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The French alpine agriculture: A diversity of systems and their evolutions over the period 2000-2010

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Abstract

Agriculture is a main stake in mountain territory. In addition of its production role, it fulfils territorial functions. Indeed, agriculture represents a main economic activity in some rural areas and participates to the maintaining of landscape and mountain environment. The French Alps can be divided in two main regions: the northern and the southern Alps, distinguishable on several characteristics as climate, economical dynamism and urbanisation. In addition of its productive utility, the alpine agriculture plays major roles in space organisation of the Alps, landscape maintaining or natural risks control. However, the difficulties faced by agriculture in such a complicated territory are multiple: high costs of productions inherent to the relief, climate or land estate pressure. Therefore the fundamental role of agriculture in rural development is promoted by the European institutions in order to justify the financial support brought to farmers of the mountain zones considered as less favoured areas. In view of the next CAP reform planned for the period 2014-2020, policy-makers need to understand what has been the influence of the past policy on agriculture orientations.

Agricultural evolutions represent farms adaptation to territorial constraints or sectorial dynamics transposed at the farm level. Also this work aims at characterising the different evolutions of the alpine agriculture over the period 2000-2010, and identifying the main driving forces behind these evolutions. The objective is to distinguish the territorial and sectorial dynamics and to put them in perspective of the different context evolutions: economic, politic, social and environmental.

To that end, the alpine agriculture characteristics were described with 2010 data and the different context evolutions were recounted. Moreover, data collected by the agricultural censuses carried in 2000 and 2010 were analysed. In order to study the territorial influence on the agriculture evolutions, the Alps were divided in 24 coherent and homogeneous geographic entities in terms of assets and constraints toward agriculture. Regarding the study of the sectorial evolutions, three of main alpine productions were studied in details by separating the different basins of production and zones benefiting of quality certification: dairy cows, sheep and viticulture.

This analysis showed that the alpine agriculture was more diversified and orientated toward vegetal productions than other mountain agricultures, but herbivorous breeding still occupies the major part of the lands. The decline in farm number is similar in the Alps (-29%) than in the totality of France (-26%). Nonetheless, the phenomenon of land abandonment is more important in the Alps with a loss of 10% of the agricultural surfaces. Regarding the discrepancies of evolution according to territorial contexts, the main notable difference is observed between the northern and the southern alpine farms. The north of the Alps has lost more farms units (-33%), but the south was more stricken by the land abandonment phenomenon (-14% of UAA). The sectorial influence on the evolution of agriculture was also clearly visible. In production sectors where a coherent downstream organization was present to regulate the production, absorb the market instability and concentrate the supply for commercialisation, the farm units decline was very limited. On the other hand, productions exposed to market instability, low prices and surplus of production faced a very complicated situation. Despite the CAP support, their decline was not avoided. Also in view of the new CAP, some past reforms could be reconsidered, such as the decoupling of some productions. Finally some prospective elements of the future of the Alps show the necessity of a CAP support helping farmers to face new challenges such as climate change or new consumption tendencies.

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List of abbreviations

A

AC-2000	Agricultural census carried in 2000
AC-2010	Agricultural census carried in 2010
AEGP	Agri-environmental grass premium
AWU	Annual work unit

C

CAP	Common agricultural policy
-----	----------------------------

D

DPU	Direct unique payments
-----	------------------------

E

EARL	Private limited farming company
------	---------------------------------

G

GAEC	Agricultural association for common farming
------	---

H

ha	Hectares
HM	High mountain

I

Insee	National institute of statistics and economical studies
ITER	International thermonuclear experimental reactor

K

k€	Thousand of euros
kg	Kilogram

L

LFA	Less favoured area payments
LSU	Livestock unit

M

M	Mountain
m	Meters
(high) mountain France	Zones of mountain and high-mountain of metropolitan France

N

NBF	Number of farms
-----	-----------------

P

PACA	Provence Alpes Côte d'Azur region
PDO	Protected designation of origin
PGI	Protected geographical indication
PMEL	Premium for maintaining extensive livestock system

R

RA	Rhône-Alpes region
S	
SAD	Sustainable agriculture contract
SGP	Standard gross product
T	
TMC	Territorial management contract
U	
UAA	Unit of agricultural area
W	
WTO	World trade organization
Z	
ZAU	Urban areas zoning
zm	Mountain zone
zhm	High mountain zone
04	Department of the Alpes de Haute Provence
05	Department of the Hautes-Alpes
06	Department of the Alpes maritimes
26	Department of Drôme
38	Department of Isère
73	Department of Savoie
74	Department of Haute-Savoie
83	Department of Var
84	Department of Vaucluse
°C	Degrees Celsius
€	Euro

Forewords

This thesis was realised within the the SUACI-Alpes du Nord framework, a public structure dedicated to accompany professionals of the alpine agriculture through the evolutions of their activity. The object of the SUACI Alpes du Nord aims to respond four main challenges: renew the productive function of agriculture and its economic model in the future orientations of the common agricultural policy (CAP), develop and formalize the contribution of agriculture to sustainable development of territories, propose innovations regarding the management of local resources and redefine the engagements between, farmers and the society.

This work is part of the Polem (policy and mountain farming) program which targets to comprehend and analyze recent alpine agriculture evolutions and to understand the impact of policies on farm units. This project is conducted in partnership with the statistical services of the regional direction of agriculture, food and forest of the Rhône-Alpes region and Provence-Alpes-Côte-d'Azur region, and the participation of the chambers of agriculture of the following alpine departments: Savoie, Haute-Savoie, Isère, Drôme, Hautes-Alpes, Alpes de Haute Provence and the French Livestock Institute.

The expectations of the SUACI Alpes du Nord concerning this work, is to obtain elements of understanding to define the main stakes and challenges of the Alpine agriculture in view of the future reform of the CAP. The finality is to identify the topics that should be discussed and argue by alpine agriculture representatives in the future CAP reform negotiations. To that end, the mobilisation of data collected by the two last agricultural censuses will be used to analyse the evolutions of the alpine agriculture over the period 2000-2010 in perspective of the different contexts evolutions: political, economical, societal and environmental.

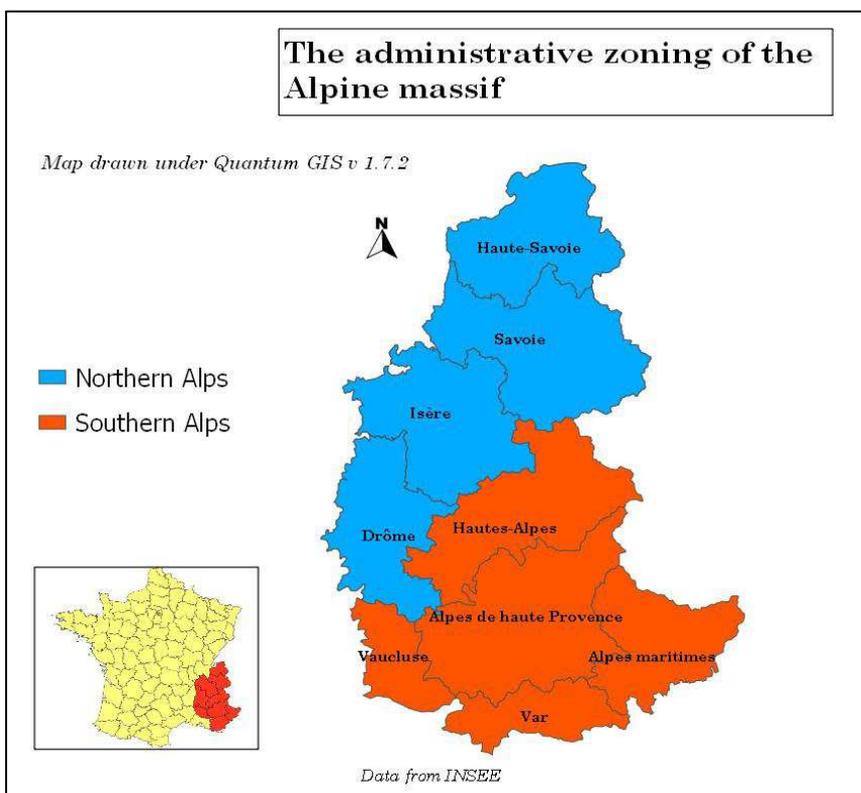
1. Introduction to the French alpine agriculture: a frail activity on a complicated territory

1.1 The Alps: the richness of a disadvantaged area

1.1.1 A complicated territory

The French Alps are a mountainous area of the south east of France covering 39 528km². The Alps are sprawled from the Italian boundary, to the Mediterranean Sea until the Rhône valley (Larousse, 2012). The alpine massif gathers 2.4 million inhabitants on territories from 9 administrative departments belonging to two distinct regions (Larousse, 2012). This administrative zoning gives origin to the slicing of the Alps into two main blocks: the northern Alps associated with the Rhône-Alpes region and the southern Alps linked with the Provence-Alpes-Cote-d'Azur region (Figure 1-1). The urban network of the Alps is particularly dense, with 71% of the alpine population living in urban areas. The Alps is the most dynamics massif in France. The demographic growth, resulting from positive migrations rates but also from the natural balance, touches all areas and particularly the rural ones (Comité de massif des Alpes, 2006).

The northern Alps are composed by two whole departments: Savoie (code 73) and Haute-Savoie (code 74) and some parts of two other departments: Drôme (code 26) with 57% of the districts located in the massif and Isère (code 38) with 60% of the districts included in the massif. The southern Alps are formed by five departments: two whole departments with the Alpes-de-haute-Provence (code 04) and the Hautes-Alpes (code 05), and some parts of three other departments: the



Alpes-maritimes (code 06) with 81% of the districts belonging to the Alps, the Var (code 83), with 39% of the districts included in the Alps and the Vaucluse (code 84) with 48% of the districts as part of the Alps territory. Thus, the Alps boundary line does not correspond to official definitions of the departmental zoning.

Because of their geographical localisation: at the confluent of oceanic, mediterranean, east and north climatic

Figure 1-1 : Map of the administrative zoning of the Alps with the departments of the northern and southern Alps and the localization relatively to France

influences, and according to their circular relief pattern, the Alps are characterized by spatial variations in temperatures and precipitations (Thomas, 2010).

1.1.2 The two alpine zones: more than administratively distinguishable

1.1.2.1 The northern Alps

The northern Alps are characterized by high mountains with a strong portion of wooded lands, spaced out valleys, and very populated and urbanised areas. From the west to the east three types of landscape following one another can be described (Larousse, 2012):

- The Prealps are composed by chalky mountains, and woodlands cover 50% of the territory. Industries are concentrated in towns (Annemasse, Annecy, Chambéry), and three regional parks are located on this territory: Bauges, Chartreuse, Vercors. The climate is wet and windy with yearly precipitations comprised between 1 and 2m.
- The “Alpine furrow” is a long depression from Megève to the Trièves region. This area is densely populated, and gathers hydroelectric equipments, bar turning industries, aluminium and chemistry industries, mechanical and electrical constructions. Recently the area has specialized in nanotechnologies.
- The central massifs vast from the Mont Blanc massif to the Beaufortin, Belledonne and Vanoise massifs. It includes the highest summit of the French Alps and woods cover a third of the territory. The intra-alpine zone separates the central massifs from the Prealps. The rainfalls are reduced compared to the Prealps but the temperatures are generally colder with the 0°C isotherm located at 1000m high. The low valleys are industrialised and employ local and foreign workers whereas the high valleys are specialized in winter and summer tourisms with altitude ski stations and two national parks (Vanoise and Ecrins).

The northern Alps are characterized by a remarkable economic dynamism mainly fuelled by tourism attracted by its landscape, a good sun exposure and altitude (Meyzenq, 1984). However, the area is victim of its own success. The road transit is under pressure in the valleys and the concentration of persons and activities on the valleys led to the clutter of the alpine furrow with important atmospheric pollution.

1.1.2.2 The southern Alps

The southern Alps present a less favourable disposition than the northern Alps due to their narrow valley: “the Durance valley”. They are globally drier and poorly ventilated. The southern Alps climate shows some Mediterranean characteristics. Indeed, the average winter temperature is 4 to 5 degrees higher than in the north, with the 0°C isotherm situated between 1 200 and 1 500m high. The precipitations are lessened of 1m generally. The urbanisation is limited with only the city of Gap overrunning 20 000 inhabitants. Nevertheless authorities put efforts in order to develop winter and summer tourism, which stimulates the local economy (Schoeneich and De Jong, 2008). The southern Alps can be divided in three main topographic entities (Larousse, 2012):

- The southern Prealps are chalky mountains, opened on the Durance valley. The area is poorly populated but includes two regional parks (Verdon and Luberon). Tourism is a developing activity and hydroelectric installations give some economic perspectives to the region.

- The high Alps are constituted by the Mercantour massif. Tourism is also considered as a developing industry with the creation of touristic stations.
- The Durance valley constitutes the only vital axe of the southern Alps. Irrigation allows crops growing and hydroelectric installations encourage the development of other industries, such as robotics and cosmetics.

The southern Alps benefit from an extremely good sun exposure but have slowed to promote this asset and develop tourism. The area stayed very rural in its mentality and overlooked industrial development (Meyzenq, 1984) until recently. The lack of transport infrastructures contributes to the isolation of some areas and impedes their economical development. Although the southern Alps do not benefit from the same industrial tradition than the northern Alps, considerable progresses have been made. Food industry has become an important activity for the massif. In 2005, the department of the Alpes de haute-Provence has been chosen for the construction of a nuclear fusion reactor, which will create 6 000 employments (Comité de massif des Alpes, 2006). In summary, in spite of its delayed economic growth, the southern Alps have put efforts to develop their economy. Though, agriculture remains an important activity not only from an economical point of view but mainly in terms of space occupation.

1.1.3 The main stakes of the alpine massif and implications for agriculture

1.1.3.1 The fundamental role of agriculture in the alpine territory

The alpine massif represents an extremely rich environment through the gradient of temperature, precipitations and sunshine brought by the altitude. This stratification of climatic systems contributes to a wide biological diversity and to the variety of habitats. In addition, the isolation of these ecosystems contributes to the preservation of the alpine heritage, the natural resources and the huge endemism of the alpine biodiversity (Langevin et al., 2008). On the other hand, the mountainous characteristics of the Alps make it an instable and vulnerable environment particularly regarding glaciers, snow cover or the geomorphology. The Alps are highly sensitive to climate fluctuations, and to a bad management of the resources and territories. The consequences on the soil, vegetation or fauna can be irreversible (Schoeneich and De Jong, 2008). Indeed, climate change has already had a strong impact in the Alps with an average rise of temperatures of 1.6°C in 30 years whereas the world average is of +0.8°C in 100 years (Langevin et al., 2008). The effects of global warming are visible with a recession of the snow cover and glaciers, and more frequent extreme natural events, as flooding, scree, mudslides or forest fires. Water stress has already impacted on agriculture but also forest, especially in the southern Alps (Langevin et al., 2008). Mountainous areas are not only affected by global evolutions as climate change but also by economical globalisation, communication development, urbanisation, abandonment of agricultural lands or tourism booming (Brun, 2008).

Clearly, the role of agriculture in mountains territories needs more emphasis. Undeniably, it does not only fulfil a production function but also endorses a role in space management, landscape sustenance, risks control (avalanches, forest fires...) and cultural identity (SUACI-GIS, 2011). Furthermore, mountain agriculture maintains economic activities in some disfavoured areas and provides local food. The grazing activity by livestock maintains the landscape and participates to the biodiversity improvement (Sérès, 2010). As a result, agriculture globally contributes to tourism development and reinforces the territory attractiveness of mountain zones (SUACI-GIS, 2011). Thus,

agriculture is one of the main action levers on mountain environments. Its characteristics and the comprehension of its dynamics of evolution constitute essential points in view to define and analyse agricultural and territorial policies.

1.1.3.2 The challenges faced by agriculture in the alpine massif

The obvious difficulties faced by agriculture in the territory of the Alps are the relief and climate (Janin and Perron, 2005). Some lands are inaccessible, not served for water or electricity or too isolated for products (milk/animals) collection. Moreover, the slopes and climatic stratification restricted the possibilities of agricultural productions in mountain zones. Even within a type of production, some constraints can be intrinsically imposed, such as late varieties of plants or rustic breed of animals, generally less productive. The topography makes agriculture expensive in terms of investments for buildings, equipments and land care, which is even more problematic in a context of markets instability and prices volatility (SUACI-GIS, 2011). Even, the region morphology has forced the concentration of towns, infrastructures, facilities and industries in the valleys particularly in the northern Alps. Consequently the competition for land access is sharpened which drives up real estate prices and agricultural exploitation of these valleys can become as expensive and difficult as in altitude (Brun, 2008). Consequently, politician and agricultural actors had to find strategies to maintain agriculture in those less favoured areas. The introduction of the rural development concept in the common agricultural policy (CAP) is part of the answer.

1.2 The alpine agriculture evolution, embedded in the economic and social theories of rural development

1.2.1 Agriculture and rural development

Agriculture has mainly been considered as a sector of activity coinciding with the rural spatial category (Saraceno, 1994). Rural areas can be defined as a productive environment, that is to say the combination of “social, economic, technological and institution factors organized in a certain way” (Saraceno, 1994). The model of rural and agricultural development until the 1990’s was orientated toward intensification and specialization of the productions systems, sometimes leading to the industrialization of some sectors (Van der Ploeg et al., 2002). Until the 1980’s, it implied a structural reorganization of rural areas with the rural exodus displacing the excess of population toward urban areas, but also the disappearance of subsistence farming, the grouping of properties and modernization of farm technologies (Saraceno, 1994). This movement corresponds to the gathering of population into the alpine furrow and a loss in population of some altitude villages (DTA Alpes du nord, 1998). The drop in the number of farms and employment encourages the increase in regional disparities and tensions between farming and the environment. The expectations in products quality and accessibility were also transformed (Van der Ploeg et al., 2002). The globalization and its impact on the international economy have made the competition for the access to production and exchange markets harder, which disadvantages the goods and services from some isolated rural areas. The gross value of agricultural products has constantly increased between 1955 until 1980, and has stabilized or even declined since 1980’s. Looking more in details, it resulted from an increase in costs of production and a stagnation of gross value (Van der Ploeg et al., 2002).

In order to offset these negative tendencies of rural social and economic evolutions, the notion of rural development appeared to be crucial. As the modernization paradigm achieved certain limits mainly practical and intellectual (Van der Ploeg et al., 2000), the concept of rural development, by integrating the values of ecological sustainability and multifunctional farms, created new links between agriculture and society (Van der Ploeg et al., 2002).

Originally, this notion of rural development was carried by local initiatives associated with emerging societal values such as regionalism or environmentalism. Besides, the European Union encouraged this movement through two agendas: economy and policy (Ray, 1997). The European regional policies abetted rural development with the objective of reinforcing cohesion, reducing poverty and regional disparities (Ellis and Biggs, 2001). The policies for maintaining mountain agriculture were part of this project. In addition CAP reforms, aiming at compensating the decline in some agricultural sectors, as ovine production were undertaken.

As a result, the concept of rural development privileges the territorial approach rather than a sectoral one, which aims at bringing more cohesion in agriculture to face problematic at the territory scale (Ray, 1997). It targets as well to ensure a better added value for agricultural goods fitting closer to society and local demands, notably by producing non-importable goods such as biodiversity. At the country side scale, rural development has induced social and geographical reorganizations.

1.2.2 Rural development and alpine demography

Regarding the demography, since the 70's, stability in population of rural areas was firstly observed with even an increase in some regions resulting from positive migration rates, and despite negative birth rates. Indeed, in terms of employment, the drop occurring in agricultural employment has not balanced the growth in non agricultural sector (Saraceno, 1994). It is particularly true in mountain areas like in Savoie and Haute-Savoie, where tourism activities, as ski stations, have been considerably developed. Consequently, as Saraceno (1994) correctly pointed out "rural is no longer the monopoly of farmers" and three categories of rural population can be identified: modern farmers, population for whom farming is a hobby and work in the local economy and the rural population with no ties with agriculture anymore.

From a geographical point of view, the translation of those changes is the emergence of a periurban area which was designed to represent the new population dispersion. It also resolved the issue concerning the static definition of rural area only associated with loss in employment and population (Saraceno, 1994). The positive dynamics observed in this zone is led by two ancillary processes. First, employment and enterprises are redistributed in non urban-areas and second, population's lifestyles and preferences evolved. The development of good communication infrastructures played a crucial role in this spontaneous spatial diffusion of economic activities (Saraceno, 1994). The limit of the application of the theory to the north alpine case is the relief which constrain spatial repartition of the population. Also, the phenomenon of periurbanization resulted in the connection of urban poles in the valleys by the expansion of suburbs.

1.2.3 Agriculture and development strategies

The rural development entailed restructuration at the farm level. Indeed farmers understood quickly their self interest in redefining their strategies, practices and network (Van der Ploeg et al., 2000). The rural development principle emphasizes the focus on development valorising local resources (Ray, 1997). From this point of view, different options can be considered by farms with the development of agro-tourism, short supply chains and new “on farm activities” but also with the remuneration of nature and landscape management as non-importable goods production. As a result farms opting for diversification strategies tend to have an income less dependent on commodity markets volatility (Van der Ploeg et al., 2002) but certainly more dependent on the remuneration of those new services through the CAP payments. From then, well organised diversification activities can improve the cohesion between activities on the farm and with the rural environment, and represent a sustainable opportunity of development. However the specialization of farm production is still the predominant model of agriculture even in mountain areas. For the downstream farm production, rural development principle can be expressed as an emergence of new food supply chains with higher quality products, local specialities production and organic agriculture (Van der Ploeg and Renting, 2000). Indeed, the alpine agricultural products are often associated with a historical and local know-how which have been utilized to create quality demarcations. The rules and specifications implemented by the products designation aim at protecting agriculture from territorial, economical and political evolutions but also promote the territory identity (Delattre et al., 2005). In addition, new forms of commercialization can represent an opportunity for alpine products valorisation on local market. Complementarily, new on-farm activities, like agro-tourism, provide a good promotion of local products as well. On the same perspective, collective approaches are increasingly used to avoid the retailer step of a product supply-chain and benefit more from the added-value of their products (Janin and Fleury, 2005).

Another strategy is based on the remuneration of immaterial goods production by agriculture. As an example, landscape can be considered as a territorial resource (Fortin, 2007). From this point of view, the economic value of the landscape amenities can be calculated in order to assess the contribution of agriculture to landscape quality (aestheticism and functionality) (Peyrache-Gadeau and Perron, 2010). As a result, a subsidy system has been implemented to pay farmers for their societal contribution to rural development. Nevertheless, not all alpine productions equally benefit from this system. Furthermore they have not followed the same development strategies which results in important inequality within a type production and between productions.

As a conclusion, the theory of rural development from an economical and social point of view raised some topical issues that stay major concerns for the actors of mountain agriculture. Indeed the drop in the number of farms seems to be presently a critical issue questioning the maintaining of agriculture in some areas. Moreover, the definition of the urban and rural zones and its influence on agriculture rate of disappearance and strategies of diversification are current concerns related to the evolution of population habits and consumer preferences. The questions of diversification and demarcation through quality productions are two of the most currently studied economic agricultural strategies, associated to territory specificities. Finally, the position of Ray (1997) on the notion of rural development justifies the framework choice of working on the Alpine massif scale as a unity of

geographical entities facing the same territory difficulties but opting for different strategies mainly expressed by local and sectorial specializations.

1.3 Conclusion: the alpine agriculture: a sectorial answer to territorial issues?

As shown in Figure 1-2, the alpine agriculture and furthermore the farm structures are resulting from the intersection between the territorial and sectorial development of agriculture, identified as the different supply chains. Indeed, the adaptation of farmers to their zone of production, to consumer expectations and to the supply chains organization is reflected by production orientations and commercialisation choices.

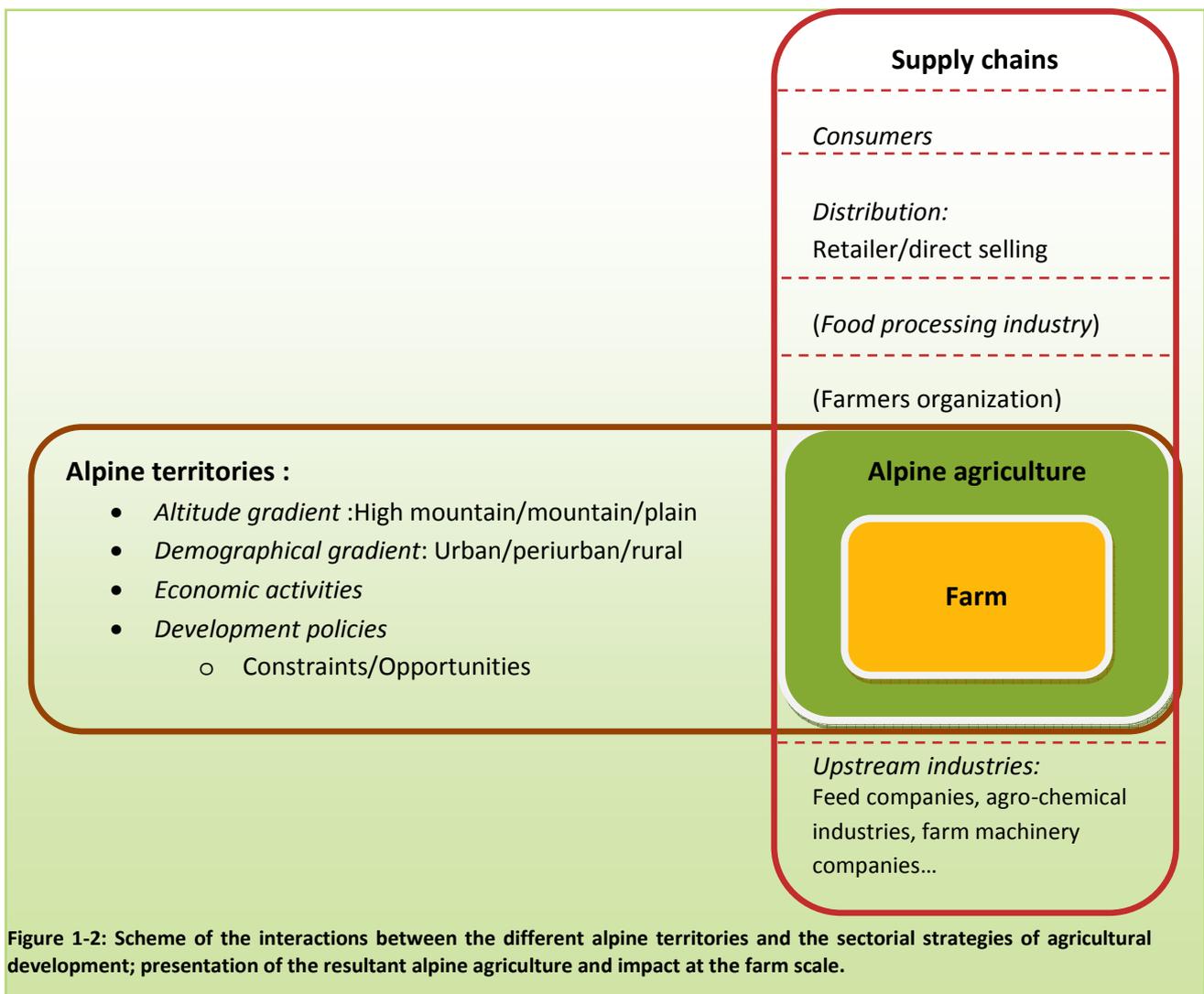


Figure 1-2: Scheme of the interactions between the different alpine territories and the sectorial strategies of agricultural development; presentation of the resultant alpine agriculture and impact at the farm scale.

