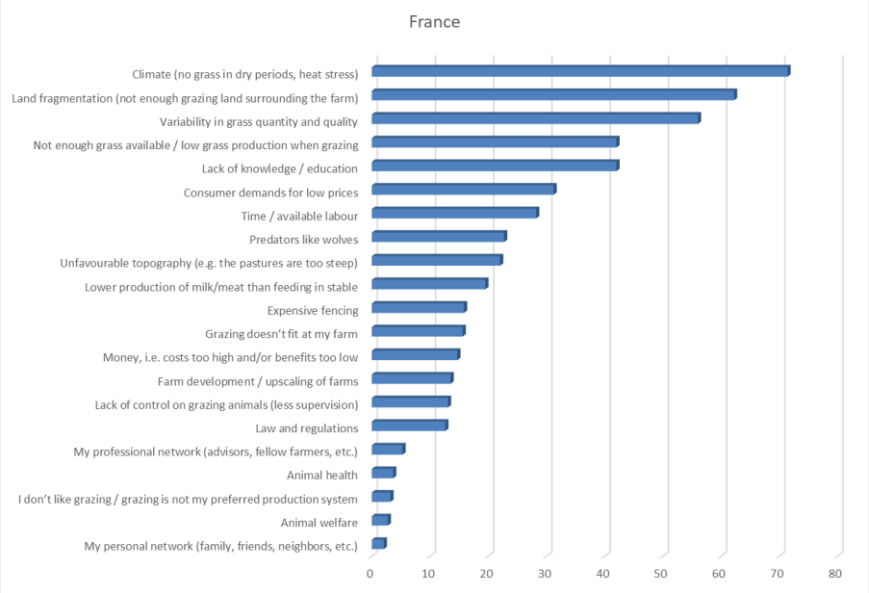


*Figure 6.17. Percentage of young French farmers (40 years or younger; n=458 for France) that chose a particular barrier in their top 5 of most important barriers.*
*Source: Van den Pol-van Dasselaar et al., 2023.*

The last significant barrier is related to the market price, where it is quoted that the consumers are looking for low prices. However, this barrier is a matter of debate. Indeed, among the key drivers reported by the young farmers (see Figure 6.18), the low cost of the grazed grass, the lower need for purchasing proteins and

the positive image of the animal products are giving other possibilities, especially through the economic value of grazing-based animal products.

The survey of the drivers identified the positive impact on animal welfare and health and on biodiversity, these elements being documented into the G4AE project.

It is also worth mentioning that the farmers expressed that they like grazing as a management. This shows the potential of grazing to appear as a social norm for grassland and animal management.

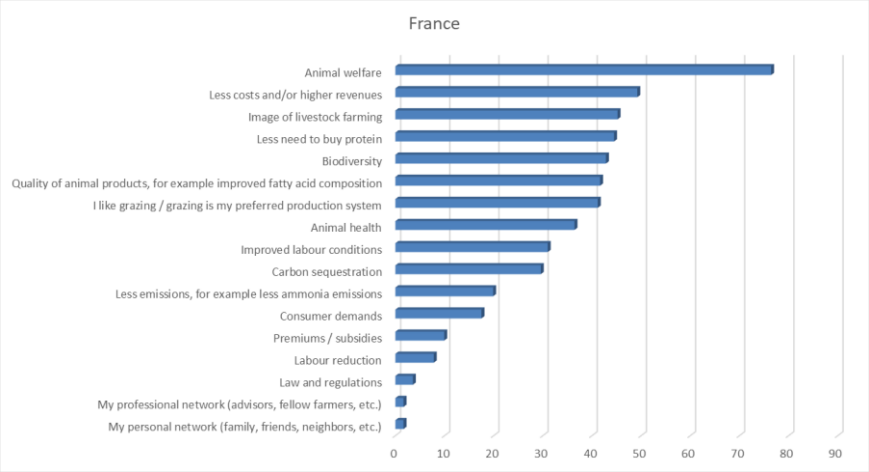


*Figure 6.18. Percentage of young French farmers (40 years or younger; n=458 for France) that chose a particular driver in their top 5 of most important drivers for grazing.*
*Source: Van den Pol-van Dasselaar et al., 2023.*

- National regulation related to grazing

France di not elaborate national or regional public regulations that are specifically related to grazing or supporting an increasing share of grazing in the diets of the herbivores. This is achieved indirectly through the trademarks and signs of quality (organic products, Label Rouge, PDO). This is particularly important in the case of dairy products, but also for some meat-based specialities (see below). The only exception is based on local agreements in order to preserve environments with very valuable natural sites, where grazing appears to be the most relevant lever. This is for instance the preservation of marshlands, such as the Marais de Rochefort, on the West Coast of France.