However, this scheme also highlights the interlocking of the farm with its belonging supply chain. It underlines the dependency and vulnerability of farms structure on regional externalities as consumer's preferences, political decisions, or energy prices (Heijman, 2007). As previously explained (section1.1.1), the alpine territory presents strong constraints for the development of agriculture. Nevertheless some aspects, as biodiversity resources or landscape attractiveness, bring potentialities

of development. Thus, agriculture actors have to develop individual or collective strategies to counterbalance the drawbacks of the territory and use its assets. Therefore, it is legitimate to show interest in the strategies that have been implemented, and their effectiveness at developing or sustaining agriculture in a given territory.

1.4 Aims

According to the previous review of literature, different challenges can be identified over the territories of the alpine massif and the prevalent role of mountain agriculture in economical, social and environmental sectors was clearly established within the Alps. Therefore, the research question of this work is: *what have been the key driving forces behind the main evolutions of agriculture over the period 2000-2010?* The idea is to identify the territorial and sectorial dynamics of evolution. Indeed, if some controllable factors are shown to positively or negatively affect the evolution of the alpine agriculture, they could give some levers of action to policy-makers to inflect the future orientation of agriculture regarding the specificity of the territory.

Therefore, through a study of the agriculture evolutions in the Alps, based on data from the two last agricultural censuses, the successes and failures of agriculture to adapt to the specificities of the alpine territory will be identified. A complementary study of economic, politic and social context changes will help allotting these trends of evolution to proper sectorial dynamics or global tendencies. So finally, this work will aim at identifying how the alpine agriculture has evolved over the last decade and which sectorial adaptations or implemented strategies have enabled the expansion or subsistence of agriculture on this particular geographical area. The impact of policies on agriculture orientations will be a central point of discussion.

2 Material and Methods

2.1 Work sequencing

In order to study the strategies of adaptation and development of agriculture to the specificities of the alpine territory, a quantitative analysis of alpine agriculture evolutions will be carried, based on data of agricultural census. Thus, the period of observation is determined by the years separating the two last censuses: 2000 and 2010.

In a first step, a picture of the alpine agriculture in 2010 will be painted in order to characterize its particularities. The goal is to identify the challenges regarding the productions, space occupation, employment, environment and commercial strategies.

Then, in a second step, the context evolutions between 2000 and 2010 will be the point of interest. The economical, political and social aspects will be studied at the Alps scale and compared to the French case. The aim is to spot out the global trends of agriculture evolution in view of isolating the proper dynamics of evolution associated to the alpine territory and related to the different production sectors.

The third step will consist in a description and analysis of the alpine agriculture evolution between 2000 and 2010. Two levels of study can be distinguished: at the alpine scale, and at a production scale. The alpine scale will serve to depict the stakes of agriculture in a mountainous area through the transformations of the farms in the different alpine territorial contexts over the last 10 years. Then, for the main alpine productions, the supply chains connected to a geographical entity will be studied separately. The interest is to highlight the changes stimulated by a supply chain organization to answer the territory constraint and the changes encouraged by context evolutions with a particular focus on CAP reform impacts. Only the three major production sectors will be analysed in terms of number of farms, space occupation or territorial cohesion and integration in this work for some delay issues.

2.2 Data

2.2.1 The data used

2.2.1.1 Data from agricultural censuses 2010

The agricultural census was organized by the statistic department of the ministry of agriculture. It was regionally administrated by the regional direction of agriculture, food and forest (RDAFF). The collected data deal with general thematic: crops and cultivated surfaces, livestock and breeding, crops protection, mechanization, diversification, commercialization, employment, farm management and collective structures. Nevertheless the agricultural census does not collect any economical or production information. Therefore, production data from the annual agricultural statistic covering the period 1999-2010 were used to supplement the census information. For this study data of the

agricultural census covering the campaign 2009-2010 were extracted by the RDAFF of the Rhône-Alpes region (RA): the northern part of the Alps.

2.2.1.2 Data from agricultural censuses 2000

Before 2010, the previous agricultural census was carried over the campaign 1999-2000. For this study, data were extracted by the RDAFF of the Provence-Alpes-Côte d'Azur (PACA) region which corresponds to the southern part of the Alps. The questions surveyed by this census are slightly different from the 2010 ones. The diversification and collective structures topics were not surveyed in this questionnaire. Also some criteria and definitions are inconsistent from one census to the other. Consequently, the comparison between 2000 and 2010 is not possible for all variables.

2.2.1.3 Data from interviews

In parallel of this work, an analysis of the 2000-2010 evolution the downstream of each production chain was conducted. For this purpose, seven interviews of specialised professionals in the downstream organization of the different alpine supply chains were conducted. The semi-directive interviews were carried by phone with always the same two main questions to answer: how is organized the downstream of the supply chain and what have been the changes in this organization over the period 2000-2010. It will be used to fuel the production sector description and the evolutions analysis.

2.2.2 Statistical secret

According to the law number 51-711 from the 7th of June 1951 on the coordination and the statistical secret, the data extracted from the censuses 2000 and 2010 are subjected to the statistical secret. It implies that neither direct nor indirect identification of the surveyed persons should be divulged. For the data related to companies, any publication of results concerning less than 3 companies (farm in this case) is prohibited. Similarly if 85% of a data result arise from a single company, this information could not be spread (Legifrance, 2008). As, the agricultural data are gathered per village; it implies that if less than three farms are listed per village, the information concerning this village are not diffusible. Similarly, if one farm represents more than 85% of the farms surfaces, work units or gross products of a single village, the information about this village are confidential. Therefore, the geographical zoning and the division of the data by type of production entail a risk of unavailability of some information. Thus, this limitation of statistical secret is the explanatory factor for the inaccuracy of some number and sums.

2.2.3 Data extraction

The RDAFF from the regions RA extracted the data of the census 2010 for this study and the RDAFF from PACA extracted of the census 2000. The data of the censuses are available by commune but it was decided to create larger geographical entities to study agriculture in the Alps. First the Alps were divided into administrative regions and departments (Table 2-1).

Table 2-1: The administrative zoning of the Alps and the percentage of the departmental population included in the Alps zone in 1999

Region	Department	Code	% of alpine districts	% of alpine population
Northern Alps	Drôme	26	57%	17.6%
	Isère	38	60%	65.2%
	Savoie	73	100%	100%
	Haute-Savoie	74	100%	100%
Southern Alps	Alpes de Haute Provence	04	100%	100%
	Hautes-Alpes	05	100%	100%
	Alpes maritimes	06	81%	16.6%
	Var	83	39%	10.1%
	Vaucluse	84	48%	15.2%

Again, in each department three topographical zones were distinguished: plain, mountain and high-mountain. Finally, this geographical division led to 24 entities as the departments 05 does not include a plain area and the departments 83 and 84 do not have high mountain zones (Appendices Figure A 1). Those 24 geographical entities will be called 24 alpine zones for the rest of this work.

In order to interpret the evolutions at the Alps scale some references of comparison are required. Therefore data extractions made for each geographical unit will also be carried for the geographical entities France and mountains France. The zone France only considers metropolitan communes and mountain France is defined by all the communes from metropolitan France fulfilling the **high-mountains or mountains** criteria, shortly described.

The raw extracted data were delivered in the form of table, with one table per main theme for the years 2000 and for the year 2010, as shown in Appendices Table A 1.

2.3 Definition

The agricultural world owns its proper official language for descriptions or quantifications. Also, it is essential to understand and agree on the main terms definitions.

2.3.1 Indicators and units

The following definitions concern the main abbreviation and units utilized in the censuses.

- **AC-2010 and AC-2000:** Agricultural census carried in 2010 and agricultural census carried in 2000
- **NBF:** Number of farm units
- **AWU:** Annual work unit. It measures the working force labour. One AWU represents the labour of a full time worker during one whole year (Agreste, 2009).
- **UAA:** Unit of agricultural area. It includes arable lands, permanent grassland and permanent crops, and is often expressed in hectares (Agreste, 2009).
- **LSU:** Livestock unit. This unit is used to compared or aggregate number of animals from different species or categories. The comparability is based on alimentary needs of the animals. In essence, one cow of 600kg producing 3 000 litres of milk a year is 1LSU, a veal calf is 0.5LSU, a ewe and a goat

represent 0.15LSU each, a horse stands for 0.75 LSU, a hen for 0.01LSU and a sow is 0.3LSU (Agreste, 2009).

- **SGP:** (standard gross product) is a coefficient representing the potential of production of farm units. The coefficients are calculated by affectation of a production potential coefficient to each unit of production of the farm i.e. a coefficient per hectare or per head of animals on the farm without subsidy. They are traducing the evolution of production structures and not the evolution of turnover of the farm. They are expressed in euro and their value is regionalized (Ministère de l'agriculture de l'alimentation de la pêche de la ruralité et de l'aménagement du territoire, 2010).
- **Type of farming (economical and technical orientation of farms)** is a classification of farm units based on a coefficient calculated according to the relative contribution of each production to the standard gross income of the farm in order to determine the dominant production of the farm (Agreste, 2009). Some examples of type of farming are: dairy cows, crops, sheep, or fruits farming.

2.3.2 Farm structure and status

The Agricultural census is based on definition and principles created in order to characterize agriculture and classify farm units.

- **A farm unit** is a structure fulfilling three criteria. A farm unit has an agricultural activity, has a day-to-day management and reach a certain threshold in surface, production or number of animals. Agricultural activity is either a production activity or an activity of maintaining land in good agricultural and environmental conditions which allows the remittance of single farm payment (SFP) decoupled from production means. It could also be the provision of surfaces for collective grazing which allow the submission of an application file for agri-environmental grass premium (AEGP). The day-to-day management is independent from any other unit. A registration to the enterprises book and to the *Sirene* organization or a login of application to the CAP can testify of the independent management (Agreste, 2009). The size threshold of a farm unit represents a UAA of 1 hectare, or 20 Ares of crops or an agricultural production expressed in number of animals, surfaces or production: a cow, 6 ewes or a unit producing 10 000 eggs or 1 ton of mushrooms over the period 2009-2010.
- **The small, medium and big holdings** are defined by their SGP value. A small holding has a SGP inferior to 25 000€, a medium holding has a SGP comprised between 25 000€ and 100 000€ and a large holding a SGP superior to 100 000€. Medium and large holdings are assimilated to professional farms (from the previous farm size classification) and small holdings to non professional farms (Ministère de l'agriculture de l'alimentation de la pêche de la ruralité et de l'aménagement du territoire, 2010).
- **Farm holder/manager or co-farmer** is the physical person who takes care of the day-to-day management of the farm. The number of farm units is equal to the number of farm holder (Agreste, 2009).

- **Private limited farming company (EARL)** is a civil company specific to agriculture under the rural code regulation where associations between spouses is admitted, the labour participation of all partners is not compulsory. However the partners can not benefit of legal transparency (Agreste, 2009).
- **Agricultural association for common farming (GAEC)** is form of society specific to agriculture under the rural code regulation characterized by the involvement of all partners in the farm labour, a limited financial responsibility and the transparency principle. It means that all partners have to keep their managers status from an economical, social and fiscal point of view

2.3.3 Zoning definition

2.3.3.1 The alpine massif

The alpine massif is delimited by the interdepartmental authority for land settlement and regional attractiveness (DATAR) by commune. The list of commune belonging to the Alpine massif is available on the DATAR website (<http://territoires.gouv.fr/observatoire-des-territoires/fr/politiques-publiques/organisation-du-territoire?ind=714>).

2.3.3.2 The different topographical zones: plain, mountain, high-mountain

The different topographical zones are defined by the ministry of agriculture.

- **The mountain** zones are characterized by a limitation in the use of lands or additional costs of equipments for the communes suffering from difficult climatic conditions and short vegetation period with 80% of their territory located between 600 and 800m of altitude; for the communes including high slopes (at least 20% slope) prohibiting the use of mechanical engines or requiring the use of expensive equipments; or for the communes combining both handicaps without one being determinant i.e. communes situated at least at 500m altitude with an average slope of 15%.
- **The high mountain** zones are defined by an average altitude superior to 1 200m and livestock density inferior to 20 LSU/km².
- **The plain** zones were defined by all other communes not fulfilling the previous criteria (Conseil Européen, 1975).
- **The France (high)-mountain** zones gathers the mountain and high mountain communes of France

2.3.3.3 The urban and rural zones

The demographical zones used in this study correspond to:

- The **urban** zone corresponds to the category 111 of the ZAU classification from INSEE, i.e. communes belonging to a big pole gathering 10 000 jobs
- The **periurban** zone corresponds to the category 112 and 120 of the ZAU classification from Insee, i.e. communes belonging to the suburb of a big pole
- The zone called **rural** which correspond to area under less urban influence

2.4 -Treatments and analysis

All the data treatments were realized under Microsoft Excel (version 2007 SP2, Microsoft Corporation). Two main kinds of treatments were considered for this study, as previously explained. First, a global approach of the evolutions of agriculture at the Alps scale distinguishing the northern and southern part of the massif was conducted. The aim was to characterize the alpine agriculture and its trends of evolution, but also to comply with the agreements entered with the RA and PACA RDAFFs and provide them more regionalized information. In addition, a second approach focused on the types of production was agreed. Indeed, previous work dealing with alpine agriculture (Girard N et al., 2010) showed that the different types of production were very much associated with specific geographical entities. To that end, two task forces were called with regional specialists of the different types of production.

The first step of the working groups regarded the determination of the study scale (departments, topographical and demographical zones) that would be the most relevant for each supply chain. Concretely for each type of production, the aims of the task force meetings were to identify the main stakes of the different supply chains and to decide which indicators to use and at which geographical scale. The idea was to create coherent territorial units for each production sectors in order to identify the sectorial and territorial dynamics of evolutions, as explained in Figure 1-2. Consequently, each production is cleft into its major chains of production (quality signs, standard...) and these entities are allocated to a geographical zone. This cutting is used for data treatments and analysis as a simplified way to create coherent and homogeneous clusters of farms. The analysis has been fuelled by the knowledge of field experts on the different types of productions systems (use of collective grazing or not, transhumant flocks... for instance) in order to refine the distinction between supply chains. Briefly, the global evolutions of agriculture are studied for the NBF, UAA, AWU, SGP employment and space occupation, livestock or/and surfaces. The evolution per type of farming is examined for the NBF, UAA, AWU, SGP, productions volumes, per zones. In addition the rate of specialization, the stock numbers, and surfaces are part of the analysis. The second task force meeting was called after the data treatments. It aimed at collecting field expert's comments and analyses on the figures of alpine agriculture evolution. The specific interest of this work was to throw light on the interpretation of evolution of each particular supply chain.

The context evolutions studies between 2000 and 2010 were realized for the political, economic, societal and environmental contexts. Most of the information were only available at the departmental scales. Policies evolutions were identified by literature review of the CAP reforms. The economical changes were analysed by treatments of national and departmental data on agricultural prices, food consumption prices, demand evolutions and policy reforms by a departmental listing of the subsidies allocated to farmers. The departmental data have to be considered carefully because they are not only accounting for the alpine zone of each department but for the whole department territory, as shown by the relative part of alpine territory of each department in Table 2-1. The societal context was divided in demographic changes descriptions and consumers expectations analysis. Finally, the environmental context was studied for climate change and predation issues.

The quantitative evolutions of agriculture at the global scale and for the three studied supply chains are put in perspective of the context evolutions to identify the concomitant points. The changes,

either launched by strategic adaptations of farms to territory or to supply chains mutations will be analysed. Policies impacts on the alpine agriculture will be discussed in view of the new CAP policy 2014-2020.

3 The diversity of the alpine agriculture in 2010

3.1 The alpine farm in 2010

3.1.1 Means of production

The Alps gather 4% of the French farm units with 20 023 farms counted by the AC-2010 (Table 3-1). The northern Alps add up 58% of the alpine holdings with a large majority (81%) located in the mountain and high mountain zones. In the southern Alps, 35% of the 8 541 farms are concentrated in the plain area where the Rhône Valley represents an attractive land for farming activities. As a point of comparison, in metropolitan France, 83% of farms are located in plain with a relief more favourable to land exploitation. As expected, the farming activities are mainly located in rural areas for 58% of the alpine farms but a sizable number (26%) can be encountered in periurban areas and in urban zones (16%). Regarding the surfaces, the mountain areas assemble 61% of the agricultural lands of the Alps, 25% are located in high mountain zones and 14% in plain. The Alps employ 4% of the French agriculture labour. The geographical distribution of the workers closely follows the repartition of farm units. In proportion to the average employment by agriculture in the French mountain zones, the alpine farm consumes slightly more working force.

Table 3-1: Quantitative qualification of the alpine agriculture in 2010 (data from the AC-2010)

Zones	NBF	% France %Alps	UAA (ha)	% France %Alps	AWU	% France Alps
Northern Alps	11482	2%	438598	2%	15990	2%
<i>High mountain</i>	1694	9%	91874	12%	2164	8%
<i>Mountain</i>	7602	38%	291450	37%	10627	39%
<i>Plain</i>	2186	11%	55275	7%	3199	12%
Southern Alps	8541	2%	349641	1%	11541	2%
<i>High mountain</i>	1450	7%	103313	13%	1933	7%
<i>Mountain</i>	4072	20%	191421	24%	5493	20%
<i>Plain</i>	3019	15%	54907	7%	4115	15%
Alps	20023	4%	788238	3%	27531	4%
France (high) mountain	80713	17%	3899498	15%	110170	15%
France	490079	100%	26965398	100%	751369	100%

NBF: number of farms, UAA: unit of agricultural area, AWU: agricultural work unit

Table 3-2: Repartition of the alpine farm by size and localization in 2010 (data from AC-2010)

Farm size		Small		Medium and big		Total	
Region	zone	Unit	%size	Unit	% size	Unit	% zone
Alps	High-mountain	1784	57%	1360	43%	3144	16%
	Mountain	6011	51%	5663	49%	11674	58%
	Plain	2607	50%	2598	50%	5205	26%
	All zones	10402	52%	9621	48%	20023	100%
France	(High) Mountain	35837	44%	44876	56%	80713	16%
	All zones	177828	36%	312182	64%	490079	100%

In contrast to what is globally observed in mountain farms in France, the proportion of small holdings in the Alps is higher than the proportion of medium and big holdings, as shown in Table 3-2. This tendency is particularly visible in high mountain zones, where 57% of the holdings are classified as small farms. This phenomenon is less obvious in mountain and plain zones, but the percentage of small structures is still higher than the national average.

3.1.2 Farms structure and orientation

The average surface of alpine farms is 16 hectares smaller than the national average (Table 3-3). In comparison with the standard of French mountain farms, alpine structures are smaller. However the volume of work per farm unit is similar for both areas and underscores the lower work productivity of alpine farms.

Table 3-3: Average size of the farms structure in the Alps in 2010, with the surfaces represented by the UAA (in ha), the working force by AWU and the economic potential by the SGP (in k€) (data from AC-2010)

<i>Per farm unit</i>	UAA (ha)	AWU	SGP (k€)
Northern Alps	38	1,4	52,6
Southern Alps	41	1,4	59,9
Alps	39	1,4	55,7
(High) mountain France	48	1,4	52,1
France	55	1,5	104,6

UAA: unit of agricultural area, AWU: agricultural work unit; SGP: standard gross product

Table 3-4: Repartition of the number of alpine farms per size and type of production and proportions of holdings located in the different zones of the Alps (high mountain, mountain, plain), in 2010 (data from AC-2010)

Type of farming	Number of farm units per size				Percentage of farms per zone		
	<i>Small</i>	<i>Medium</i>	<i>Big</i>	<i>All</i>	<i>High-mountain</i>	<i>Mountain</i>	<i>Plain</i>
Arable crops	1950	623	229	2805	8%	65%	27%
Market gardening	94	97	52	249	1%	45%	44%
Horticulture	120	217	147	488	2%	40%	51%
Viticulture	710	748	737	2200	0%	28%	71%
Fruits growing	2334	600	473	3408	1%	60%	39%
Dairy cows	319	1405	701	2427	30%	64%	6%
Suckling cows	833	376	43	1255	30%	63%	6%
Mixed cattle	123	108	58	293	33%	54%	4%
Sheep	821	781	74	1677	43%	52%	4%
Goats	215	334	42	596	23%	69%	5%
Other herbivores	1046	306	21	1381	26%	63%	9%
Battery breeding	228	128	182	542	10%	70%	13%
Mixed crops and mixed livestock	1597	854	246	2699	12%	66%	22%
All types	10402	6585	3036	20023	16%	58%	26%

The southern Alps farms have a slightly greater surface than in the north but employ the same amount of labour. Regarding the potential of production, the national SGP is two times greater than the one of mountain zones. However, this indicator has to be taken carefully, because it only

considers the means of production (surfaces values and animals), and ignore all the valorisations aspects of the production and prices differentiation, particularly important in quality appellation zones.

On the contrary of some picturing of the alpine agriculture, the most represented production in number of structures is fruit growing with 3 408 listed farms (Table 3-4). The second type of farming of the Alps in terms of number of farms is arable crops. These two productions mainly gather small structures and do not represent the dominance of a type of agriculture in terms of space occupation. These farms are principally located in mountain zones of the massif. Small farms mixing crops and livestock rearing are also present in a substantial number in the mountain zone. The medium and big farms are generally more orientated toward dairy production (cows), wine production or sheep farming.

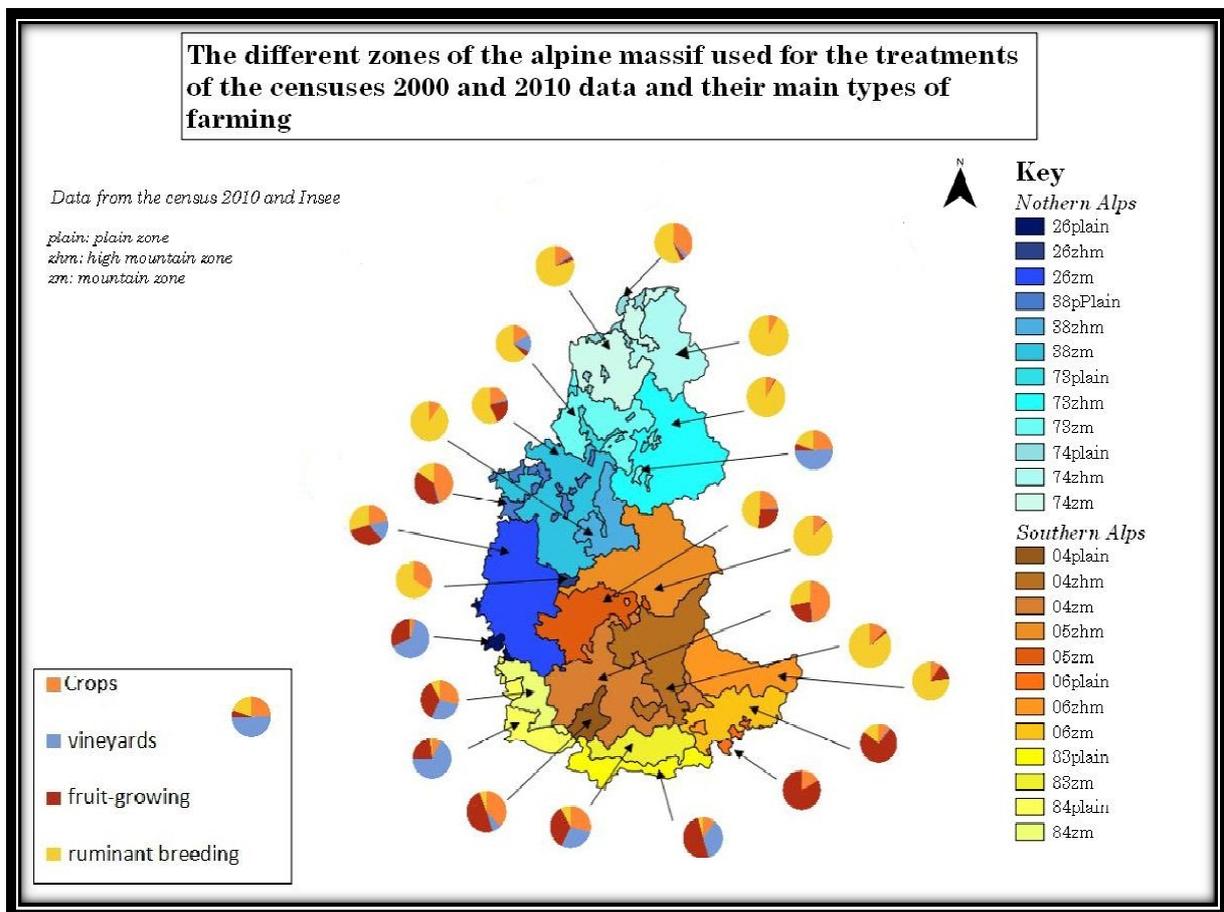


Figure 3-1: Map representing the 24 alpine zones and the proportions of the main alpine productions: crops, wine, fruits and herbivores in each geographical entity. The map was drawn under Quantum GIS v1.7.2 with data from INSEE, NGI (national geographic institute) and AC-2010.

The map of the Figure 3-1 underlines a distinction between the southern and northern Alps. Indeed, the south is more diversified and orientated toward vegetal productions. Ruminant farming is an option envisaged in high mountains zones, where relief and climate constraints limit the possibility of vegetal growing. On the contrary, in the north of the Alps, livestock farming is largely dominating high mountains and mountains zones. In plain, agriculture is a bit more diversified with wine, crops and fruits production, but ruminants are still present.