# 6.4 Grass-based products

In France, many animal products are covered by certifications and labels. Part of these labels or quality signs are related to agricultural practices and how these practices are relevant to agroecology. A review of all agroecology-based labelled products has been done by Magrini et al (2025). The certification processes are carried out by different stakeholders. They either belong to the production sector, i.e. groups of farms and cooperatives, are under control of the processing industries, or are also shaped by the retailing sector. The visibility of these specifications for the consumers may be contrasting. When it is only present in a charter, the consumers have little awareness of the content of the specifications. On the opposite, when transcribed in Label Rouge or other quality signs in retailing, it is a key criterion of the willingness to pay of the consumers. As illustrated in a sub-sample in Figure 6.19, the grassland-based products cover the whole range. The most accessible ones for the consumers are the Label Rouge and AOC products. Some meat products have been awarded such quality signs, such as 'Viande de Boeuf Label Rouge' or Lamb meat (such as baie de Somme or Prés salés) where quality signs reach 20% of the production volumes (see Figure 6.20). It is also true for dairy

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products where a lot of PDO products (AOC in French) are produced, from most milk production regions. Over the regular revisions of the specifications, the attention paid to grazing and to grassland management has been regularly increased. It is worth quoting here the dairy products Comté, Cantal, Laguiole and of course Camembert. For sheep, roquefort specifications include some items relevant to grassland management. At the opposite, the PDO goat cheeses include items related to animal feeds, excluding silage but pay little attention to grazing and grassland management.


*Figure 6.19. Analysis of the labelled products associated to agroecological practices across all value chains. Many of them are related to dairy and meat products in relationship with grazing and pasture management. Source: Magrini et al, 2025*

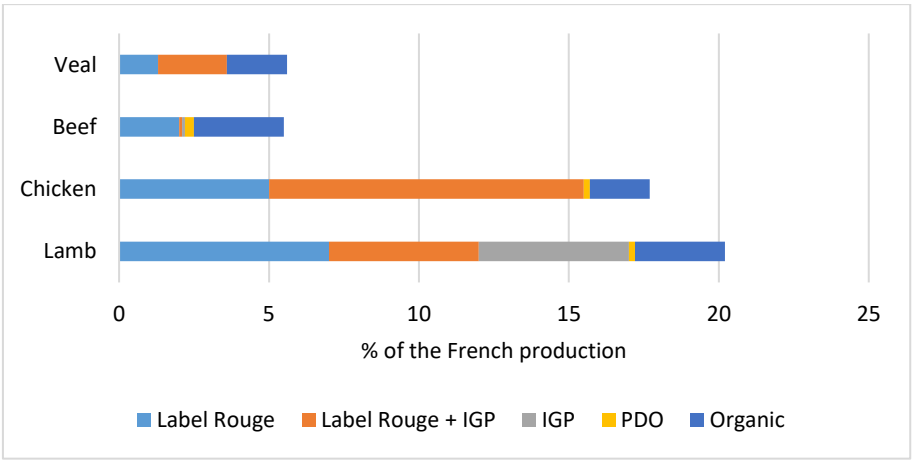


*Figure 6.20 Proportion of the French production (in number of slaughtered animals) in 2021 under the various quality signs. Source: Chatellier, 2024*

# 6.5 Grassland innovations

Several innovations are being increasingly implemented in France for a more sustainable use of grasslands. The implementation, as well as the benefit for the farmers were evidenced in the G4AE project and in the practice abstracts.

The Grazing4Agroecology project in France found good practice examples of actions farmers took to reduce their workload while maintaining sustainable grass-based systems (Table 2). These relate to changes to

improvements of grassland management, animal management, workload reduction, and improvement of nutrient cycle.
In relevance with the agroecology principles, it is proposed here to highlight 2 innovations, highlighted in yellow in Table 2.

6.5.1 Multi-species grasslands
This innovation is built on many experimental work and research results from a series of national and European projects (see above).
As well described in the case study run on the farm of François Pinot, the increasing species diversity in the paddocks is contributing to higher biomass available for grazing all along the year. The species were selected to fit with the specificities of the farm (climate and soil) and to maximize the ecosystem services that are provided and the grazing management was adapted to better use this biomass.

These benefits achieved thanks to more specific diversity are also explicit in other practice abstracts. It is worth mentioning here the following case studies

- *Grazing pastures adapted to climate change, as quoted by Etienne Le Roux. The composition of the grassland swards is essential to ensure that they are able to adapt to climate change and to the increasing seasonal and annual variations that are becoming larger due to climate change. The optimum botanical composition relies upon a larger number of species*
- *To sow chicory, plantain, and clover to maintain grazing throughout the summer, as performed by J.F. Cornic and S. Marx-Marty. Here again, the addition of more species in the swards and in the diversity of grasslands makes it possible to provide more biomass along the year and especially during the summer. It also ensures a better use of the available nitrogen and improves the overall nitrogen use efficiency.*
- *More diversity for more services may also be provided in time. This was performed by N. Floc when sowing the grasslands under the cover of a cereal or a protein crop. Here again, the agroecology principles are used to maximize the ecosystem services as a consequence of more functional diversity.*

To get the best out of these multi-species swards and more diversity across the grasslands, it is very important for the farmers to rely upon highly performing advisory systems and updated education and training systems.

5.2 Grasslands, milking robots and equipment
Workload is a real concern for people running animal farms, and especially the dairy farms. Grazing is reducing workload and production costs. However, maximizing grazing sometimes appears incompatible with other options that may be implemented to reduce workload. It is especially the case when the use of milking robots is envisaged to reduce workload and time constraints. In the farm of R. Chevrel, a milking robot was installed to reduce the workload, but the highest use of grazing in the various seasons was preserved. This was achieved through the use of a sorting gate, where depending on the seasons and the period in the day, the animals are oriented either towards the paddocks under grazing or indoor to get access to stored feed, mainly silage. Doing so, the combination of a milking robot and a sorting gate contributes to ensure a high quality of animal welfare, preserving the natural behaviour during access to grazed grass.
More generally, the choice of the infrastructure and equipment is essential in the successful management of grazed grasslands. Among the French case studies, two more case studies are related to this issue.

- *When creating tracks and cow tunnels, R. Guegan is increasing the area of grasslands easily accessible for grazing. Good tracks are also ensuring an easy move of the animals, that is a key component of animal welfare*
- *The machinery for sowing grasslands is very important for successful grasslands, especially when sown with a mixture of species. In the farm of S. Thomas, it is a quad that is used for an easy sowing of large areas, that can be sown over short period of time, especially when the weather conditions are not favourable (too wet or too dry). Successful sowing of multi-species swards or perennial forage species being sown under cover of cereals or protein crop will be facilitated with adapted high-quality seeding machines*

*Table 6.2. Type of innovations identified in France within the Grazing4Agroecology project.*

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| Innovation domain | Innovation adopted at farm level |
|---|---|
| Improvement of grassland management | Grazing pastures adapted to climate change |
| | A plot exchange to maintain a grazing system despite the increase in herd size |
| | Multi-species grasslands (see Figure 6.20) |
| | 100% grass-fed dairy cows |
| | Grazing forage species while renewing pastures |
| | Grazing forage rape |
| | Sowing grassland with a quad |
| | Connected plate meter and decision support tool for precise grazing management |
| Animal management | Three-way crossbreeding |
| | Spring block calving |
| | Once a day milking in a grassland system |
| | Rearing calves with grazing foster cows for better results and simplified work (see Figure 6.22) |
| Workload reduction | Grazing with a milking robot (see Figure 6.21) |
| | Creating tracks and cow tunnel to graze more |
| Improvement of nutrient cycle | Sowing grassland under a cover of cereal and protein crop |
| Scan QR code for detailed description of each innovation (Practice abstract + Video) or click on the link: https://grazing4agroecology.eu/best-practices/ | |

## Multi-species grasslands

François PINOT and his companion have a herd of 85 dairy cows in northern Brittany. Their farm is about 91 ha, including 37 ha of grassland. Their herd produces 573,000 litres of conventional milk per year. Each cow produces 9,000 litres of milk per year and consumes1,000 kg of concentrates. Every cow has access to 0.40 ha of grassland for grazing. Over the last four years, the dairy cows graze multi-species grasslands made of 15 kg of perennial rye grass, 3 kg of white clover, 2 kg of hybrid rye grass and 3-4 kg of tall fescue, as well as of another complementary species, namely red clover, hybrid clover, timothy, or birdsfoot trefoil. In order to be in line with the expected level of milk production, the aim is to have mixes adapted to animal's needs, homogeneous grasslands, higher grass yield and a better nutritional value all year round thanks to a lot of legumes (clover).