3.1.3 Employment

The proportion of agriculture employment has drop from 10.1% to 3.2% of the total employment between 1975 and 2008 in France (Dayan, 2008). Nevertheless, in some disfavoured areas it still represents a sizeable source of employment, until 20% of the local employment rate, and is consequently synonym of economic activity and social vitality (Perron et al., 2007). Therefore, agriculture employment is an important stake in the Alps. Farmers' lifestyle and expectations from their work have profoundly evolved and impacted on the farm working force structure. The proportion of labour in the Alps is mainly allocated to holders and co-farmers (62%) and the rest of the work is approximately equally shared between spouses, permanent and temporary employees. In the southern Alps the rate of temporary employees is slightly higher due to the production orientation toward fruits and wines, manually harvested and employing numerous seasonal workers. A small amount of work is still carried out by family workers (Table 3-5).

In comparison with France, the recourse to permanent employees is less widespread (Table 3-5), but the average size of farm is also usually smaller (Table 3-3). However the major part of labour in the French mountains is ensured by the holders and co-farmers at 71%. The utilization of employees stays marginal.

Table 3-5: Description of the working force, (expressed in AWU (annual work unit) and in proportion of the total AWU) in the northern and southern Alps in 2010 and comparison with France (data from AC-2010)

zone	Total	Holders and co-farmers		Spouse (non-co-farmer)		Other family workers		Permanent employees		Temporary employees	
		AWU	%	AWU	%	AWU	%	AWU	%	AWU	%
Unit											
Northern Alps	15990	10174	64%	1644	10%	991	6%	1471	9%	1635	10%
Southern Alps	11541	6972	60%	1096	9%	470	4%	1272	11%	1667	14%
(High) mountain France	110170	78417	71%	12044	11%	6563	6%	6449	6%	6104	6%
France	751369	445772	59%	60100	8%	27010	4%	127891	17%	78926	11%

Table 3-6: Number of farms (NBF) and proportion of farms classified by the age of the holders and their localisation, comparison with France (data from AC-2010)

Age (in year)	North Alps		Southern Alps		(high) mountain France		France	
	NBF	%	NBF	%	NBF	%	NBF	%
Less than 35	1110	10%	669	8%	8279	10%	42012	9%
35 to 44	2334	20%	1620	19%	18272	23%	102764	21%
45 to 54	3599	31%	2408	28%	26452	33%	158540	32%
55 to 64	3043	27%	2326	27%	19874	25%	126978	26%
65 and more	1396	12%	1518	18%	7834	10%	59700	12%
All ages	11482	100%	8541	100%	80715	100%	490032	100%

The dynamism of agriculture can be observed through several indicators. One of the most important is the age of farmers. The turnover in the farmers' population is synonym of sustainability of the activity. The ageing of the farmer population can often reflect a depressed agriculture. As shown in Table 3-6, in the Alps 42% of the farm holders are over 55 years old, which is somewhat higher than the national average (38%). Although, in the French mountain the farmer population tends to be

younger than nationally; the age distribution of farmers in the north of the Alps closely follows the one of France. On the contrary, the farming population of the southern Alps is likely to be older with 45% of the farm holders over 55 years old and only 27% under 45 years old.

3.2 Spatial occupation of the Alps by agriculture

3.2.1 Land characterisation

Agriculture can occupy surfaces in two main ways. The first type of utilization is by growing plants on the soil such as cereals, fruit trees, or vineyards. This activity occupies 19% of the surfaces in the northern Alps and 29% of agricultural areas in the southern Alps (Table 3-7). Over-all, the proportion of cultivated land is lower in the Alps (24%) than in average in France (51%). And the obvious explanation comes from the relief and climate making crops growing difficult and expensive. Thus, a positive gradient of the cultivated surfaces proportion is observed in the Alps, along with the decrease in altitude. The second use consists in roughages production for animal feeding. The forages can be directly grazed by animals or cut and conserved for winter feeding. Grasslands represent 80% of the northern Alps agricultural surfaces and 69% in the south. Also, livestock breeding endorses a main territorial role regarding its space sprawling. Its impact on the alpine environment is all the more significant and its influence on landscape and tourism issues is determinant for the Alps territory.

Table 3-7: Repartition of the surfaces in the north and south of the alpine massif between cultivated land (cereals, industrial crops, oil and proteins crops, aromatic and medicinal plants) and grasslands (annual forages, artificial, temporary and permanent pastures, low yield pasture) in 2010 (data from AC-2010).

Region	Zone	Cultivated land		Grasslands		UAA total
<i>In 2010</i>	<i>Units</i>	ha	%	ha	%	ha
Northern Alps	High-mountain	737	1%	90955	99%	91873
	Mountain	53467	18%	236088	81%	291450
	Plain	30459	55%	23365	42%	55275
	Total	84662	19%	350407	80%	438598
Southern Alps	High-mountain	3960	4%	99269	96%	103313
	Mountain	55551	29%	129797	68%	191421
	Plain	39225	71%	12786	23%	54907
	Total	98736	28%	241852	69%	349641
France	Total	13718373	51%	12542461	47%	26965398

UAA: unit of agricultural area

Furthermore, by adding the collective mountain grazing surfaces to grasslands, the Figure 3-2 clearly shows that alpine agriculture holds an important role in the maintaining of pastoral lands which represent 84% of agricultural areas. Despite the domination in number of farms of arboriculture and arable crops, the surface dedicated to these productions is not proportional.

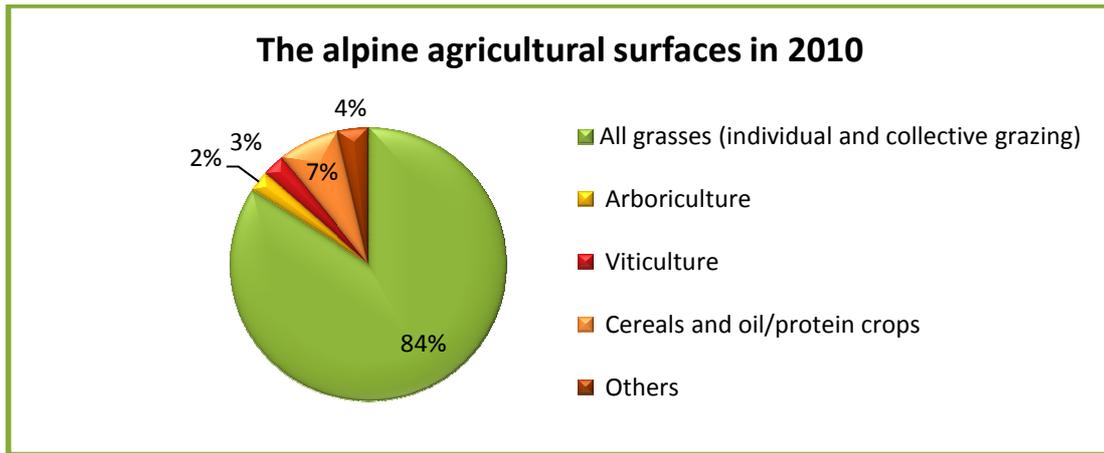


Figure 3-2: Proportion of the different agricultural surfaces in the Alps in 2010 (data from AC-2010)

3.2.2 Livestock repartition and characterisation

The livestock units repartition in the Alps results from two components: the actual localisation of livestock and the type of livestock reared. Indeed, a cow account for 1LSU whereas a ewe for 0.15LSU. The Figure 3-3 illustrates the concentration of farm animals in the mountain area of the northern Alps (52% of the Alps LSU). In the southern Alps, animals are approximately equally divided between the mountain and high mountain zones.

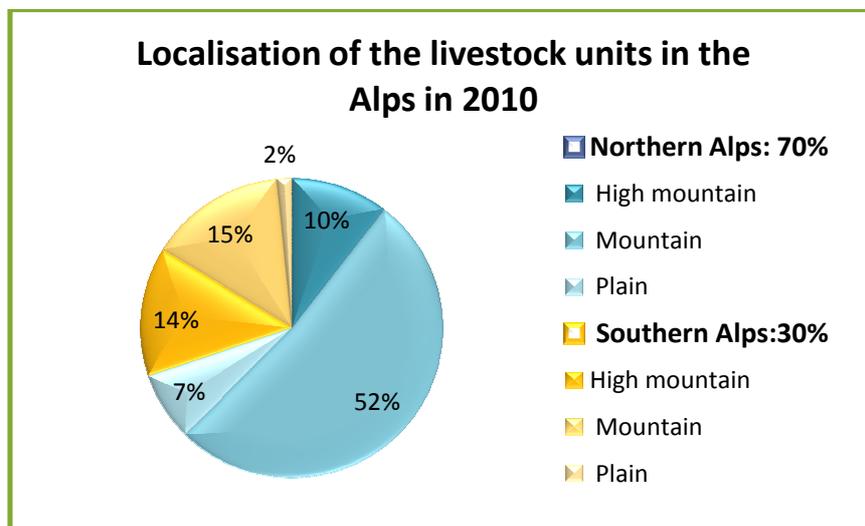


Figure 3-3: Repartition of the livestock units in the alpine massif in 2010 (data from AC-2010)

The two main herbivorous productions of the Alps are dairy cows (33% of the herbivorous breeding) and sheep (23% of the herbivorous breeding). The repartition of dairy cows in the northern Alps and suckling ewes in the south (Figure 3-4) can partly explain the difference in LSU between the north and the south of massif. The majority of heavy animals (86%) are located in the mountain and high mountain areas of the north whereas 71% of the lighter animals (sheep) are in the south. This can be explicated by the capacity of sheep to utilize the dry vegetation of the south, but also by the historical cow cheese tradition of the north. Indeed, the high-mountain and mountain area of the north benefits from several protected designations of origin and protected geographical indications for cheeses.

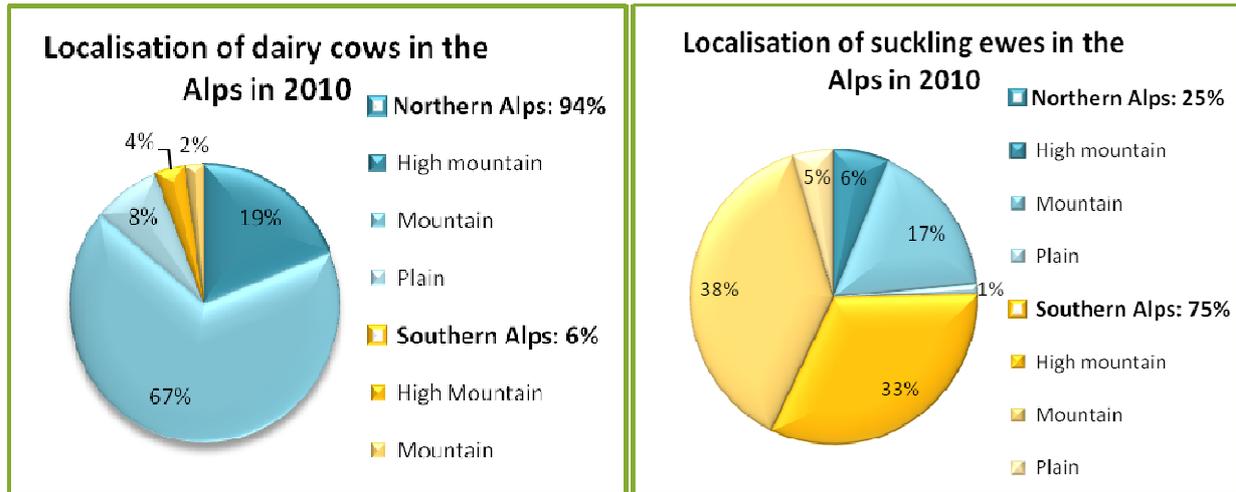


Figure 3-4: Repartition of dairy cows and suckling ewes (expressed as LSU) in the Alps in 2010 (data from AC-2010)

3.2.3 The main alpine supply chains and their territories

The first differentiation between farming activities resides in the variations of production. Nonetheless, within the different alpine productions, several strategies have been considered by farmers. Some are individual initiatives, but others resulted from collective projects between farmers. This is particularly the case for quality demarcations. The richness of the alpine territory also resides on the culture of its popular tradition and perpetuation of its savoir faire, for instance culinary traditions. These cultural resources permitted the creation of several quality certifications associated to the Alps land and history. For the main alpine productions, the Table 3-8 represents the number of farms selling products under quality certification out of the total number of owners of production means. The northern Alps gather the major part of the alpine certifications, with milk, wine and fruits. In the southern Alps, agriculture does not benefit from the same differentiated market. The first quality supply chain is wine, and the second, four times smaller than wine in number of farms, is sheep.

Table 3-8: Number of farms selling fruits, wine, crops, sheep or milk under quality certification and proportion of this farms out of the total number of orchard owners, vineyards owners, crops owners, suckling ewes and dairy cows, ewes and goats owners, respectively, in 2010 (data from AC-2010)

Productions	Fruits		Wine		Arable crops		Sheep		Milk	
	NBF	%	NBF	%	NBF	%	NBF	%	NBF	%
Alps	1176	18%	2384	55%	385	6%	439	14%	2163	45%
Northern Alps	945	33%	1105	67%	193	5%	145	9%	2071	55%
Southern Alps	231	6%	1277	48%	192	7%	294	20%	90	9%
(high) mountain France	1440	7%	4656	66%	600	2%	3326	26%	12052	43%
France	7595	7%	69490	69%	11842	4%	7836	16%	35104	34%

NBF: number of farms

Most of the quality labels are associated with a specific geographical area. The Figure 3-5 illustrates the repartition of the principal productions under quality signs per geographic zones. It clearly testifies of the association between a given supply chain and a geographic area, and therefore justifies a geographic zoning to gather farms involved in the same production through the same supply chain.

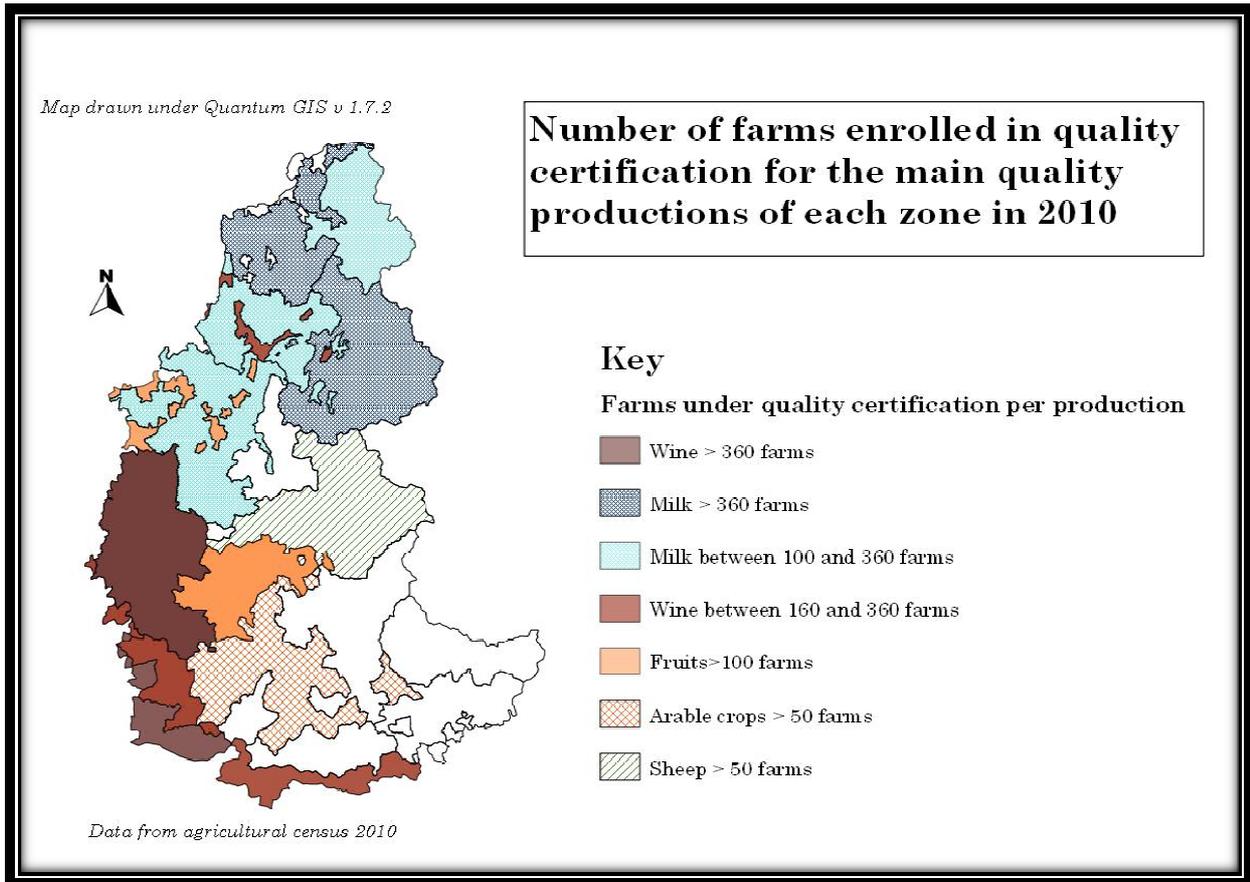


Figure 3-5: Map representing number of farms enrolled in the main quality productions in the Alps and their localization in 2010 (data from AC-2010)

3.2.3.1 Milk

The first quality product of the northern Alps is milk for cheese making. Cheeses are historically recognized and their sells take advantage of winter and summer tourism. Four areas of production can be associated to their main supply chains and identified through their products:

- The area of high mountain of Savoie (73) corresponds to farms producing Beaufort cheese (protected designation of origin: PDO). It is a typical product respecting local traditions and promoting local resources. The cows producing the milk used for the cheese must be of the local breeds (Tarentaise or Abondance) and their yield of production is restricted to enhance the quality of the milk. The feeding of the animals is controlled and farmers are incited to use mountain grazing by the presence of six collective mountain grazing associations. The fabrication process is unique and very strict. About 70% of the cheese volume is produced by seven permanent cooperatives. In addition approximately 30 farmers process themselves milk on the farms (Syndicat de défense du fromage de Beaufort, 2008).
- The area of high mountain of Haute-Savoie (74): is associated with Reblochon and Abondance PDO. The reblochon is produced from only three mountain breeds of cows, fed with strict limitations on the raw material. The cheese manufacturing process follows clear rules as well (Syndicat Interprofessionnel du Reblochon, 2007). Farmers can process milk on farm and sell directly their products to consumers. But in most cases farmers sell their milk to 10 collective dairies for cheese processing, or they can sell young cheese to refiners. The main volume of the cheese is sold through retailers, but also through cheese shop or local markets. The Abondance

is a cheese produced with the milk of the Abondance breed in the valley of Abondance of Haute-Savoie (74) with a specific know-how (Syndicat Interprofessionnel du Fromage Abondance, 2012). The volumes produced in Abondance are much lower than in Reblochon.

- The area of mountains of the Savoie (73) and Haute-Savoie (74) departments includes farms under Reblochon certification, but also farms producing Tomme de Savoie and Emmental; two protected geographical indications (PGI). They are both associated with the territories of Savoie and Haute-Savoie, the milk is produced by three mountains breeds of cows and their feeding is controlled. The cheese processing is made by 20 dairy-cooperatives or to by farmers and young cheeses are sold refiners. The final product is sold through retailers, cheese shops, markets or local producer shops.
- The alpine part of Isère (38) added to the department of the Hautes-Alpes (05) is a zone where the number of farms producing cow milk is notable, but without quality distinction. The milk is sold to industrial dairy companies (Lactalis, Sodial, Danone).

3.2.3.2 Sheep

Sheep production is the main livestock rearing the Southern Alps. In the Alps, the north and the south can be differentiated by the size of the flocks and the possibilities of certification.

- In Savoie (73), Haute-Savoie (74) and Isère (38), sheep are produced in small herds, rarely representing the only production on the farm. There is not geographical quality certification in this area, only the possibility of selling meat under quality label “agneau de l’Adret”.
- In the high mountain area of departments of Alpes de haute-Provence (04), Hautes-Alpes (05), Alpes maritimes, and Drôme (26), sheep production can benefit from the label “agneau de sisteron” (*lamb of Sisteron*) and since 2007 from the PGI “agneau de sisteron”. It guarantees the origin of the production, its alimentation quality and the meat has to comply with standard quality expectations. These farms usually utilize mountain grazing and the size of the herds is limited by the building size for wintering.
- In the mountain zones of the southern Alps (04/05/06/83/84) departments and the mountain area of the alpine part of Drôme, sheep can also be certified with the label and PGI “agneau de sisteron”. These systems are called pastoral because herds are generally larger than in high mountain and can be either sedentary or transhumant in summer according to the grass production supply during the dry season.

3.2.3.3 Wine

Wine is the first alpine production under quality certification in number of farms. Besides, the diversity of the alpine territory permits a variety of enhancements.

- In Savoie (73) and Haute-Savoie (74), the wines benefit from the PDO “Vins de Savoie”. This quality sign was created in 1973 and allows the promotion of the products through tourism (P. Thormeyer, 2003).
- In the departments of the Alpes de haute-Provence (04), Drôme (26), Var (83) and Vaucluse (84), the wine grows among the Rhône Valley. Thus, several quality signs have been approved for wine products in these areas. For the Drôme and Var, the red wine can be labelled under the PDO “Côtes du Rhône”. In the Vaucluse, the dominating production is Rosé, and since 2009 it is recognized by a PGI. In the Alpes de haute-Provence a PDO was created in 1998.

- In the departments of the Hautes-Alpes (05) and Alpes maritimes (06), wine production is not distinguished by quality labels.

3.2.3.4 Fruits

Arboriculture is the first production of the Alps in number of farms and the third in number of farms under quality certification. The production units are dispatched in the massif as well as the types of fruits produced. About 68% of fruits growing units are of small dimension. The diversity of fruits produced in the Alps corresponds to a lot of different markets and consumption situations. Thus it complicates the creation of homogeneous territorial entities associated with uniform types of production. The precision of data offered by the agricultural census does not enable to distinguish at the farm level the different fruits produced and the interpretation of evolutions is made difficult. Therefore this supply chain will not be analysed in the following work.

3.2.3.5 Arable crops

The second specialization of farms production in the Alps is arable crops. Nonetheless, 70% of the units are considered as small holdings. The range of productions is very broad with a great variety of cereals (durum wheat, sorghum, barley...), but also lavender, industrial tomatoes, tobacco, potatoes... and the annual rotation makes a meaningful supply chain analysis complicated. Consequently, despite the prevalence of the production in the number of production units, it will not be studied in details in the rest of this work.

The particularity of the Alpine massif compared with the other French massifs resides in the diversity of its agriculture and the strong presence of vegetal productions. Arboriculture and viticulture are not land occupying activities as they only requires small production surfaces. Also the dominance of these types of agriculture raises concerns about space occupation and landscape management issues. The capacity of alpine agriculture to fulfil production functions while preserving the environment can be questioned as well as the viability of small farm structures. Nevertheless different stakes can be identified between the northern and the southern Alps where agriculture is less sectorally organized. Therefore, the orientations taken by agriculture are major stakes for a sustainable management of the alpine region. A study of the evolution of agriculture over the last 10 years will highlight the future challenges for agriculture. Moreover, the contextual enlightenment of these evolutions will permit to identify the levers to pull in order to guide the future development of agriculture.

4 Contexts evolutions

In this section, the evolution of the political, economical and societal context potentially impacting on the alpine agriculture over 2000-2010 will be described.

4.1 Political context

4.1.1 General description and historical review of the CAP

The common agricultural policy (CAP) is the first common policy for the member states of the European Union (EU). In an after war context, the CAP was implemented in 1957 with the ratification of the Rome treaty and it first targeted to ensure food supply for European population at affordable prices. Originally, the CAP mechanisms were based on a price support system by stocking an exceeding quantity of food in order to maintain high prices for the European production (Bureau, 2007). Concretely, based on the offer and demand principle, when the world market prices dropped under a define intervention price corresponding to the minimal acceptable price for European product, the EU intervened on the market to remove the necessary quantity from the market and improve the world market prices. This CAP scheme found rapidly its limits. Indeed, the EU became self sufficient in food supply with the modernization of agriculture and the secured high prices stimulating European production. On the other hand, the high prices for consumers curbed the sales, and the combination of both factors lead to over-production in some sectors. Consequently an expensive stocking of impressive quantity of meat, cereals, butter and milk powder had to be implemented. Over the period 1970 to 1990 timid reforms were undertaken in order to solve production surplus issues. In 1984, a ceiling was put on CAP expenses and the first determinant reform was decided by creating a production quotas system for milk (Bureau, 2007). In addition, some tiers countries part of the world trade organization (WTO), and important food producers (the Cairns group) put pressure on the EU to obtain a progressive liberalization of the markets with free trade of goods. For the EU, it implied to stop the support to agriculture production and subsidies to exportations of goods and to open the barriers to importations.

Therefore, in 1992 the European commissioner McSharry initiated the CAP reform of his name, consisting in the decrease of price supports, compensated by direct payments to farmers. No minimal yield was required in order to perceive the payments. The amounts were calculated by surface of lands, but the granting was conditioned by the compulsory laid fallow of a part of the crops surfaces (Pôle économie et prospective des Chambres d'agriculture des pays de la Loire, 2009). This reform also imposed to the member states the implementation of agro-environmental measures consisting of compensatory payments to volunteer farmers for the use of sustainable farming techniques (i.e. organic agriculture, landscape conservation). The consequences of this reform were a global raise of the CAP budget due to the total compensation of the drop in prices support by direct payments. The incitation to production was still very strong and the effects on the environment very limited. However, the stocking issue of cereals was eradicated with notably the growth in cheaper European cereals purchases from feed companies (Bureau, 2007).

In the 1990's the enlargement process of the EU was already operating and some further entrances of new member states were planned. The European commission feared increased expenses of CAP and a massive augmentation of the food surplus, even more since the signature of the multilateral agreement on trade of the Uruguay round and the ceiling put on subsidies to exportations. In parallel, some environmental concerns started to be raised by researchers and the succession of sanitary crisis push consumers to question their alimentation and expectations from agricultural products. To cope with those new constraints on the CAP budget, WTO pressure, consumer's expectations and new countries integration, a series of reforms were undertaken between 2000 and 2010.