The objective is also to have grasslands adapted to wet conditions and drought resistant. The different species match each other well and offer grass at every time of year. Because of the higher seeding density, seeds cost more. Moreover, it is not always easy to have grasslands which remain homogeneous in the long term, to keep good proportion and a great density of legumes, and to prevent weeds from developing. Before sowing multi-species grasslands, it is very important to start by thinking carefully about the use of the grassland and to take time to choose the correct species and varieties to ensure the mix is as suitable as possible: the ideal is to buy the seeds individually and to make your own mixes.

Comments

- The use of multi-species grasslands is relevant to all conditions, whatever the soil and climate conditions and for all purposes. It makes it possible to achieve high production and quality. It also gives the possibility to increase the resilience of the grasslands against the climate variation and the variation among years. Indeed, a large of species is available, offering a very large range of functional diversity.
- However, to get the best out of these possibilities, it is important to have access to all species and to the best varieties. To make the best choice, it is important for the farmers to receive support from advisors or to share knowledge within farmers groups. The availability of seeds may also be a limiting factor, especially for the so-called minor species such as some forage legumes or herbs. This is why, as done by François Pinot, buying seeds, possibly together with other farmers and making his/her own mixtures may be the best option.

*Figure 6.21. Example of improved grassland management thanks to the use of multi-species swards. Generated from farmer interview - Chambre d'Agriculture, Bretagne with comments by the author*

François PINOT

91 hectares

improvement of grassland management

Farmer Interview

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## Grazing with a milking robot

Romain Chevrel is an organic milk producer in Val-d'Izé, Brittany. His father and he are partners in a farming partnership (GAEC) and employ one worker. The farm sells 664,000 litres of milk per year produced with 120 crossbred cows on 124.5 hectares. In 2017, to reduce the workload, Romain installed two milking robots while maintaining a grazing and economical forage system. The cows graze for 330 days/year, including 120 days with a forage ration composed of 100% fresh grass! To achieve this result, the robot is equipped with a sorting gate to direct the cows to the grazing plots. The land is divided into day paddocks and night paddocks to encourage the animals to go to the robot: after milking, the cows know they will have access to a good meal of fresh grass. Finally, 900 meters of tracks have been arranged to facilitate the movement of cows between the paddocks and the robot. The amount of concentrates distributed by the robot is 500 kg/cow/year and consists solely of dehydrated corn ears produced on the farm. The forage system is also self-sufficient. Romain finds that the cows are calm with the robots: they move freely, are never pushed, and are less stressed. Robotic milking has significantly reduced the workload. On weekdays, the workday starts at 9:00 am and ends at 6:00 pm. For the weekend, one person can complete the work in 3 hours/day. The robots have allowed a different organization of work and freed up time for each partner: for example, Romain doesn't work on Wednesdays and takes care of his children!

Comments

- Robots and equipment provide a very good answer to workload issue and availability. This is the main reason why the purchase of robots is done by many farmers when installing. However, the financial issue is important and milking robots may lead to cows staying in barn all year long, thus leading to the disappearance of grazing and sometimes to the disappearance of grasslands with silage maize and soyabean meal becoming the only feed source.
- The innovation implemented by Romain Chevrel, combining robots and sorting gate makes it possible to combine all objectives. It is accessible to all farms where the grasslands are easily accessible. This accessibility may be increased with quality paths facilitating the cow movement and favourable to animal welfare. It may also be combined with cow tunnels to increase the area that can be freely grazed by animals.
- Robots, sorting gates and grasslands for grazing are all producing and using huge amounts of data. The data management and the available software are key for a successful use of robots and especially robots while preserving the use of grazing for sake of production costs, animal welfare and biodiversity preservation.