4.1.2 The successive reforms between 2000 and 2010

4.1.2.1 Agenda 2000

In 2000, the EU decided to slow down the incitation to production with a decrease in intervention prices and set new objectives for the CAP, through a reform called the Agenda 2000. The desertion of some rural areas in Europe and the integration of eastern European countries incited the commission to put the accent on rural development in the CAP. The EU agriculture should fulfil more than a productive function. Thus, the concept of multifunctional agriculture was created, supporting a sustainable agriculture homogeneously spread over the territory (Desquilbet et al., 1999). Practically at the EU level, the CAP became separated in two parts: the 1st pillar dealing with direct payments to support farms production means, and the 2nd pillar grouping support to rural development and sustainable farming. Land use contracts were created in France with a length of 5 years to finance projects associated with the different aspects of sustainable development: economical, social, environmental or territorial. They were replaced in 2003 by sustainable agriculture contracts also signed for five years and targeting the same type of projects. Nevertheless, the budget required to financing this plan led to its downfall and the last contracts were signed in 2007. In parallel, conditionality of payments on environmental criteria was reinforced. The EU member states became able to modulate payments, that is to say deduct a part of direct payment from the 1st pillar of the CAP awarded to the biggest farms, in order to finance agro-environmental and rural development measures. Then, in 2000 the regulation on rural development became effective. It constituted the first step of the reorientation of the EU CAP budget, followed by the next CAP reform in 2003.

4.1.2.2 Luxembourg Agreements 2003

With a view to the compliance in the WTO negotiations framework and to prepare the EU enlargement, a new reform of the CAP was foreseen in 2003. The European commission targeted to bring closer the European agriculture to the world markets and to ensure the security of the products, after the succession of sanitary crises of the last decade. The main idea was to break the link between direct payments and the produced quantity: the decoupling. This principle was enforced in 2006 and unique payments were allocated to farmer without any production requirement, but still under the conditions of good farming practices. In addition, the new reform reduced the intervention prices for rice, milk powder and butter. A ceiling on the support from the first pillar was implemented. The 2003 reform brought as well more freedom for the national

management of the CAP, with more decision power to the member states on the modalities of unique payments allocation. Although, the 2003 reform did not impact clearly on the amount of subsidies received by farmers, the decoupling principle applied to farm payments could profoundly modify the political perception of agriculture.

Concerning the 1st pillar, unique payments started in 2006 for arable lands, bovines and sheep. Each payment was calculated on the basis of historical references consisting in the average of the payments received in 2000, 2001 and 2002 by farmers and allocated by hectare. The attribution of those subventions is conditioned to the honouring of some environmental standards, public safety rules, animal welfare considerations and the maintaining of good agronomical and environmental conditions of the lands. France decided to keep coupled subsidies with the cereals and bovine productions and tried to favour the installation of young farmers through a national stock of direct payments (Desriers, 2007). On the other hand, the 2nd pillar was more focused on environmental measures and rural development. The rural development regulations involve topics about environment conservation, quality of products and animal welfare. Furthermore, the European commission decided to decentralize this axis of the CAP, leaving each member states more decision power for choosing the suitable measures to their territories. The modulation of payments from 1st to 2nd pillar became compulsory for member states by 3% in 2005, 4% in 2006, 5% since 2007 (DG Agriculture et Développement- Rural Commission européenne, 2008).

4.1.2.3 CAP Health Check 2008

This new reform of the CAP was in line with a continuous rise of the food prices. In addition, an increased pressure on the new challenges of global warming, energy supply, water management and biodiversity pushed to more radical changes in agricultural practices. Also, with the previous decoupling of payments, the CAP modalities had become complicated for farmers, and were not adapted anymore to the market (DG Agriculture et Développement- Rural Commission européenne, 2008). Therefore, the new 2008 reform first aimed at simplifying and re-targeting the direct payments, but also at suppressing the ceilings put on production in order to improve the adaptation flexibility to the markets and to price volatility. The second aim was to strengthen the rural development policy and find new solutions to cope with environmental challenges.

Regarding the simplification of the CAP, the obligation of fallow was abolished, attribution rules of direct payments were simplified and a minimal threshold was introduced. The sum of direct payments was also standardized per member states. The conditionality of payments residing in good agricultural and environmental conditions was reinforced. European coupled payments had to be decoupled of production for cereals and oil/protein crops premium and slaughter premiums. In France, the measure was implemented in 2010 and suckling cow premiums stayed coupled at 75%, but for all other sectors, the payments had to be decoupled at 100%. Half of the recently decoupled payments are not included in the unique historical payment but used to finance new national direct payments: a “grass-direct payment” supporting productive grasslands, maize direct payments are revalorised and open-field vegetables and potatoes would be granted with direct payments (Groupe prospective-Chambre d'agriculture de Normandie, 2009) In addition the creation of new national coupled payments, giving more means and flexibility were implemented. They are financed by debit from other subsidies. In France, were created: a goat and ewe premium (22€/animal), a harvest

insurance for climatic vagaries for crops, payments for the development and maintaining of organic farming, support to mountain milk, support for milk-fed calves and for some specific vegetal productions (durum wheat, legumes...). Concerning market policy, an increase of milk quotas was planned and intervention measures were suppressed in most sectors except for wheat. Finally, a raise in the modulation budget was organized to finance the increasing role of the rural development. A franchise augmentation was intended between 2009 and 2012, in order finance grass premiums, new agro-environmental measures for organic conversion, water protection and the revalorization of compensatory payments for natural handicap.

Some orientations of CAP taken between 2000 and 2010 could potentially impact on the farm structure. Indeed the shift of payments newly allocated by hectare could encourage farm enlargement, or the decoupling of CAP payment could lead to the extensification of farming system or to a decrease of production. The study of the evolution of the farm structure will help to analyse the actual effects of these new policy measures.

4.1.3 The key elements of the CAP specificities regarding the Alps and the selected supply chains

4.1.3.1 Mountainous areas specificity

Originally, the first measure of the CAP to support agriculture in the less favour areas was the compensatory allowances for natural handicaps created in 1975 called less favoured areas directive (LFA payments). It aimed at financially upholding agriculture where slopes or altitude make it more difficult and expensive to develop. The payments were first allocated by livestock unit, and became allocated by hectare of land in 2001 (Ledent and Burny, 2002). A ceiling was put on the number of hectare (50ha) eligible for LFA payments as well as requirements on the range of animal loading per unit of grassland to respect. As part of the McSahrry reform, the French premium for maintaining extensive livestock (PMEL) farming systems became a new measure very specific to mountain agriculture due to its constraints of grass uses and extensification (Dussol et al., 2003). In 2003 the agri-environmental grass premium (AEGP) replaced the PMEL and added an environmental constituent to this premium. Furthermore, in 2008 the AEGP became accessible for farmers placing their animals in pastoral groups, but limited to 100ha or 7600€ per farm (DG Agriculture et Développement- Rural Commission européenne, 2008). Later on, in 2008, a new reform concerning the supply of forages was decided with the direct payments revalorization for the hectare of forage maize intended to stock alimentation, and hectare of natural and temporary pasture pushing to the valorisation of local resources and to the farm autonomy for animal feed (Chatellier et al., 2010).

4.1.3.2 Dairy cows

The dairy production had experienced the first drastic measure to limit production surplus in 1984 with the execution of dairy quotas. In France this measure has been favourable to mountain zone because the production rights were allocated by farmers and departmentally managed. In 1992 a drop in intervention price for dairy products was followed by drop of 2% of the quotas referenced quantity between 1992 and 1994 (Ledent and Burny, 2002). The Agenda 2000 decided of a 15% decrease of intervention prices on butter and milk powder from 2005, but also the creation of a

compensatory premium per ton of quota planned for 2007. The maintaining of dairy quotas until 2005/2006 and an increase of dairy quotas of all member states of 1.5% in three steps with additional quantity for young farmers and mountainous areas producers were decided (Desquilbet et al., 1999). The Luxembourg agreements extend the quotas renewed until 2014-2015, and confirm the intention of EU to limit its markets interference by a new decrease of intervention prices on butter, compensated by an increase of direct payments. It was decided as well that milk payments will be included in unique payment from 2008 and the increase of dairy quotas was postponed to 2006 (Ministère de l'agriculture de l'alimentation de la pêche de la ruralité et de l'aménagement du territoire, 2003). In 2008 the increase of dairy quotas of 1% a year from 2009 until 2013 was chosen in order to prepare the liberalization of dairy markets with the suppression of quotas envisaged for 2015 (Chatellier and Guyomard, 2008).

4.1.3.3 Sheep

The first subsidy supporting sheep farming was created in 1981 as ovine compensatory premium which aimed at compensating the European prices of lamb. In 1992, direct payments were implemented to pay off the losses of revenue caused by the diminution of intervention prices. The ewe and sheep-goat premium appeared in 2002 with an annual constant price and completed by a premium for farms located in less favoured areas. In 2003, the Luxembourg agreements proposed a decoupling of 50% of ewe and sheep-goat premium, implemented in 2006 in France and followed in 2008 by a complete decoupling implemented in 2010 (Chatellier and Guyomard, 2008).

4.1.3.4 Wine

Wine productions do not benefit from direct CAP support, apart from the LFA payments for the eligible surfaces. Nevertheless a budget is allocated to the common market organisation for wine production. The functioning of this organisation guarantees minimal prices to producers in case of market crisis and imposed maximal exceeding quotas of production. The 2000 reform aimed at limiting production surplus and helping the reorientation of wineries toward more lucrative markets. Also the budget financed vineyard pickling and distillation of surplus. In 2008 a reform of this common market organisation has been decided in order to eradicate market intervention measures but it will only take effect after 2010.

4.1.4 Future orientations of the CAP after 2013

The interest of the EU to strengthen and improve the CAP resides in the added value brought by the first common policy to all the EU member states. The objectives declared by the EU for the future 2014-2020 CAP are driven by economic targets, European cohesion and environmental issues. Some of the main topics are climate change mitigation, biodiversity enhancement, strengthening of economical and social cohesion, development of the single market with a common commercial policy for the EU. The efficient use of budgetary resources has also become a main economic stake for the EU since the enlargement to 27 countries. The EU aims to an economically performing agriculture but also an equilibrated agriculture from a territorial and environmental points of view (Commission européenne, 2011).

In practical terms, the main points of the 2014-2020 CAP are likely to keep some 2003 and 2008 orientations (Commission européenne, 2010):

- The global architecture of the CAP and the two pillars should remain, with an increased flexibility offered to member states through the 2nd pillar and the 1st pillar would endorse all the annual fixed payments to farmers
- Conservation of direct decoupled payments, but with a standardization of payments per hectare at the national or regional level and the implementation of a limit on the payments received by a single farm in a homogenisation perspective
- The conditionality laying on good environmental practices would be kept but generalized with no time limitation and reinforced in some aspects such as permanent pasture or crops rotation under the green box payments
- The clause supporting private stocking could be renewed and extended to other products

Besides, a part of the future CAP should be built on innovations:

- A new income support, as part of the 2nd pillar, for farms situated in zones with strong natural constrains
- A simplified financial support for small farmers to improve their competitiveness and limit the administrative complexity
- Dairy quotas will be suppressed in 2015
- New rules for the better repartition of the added value among the supply chain could be implemented in order to overcome the constant decreasing margin allocated to farmers
- Possible targeted quantities could be set for products sold through alternative supply chain (direct selling, local market)
- New risks management tools could be created in order to secure the farm income against price volatility, climatic vagary

Briefly, the objectives of the CAP are to help agriculture coping with the economic instability of the global market, but also to comply with sustainable rules of production and development. On the other hand, an international pressure is put on the EU about the unfair competition on the food market created by its support to agriculture. The new CAP reform challenges are then to guarantee the performances and durability of the European agriculture in a sustainable way, to secure the competitiveness of European products in the world market and to ensure that such financial support is acceptable regarding the international regulations and taxpayers.

4.1.5 Evolution of the payments to farmers

4.1.5.1 From a departmental point of view

In this section, the departmental amounts of subsidies allocated to farmers will be studied for the main alpine departments (38/73/74/04/05/06). As previously mentioned the departmental data are completely meaningful for departments with 100% of their territory included in the Alps. Otherwise they are not fully representing the alpine reality (Table 2-1) and should be taken as information.

The second pillar was only created with the Agenda 2000. Thus, the payments considered as part of a fictive 2nd pillar before 2000, in the graphs, are actually the less favoured areas (LFA) created in 1975, but also the premium for maintaining extensive livestock farming systems (PMEL) created by the McSharry reform, implemented in 1993 and lately replaced by the agri-environmental grass premium (AEGP). The other environmental premiums include the agri-environmental premium and the territorial management contracts (TMC), replaced in 2004 by the sustainable agriculture contract (SAD).

- Isère

The amount of subsidies received by agriculture from Isère between 1990 and 2009 clearly reflect the EU policy. Indeed, as show in Appendices Figure A 4, since 1992 the direct payments increased considerably in order to compensate for the cut in market prices regulation. The peak observed between 2000 and 2000 and 2003 is the result of the implementation of territorial management contracts. Then, between 2005 and 2006 an important drop in 1st pillar support reflect the decoupling of payments with the creation of unique direct payments (DPU) to farms. The financial support of Isère mainly relies on the 1st pillar, because those data are an average of the whole department support, not only its alpine parts. Indeed, the non alpine part of Isère is a cereals production area and so benefits from direct payments from the 1st pillar.

Looking more in details at the 2nd pillar (Appendices Figure A 3), the conclusion is that LFA is a small part of the support before its revalorization and changing in payment modality in 2001. The start of the TMC in 2000 increased the weight of the second pillar in the farm income but the last TMC were signed in 2007 and this financial support decreased.

- Savoie and Haute-Savoie

The two departments Savoie and Haute-Savoie present the same topographical assets and drawbacks and use the same agricultural strategies to offset these territorial constrains.

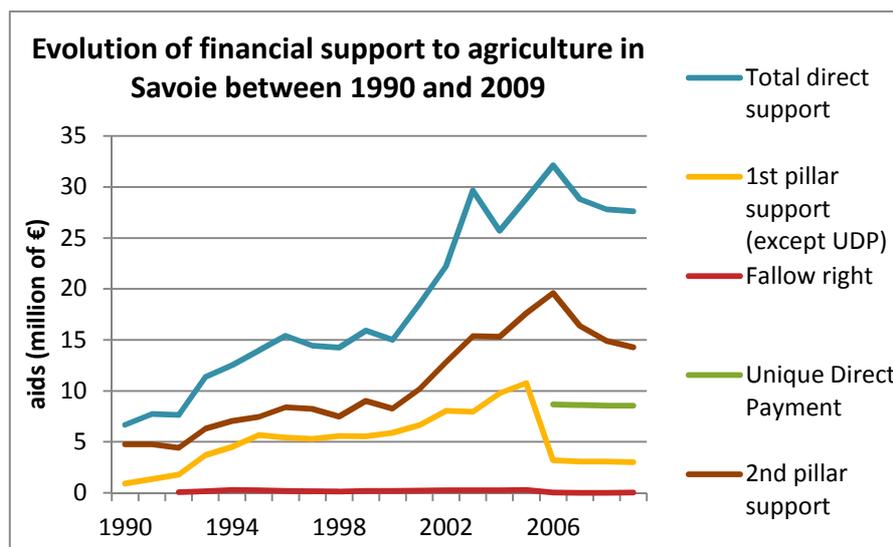


Figure 4-1: representing the evolution of the CAP support for the department of Savoie over the period 1990-2009 (data from agricultural accounts, 2012)

Thus the amount and proportion of subsidies they received from both CAP pillar are similar, and so only the evolution of payments for Savoie will be presented. On the contrary of Isère, the main part of the received payments is coming from the CAP 2nd pillar (Figure 4-1)

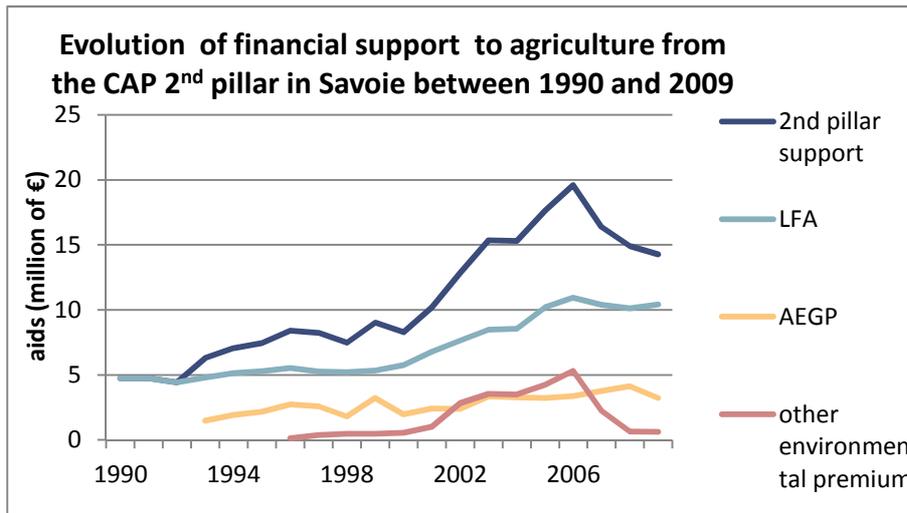


Figure 4-2: Graph representing the detailed evolution of the CAP support from the 2nd pillar for the department of Savoie over the period 1990-2009 (data from agricultural accounts, 2012)

The LFA is the main subsidy from this side of the CAP (Figure 4-2). The amount perceived at the department scale has increased constantly since 1990 until 2006 through revalorization, the transition of the payments by livestock unit to payments by

hectare of fodder and also the increase on fodder area per farm

between 1990 and 2000 (Agreste, 2005). The increase in the first pillar aids in 2004 is mostly the consequence of the attribution of the direct milk aid in this dairy oriented area, included in the UDP since 2006.

- Alpes de Haute Provence

The financial support from the first pillar of the CAP increased in the department of the Alpes de Haute Provence in 1992 in relation with the high number of crop farms (Appendices Figure A 4). In 2002 the implementation of the ewe and goat premium raised again the level of the 1st pillar supports. In 2006, the drop in 1st pillar support has not been completely compensated by the creation of the UDP because a part of the subsidies stayed coupled in France and supplement premium to ovine production located in less favoured areas have been partly suppressed. Regarding the 2nd pillar (Appendices Figure A 5), the main compensation comes from LFA with a marked increase since the shift of payment modality per hectare of land.

- Hautes-Alpes

The Hautes-Alpes department is exclusively composed of mountain and high-mountain territories. So, the 1st pillar support in this department is not predominant. It slightly increased in 1992 with the implementation of cereals payments and in 2002 with the ewe premium as illustrated in Appendices Figure A 6. Nevertheless, according to the topographical characteristics of this area, the second pillar represents the first support to farmers with a constantly increasing LFA payment due to changes in allocation modalities and revalorization (Appendices Figure A 7).

- Alpes maritimes

The Alpes maritimes department is dominated by vegetal productions. The massive drop in cereals production can explain the fall in 1st pillar support at the end of the 1990's (Appendices Figure A 8). The yearly variability in financial support can be allocated to rotations of the type of products grown in this area: oil crops, protein crops, or durum wheat. The diminution in second pillar support after 2006 is the results of concordant events as the cessation of sustainable agriculture contracts

attribution, a decrease in ovine production and consequently LFA and AEGP payments (Appendices Figure A 9).

4.1.5.2 In proportion of the farm income for the main alpine farming systems

The CAP subsidy system certainly contributes to maintain and develop agriculture in the EU. Nonetheless it is legitimate to ask to what extent it can weaken the productions systems? Indeed, the financial contribution to the farm income can create a dependency situation according to the type systems and production.

For the dairy cows systems, the profit of the farms relies on CAP aids from 35 to 65% according to the quality chain: PGI Tomme/Emmental and standard milk respectively in 2010 (Appendices Figure A 10). This reliance has been amplified between 2000 and 2010 because of the creation of the milk direct aid in 2006.

The sheep farms face a more complicated balance. For all the production systems the proportion of the operating profit coming from the CAP payments is fluctuating between 97 to 125%. Even; the situation has become more critical than in 2003 probably because of the creation of the new ewe premium in 2006 (Appendices Figure A 11).

The previous numbers highlight a limitation of the CAP systems with the extreme dependency on some production systems, as sheep, to CAP payments that may maintain a certain agriculture in some areas but can also prevent the selection of the most effective and competitive systems or the rearrangement of some production units.

4.2 Economical context

Originally, the EU, through the CAP, tried to guarantee prices to producers but the recent pressure of the WTO prompted the EU to liberalize its market. Therefore, european agricultural prices are now less dependent on the EU policy and more variable in time according to production and consumption fluctuations (Baldwin and Wyplosz, 2004).

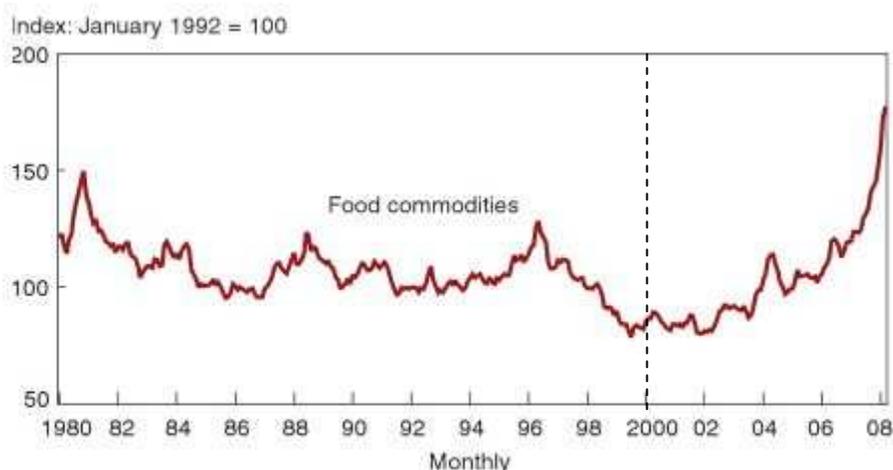


Figure 4-3: Evolution of the world market food commodities prices (index 1992=100) (average prices of grains, vegetables, meat, seafood, bananas...) over the period 1980-2008. Extracted from Trostle (2010)

4.2.1 Evolution of prices toward more instability

Food prices variations are a world global concern as food represents an essential commodity. An increase in prices can strongly harm low income consumers, but the contrary can endanger the viability of some production units. Therefore as Trostle (2010) has underlined, “food prices inflation is socially and politically sensitive”. As a matter of facts, food commodities prices have been constantly increasing since the year 2003 (Figure 4-3) with a rise of more than 60% of the prices of grains and vegetable in 2008 (Trostle, 2010). This 2008 price spike was the results of a combination of factors such as a rapid economic growth of emerging countries (i.e. China), the consequences of underinvestment in agriculture, poor harvests, US dollar depreciation and diversion of crops for biofuels (Gilbert and Morgan, 2010). Indeed, prices volatility is a consequence of shocks originating from diverse sources. The volatility of grains prices has a significant repercussion on the world economy as they are assimilated staple food but also input for meat production.

Agricultural production is determined by the number of production units, the yield and the production hazards. Thus climates change becomes an added factor of price volatility with an increasing uncertainty of production. Another characteristic of agriculture economy is the lake of elasticity of the supply and the limited adaptability of production to the market on a short run perspective, with, at least, one year required to shift from a cereal to another. The demand is also poorly elastic since consumers are not easily disposed to change their alimentation habits and may have few alternatives according to their income (Gilbert and Morgan, 2010).

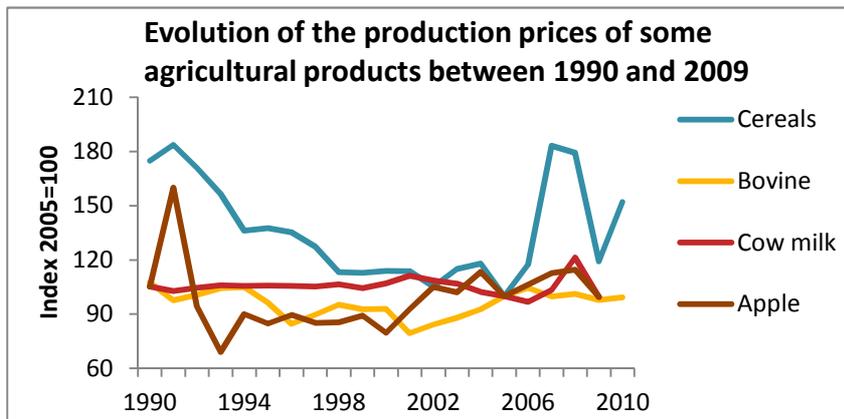


Figure 4-5: Evolution of some agricultural production prices in France between 1990 and 2010, with the year 2005 as index 100 (Data from Agreste and Insee, 2010)

The continuous decrease of cereals prices between 1990 and 2000 is the result of the CAP reform and the limitation in price support (Figure 4-5). This constant fall was counterbalanced by an upsurge of production costs from 2000, associated with a raise of energy costs, pushing up agricultural

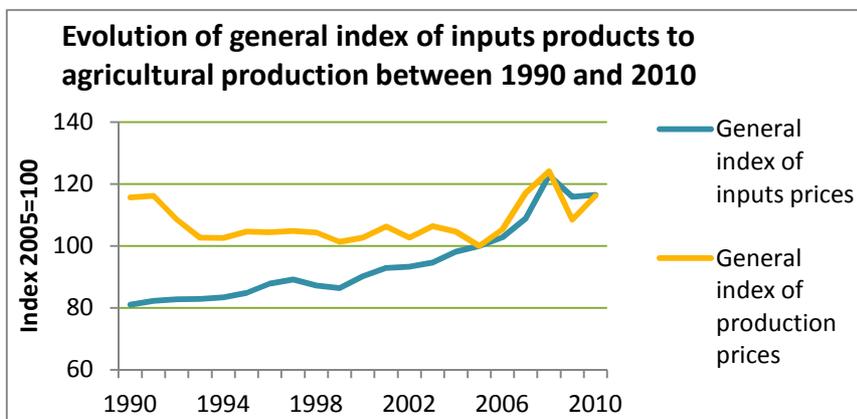


Figure 4-4: Evolution of agricultural inputs prices in France between 1990 and 2010, with the year 2005 as index 100 (data from Agreste, 2011).

productions prices, as illustrated in Figure 4-4 (Agreste, 2010b). Besides, the prices of the animal products follow the trend given by cereal prices, as it is one of its main inputs (Figure 4-5). Consequently, the price of bovine declined between 1990 and 2000 and augmented afterwards. Similarly the 2008 spike on

cereals price was accompanied by a substantial rise on milk price. On the contrary, productions out of the CAP scheme, like apples, showed less stability and more annual volatility of prices, mainly linked with climatic vagaries, or input prices variability. The recent upturn of cereals prices in 2009-2010 resulted from the drop in euro exchange rate but also from incertitude regarding the next harvests in Europe (Agreste, 2010b).

In summary, the economic conjuncture of agricultural production deeply evolved over the period 2000-2010. The past stability brought by the CAP price support system has been largely reduced and agricultural prices are more dependent on externalities as climatic vagaries, energy costs, chemical inputs prices, or euro exchange rates. Therefore the increased volatility on prices to production can appear as a discouragement factors for agricultural investments. On the other hand, demand is the other key element determining prices evolutions, as shown by the supply and demand diagram (Baldwin and Wyplosz, 2004), and the changes in consumers expectation can be reflected at the farm level.

4.2.2 Global demand evolution and rise in food prices

The food consumption has evolved in France since the 1960's from covering essential needs to food sufficiency, overconsumption or nutraceutical. Over the period 2000-2010 even if the volume of food consumed per inhabitant is still increasing, the proportion of household budget dedicated to alimentation has been continuously decreasing (Appendices Figure A 12). Both salary and

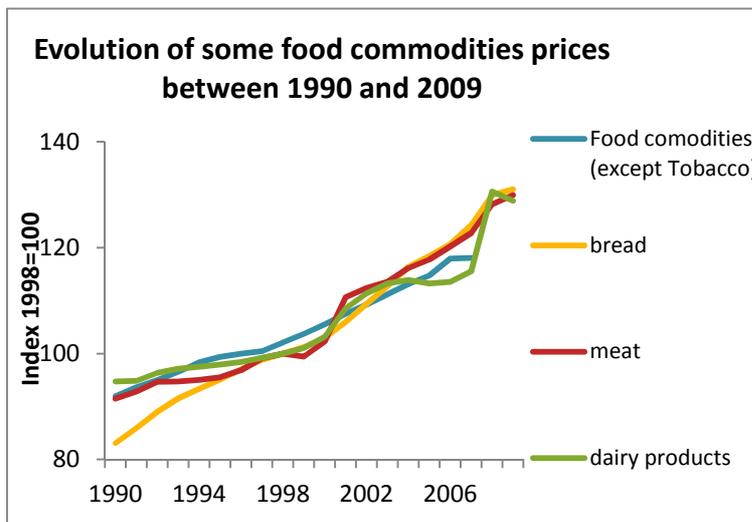
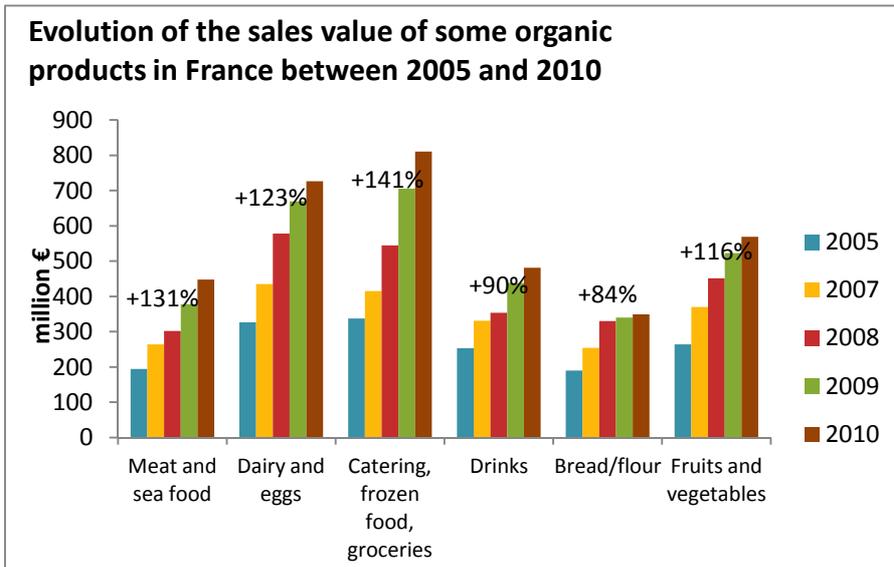


Figure 4-6: Evolution of consumption prices of some food commodities in France between 1990 and 2009. Data from INSEE, 2010

commodities prices (Figure 4-6) have increased since the 1960's. But the income rise has been passed on an augmentation in leisure and culture expenses which contributed to decreased the proportion of food expenditure in household accounts (Agreste, 2010a). In addition, the recent drop in the French purchasing power associated with inflation participated in reducing expenses for food. Indeed, to face prices augmentation, the first cut in households' budget was the one of

food with the intention of preserving the proportion dedicated to leisure and holidays (Insee, 2010). Thus, consumption of expensive goods, such as red meat or fresh fruits have been reduced, of 46% and 43% respectively between 1988 and 2005 in favour of bread and starches products: +53% (appendices Figure A 12) despite their strong price increase (Figure 4-6).

On the other hand, the concerns of French consumers for environment and sustainable development have been considerably enhanced over the last decades. The Figure 4-7 attests of the growth in the



sales of organic products between 2005 and 2010 with organic catering, frozen food and groceries representing the highest increase in sales value (+143%). This growing fad for organic products opens a new mass market which could deeply impact on the food chain and the production structure of farms.

Figure 4-7: Evolution of the sales value of some organic products in France between 2005 and 2010 (data from AgenceBio (2011))

The evolution of prices paid to producers and the prices paid by the consumers for food commodities

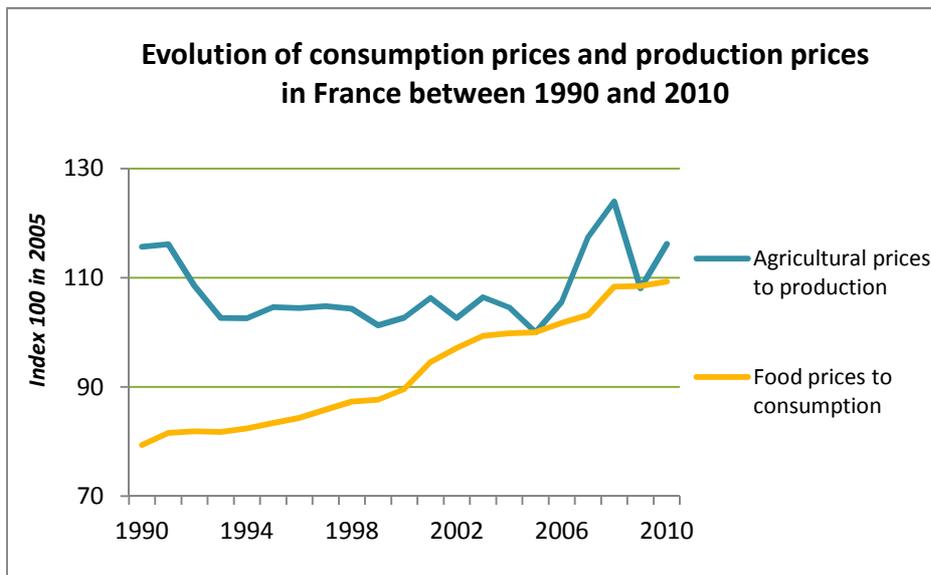


Figure 4-8: Evolution of consumption prices and production prices in France between 1990 and 2010. Data from Agreste (2011)

are presented in Figure 4-8. The policy of price support decrease is reflected in the rapprochement between the two curves. Despite a constant growth in prices paid by consumers, farmers' income stays stable which highlights dysfunctions in the repartition of added

value among the supply chain. The production prices peak between 2007 and 2009 is associated with the 2008 oil shock and a drought year. The rise in production prices for the season 2009/2010 is resulting from abnormal harvests due to climatic vagaries and a shortage in crop production on the world market (Agreste, 2011). Consumption prices have constantly increased since the McSharry reform and underwent acceleration with the changeover to euro currency in 2002.

4.3 Societal and territorial contexts

4.3.1 The growing population of the Alps

The Alps surroundings contribute to the attractiveness of the region. The two last national censuses testify of notable evolution in the demography of the alpine departments (Figure 4-9). Between 1999 and 2008 the department of the southern Alps have shown a strong growth rate in population about +1.3% every year. Nevertheless the northern Alps stay more populated and still record a high growth rate. It should be noticed that the Alpes maritimes department is not entirely included in the Alps zone and only 16.6% of its population is part of the alpine massif (Table 2-1). The demographic

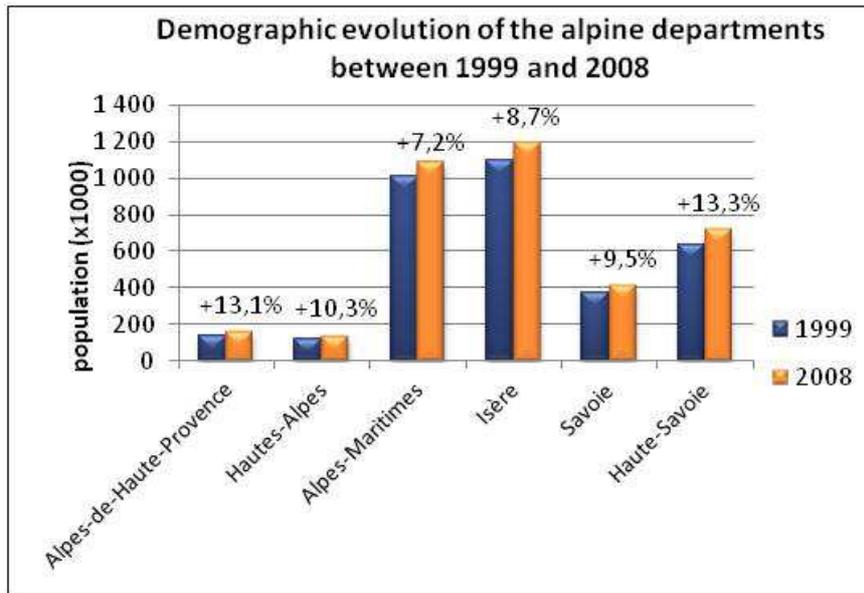


Figure 4-9: Evolution of main alpine department population between 1999 and 2008 (data from Insee)

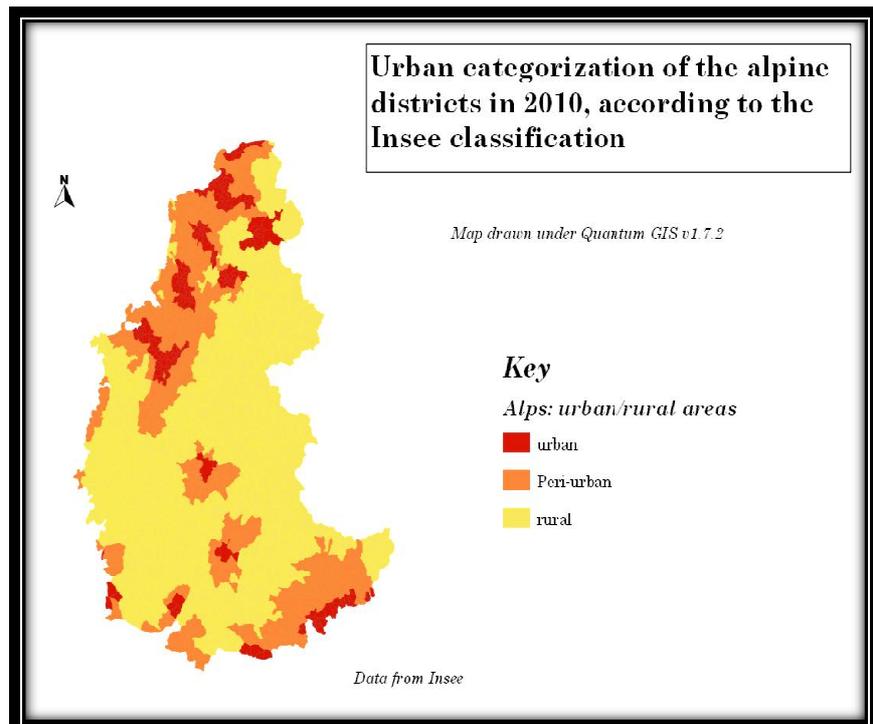
discrepancy between alpine regions can traduce a variation of pressure for the access to land. It can also reveal different assets and drawbacks for the implementation of some commercial circuits as direct selling. But globally, the increase of population concerns every part of the massif and particularly the far north and far south (Appendices Figure A 13). Indeed the growth rate

exceed 25% in the winter touristic valley of the Haute-Savoie department and the famous summer touristic regions in the hinterlands of the cities of Nice and Fréjus in the Alpes maritimes and the Var departments respectively, close by the Mediterranean seacoast.

4.3.2 The development of the alpine urban network

In terms of urbanization, the growth in population has led to an enlargement of the alpine furrow in the northern Alps (Figure 4-10). The cities of Genève, Annemasse, Annecy, Chambéry and Grenoble (from the north to the south of the furrow) are now linked up by a dense periurban network. The south urban network has also developed itself and the northern configuration will probably be soon observable between the cities of Gap, Dignes-les Bains, Nice Manosque and Draguignan. Also the position and role of agriculture in those newly urbanized regions will have to be turned into question.

A study of the agricultural land prices over the period 2003-2010 illustrates the increasing pressure on farmers for the access to land. As shown in the Table 4-1, the price of agricultural land can be four times higher in the Alps than the national average for the year 2010. Yet, some differences between alpine departments can be observed. The emerging touristic areas of the southern Alps (i.e. the



Hautes-Alpes and the Alpes maritimes) underwent a remarkable increase in land prices (+66% and 77% respectively); whereas the department for the Alpes de haute-Provence, prices dropped of 5% over 2003-2010. In the north, pressure on prices keeps increasing but they stay lower than in the south. This rise in land prices can be explained by two phenomenon: the fad of tourists for the areas with the augmentation of holiday homes sales in the relief zones and the augmentation of first residence sales in the hinterlands zones nearby urban hurbs (INSEE Provence-Alpes Côte d'azur, 2011).

Figure 4-10: Map classifying the Alps according to the Insee nomenclature of urbanization in 2010. The urban regions are defined by areas gathering more than 10 000 employments; the periurban areas aggregate the suburbs of major urban centres and municipalities part of large urban areas; the rural areas is made of all the other categories of Insee and represent the area under less urban influence.

Table 4-1: Value of the agricultural lands (per hectare) (except vineyards) in 2010 and evolutions over the period 2003-2010 (data from FNSafer, 2011, calculated by triennial average)

Department	Land value 2010	evolution 2003-2010
Drôme	6350€	24%
Isère	5980€	65%
Savoie	6230€	30%
Haute-Savoie	9280€	34%
Alpes de haute-Provence	6820€	-5%
Hautes-Alpes	11760€	66%
Alpes maritimes	21100€	77%
Var	17780€	54%
Vaucluse	13230€	17%
France	5230€	20%

Finally, the growing demographical pressure in the Alps can represent a potential harm for agriculture by engendering an urban sprawl in the agriculture network. The demographic growth could represent an additional factor contributing to farming abandonment and authorities have the responsibility to accompany the population development without being harmful to the agricultural

potential of their territories. This is particularly the role of land management services of being watchful on land transactions.

On the other hand, this demographic phenomenon can be seen as an opportunity. The local population represents the first market for agriculture products and a study of the evolutions of consumers' preferences and expectations can help interpreting agriculture transformations.

4.3.3 Consumers expectations toward alpine agriculture

4.3.3.1 A growing preference for quality products

Broadly, the French consumers had cut their budget for food expenses over the last two decades (Agreste, 2011). Nonetheless their preferences for different products have also evolved. For instance,

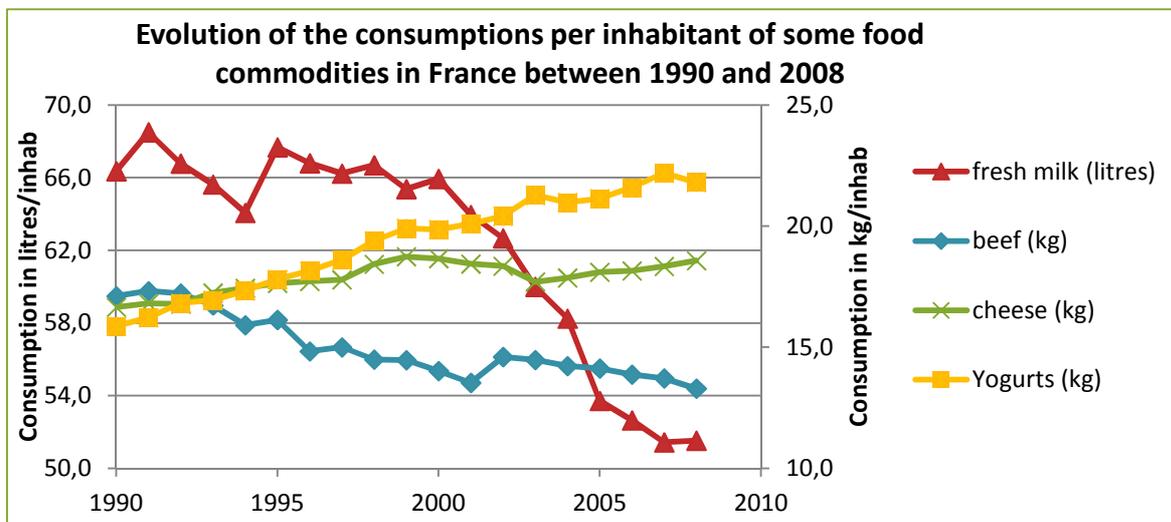


Figure 4-11: Evolution of the consumption of some food commodities in France between 1990 and 2008, either expressed in kg/habitant or in litres/inhabitant (data from Insee)

French consumers have bought toward more processed food and ready meals than raw products. They have orientated their consumption of proteins toward more dairy than meat products and particularly processed dairy products as cheese and yogurts (Figure 4-11). These trends of consumption can be explained by the increasing prices of meat due to the rise in production costs, but also by an emerging vegetarianism movement and the promotion of the diminution of meat consumption. In addition, the two sanitary crises of the bovine spongiform encephalopathy in 1996 and 2003 had contributed to the decrease in beef meat sales. Similarly mutton consumption dropped from 5.2kg/inhabitant to 3.8kg/inhabitant between 1996 and 2006 (Agreste, 2010a) On the contrary, the advertising of dairy products as healthy food and the connection with probiotics boosted their sales.

Besides, the development of sustainable consumption has favoured the return of regional products in the shopping trolleys. Therefore the traditional quality cheeses produced in the Alps have benefited from this renewed interest for local productions. The sales of PDO cheeses have mostly increased between 2000 and 2010, except for the Reblochon cheese (Figure 4-12). Indeed the Reblochon supply chain underwent difficulties in marketing, suffered from industrial competition and had to deal with production surplus.

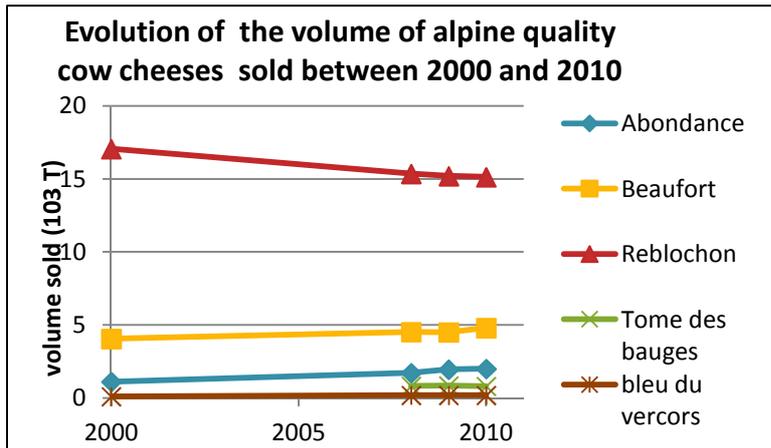


Figure 4-12: Evolution of the sales in volume of some quality cow cheeses produced in the Alps, between 2000 and 2010 (data from the national institute for designations of origins (Creusat, 2011)).

sixth of the beef volume eaten by French consumers each year. Moreover the conditions have deteriorated with the scrapie (spongiform encephalopathy) crises in the early 1990's and in 2006. Furthermore the introduction of imported sheep meat on the market has contributed to a fall in the products quality, and therefore in consumers' confidence. Thus, sheep industry has been experiencing a crisis for about 20 years in spite of the advertising actions to relaunch consumption.

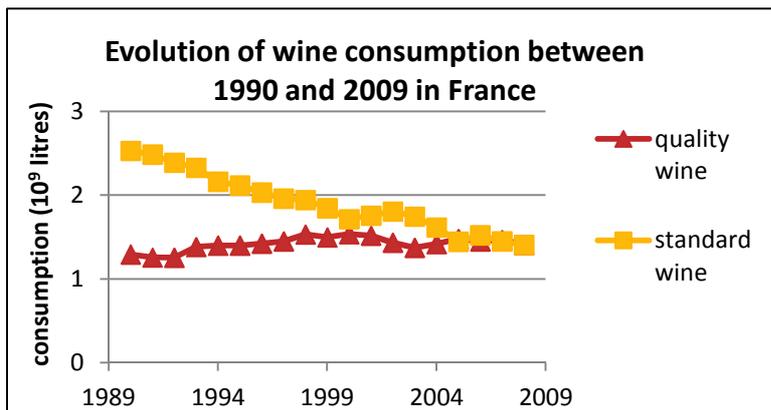


Figure 4-13: Evolution of wine consumption in France over the period 1990-2009 (data from Insee)

Regarding the consumption of fruits and vegetables per inhabitant in France (Appendices Figure A 15), volumes of fresh products eaten each year have been in over-all stable over the period 1995-2010. However the consumption of processed fruits and vegetables has increased.

The sales of organic products have been growing of approximately 10% each year in France between 2005 and 2010 (Figure 4-7). These figures can suggest that organic farming has undergone a similar increase at the production level, particularly for dairy and fruits productions, which seem to be particularly popular organic products. Consumers through their food purchases are remunerating agriculture and therefore their choices directly impact on the agricultural orientations. In addition, the study of the tendencies of consumption clearly demonstrated that food commodities purchases were not only driven by prices or products properties but also by personal convictions and motivations. Agriculture does not only fulfil a productive function.

Despite the fall in beef consumption per inhabitant (Figure 4-11), the nationally sold volume have increased between 1990 and 2009, as illustrated in Appendices Figure A 14. Strong advertising campaigns were carried during the last 10 years in order to boost beef meat sales, after the sanitary crises, and consequently the consumption have been maintained in the years 2000. Sheep meat consumption is in a more critical situation; with only a

Looking at the wine consumption in France, the same tendency as for cheese can be observed. The quality wine consumption has caught up with standard wine consumption (Figure 4-13). Also wine has become a pleasure commodity and the designation of origin vouches for this quality as well as the reputation of grape varieties.

4.3.3.2 The societal pressure on agriculture

Agriculture is by far the first source of raw material for human alimentation through the transformation of nature (Bachelier, 2004). It is now one of the main society stakes, exceeding the quantitative needs satisfaction. Society expectations are growingly orientated toward production impacts on health, welfare and living environment (Bachelier, 2004).

First consumers are extremely demanding regarding food safety. In 2000 61% of French consumers were already considering that a death by food poisoning was intolerable (Bachelier, 2004). In addition they also exact tasty and nutritionally equilibrated products. The concept of quality has a cultural and social origin since it refers to traditional processes. This product authenticity is something really demanded by tourists visiting a particular region, such as quality cheeses brought back as a souvenir by alpine tourists. But this notion of quality can also be associated with systems of production as organic farming or improved welfare stockbreeding. Thus, quality certifications are growing answers to consumers' expectations (Bachelier, 2004).

Second, citizens are asking agriculture to be respectful to a representation of the environment favourable to the human species. A study carried in 2004 revealed that 65% of surveyed persons judged that the first mission of agriculture is to feed the population and 89% thought that it is extremely important for agriculture to protect the environment. On the other hand, 42% of the respondents considered that farmers are responsible for the diffusion of dangerous substances in the nature (Bachelier, 2004). This society pressure on agriculture has been increasing during the last decade. This results partly from the contest of the productionist model of agriculture but also from the awareness of negative externalities associated with farming intensification (Guillaumin et al., 2008). The society requests are expressed toward landscape, water management, biodiversity protection, global warming and space occupation. The landscape issues assigned to agriculture are mainly related to landscape enhancement (crops choices), rural structuring (tracks, watercourse sides...), and farm buildings. Regarding water management, agriculture is the first water consuming activity in France with quadrupled irrigated surfaces between 1950 and 2000 (Bachelier, 2004). Furthermore, agriculture is responsible for nitrate and phosphorus water pollution. Then biodiversity is a central stakes for agriculture. Indeed, by the diversity of its activity and applications, agriculture can be either beneficial for the conservation and enrichment of the fauna and flora but it can also be detrimental. Livestock farming, manure and fertilizers utilizations contribute to 18% of the green house gases emission in France (Bachelier, 2004), which adds up to the global warming phenomenon and affects the biodiversity as well through climate change. Finally, the concentration and specialisation of agriculture activities worsen the situation because of the accumulation of harmful effects on the local environment; but also because of the lack of complementarity of farming activities such as the use of manure for crops fertilisation.

These reflections agree with the concept of multifunctionality of agriculture promoted by the EU policy. From a social sciences perspective the interest is to identify the territorial stakes and local demands toward agriculture in order to evaluate its capacity to integrate into its territory. This is what has been called "the new contract between society and its agriculture" by Hervieu (2002). Recently, the financial crisis has reminded EU of the primordial production function of agriculture through the potentiality of cereals shortage in Europe. Therefore the new policy orientation for

agriculture is bound to refocus financial support on the production means under the cross-compliance principle (Anania, 2009)

Expectations of consumers are one of the main driving forces of agriculture orientations. Indeed, the supply diversification of the last century has brought consumers at the top of the supply chain ladder and has given them the power of decision. Their growing preoccupations for their health and the environment, combined with markets and political constraints push agriculture from a productionist system to a sustainable one. Taste and preferences in-between products and within a range of products has also evolved. Healthy food, local and traditional products have gained in popularity and the sales of certified and organic commodities have been increased.

4.4 Environmental context

4.4.1 The high sensitivity of the Alps to climate change

The complexity of the alpine reliefs makes it very sensitive to climate change. Indeed, the Alps climate change is consistent with the global warming but three times more sensitive than the world average (Beniston, 2005). Indeed the Alps average temperatures have risen of 2°C during the 20th century and the beginning of the 21st: In particular, the years 2007 and 2008 are two of the warmest years never recorded (Thomas, 2010). The annual minimal and maximal temperatures sometimes have soared 3°C. The average alpine zero isotherm are bound to rise of 300 to 400m until 2050. The regional precipitations have globally dropped since the 1970, but not significantly. Nevertheless, it is not a homogeneous phenomenon. At the Alps level, the winter precipitations have increased whereas the summer amount of rain has fallen. But in some areas of Savoie, the yearly precipitations could have decreased of 17% over the period 1959-2008. Moreover the number of snow days has been cut of 30 to 35 days between 1980 and 2010 and the glacier volume reduced of 15% between 2000 and 2010 (Thomas, 2010).

4.4.2 The specificities of years 2000 and 2010

The data of the agricultural censuses 2000 and 2010 are intrinsically integrating the climate parameters of the years farmers were surveyed. The farms characteristics relying on the climate on an annual basis will be interpreted according to the conditions of the given year.