*Figure 6.22. Example of workload reduction thanks to the use of robots. Generated from farmer interview - Chambre d'Agriculture, Bretagne with comments by the author*

Romain Chevrel

120 hectares

Workload reduction

Farmer Interview

**Rearing calves with grazing foster cows for better results and simplified work**

As soon as he settled into organic dairy production in 2018, Thibault Monneray wanted to set up a grass-fed farming system. His two main objectives were to reduce the workload as much as possible and to be able to manage the breeding by limiting the time of on-call for better quality of living. He quickly milked his 60 jerseys once a day (2020) with seasonal spring calving. Quite naturally, the question of rearing calves with foster cows arose for reasons of working time and the health of the calves. After 4 years of practice, today there are 45 calves (heifers and veal calves) raised by 15 foster cows. The cows and the calves are doing rotational grazing in spring, which has improved the calves' health in addition to reducing feed costs. The calves start grazing quickly. The foster cows of the male calves and crossbred females return to the milking parlours when their calves leave for the slaughterhouse. For Thibault, grouped calvings support this technique, but it is not compulsory. Finally, according to him, rearing calves with grazing foster cows only has advantages: fewer health problems, fattening calves reach their slaughter weight one month earlier, grazing heifers and above all comfort and a reduction of his workload.

His advice: Don't hesitate to take the calves out early in spring to have a healthier and more robust herd.

Comments

- Reducing workload while preserving income requires to redesign the production and management system. Redesign is a slow process, run in several steps, where some are definitely changing the trajectory. The choice of using foster cows is very disruptive but it made it possible to combine all objectives. Moreover, it made it possible to adequately use the resource offered by the grasslands, while increasing the animal health and welfare.
- The success of this innovation also relies upon the use of crossbreeding in order to get male and female calves with good meat production. An additional element explaining the success of Thibault's strategy is the management of the animals. Indeed, the flexibility of the foster cows to accept feeding calves before returning to a milking strategy requires a wise choice of these flexible cows and a calm management.

*Figure 6.23. Example of improved animal management thanks to the use of foster cows. Generated from farmer interview - Institut de L'Elevage – Idele, with comments by the author*

Thibault MONNERAY | 72 hectares | Animal management | Farmer Interview

# 6.6 Future vision of grazing in agroecology

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101059626.

**Conclusions and key messages**

As a conclusion of this chapter dedicated to the grasslands and forage crops in France, their production, their use by herbivores, the production and consumption of animal products, some key elements may be identified.

The driving force is the consumption of animal products. Even if the proportion of animal proteins in the human diets remains high (61%) and stable, the consumption is changing as shown by the share among products, with less beef meat, more poultry meat and stable dairy product consumption and a steady and sharp increase in the consumption of eggs. The share of animal products covered by quality signs is contrasting among productions. The market share for organic farming was steadily increased till the crisis in 2022-23 because of the large inflation of food prices. At the date when we are writing this conclusion, the organic farming market is recovering.

The commercial balance for animal products shows a stable pattern, where France is exporting living animals and importing of meat. This is a characteristic and a weakness of the French meat supply chains.

French herds of ruminants show a continuous decline of numbers of animals (dairy and beef cattle as well as sheep). This is partially compensated by the individual productivity, especially for milk yield, where a very efficient animal breeding is at work.

There is a strong drop in the numbers of farms involved in animal production. This is partly due to consolidation leading to larger farms and larger herds. However, some farmers quit animal production before retirement, especially in dairy production. Major social questions are emerging, regarding the next generations of farmers, as 50% of the farmers will quit in the next 10 years. In the French law voted in early 2025, a chapter was dedicated to this issue, in order to foster education and training and to facilitate new practitioners entering agriculture and especially animal production. A focus is given to welcome more young farmers who are not originating from the agricultural sector.

Over the last decades, changes have been seen in feed sources, with less and less grazing, even in very favourable regions such as Normandy and Brittany, a constant acreage of silage maize with an induced high dependency to imported plant proteins and a perennial legumes acreage that has been increasing over the last 10 years for on-farm use and for sales.

The animal production is facing hurdles and threats. It is worth mentioning the severe animal diseases, as France experienced over the last years blue tongue disease on sheep, epizootic haemorrhagic disease and lumpy skin disease on cattle. This has severe incidences on the farmers due to the compulsory slaughtering of contaminated herds and sometimes surrounding ones, limitation of movements of animals, and of course on farm and national budget due to compensations paid to farmers. Similarly to other European countries, there are more and more concerns regarding predators, especially wolves, that are a threat for sheep herds in transhumance areas but also in plains.

The on-going and quick climate change is also a major threat for grassland-based animal farms. Indeed, it induces more variation among years with more floodings and more droughts, higher temperatures in the summers and in the winters. As a consequence, there is a need to secure feed resources and a need for more feed storage, with all associated costs. However, there are contrasting situations among French regions. Up to now, there has been only a limited adaptation of acreage of forage crops and grasslands.

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