The year 2000 was particularly warm and rainy. The annual average temperature was 2°C superior to the reference average calculated over the period 1971-2000. The winter was very dry and mild and a succession of episodes of rains and warm waves alternated in summers. Several flooding and mudslides were observed in the south of France (www.meteoparis.com).

The year 2010 was 0.3°C colder than the reference average calculated over the period 1971-2000. It was of the coldest year of the two last decades. Precipitations were lacking in the northern Alps and exceeding in the southern Alps. Notable rainfalls were observed in the Var department in June (www.meteofrance.com).

The year 2003 appears like a turning point in terms of climate change with a notable increase in warm and dry years leading to the decrease in forage productions yields, the proliferation of some

destructive species such as vole or grasshoppers, the expansion of diseases to other species such as bluetongue disease on bovine, and water supply shortages in some mountain pastures with the drying up of some watercourses (Sérès, 2010).

4.4.3 Predation: the case of the wolf

Since the 1990's the wolf has come back in the Alps through Italy, colonizing first the Alpes maritimes department, after 60years of disappearance. The wolf is an opportunistic carnivorous and can easily attack small ungulates as sheep and goats. The first wolf attacks were counted in 1992 in flocks grazing in opened mountain areas. In addition straying dogs have also been identified as ungulates predators. The most affected type of farming is sheep, with 95% of the wolf attacks listed against them due to their small size and widespread utilization of mountain pastures. Also livestock farmers utilizing mountain grazing had to take expensive measures to prevent their animal from being attacked. Therefore since 2004, the government has provided funds to mountain farmers for the financing of herding, guarding dogs and all the pastoral equipments (fences...) (Ministère de l'Écologie and Ministère de l'Agriculture de l'Alimentation de la Pêche de la Ruralité et de l'Aménagement du Territoire, 2010). The remarkable increase in the number of attacks by wolf in some alpine areas can constitute a psychological hindrance to the installation of new sheep farmers (Appendices Table A 2), in spite of the financial compensation.

Changes in different fields associated with agriculture are key elements to understand in order to correctly interpret analysis of agricultural evolutions. Indeed, the political, economical, societal and environmental contexts affect the orientations taken by agriculture. The future of the common agricultural policy and some national policy aspects are key elements to counterbalance unfavourable situation for agriculture development, such as inflation, land estate pressure, or global warming.

5 Analysis of alpine agriculture evolutions between 2000 and 2010

The comparison of the data from the two agricultural censuses conducted in 2000 and 2010 enabled the analysis of the evolution of the alpine agriculture.

5.1 The decline of the alpine agriculture

Between 2000 and 2010 major changes happened in the agricultural sector of the Alps. First, as shown by the Table 5-1, the alpine agriculture has lost 29% of the farm structures. This result is comparable with the national French average decrease of 26%. However, in terms of surfaces, the Alps were amputated of 10% of their agricultural lands whereas in France the average loss is 3%. The loss in work force is comparable at the alpine or national scale. However, the work productivity calculated by the number of work unit per unit of land (AWU/UAA) is more improved in France than in the Alps. It results from the difficulty of mechanising work in steep slopes.

Table 5-1: Evolution of the alpine agriculture structure between 2000 and 2010 and comparison with France (data from Ac-2010 and AC-2000)

Region	Dimension	2010 Inventory				Evolution 2000-2010			
		NBF	UAA (ha)	AWU	SGP (k€)	NBE	UAA	AWU	SGP
Alps	Small	10402	149422	7478	81543	-38%	-15%	-16%	-31%
	Medium	6585	369868	10571	355806	-23%	-22%	-25%	-22%
	Big	3036	268949	9481	677816	-2%	19%	-10%	10%
	All	20023	788238	27531	1115165	-29%	-10%	-21%	-6%
France	Small	177828	1864735	100075	1437175	-36%	-19%	-19%	-32%
	Medium	150533	7983017	208802	8755796	-31%	-22%	-35%	-31%
	Big	161649	17117646	442492	41058785	-4%	12%	-9%	5%
	All	490079	26965398	751369	51251756	-26%	-3%	-21%	-5%

NBF: number of farms, UAA: unit of agricultural area, AWU: agricultural work unit; SGP: standard gross product

Similarly to France, the small dimension alpine farms disappeared faster than medium and big farms. The large space occupation by small holdings in the Alps (19% of the total UAA) compared with France (7% of the total UAA) explains the high loss in surfaces of the Alps. The small and medium structures lost surfaces, workers and production potential (SGP), whereas the big structures have gained in surfaces and lost workers. It illustrates that the enhancement in work productivity mainly concerns big farms. These changes are driven by several dynamics levers coming under territorial or sectorial specificities.

5.2 Territorial dynamics of evolution

5.2.1 The northern and southern differences of evolution

The agricultural means analysis gives an overview of the capacity of producing food but also maintaining and occupying spaces. The cutting of the Alps in different topographical zones permitted the creation of homogenous territories according to the constraints they face. The crossing of the

study of the production means analysis per territories can help understanding the aptitude of agriculture to adapt a territorial context.

The fall in holdings number is more important in the north (-33%) of the Alps than in the south (-24%). Nevertheless, the decrease in agricultural surfaces (UAA) is limited in the north (-7%) compared to the south (-14%). Therefore, in spite of the cut in the effective of farms, the agricultural activity in the north is still maintained thanks to the restructuring and enlargement of farm units. The restructuring of the southern farms is less visible and more agricultural lands are abandoned. Thus, two different territorial adaptations can be observed between the farms of the northern and southern Alps. In the north the drop in number of farms is growing with altitude. The farms of the valleys have a better resistance than the one of mountain or high-mountain zones. On the opposite, the mountains farms of the south have a better resistance than the plain farms.

Furthermore, according to their localisation the different dimension farms, does not have the same survival faculty (Table 5-2). In the north, the small structures underwent an important fall (-43%) in effective but also in surfaces (-22%) and workers (-23%). The drop in the number of medium holdings is less impressive but they have lost as much lands and workforces. Consequently, the farm restructuring trend limiting land abandonment phenomenon in the north, seems to have taken place at the large farm level. Indeed, the number of big structures increased in mountain and high-mountain zones of the northern Alps, and their size grew even faster. The same configuration is observed in the high-mountain area of the southern Alps, whereas in the other areas the drop in number of farms touches all farm dimensions.

Some general trends can be identifies through these territorial evolutions. The difference in the disappearance gradients between the northern and southern Alps results from territorial specificity. The small units are mainly located in the high mountain and mountain zones of the north and mountain and plain zones of the south. As small holdings have been the most subjected structures to abandonment, the north and south tendencies are reversed. Indeed, the increased necessity of efficiency and productivity at the farm level due to the closing up between inputs prices and production prices (Figure 4-4) was prejudicial to small structure with low resilience capacities. The disappearance of small structures can result as well from the lack of modernity of some facilities and from the lack of perspective for a potential successor.

In addition, as described in section 3.2.1, the south is dominated by vegetal growing. The crisis encounters over 2000-2010 by these productions (as wine and horticulture) located in the valleys, added to the explosion of land prices in the Var and Alpes maritimes departments comports a high proportion of plain are possible causes of plain farms disappearance in the southern Alps (Table 4-1).

Regarding the differences of restructuring movement between the north and the south, the explanation is mostly associated with a difference in productions and origin size of the farms in 2000. The case of the medium farms is more complicated to analyse due to the variability of the sample size between 2000 and 2010. Indeed, some medium farms have probably followed the restructuring movement and became big holdings, or small holdings enhanced their dimension to become medium holdings. As a result, conclusions on the medium range of farms can hardly be drawn.

Part 5: Analysis of alpine agriculture evolutions between 2000 and 2010

Table 5-2: Evolution of the number of farms, surfaces, and employment in agriculture according to the dimension of the alpine farms and their localization between 2000 and 2010, comparison with France (data from AC-2010 and AC-2000)
NBF: Number of farms, UAA: unit of agricultural area, AWU: agricultural work unit

Region	Zone	Dimension	2010 inventory			Evolution 2000-2010		
			NBF	UAA (ha)	AWU	NBF	UAA	AWU
Northern Alps	High-mountain	<i>Small</i>	1049	22854	896	-46%	-26%	-31%
		<i>Medium</i>	519	38736	905	-15%	-18%	-19%
		<i>Big</i>	126	30283	363	58%	87%	39%
		<i>All</i>	1694	91873	2164	-36%	-2%	-19%
	Mountain	<i>Small</i>	3843	53199	2718	-43%	-21%	-21%
		<i>Medium</i>	2621	131866	4423	-27%	-21%	-29%
		<i>Big</i>	1138	106386	3485	10%	30%	12%
		<i>All</i>	7602	291450	10627	-33%	-8%	-17%
	Plain	<i>Small</i>	1045	7480	609	-41%	-24%	-19%
		<i>Medium</i>	704	22137	1102	-26%	-21%	-31%
		<i>Big</i>	437	25657	1488	-2%	18%	-3%
		<i>All</i>	2186	55275	3199	-31%	-7%	-18%
Southern Alps	High-mountain	<i>Small</i>	735	24858	708	-28%	-5%	-18%
		<i>Medium</i>	646	61584	1015	-12%	-19%	-16%
		<i>Big</i>	69	16871	209	35%	49%	25%
		<i>All</i>	1450	103313	1933	-20%	-9%	-13%
	Mountain	<i>Small</i>	2168	33911	1661	-26%	-4%	-3%
		<i>Medium</i>	1322	96425	2019	-17%	-28%	-19%
		<i>Big</i>	582	61085	1814	-15%	-1%	-24%
		<i>All</i>	4072	191421	5493	-22%	-17%	-17%
	Plain	<i>Small</i>	1562	7120	885	-33%	-4%	5%
		<i>Medium</i>	773	19120	1108	-28%	-16%	-26%
		<i>Big</i>	684	28667	2122	-14%	-12%	-31%
		<i>All</i>	3019	54907	4115	-28%	-13%	-24%
Alps	High mountain	<i>All</i>	3144	195186	4098	-29%	-6%	-17%
	Mountain	<i>All</i>	11674	482871	16120	-30%	-12%	-20%
	Plain	<i>All</i>	5205	110182	7314	-29%	-10%	-22%
	All	All	20023	788238	27531	-29%	-10%	-21%
France	(high) Mountain	<i>Small</i>	35837	584140	26537	-31%	-15%	-21%
		<i>Medium</i>	33893	2150688	53054	-23%	-14%	-28%
		<i>Big</i>	10983	1164670	30579	14%	30%	10%
		<i>All</i>	80713	3899498	110170	-23%	-4%	-18%
	All	<i>Small</i>	177828	1864735	100075	-36%	-19%	-19%
		<i>Medium</i>	150533	7983017	208802	-31%	-22%	-35%
		<i>Big</i>	161649	17117646	442492	-4%	12%	-9%
		All	490079	26965398	751369	-26%	-3%	-21%

5.2.2 The stake of livestock regarding space occupation

In 2010, the main agricultural surfaces of the mountain and high mountain zones of the Alps are low productive grasslands which represent 41% of the total alpine UAA in spite of 17% loss since 2000 (appendices Table A 3). Then the permanent and temporary pastures cover an additional 40% of this zone with only 1% of surface loss. In the plain zone, the dominating surfaces are cereals, still covering 28% of the agricultural lands despite a 9% drop during the studied period. Then pasture (permanent and artificial) gather 20% of the plain hectares. The alpine agricultural productions have shown difficulties in maintain the surfaces dedicated to their activities. Indeed the 10% loss (Table 5-3) is largely superior to the -3% counted for the national average.

In 2010, without considering the collective surfaces, dairy cow farms occupy most of the Alps territory, whereas in 2000 it was sheep farming. Indeed ruminant breeding activities are space consuming due to their feeding system utilizing large grazing areas. The arable crops surfaces are located at 74% in the mountain and high mountain zones. It is the only space requiring vegetal production. Indeed, although wine and fruits productions represent a large number of farms, they do not occupy large amount of agricultural surfaces. Indeed, for viticulture and arboriculture, the value of their products minimized the necessity of their expansion in surfaces. Thus, the space occupation of farming activities is not proportional to the number of farms represented in each type of production, and all the productions do not have the equal capacity to fulfil this function.

There is no visible global distinction between space occupying activity and space restricted types of farming in terms of evolutions. The criteria of territorial expansion of productions does not clearly positively or negatively affect their resistance capacities, in spite of the implementation of EU policies encouraging surfaces occupation activity with a farm subsidies system allocated by hectare.

Table 5-3: Evolution of space occupation (excluding collective grazing surfaces) of the different types of farming, bases on the UAA (unit of agricultural area) (ha) values, in the Alps between 2000 and 2010 in comparison with France (data from AC-2010 and AC-2000)

zone	Alps		(high) mountain France		France	
	UAA(ha) 2010	2000-2010	UAA (ha) 2010	2000-2010	UAA (ha) 2010	2000-2010
Type of farming						
Arable crops	104114	3%	149659	7%	9182644	7%
Market gardening	1969	-5%	2248	-12%	66435	9%
Horticulture	2243	-15%	6568	32%	70364	-4%
Viticulture	32962	-10%	43535	-11%	1096216	-10%
Fruits growing	37878	-7%	46930	-6%	274823	-12%
Dairy cows	183475	-8%	905418	-9%	3952419	-11%
Suckling cows	71027	2%	1260973	10%	3853932	5%
Mixed cattle	24225	-10%	263905	-20%	1086745	-18%
Sheep	166813	-19%	603328	-11%	949449	-12%
Goats	25766	1%	78391	16%	222392	17%
Other herbivores	50599	-8%	252168	-12%	690784	-11%
Battery breeding	11453	-4%	87875	-6%	1257974	-7%
Mixed crops and mixed livestock	75715	-24%	198156	-18%	4243738	-12%
All types	788238	-10%	3899498	-4%	26965398	-3%

In terms of agricultural surfaces use, different tendencies of evolution can be observed, as shown in Appendices Table A 3. The annual forages surfaces have dropped of 17% in the northern Alps and increased of 170% in the southern Alps. This notable change is explained by the climatic differences existing between the southern and the northern Alps. Indeed the use of annual roughages, such as alfalfa represents an adaptation to climate drying up for the feeding of animals, and particularly sheep in the southern Alps. Also, the increase in the artificial or temporary pasture surfaces reflects a farming adjustment to climate change with the necessity of having more productive pasture or/and more adapted grass species to the climate. The most important increase (+62%) is seen in plain of the southern Alps where the climate change seems to push farmers to opt for temporary pastures instead of permanent pastures (-32%). Vegetables growing area have undergone a remarkable rise in (high) mountain zones: +22% in the north and +34% in the south of the Alps and have dropped in the plain areas (-22% in the Alps). The real estate pressure is mainly responsible for the relocation of vegetable farms from plain and urban zones to mountain periurban and rural zones. Nevertheless, the growing surfaces testify of the high demand for local vegetable production and the good dynamics of this production. Walnuts production benefit as well from the great notoriety carried by the quality certification “Walnut from Grenoble”, which have led to the expansion of walnuts surface in the certified production area of the northern Alps.

Regarding the livestock distribution, in appendices Table A 4 two territorial gradients can be observed. First the decrease in number of livestock units is negatively proportional with the altitude of the studied areas: the livestock of high mountains have the greatest resistance to the decrease trends and the livestock of plain have the lowest one. Indeed, the slopes and the climate make livestock rearing one of the only types of agriculture possible in this area. The CAP orientations and the reinforcement of less favoured areas subsidies have probably helped maintaining farm productions in these complicated territories. Also livestock farming is a space requiring activity, and the enclosure configuration of the Alps valleys makes agricultural land rare and expensive in plain. Second, the fall in livestock unit is stronger in the southern than in the northern Alps. From a territorial point of view, it is related to the climate differences between the two alpine parts. The mediterranean influence of the southern Alps makes low productive grasslands dominating the mountain zones. Moreover, the economical and societal conjunctures of the period 2000-2010 may have encouraged farmers to shift from animal to vegetal production. The market was more favourable to crops and fruits productions with the rise in prices (Figure 4-5). In addition, the work associated with animals is more restrictive and less matching new farmer lifestyle expectations. The predations issues still represent an additional discouragement to the maintaining of herbivorous breeding in mountain zones.

5.2.3 The end of the traditional family farm model

The alpine agriculture has lost approximately the same proportion of work units than the French average. The fall mainly comes from family workers and temporary workers in the southern Alps (Table 5-4). Regardless the distinction northern/southern Alps, agriculture employment looks more resistant in mountain and high mountain zones, as illustrated in Table 5-4. The difficult topography limits mechanisation and the working force cannot be completely replaced by machines.

Part 5: Analysis of alpine agriculture evolutions between 2000 and 2010

Table 5-4: Evolution of the working force in the different topographical zones of the Alps between 2000 and 2010

zone	Total		Holders and co-farmers		Spouse (non-co-farmer)		Other family workers		Permanent employees		Temporary employees		
	Units	AWU	%	AWU	%	AWU	%	AWU	%	AWU	%	AWU	%
Northern Alps		15990	-20%	10174	-15%	1644	-42%	991	-53%	1471	16%	1635	-7%
<i>High-mountain</i>		2164	-21%	1522	-14%	275	-37%	176	-47%	52	16%	134	-3%
<i>Mountain</i>		10627	-20%	6948	-14%	1093	-42%	637	-56%	817	35%	1084	-5%
<i>Plain</i>		3199	-21%	1704	-19%	276	-42%	177	-42%	602	-3%	417	-13%
Southern Alps		11541	-22%	6972	-12%	1096	-42%	470	-49%	1272	-11%	1667	-32%
<i>High-mountain</i>		1933	-15%	1423	-5%	235	-34%	126	-55%	69	47%	77	9%
<i>Mountain</i>		5493	-19%	3465	-10%	511	-43%	223	-49%	453	-5%	815	-24%
<i>Plain</i>		4115	-28%	2084	-19%	349	-45%	122	-43%	750	-18%	775	-40%
France		751369	-21%	445772	-17%	60100	-52%	27010	-51%	127891	-7%	78926	-16%
(high) Mountain		110170	-20%	78417	-12%	12044	-44%	6563	-53%	6449	14%	6104	-9%

AWU: agricultural work unit

A clarification to this tendency is associated with the growing number of big holdings in high mountain zones (Table 5-2). As shown by the Table 5-4, the increasing rate of permanent employees traduces the expansion of farm size and possibility for high mountain farmers to hire workforce and inflate the rate of employment. Also a great proportion of farmers is pluriactive in high mountain (43% in the north and 31% in the south of the Alps) (appendices Table A 5). Indeed seasonal employment of high mountain farmers in ski stations brings them a complementary living during winter which represents a less work requiring period. In the mountain zones, two different tendencies can be identified between the northern and southern alpine farms. In the north the employment level increased in big holdings (Table 5-2), which corresponds to a rise in number of farm associations as EARL structures and to the enlargement of the GAEC types of farm associations (appendices Table A 6). The proportion of permanent employees increased in this area with the possibility for larger farms to resort to wage-earning workers. On the contrary, in the south of the Alps, all types of working force decreased as well as the number of farms regardless their size. It can be associated with a lack of restructuring of these farms and to a larger extend of the farming abandonment phenomenon. The notable drop in the temporary workers employments of plain and mountain of the south is linked with the decrease of seasonal labour requiring types of farming such as viticulture and arboriculture, but also to the mechanisation of harvest and pruning.

The large drop in the number AWU of other family workers corresponds to the decline of the heritage agriculture model, where the parents stayed on the farms after the father to son transmission of the farm. Similarly, the fall in the volume of work from non co-farmer spouse is firstly reflecting the change in lifestyle with the spouse having his/her own profession and actually marrying the farmer, not "marrying agriculture" anymore. Secondly this tendency can be explained by the new possibility for farmers and their spouses to be associated under the EARL farm status, which also explains the sharp increase in the number of EARL structures (appendices Table A 6). These evolutions translate the volition of farmers to connect their lifestyles with the ones of other socio-professional categories and to have more free-time and the possibility of taking holidays. The aging of the agricultural population is not uniform according to the topographical zones. Big farms run by young farmers (under 45 years old) increased in high mountain zones, so potentially in association types of farming, as shown in Appendices Table A 7. On the contrary, in plain and mountain zones, the number of big structures managed by young farmers decreased and the big structures managed

by farmers over 55 years old grew. It can result from the revalorisation of CAP subsidies aiming at helping young farmers setting up a farming activity in less favoured area. The majority of big and medium holdings are owned by farmers under 55 years old whereas small holdings are mainly structures related to farmers over 55 years old. It can correspond to a post-retirement activity, to small farmers that have not invested in their farms for years and are now close to the retirement age, or to small farmers over the retirement age, who do not stop their farming activity.

5.2.4 An unequal farm restructuring between the north and the south of the Alps

The northern Alps farms underwent an important process of restructuring between 2000 and 2010 (Table 5-5). The farm enlargement and rise in potential of production was particularly significant in high mountain zone due to the notable decrease in small holding numbers (46%, Table 5-2). The disappearance of a large number of farms units in the north has offered the possibility of acquiring vacant lands to farmers, also pushed by the EU policy system remunerating agriculture on a hectare of land basis. In the southern Alps, the restructuring process was more limited. Nonetheless the farm structures were already larger than in the north. The south mountain farms structures stayed quite stable over 2000-2010 but their potential of production increased which traduces a shift of surfaces utilisation toward more valuable productions such as viticulture, crops or fruits and at the expense of ovine, mixed cropped and mixed livestock productions. Nevertheless, comparing the alpine results with the French average, for a similar increase of SGP, the work input was more important in the Alps.

Table 5-5: Evolution of structure of alpine farms between 2000 and 2010 according to their localisation, comparison with France (data from AC-2010 and AC-2000)

Region	Zones	2010 farm structures				Evolution 2000-2010			
		NBF	UAA(ha)	AWU	SGP (k€)	NBF	UAA	AWU	SGP
Northern Alps	High-mountain	1694	54	1,3	32,0	-36%	51%	25%	53%
	Mountain	7602	38	1,4	52,0	-33%	38%	24%	42%
	Plain	2186	25	1,5	70,8	-31%	34%	19%	42%
	All	11482	38	1,4	52,6	-33%	40%	23%	44%
Southern Alps	High-mountain	1450	71	1,3	32,9	-20%	13%	8%	13%
	Mountain	4072	47	1,3	59,2	-22%	6%	7%	29%
	Plain	3019	18	1,4	73,7	-28%	22%	5%	14%
	All	8541	41	1,4	59,9	-24%	12%	6%	19%
Alps	High-mountain	3144	62	1,3	32,4	-29%	32%	18%	34%
	Mountain	11674	41	1,4	54,5	-30%	25%	18%	38%
	Plain	5205	21	1,4	72,5	-29%	27%	11%	24%
	All	20023	39	1,4	55,7	-29%	27%	16%	33%
France	(high)-mountain	80713	48	1,4	52,1	-23%	25%	7%	24%
	All	490079	55	1,5	104,6	-26%	31%	9%	29%

NBF: Number of farmers, UAA: unit of agricultural area, AWU: agricultural work unit; SGP: standard gross product

The restructuring phenomenon has specially concerned small and big size farms, as illustrated in Figure 5-1. In the northern and southern Alps, the restructuring phenomenon of small farms enhanced their size but the potential of production was not as much improved. The gain in work

productivity is clearly visible in big and medium farms of both alpine zones with the fall in number of work unit per farm. It testifies of the modernisation and mechanisation of agriculture.

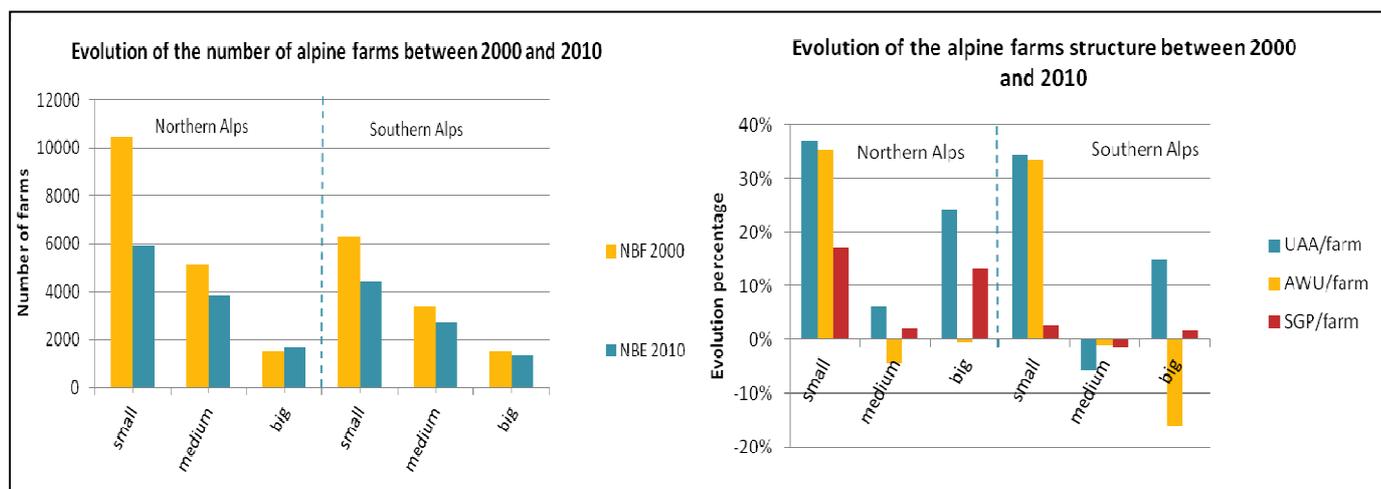


Figure 5-1: Evolution of the number of northern and southern alpine farms according to their size, and evolution of their structure (UAA, AWU, and SGP) between 2000 and 2010 (data from AC-2010 and AC-2000)

The increase in work unit per farm in small structures can either result from the impossibility of mechanizing the work for technical or financial reasons, or the result of a developing trend of sustainable agriculture returning to manual work and animal drawn machines for soil cultivation. Globally the restructuring phenomenon is more important in the Alps than in France or in the French mountains farms.

Finally, a clear trend of restructuring at the farm scale can be observed in the Alps. Nonetheless, two levels can be distinguished. On one hand a significant enlargement in terms of surfaces, work units and potential of production is observed in the northern Alps. On the other hand, a limited surfaces expansion and work unit increase is noticed in the southern farm structures. These two different dynamics are driven by the CAP orientations but also by the traditional agriculture existing on these territories. Indeed, southern farm sizes were already larger and despite changes in the CAP system of payment allocation, the ceiling put on the eligible number of hectare was probably already reached by the farms. On the contrary, the restructuring of high-mountain holding of the northern Alps is remarkable in terms of surfaces expansion. It probably results of the CAP influence and the availability of newly vacant agricultural lands. In the mountain zones of the south a shift of production can be observed through the rise of the potential of production (SGP), although the farm organization stays stable.

The decline of the number of farms in the Alps between 2000 and 2010 is clearly visible. Nevertheless a territorial division between the northern and the southern Alps reveals two different dynamics of evolutions. An important restructuring in the north has changed the agricultural landscape. The enlargement of the farm size concerns a large part of the northern farms, particularly in high mountain zones. Nevertheless, a part of small holdings restructuring happened through the development of marginal productions (ovine, horticulture) which has ensured their viability. In 2000, the farm size of the south was already larger than in the north. Thus the drop in number of farms and their restructuring is inferior to the national average. The agriculture of the southern mountain areas shifted from animal productions to vegetal

productions. Hence, in the south of the Alps higher rates of land abandonment were observed. Generally at the alpine farm level, improvement in work efficiency was globally observed and accompanied by a specialisation of the farm productions, even if the phenomenon is limited compared to the national level.

Briefly, a clear territorial stamp can be associated to the alpine agricultural evolutions. Indeed, the specificities of the Alps territory convey its own geographical, climatic, topographical, economical, and demographical characteristics, all impacting on the decisions taken at the farm level and participating in the orientations taken by agriculture. Nevertheless the previous analysis also reveals that some tendencies of evolutions are specific to certain productions sectors regardless the territory. Therefore these dynamics of evolutions are going to be studied for the main alpine productions.

5.3 Dynamics the main alpine production sectors

As previously observed, the constraints and assets related to a specific territory have a deep influence on the orientation of agriculture which has to adapt its systems in order to be the most efficient and competitive regarding its environment. However different strategic orientations and evolutions can be perceived between different production sectors. It reflects proper sectorial dynamics which will be analysed through the study of the changes in the organisation of the three main alpine productions (milk, sheep and wine) between 2000 and 2010.

5.3.1 Overview of the main alpine sectorial evolutions

The heterogeneity of the distribution of the different productions among the different alpine territories has been formerly demonstrated. Nonetheless, the Table 5-6 illustrates that dynamics of evolution are peculiar to some productions systems. For instance, the arable crop farms have a very low rate of decrease compared to the other alpine productions. It can be the result of the rise in premium per hectares of cereals in 2000 and the increasing market prices after 2003. On the contrary, mixed crops and mixed livestock farms have a remarkable high rate of disappearance (-46%). This tendency can be imputed to the phenomenon of specialisation of the farming systems, independently of the topographical zone.

Table 5-6: Evolution of the number of farms (NBF) per type of farming between 2000 and 2010 in the different topographical zones of the Alps (data from AC-2010 and AC-2000)

Alps	High-mountain		Mountain		Plain		France	
	NBF 2010	2000-2010	NBF 2010	2000-2010	NBF 2010	2000-2010	NBF 2010	2000-2010
Arable crops	222	-3%	1828	-9%	755	-9%	118746	-6%
Market gardening	9	-40%	121	-40%	119	-28%	6151	-20%
Horticulture	23	-30%	206	-34%	259	-23%	8441	-28%
Viticulture	4	-80%	619	-34%	1577	-26%	69971	-28%
Fruits growing	38	-16%	2037	-27%	1333	-30%	18597	-24%
Dairy cows	722	-30%	1562	-35%	144	-37%	50230	-34%
Suckling cows	379	-34%	797	-30%	81	-32%	59530	-25%
Mixed cattle	106	-35%	169	-20%	18	-5%	10793	-40%
Sheep	733	-19%	871	-16%	73	-11%	22772	-31%
Goats	140	-20%	417	-15%	39	-15%	5100	-17%
Other herbivores	370	-31%	882	-31%	129	-42%	28347	-34%
Battery breeding	68	-35%	381	-38%	93	-23%	29877	-26%
Mixed crops and mixed livestock	330	-46%	1784	-44%	585	-48%	59581	-40%
All types	3144	-29%	11674	-30%	5205	-29%	490079	-26%

Also within similar types of production such as suckling cows and sheep, very distinct tendencies of evolutions can be observed. It relies on differences in the sectorial organisation with strong historical alpine roots for the sheep sector. Similarly, fruits and viticulture are two productions having close

requirements in terms of territory specificities. However, their capacities of resistance on the different alpine topographic zones are opposite, with a better resistance to disappearance in plain for wineries, whereas fruits growing are more resistant in mountains.

Thus the strategies behind these discrepancies of evolutions observed between supply chains will be detailed for the dairy cows, sheep and wine production sectors

5.3.2 Dairy cows

5.3.2.1 The different quality chains and their organization

The alpine dairy cows supply chain was divided into four geographical entities based on their homogeneity in terms of territorial constraints and opportunity but also for their common products demarcation, as detailed in section 3.2.3.1 :

- The 04, 05, 26, 38 departments (04/05/26/38) : 65% of milk is sold as standard quality (appendices Table A 8) and the remaining 35% are sold under retailer's brand as "mountain milk" which is not specific to the alpine territory
- High mountain zone of the 73 department (73HM): 90% (appendices Table A 8) of the milk produced in this area is used for the production of the PDO cheese Beaufort
- High mountain zone of the 74 department (74HM): 77% (appendices Table A 8) of the milk coming from this zone is used for the production of PDO Reblochon and Abondance cheese making
- Mountain zones of the departments 73/74 (73/74M): 83% (appendices Table A 8) of the milk of this area is transformed into PGI cheese "Tomme de Savoie" and "Emmental de Savoie", or into PDO Reblochon cheese

As previously explained in the section 3.2.3.1, different production organisations are distinguishable in the Alps. The supply chains of the high mountain zones of 73 (73HM and 74HM) valorise their milk with very high added value cheeses, but require more important constraints of productions for farmers. These systems can be opposed to the standard quality milk supply chain in the 04-05-26 and 38 departments in which more freedom is left for the choice of animal breed or for their alimentation. An intermediate dairy cows system is represented by the 73/74 mountain zone, where milk is used for well valorised cheese production, but with less territorial and production constraints on the farm than in the high mountain zones of the 73 and 74.

Table 5-7: Evolution of the rate of specialisation of dairy farms enrolled in the different alpine supply chains of production between 2000 and 2010 (data from AC-2010 and AC-2010)

Entities	Owners 2010	Specialisation 2010	Specialisation 2000
04/05/26/38	784	62%	61%
73HM	400	86%	85%
74HM	323	84%	85%
73/74 M	1365	88%	91%
Alps	3056	79%	80%
France	82466	61%	59%

Another difference between the production chains is the rate of specialisation (number of farms specialised in cow milk production/number of farms owning dairy cows) of the farms. Indeed, when

the farms have the possibility to enrol organized systems for milk valorisation, they generally tend to be highly specialised (about 86% of the farms) in dairy cow farming (Table 5-7). This rate has been quiet stable over the period 2000-2010.

In the rest of the work, for data accession reason, only the specialized farms in dairy cows production will be studied. Also, a limit of the method is that for the 04/05/28/38 entity, only 62% of the farms owning dairy cows will be represented (the specialized ones). In the farms of the 04/05/26/38 departments, the cereals production is often associated with dairy cows.

5.3.2.2 A better resistance for the systems producing milk under quality certification

The alpine loss in dairy farms is equal to the French average: -34%. Nevertheless, the resistance capacity of dairy alpine farms is generally increased by their enrolment into quality supply chains. Indeed, as shown in Table 5-8, the drop in number of farms of high added-value chain of production is reduced compared to the national average and to the standard quality systems of the Alps. Only 20% of the alpine dairy cows units are not located in the 73 and 74 departments and mountain zones of 73 and 74 departments gather about 50% of the Alps production means. In the standard production area, the production means evolution is more negative than in France, with a notable loss in cow herd. Thus the territorial constraints faced by standard quality production systems pull down the capacity of maintaining rate of dairy farms.

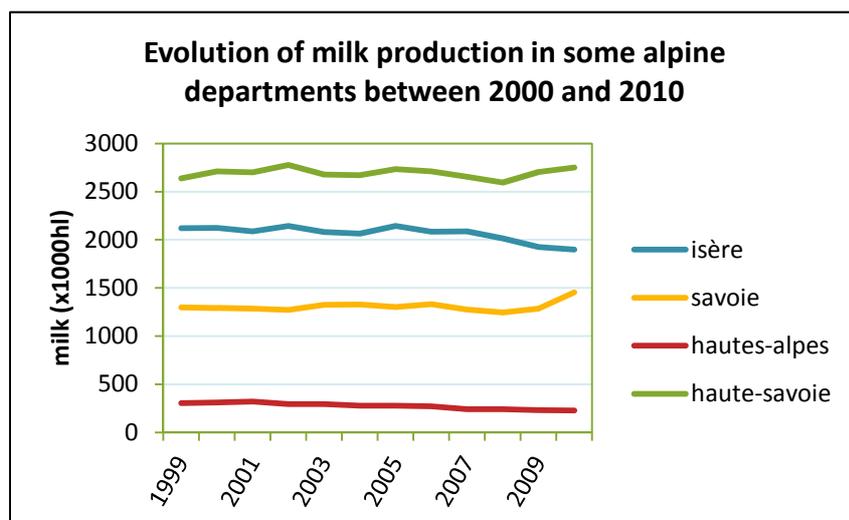
5.3.3 An increase capacity to maintain land occupation for the Beaufort producers

The 73HM zone is the only system of production with increasing surfaces, herds and potential of production. The strict specification of the Beaufort supply chains limiting the volume of milk produced per cow can partly explain this tendency. Indeed, in order to augment the volume produced on the farm allowed by the dairy quota increase, farmers cannot boost the production per animal; they have to increase the size of their herd and therefore their surfaces as they have to respect a certain animal load per hectare. In addition, the good prices of Beaufort milk can stimulate farm size expansion. On the contrary, the standard milk farmers have lost surfaces. It illustrate the sectorial dynamics impacts on the territory and their contribution to rural development and environment enhancement

Table 5-8: Inventory and evolutions of the production means of the different alpine dairy cows supply chains, based on data of specialized farms, between 2000 and 2010 (cow are expressed in heads) (data from AC-2010 and AC-2000) (NBF: number of farms UAA: unit of agricultural area, AWU: agricultural work unit; SGP: standard gross product)

Entities	2010 inventory					Evolution 2000-2010				
	NBF	UAA(ha)	AWU	Cows	SGP (k€)	NBF	UAA	AWU	Cows	SGP
04/05/26/38	488	37165	948	23243	41327	-40%	-17%	-35%	-21%	-17%
73HM	343	32061	607	11642	21189	-27%	9%	-22%	5%	7%
74HM	270	15550	451	7646	13762	-29%	-10%	-27%	-6%	-7%
73/74 M	1203	89375	2574	54792	108795	-33%	-7%	-26%	-10%	-11%
Alps	2428	183475	4842	104116	196751	-34%	-8%	-28%	-11%	-11%
France	50230	3717391	95382	3717391	6537457	-34%	-11%	-30%	-11%	-9%

Although the number of farms has dropped in the Alps, the production level has stayed rather stable



in the main producing alpine departments until 2008 due to the dairy quotas. Indeed, between 2006 and 2008, the market price of milk underwent a spectacularly increase. In 2008 the rise in energy and inputs prices and the fall of consumption power due to the economic crisis provoked an international crisis and a

Figure 5-2: Evolution the milk production in the main alpine departments between 2000 and 2010 (data from agricultural accounts, 2012)

brutal drop in milk price. It had two divergent effects according to the type of supply chains. In the departments producing standard milk (Isère: 38 and Hautes-Alpes: 05), the production decreased under the effect of farm liquidations. In the quality production departments, the production has even increased since 2008 with the implementation of a rise in dairy quotas. Indeed, the cooperatives collecting milk and the short commercialization circuits involved in these supply chains played a buffering effect on the volatility of the market prices.

5.3.3.1 The enlargement of the farm structures

The dairy alpine farms structures have enlarged with a gain of 39% in surfaces, 9% in work unit and 34% in cows per farm (Table 5-9 and NBF: number of farms UAA: unit of agricultural area, AWU: agricultural work unit; SGP: standard gross product)

This system is the most extensive of the Alps with 0.3 cows counted per hectare. It reflects the environmental and land occupation policy conducted by the Beaufort organization. Indeed, the Beaufort supply chain has been the only systems occupying more surfaces in 2010 than in 2000. In addition the good maintaining of these farms is also associated with the high rate of pluriactivity registered for farmers of this zone: 43% (against 20% in the Alps) which permits to fill in the off-production season and earn a complementary salary. Furthermore, the renowned of the Beaufort cheese offers a secure market of commercialization and a great popularity with tourists.

Table 5-10). The evolution of the farm structures over 2000-2010 differ from a system of production to the other. In the standard milk production chain (departments 04/05/26/38), the restructuring movement is very similar in France. The market evolutions have selected the most productive and efficient structures, which are still growing in size. However, a small portion of small holdings underwent restructuring and opted for diversification activities such as organic production, milk processing and direct selling under the growing demand for local and organic production. In the Beaufort zone (73HM), the average size farm was doubled in hectares, cows number and potential of production between 2000 and 2010. The work productivity was largely improved.

Table 5-9: Evolution of the specialized dairy cow farm structures of the main alpine production systems between 2000 and 2010 (data from AC-2010 and AC-2000)

Entities	2010 Inventory				Evolution 2000-2010				
	Per farm	NBF	UAA (ha)	AWU	SGP (k€)	NBF	UAA	AWU	SGP
04/05/26/38		488	76	1,9	84,7	-40%	37%	8%	38%
73HM		343	93	1,8	61,8	-27%	50%	8%	47%
74HM		270	58	1,7	51,0	-29%	26%	3%	30%
73/74M		1203	74	2,1	90,4	-33%	38%	10%	33%
Alps		2428	76	2,0	81,0	-34%	39%	9%	35%
France		50230	79	1,9	130,2	-34%	36%	7%	38%

NBF: number of farms UAA: unit of agricultural area, AWU: agricultural work unit; SGP: standard gross product

This system is the most extensive of the Alps with 0.3 cows counted per hectare. It reflects the environmental and land occupation policy conducted by the Beaufort organization. Indeed, the Beaufort supply chain has been the only systems occupying more surfaces in 2010 than in 2000. In addition the good maintaining of these farms is also associated with the high rate of pluriactivity registered for farmers of this zone: 43% (against 20% in the Alps) which permits to fill in the off-production season and earn a complementary salary. Furthermore, the renowned of the Beaufort cheese offers a secure market of commercialization and a great popularity with tourists.

Table 5-10: Evolution of the number of dairy cows per farm (calculated by the total number of cows of the area divided by the number of owners) between 2000 and 2010 for the main dairy supply chains of the Alps (data from AC-2010 and AC-2000)

Entities	cows	Evolution 2000-2010
04/05/26/38	30	33%
73HM	29	46%
74HM	24	30%
73/74 M	40	31%
Alps	34	34%
France	45	38%

Regarding the Reblochon supply chain (74HM), the fall in farms number stayed under the alpine and national average. However the restructuring movement is limited compared with the national scenario. The size of the herd per farm is the smallest of the Alps and the increasing land estate pressure led to a loss in agricultural surfaces (Table 5-8). The financial difficulties encountered by the Reblochon supply chain and issues of over production have limited the possibilities in expansion of the farm units. The drop in volume of cheese sold (Figure 4-12) is the illustration of structural and commercial difficulties encounter by this production.

In the mountain zones of 73/74 departments, the restructuring is very similar to the national average. These farms have the largest in herds and workers (Table 5-9 and Table 5-10) of the alpine systems. The mechanisation and modernisation of farm units permitted to obtain better work efficiency. Nonetheless agricultural surfaces have been lost. The increasing land estate pressure of this mostly periurban area can be one of the explicative factors. Also the ceiling put on the LFA payments to 50ha has not incited farms to enlarge their structure due to the fact they were already benefiting for the maximum eligible number of hectares. These dynamics of evolutions between 2000 and 2010 result from two opposite sectorial influences that cannot be clearly distinguished as

they are produced over the same territory: the encouraging commercial results of the Tomme de Savoie and Emmental de Savoie and the less positive results of the Reblochon sales (Figure 4-12).

Finally, this analysis shows that concerning dairy cow production, a first distinction can be done. The organized supply chains benefiting from quality certification of traditional and local cheeses showed a better resistance to market crisis and a greater capacity to occupy space. On the opposite, other standard milk farms delivering their milk to big dairy industries or directly selling products processed on the farm represents a frail minority of dispersed units, they are lacking of downstream cohesion to face the market instability, and the only solution has been found through the increase of productivity per animal and per work unit. Even within quality certification, differences can be identified between types of products. The Beaufort production chain of high mountain of Savoie obtained the best results in terms of evolutions. Its organization through very active cooperatives, collective mountain grazing associations, and the high rates of pluriactivity of milk producers are two determinant factors of its success. On the other hand, the Reblochon supply chain involves more different actors (cooperatives, cheese makers, refiners, direct selling) and suffers from a strong industrial competition on its product. Thus, it underlines the fundamental role of commercial organization and producers' cohesion to face these types of very narrow and targeted markets.

5.3.4 Sheep

5.3.4.1 The main basin of production and their supply chains organization

The sheep production of the Alps is orientated toward meat production at 98% (number of sucking ewes/total number of ewes); also for the analysis of this sector of production the figures of specialized sheep farms will be only considered as meat production farms. The units were divided in three main basins of production:

- The farms of the departments 38/73/74 corresponds to emerging small structures in a territory historically dominated by bovine livestock breeding. Only 3% (appendices Table A 9) of the sheep produced in this area are sold under the certification "agneau de l'Adret" a product quality certification not associated with a specific territory but with farming practices and meat quality:
- In the high mountain zone of the 04/05/06 and 26 departments, sheep farms practice mountain grazing. This area of production is located on the PGI certification zone "agneau de sisteron", but the territorial constraints and isolation make the adaptation to the PGI requirements complicated for farmers. Also only 9% (Appendices Table A 9) of the sheep produced in this area are sold under this quality certification.
- The mountain zone of the 04/05/06/26/83 and 84 departments gather more heterogeneous types of farms. The folks are generally larger than in the other entities. The productions systems can be differentiated accordingly to the management of forage resources. The pastoral farms have large sedentary herds and dispose of sufficient forages resources for a yearlong grazing on the farms. Then when forages provision are limited, two different systems can be distinguished: the transhumant farms utilizing high mountain grazing lands in summer or the farms utilizing large surfaces of low producing range pastures around the farm. In this zone, 28% (Appendices Table A 9) of the farms sell lamb under GIP "agneau de sisteron" certification.

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The diversity of demarcation is more restricted for sheep than for dairy cows milk production. However different strategies can be identified between entities of production according to the constraints and opportunities offered by the territories.

Extremely variable rates of specialization can be observed between the different basins of productions (Table 5-11). In the north only 38% of the farms owning sheep are specialized in this production, because they are often associated with other animal productions such as suckling cows. Though, as only specialized sheep farms can be analyzed, just 38% of farms owning sheep will be represented in the study of this entity. In high mountains of 04/05/06/26 departments, the specialization is highly marked with 82% of farms rearing sheep specialized in this production. The topographical constraints make livestock breeding one of the only possible activities in this zone. The southern Alps mountain systems (04/05/06/26/83/84M) are more specialized structures than the national average but the association with vegetal productions (crops or fruits) is still possible.

Table 5-11: Evolution of the rate of specialisation of sheep farms enrolled in the different alpine entities of production between 2000 and 2010 (data from AC-2010 and AC-2010)

Entities	Owners 2010	Specialisation 2010	Specialisation 2000
38/73/74	1185	38%	32%
04/05/06/26HM	657	82%	80%
04/05/06/26/83/84 M	1124	56%	50%
Alps	3053	55%	47%
France	49914	46%	37%

5.3.4.2 The decline of sheep production

The loss in the number of farms in the Alps (-19%) is minimized compared with the national average (-31%, Table 5-12). Indeed the national decline reflects the concentration of sheep breedings in some difficult territories where they cannot be substituted to other productions. However in the Alps the fall in farm number is not compensated with a restructuring movement since the proportion of lost surfaces exceed the one of the farms number.

Table 5-12: Inventory and evolutions of the production means of the different alpine sheep basins of production, based on data of specialized farms between 2000 and 2010 (data from AC-2010 and AC-2000)

Entities	2010 inventory					Evolution 2000-2010				
	NBF	UAA(ha)	AWU	Ewes	SGP(k€)	NBF	UAA	AWU	Ewes	SGP
38/73/74	456	25360	438	82697	7480	-25%	25%	8%	6%	12%
04/05/06/26HM	540	54505	777	180035	20443	-15%	-15%	-13%	-2%	-5%
04/05/06/26/83/84 M	632	80534	939	263777	26489	-13%	-28%	-17%	-11%	-7%
Alps	1677	166813	2226	551796	57007	-17%	-19%	-11%	-6%	-4%
France	22772	949449	21618	4143455	736693	-31%	-12%	-18%	-20%	-10%

NBF: number of farms UAA: unit of agricultural area, AWU: agricultural work unit; SGP: standard gross product

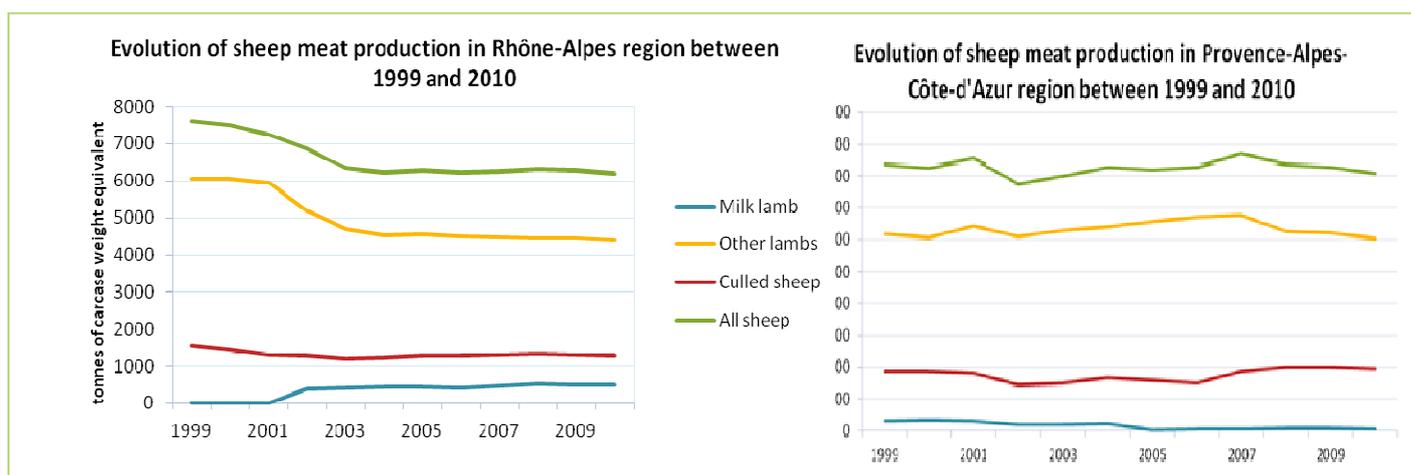


Figure 5-3: Evolution of the production of different sheep meat production volumes (in tonnes of carcase weight equivalent) in the two administrative regions including the alpine massif: the Rhône-Alpes region (northern Alps), the Provence-Alpes-Cote-d'Azur (southern Alps), between 1999 and 2010 (data from agricultural accounts, 2012)

Two tendencies can be already identified: a massive farm restructuring in the departments of the northern Alps and a disappearance of units in the south without transferring lands from a farm to another. It illustrates that the policy aiming at the land occupation and the farm size extension has reached a limit in the south. In spite of an increase in production means in the north, the marginality of sheep farms in this zone does not compensate for the loss of the south. No effect of predation is visible with no clear difference in the fall of the number of ewes between the mountain and high mountain zone of the southern Alps compared with the national figures.

Regarding the production level, the Figure 5-3 shows stagnation or even a decline of the alpine production. A drop is observed in the two Alpine regions between the year 2000 and 2001. Indeed, between the year 2000 and 2001, the foot and mouth disease epidemic striking in Europe led to massive slaughter of sheep herds and a decrease of consumption. In addition, the opening of EU barrier (over the period 1995-2000) with the decrease of the tariffs on import required by the WTO, facilitated the entrance of New-Zealand and Australian sheep meat in the EU market and raised the competition. In 2002 the implementation of the ewe premium boosted the production in the southern Alps region and stabilized the one of Rhône-Alpes region. In spite of the creation of the PGI certification "agneau de sisteron" (lamb of sisteron) in 2007, the sheep meat production decreased in the southern Alps, which corresponds to the decoupling of the ewe premium and an increase of ewes culling (red curve).

5.3.4.3 A lack of sectorial dynamics to initiate a restructuring

In the northern Alps department, a majority of small farms (56ha and 01 AWU in average, Table 5-13) underwent a clear restructuring movement with more than a doubling the farm size (Table 5-13), and a professionalization of the structures by a drop of pluriactivity from 80% to 51% between 2000 and 2010 (AC-2010 and AC 2000). These farms mainly opted for individual diversification strategies, orientated toward organic agriculture or direct selling. These approaches permitted a better added-value for their products on the local market, although it is not considered for the SGP calculation. The size of the herd is 2.5 times smaller than the alpine average with only 70 ewes per farm (Table 5-14). A few big holdings appeared between 2000 and 2010 under societal status with an

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average size about two times the big farms alpine average size. Generally northern Alps sheep farms are located in the mountain and high mountain zones and can practice mountain grazing.

Table 5-13: Evolution of the sheep farm structures of the main alpine production basins between 2000 and 2010 (data from AC-2010 and AC-2000)

Entities	2010 Inventory				Evolution 2000-2010			
	NBF	UAA(ha)	AWU	SGP(k€)	NBF	UAA	AWU	SGP
Per farm								
38/73/74	456	56	1,0	16,4	-25%	68%	45%	50%
04/05/06/26 HM	540	101	1,4	37,9	-15%	-1%	1%	11%
04/05/06/26/83/84 M	632	127	1,5	41,9	-13%	-18%	-4%	7%
Alps	1677	99	1,3	34,0	-17%	-2%	7%	16%
France	22772	42	0,9	32,4	-31%	27%	18%	29%

NBF: number of farms UAA: unit of agricultural area, AWU: agricultural work unit; SGP: standard gross product

In the high mountain zone of the southern Alps, the high rate of specialization enhanced the size of the farms and flocks (235 ewes per farms, Table 5-14). The farm decline is low but the farm size stayed stable between 2000 and 2010 (Table 5-13), which explains the loss in surfaces and workers. However an intensification of the production is observed with the rise in the number of ewes per farm, in spite of the surfaces stability.

Table 5-14: Evolution of the number of suckling ewes per farm (calculated by the total number of suckling ewes of the area divided by the number of owners) between 2000 and 2010 for the main sheep production basins of the Alps (data from AC-2010 and AC-2000)

Entities	Ewes	Evolution 2000-2010
38/73/74	70	71%
04/05/06/26 HM	274	18%
04/05/06/26/83/84 M	235	14%
Alps	181	32%
France	83	40%

In the mountain zone of the southern Alps departments plus the Drôme mountain zone, the decline of sheep production is less visible in number of farms but more important in land abandonment and loss of employments (Table 5-12). The farms dimensions have regressed in surfaces and workers over the period 2000-2010. Nonetheless as in the high mountain zones, the herd size has increased and the production intensified. Indeed the bad conjuncture and market instability have selected the most efficient structures concentrating more ewes in fewer surfaces. Systems utilizing mountain grazing have an additional constraint with the impossibility of producing out-of-season lambs, and to benefit from better market prices for the meat. These systems are extremely relying on the volatility of meat market prices. The existence of the red label "agneau de sisteron" (lamb of sisteron) and the approval of the GIP brought positive dynamics to the supply chains, but the limited number of members (260 to 270 in 2010, L. Siciliano, personal communication) does not permit to observe its beneficial effect. This dull tendency of evolution for the traditional sheep farms of the southern Alps is reinforced by the concurrence of vegetal productions such as crops, wine and fruits. Indeed, they benefit from favourable market conjuncture and are advantaged by the warming of the climate. These vegetal productions also represent less constraining work organization with more easiness to have free weekends and holidays.

The issues encountered by the downstream of the sheep supply chain have also reflected in the farm level. Farmers can sell their sheep either through cooperatives, horse dealers, private companies, directly on the farm or through producers shop. Currently about 50% of farmers are member of only three cooperatives collecting lambs and ewes over the Alps (L. Siciliano, personal communication). The small number of collective downstream structures concentrates the supply which represents an asset to face transformation industries and retailers but create a distance with farmers. Furthermore the difficulty of maintaining local, competitive and efficient slaughterhouse units is one of the main concerns according to the centralization trend of production means. The distance between the downstream facilities and some rural zones can hinder the maintaining of sheep farming in certain areas.

Finally, alpine sheep production is facing variable situations according to the territory and to the implemented strategies. Small and diversified farms, selling directly on the farm or under organic certification have the best restructuring and resilience capacity regardless the production area. The high mountain basin of production of the southern Alps, benefit from the lack of competition from other agriculture. Activity is also maintained thanks to the high rate of pluriactivity of farmers which bring complementary revenue to compensate sheep meat prices volatility.

5.3.5 The ambivalence of the CAP payments to sheep farms

Globally sheep farms are extremely relying on the CAP payments to earn a living (appendices Figure A 11). Indeed, the extremely low market prices of sheep meat, comprised between 4.5 and 5.5€/kg are fuelled by the increasing competition with cheap Pacific sheep meat and the disinterestedness of consumers for lamb and mutton. The large rise of CAP payments with the augmentation of ewe premium permitted the compensation of a part of the prices fall but increased the dependency of the sheep production on CAP orientations and reforms. However, although the EU policy tried to encourage land occupation agriculture, most of the sheep farms of the southern Alps had already reached the ceiling put on the 50ha eligible for LFA payments or on the 100ha of agri-environmental grass premiums. Thus, the high revenue dependency on CAP premium conditioned the survival of a large majority of sheep farms, but the level of payments is not sufficient for maintain the sheep sector dynamism and the capacity of the activity to fulfil its land occupation function.

Nonetheless, the maintaining of sheep breeding in the southern Alps is an essential environmental stakes for the territory. The capacity of sheep to graze in steep mountain lands and under woods allows the maintaining of landscape, biodiversity and prevents natural risks such as avalanches or fire. In addition, despite the drop in sheep meat consumption, the national production only supplies less than half of the consumed volume in France and potentialities of development are still broad for French sheep farms (FranceAgrimer, 2011). The advertising attempted by the national organisation to promote sheep meat consumption was unsuccessful.

5.3.6 Wine

5.3.6.1 The different designations and their basins of production

Viticulture is the fifth alpine production in number of farms, but the second if only medium and big size farms are considered. More than 70% of the wine production farms are located on the plain zone

of the massif (Table 3-4). Indeed, the altitude and climate constraints limit the possibilities of production in mountain areas. The Alps wine production was divided in three main supply chains corresponding to three cohesive territorial entities:

- In the 73/74 departments, wine is produced over a very fragmented territory, mainly located in the Alpine furrow. This wine production benefits from the massive winter tourism and the proportion of farms selling their production under the PDO certification has increased over the last 10 years to reach 64% in 2010 (appendices Table A 10)
- The wineries of the 04/26/83/84 departments represent 82% the alpine vineyards. They benefit from the prestigious reputation of the “Cote du Rhône” wines and 55% of the farms are recognized by several designations or indications of origin (appendices Table A 10).
- Wine is a niche market in the 05 and 06 departments. The production is organized around a few farms but they do not weight at the alpine scale. In the 05 department few farms sell directly or already packaged bottles to local minimarket.

The rate of specialization of alpine wineries is lower than the national average (Table 5-15). Indeed, some patrimonial vineyards are still subsisting even if this tendency has largely decreased since 2000. Also some farms or pluriactive persons have kept a few ares of vineyard for their personal consumption.

Table 5-15: Evolution of the rate of specialisation of wineries enrolled in the different alpine entities of production between 2000 and 2010 (data from AC-2010 and AC-2010)

Entities	Owners 2010	Specialisation 2010	Specialisation 2000
73/74	592	57%	42%
04/26/83/84	3497	52%	39%
05/06	97	25%	17%
Alps	4338	51%	37%
France	100779	69%	52%

5.3.6.2 The impact of the national wine crisis on the alpine production

Since the beginning of the year 2000, French wine production has been subjected to a massive production crisis. Several concomitant factors are contributing to the feverishness of the wine sector. First the emergence of new wine producing countries such as Australia, South-Africa, Argentina, New-Zealand and the USA created new competition on the international market. Their products are generally more competitive due to their laxer production regulation. Also historic French wine buyers are tempted to turn to this new furnishers for their wine supply (Smith et al., 2007).

Table 5-16: Inventory and evolutions of the structure of the different alpine wine basins of production, based on data of specialized farms between 2000 and 2010 (data from AC-2010 and AC-2000)

Entities	2010 Inventory				Evolution 2000-2010			
	NBF	UAA (ha)	AWU	SGP(k€)	NBF	UAA	AWU	SGP
73/74	338	2523	583	15843	-41%	-10%	-12%	0%
04/26/83/84	1802	29752	2867	184802	-25%	-10%	-17%	-10%
05/06	24	382	30	846	-63%	60%	99%	84%
Alps	2200	32962	3527	202681	-29%	-10%	-15%	-9%
France	69971	1096216	132550	9381058	-28%	-10%	-9%	-2%

NBF: number of farms UAA: unit of agricultural area, AWU: agricultural work unit; SGP: standard gross product

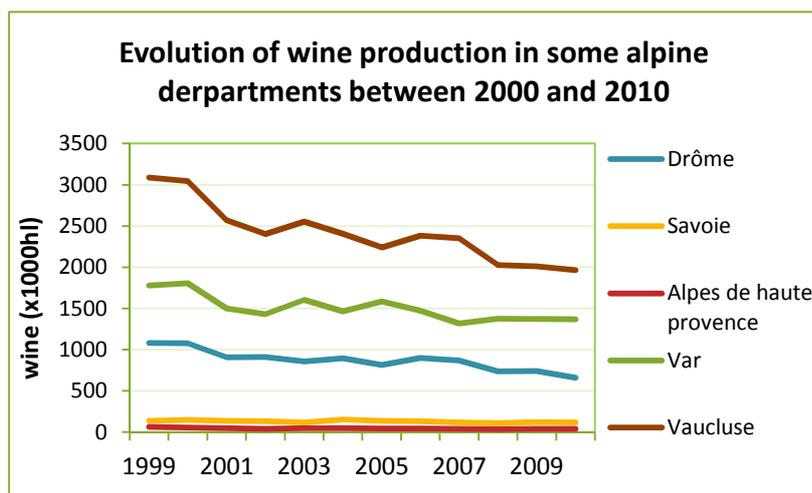


Figure 5-4: Evolution of the volume of wine produced between 2000 and 2010 in the main alpine producer départements (data from agricultural accounts, 2012)

Second, the French consumption has continuously dropped since the 1970's, under the anti-alcohol campaigns. So, French consumers drink less but they opt for higher quality products (Figure 4-13). Besides, the rigidity of French wine production systems make them insufficiently reactive to the market and conjuncture evolutions. Therefore a large drop in the number of farm and vineyard surfaces has been observed over 2000-2010 (Table

5-16). The results of the Alps are slightly more negative than in France, but discrepancies exist between basins of production. The large fall in number of holdings in the 73 and 74 départements (-41%) was partly absorbed by the restructuring of the remaining structures, and the loss in surfaces was restricted to 10% in specialized farms and 6% in total (Appendices Table A 11). The wineries of the Cote du Rhône area of certification follow the national tendencies of evolution with a loss of 25% of the farms and 10% of the surfaces of specialized farms and 12% in total (Appendices, Table A 11).

One of the other consequences of this wine crisis is the constant fall in produced volume as illustrated in Figure 5-4. This fluctuation in volume is linked to the market instability and prices volatility. A reform of the common organization of the wine markets was undertaken in 2008 in order to limit the surplus of production and readjust the supply with the demand but has not been yet implemented. The increased frequency of extreme climatic events has also contributed to the instability of the quantity of wine produced each year.

5.3.6.3 A selection of the most efficient farms

The translation of this market trend at the farm level is different according to the basin of production (Table 5-17). In the wineries of the 73 and 74 départements, in spite of a massive fall (-41%) of the number of holdings, they underwent restructuring. The average farm size has doubled and the potential of production has grown even faster. Nonetheless a large part of wineries remains patrimonial properties (F. Michez, personal communication) or are managed by pluriactive farmers (31% of wine producers) which limited the fall in surfaces. On the contrary, the historical big wineries names have benefited from the crisis for recovering a part of the abandoned vineyards and expand their size. The wineries of 73/74 départements had a good resistance to the crisis until the year 2006 thanks to their local market and positive consumption brought by tourism and the PDO certification (F. Michez, personal communication). However in 2006, a big shock struck the production with the emerging competition of the wine from the midi (south east of France). In addition, the recent apparition of new foreign tourist customers has been detrimental for the 73/74 wine production. Indeed these new clients first privilege the consumption of French wine before thinking about the local origin. However; the potential of production for the Savoie wines is still extremely broad since the local consumption represents 10 times the local production. The merger of the commercializing

cooperatives has concentrated the supply but their lack of commercial strategies is prejudicial to the whole production sectors (F. Michez, personal communication).

Regarding the wineries of the Côte du Rhône area, the loss of farms was limited to 25% of decrease. Only the very small structures have massively disappeared and the pluriactivity rate dropped from 44 to 16%. The farm size has increased in average (Table 5-17). Notably the work productivity was improved with the possible mechanisation of harvest in plain zones where are mainly located these production units. Within this territorial entity, several sectorial situations can be identified. In the 04 departments, wine production is carried by only one cooperative and a few independent winemakers. It creates isolation between producers and do not contribute to a professional cohesion (F. Cordier, personal communication). The products are intended to local market with the near urban poles: Marseille, Avignon, Nice, or with the winter tourism. In the 83/84 departments the concentration of cooperatives is also an observed phenomenon. This tendency is quite detrimental for the supply chains because cooperatives hold important roles such as structuring the supply, helping farmers to live from their work on their home territory. Indeed cooperatives participate to town and country planning and permit to decrease the land estate pressure put on farmers.

Consequently the centralisation and concentration movement nationally insuflated participated to the dismantling of the rural social fabric and contribute to the decline of the wine sectors and high loss of vineyard surfaces. In the 26 department, more wineries companies were created by farms merging. The development of collective selling points was a positive initiative and organic wine production is still gaining in success (F. Cordier, personal communication).

In the 05 and 06 departments viticulture stays an anecdotal production. However a large restructuring can be observed (Table 5-17), with a massive loss of total surfaces (-34%, appendices Table A 11) whereas the surfaces of professional farms has increased. The existing wineries have been professionalized with the rate of pluriactivity falling from 88% to 28%, and patrimonial surfaces have been abandoned.

Table 5-17: Evolution of the wineries structures of the main alpine production basins between 2000 and 2010 (data from AC-2010 and AC-2000)

Entities	Inventory 2010				Evolution 2000-2010			
	NBF	UAA (ha)	AWU	SGP (k€)	NBF	UAA	AWU	SGP
Per farm								
73/74	338	7,5	1,7	46,9	-41%	52%	49%	68%
04/26/83/84	1802	16,5	1,6	102,6	-25%	20%	11%	20%
05/06	24	15,9	1,2	35,3	-63%	334%	439%	397%
Alps	2200	15,0	1,6	92,1	-29%	27%	19%	28%
France	69971	15,7	1,9	134,1	-28%	26%	26%	37%

NBF: number of farms UAA: unit of agricultural area, AWU: agricultural work unit; SGP: standard gross product

The whole wine sector of production faced a national crisis. The common market organization measures undertook in 2000 has not been efficient to regulate the market supply. However, different reactions could be observed in the basins of production according to their supply chain organisation. The downstream organisation is a main stake for the health of the wine production sector. In the 73/74 case, the restricted scope of their market and the good structuring of their

supply permitted to have a good resistance capacity during the national crisis. Nonetheless, the restructuring of the downstream organisation and the passivity of the cooperatives weakened the sectors and made it vulnerable to competition. On the other hand, the high dependency on the national and international markets of the Côte du Rhône wineries made it very sensitive to the international crisis. The consequences were the selection of the most competitive and efficient farms and abandonment of some production means. Furthermore, the consumers also played an important role in the orientation of the production. Indeed, on the opposite of the other productions, the quality demarcation of wine is now considered as an essential commercial asset and the standard quality wine market is low. Therefore the attending role of the professional organisations, such as cooperatives, is fundamental for market exposed sectors in order to strategically orientate the production at the farm level.

6 Perspective on the expected development of the Alpine region

The study of the past evolutions of agriculture shows that some challenges have to be taken up in the future in order to maintain sustainable agricultural activities in the alpine massif. The previous analysis also highlighted the regional externalities influencing the orientations followed by agriculture in the Alps region. This part will then attempt to anticipate the future evolutions of these externalities in order to have a prospective view of the alpine agriculture stakes. It can help to argue the discussions about the future CAP by anticipating its effects.

6.1 Prospective on the development of the Alps

6.1.1 Growing and ageing population

The population can either represent a threat and an opportunity of development for the alpine agriculture. The local population is the first market for agriculture products and a growing population represent even more commercial outlets. Nevertheless, according to the alpine topography, the surfaces of building and farmable lands are limited.

As previously described, the alpine population have grown over the past 10 years (section 4.3.1) and it has observed as an expansion of periurban areas. Looking at the projection of population evolution from Insee in the alpine departments (non limited to the Alps zoning), the increase in population should touch all the alpine areas (**Erreur ! Source du renvoi introuvable.**). Even in the departments

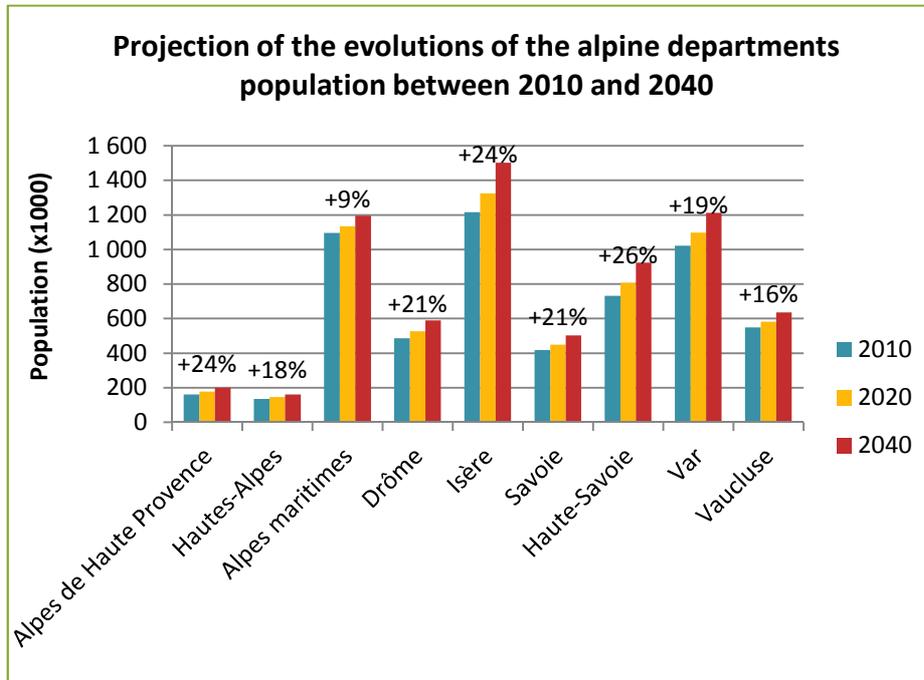


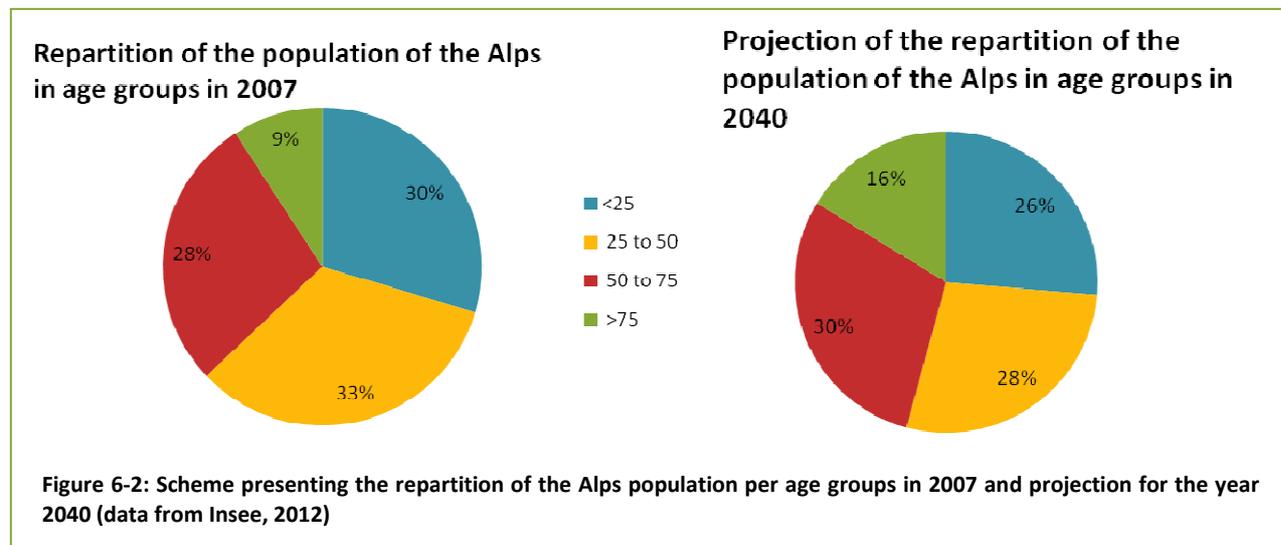
Figure 6-1: Graph presenting the projection of the evolution of alpine departments population (calculated as the sum of the population of all the departments included in the alpine massif: 04, 05, 06, 26, 38, 73, 74, 83, 84) between 2010 and 2040 (data from Insee, 2012).

where urbanisation has already reached an important level of saturation in 2010 (Figure 6-1**Erreur ! Source du renvoi introuvable.**) as Savoie, Haute-Savoie or Isère, the specificities of the area is bound to keep attracting more inhabitants until 2040. The space under strong urbanisation pressure should increase of 23% by 2030. As space is limited in the valleys area, it would lead to a further loss

of 5% of the agricultural surfaces between 2005 and 2030 (INSEE Provence-Alpes Côte d'azur, 2011)

Part 6: Perspective on the expected development of the Alpine region

The Insee projection of population was based on the decrease of the mortality rate, increase of the life expectancy and a positive migration rate. Also, as illustrated in Figure 6-2, the percentage of the population aged over 50 would grow from 37% of the Alpine population to 46%. A study from



FranceAgrimer (2010) clearly demonstrated that the food consumption tendency evolves with consumers age. People aged over 50 generally buy more fresh products, more red meat in proportion but also more diversified kind of products such as duck, rabbit, veal or lamb.

Within the same study, the consumption habits were also studied according to the geographical origin of the consumers. According to the origin of the immigrating population settling in the Alps, it could modify local consumer preferences with for instance a population buying less lamb but more cooked pork meats.

6.1.2 The continuity of global warming

Climate is a determinant factor for agricultural activities. The study of the evolution of practices over the period 2000-2010 has already underlined the impact of climate change on the alpine agriculture. Regardless of the hypotheses, the predictive models of the future alpine climate mostly agree on a rise of 4 to 6°C for summery temperatures and 3 to 5°C for wintry temperatures between the years 2050 and 2100 (Bigot and Rome, 2010; Yoccoz et al., 2011). The precipitations should be reduced in summer and increased in winter and spring. In addition, by 2100, the models predict a drop of 30% of snow falls with the almost disappearance of snow under 500m of altitude (Bigot and Rome, 2010). Based on the specificities of the alpine mountains, these potential changes could strongly disturb the environment equilibrium with the regression of glacier, the melting of the permafrost, floods of altitude lakes and streams, sediments streaming, changes in snow properties and increased risks of mudslide, screes and fires (Richard et al., 2011). The repartition areas of alpine vegetation are also determined by the climate and particularly by the local coldest temperatures. Therefore a climb up of the vegetation stratification of 500 to 1000m of altitude can be envisaged for the next 100 years (Yoccoz et al., 2011). The vegetative cycle could be deeply altered by the decrease of the number of frost days which is a determinant component of vegetal growing and by water stress (Bigot and Rome, 2010).

6.1.3 Perspective of economic development

The economic development of the alpine region has played a preponderant role in the agriculture dynamism. Indeed, the previous analysis showed that the agriculture of the northern Alps has benefited from the positive influence brought by the industrial tradition of the area and by tourism investments. On the contrary, in the south the development opportunities of agriculture have been limited by a lack of investments in infrastructures, delayed touristic investments and a late industrial development. Also the future projects bringing economic development in the Alps are of particular concerns for the future of agriculture. Three main projects concerning the Alps have been identified as economic driving forces that could potentially affect agriculture evolutions in the future.

The ITER (international thermonuclear experimental reactor) project is an international cooperation between Europe, The United States of America, Russia, Japan, China, South Korea and India. The program aimed at building an experimental reactor of fusion by magnetic containment. France is the host country of the ITER project and more precisely the PACA region. The site of Cadarache located at the boundary of the Alpine massif and the Var department has been selected to receive the project. The program is built on a 45 years basis: 10 years of construction, 20 years of exploitation and 15 years of dismantling. Regarding the employments, during the construction step, 500 persons will be directly employ by the project and 1 400 jobs should be indirectly created in the PACA region. During the exploitation step, 1 000 persons will be directly hired by the ITER organization and 2 400 indirectly created (CEA/Agence ITER France, 2012).

A second major project concerns more the northern Alps with the railway connection between Lyon (in the RA region and at the west border of the French alpine massif) and Turin in Italy. The project aims at building 5 000km of railways in order to unburden the road freight transports and connect Lyon and Turin within two hours. The objective is to carry 40 millions of tons of merchandises and 5 million of travellers. The construction works should begin in 2013 and the connection should start operating in 2023. The program could generate 2 000 jobs directly and 4 000 indirectly among the region, but ambiguity remains on the working force hiring. This new railway should also bring economic spin-off with the creation of logistic platforms, maintaining centre and other services (LTF, 2012). Nevertheless, the project will require the provision of agricultural lands for the construction of the new railways and reposition of embankment and the layout of the project should cross 71 villages.

Then, the Biovallée (organic valley) is a developing project carried on the Drôme territory (centre-west of the Alps) in order to develop research and education activities devoted to the sustainable development and promoted by local actors. Several partnerships have begun with universities of PACA and RA regions. Regarding agriculture the program consists in promoting organic agriculture, supplying collective or local catering with organic products, creating a centre capitalizing the knowledge about organic agriculture with research infrastructures, and the development of formations (Biovallée, 2012).

6.2 Implications for agriculture

6.2.1 Land estate pressure and consumption evolution

The growing population of the Alps will probably fuelled the increase in land estate prices of the Alps. Also the access to land for farmers is bound to be even more difficult, and the incitation of selling agricultural land for real estate projects will be very tempting. The enlargement tendency observed in the farm structures will probably be limited by the availability of agricultural lands. Farming activities traditionally established at the fringe of urban areas, as gardening farms, could be delocalized to mountain zones.

Regarding the composition of the Alpine population, the positive immigration rate and the ageing of the population could lead to a change in food consumption habits. Indeed, the immigrating population settling in the Alps and coming from other French regions do not probably have the same attachment to traditional alpine products. However, the whole marketing strategy of the alpine agriculture is based on the tradition of products belonging to a “terroir”, a specific land of production though the appellations of origins as cheeses or Savoie wines. It could potentially destabilize alpine quality supply chains, in particular for wine of Savoie whose market is very local and the appellation mainly recognized by local consumers. On the other hand, the growing demand of local products and the increasing local market potential could benefit to standard quality farms using short circuits of commercialization. Indeed, if consumers orientate their choice toward local productions instead of quality products, potentiality of development could appear for farms located out of appellations areas, as for the dairy farms of the 05 and 38 departments.

Regarding the landscape issues, agriculture will probably hold an even more important role with the growing urbanisation of the Alps. Indeed, the maintaining of agricultural lands permits to contain the urban development and partly preserve an attractive landscape. This positive externalities of agriculture should stay a point of emphasize in the discussion of the new CAP reform.

6.2.2 The global warming questioning the alpine farm model

The expected warming of the climate is likely to have specific impacts on the Alps environment. Regarding vegetal production, the rise in temperature, variations in precipitations and season sequences will lead to modifications on agricultural calendars and technical arrangements (Bigot and Rome, 2010). The consequences could lead to a change of varieties cultivated in the region, with species less sensitive to water stress or requiring less frost days in their vegetative cycle. The wine appellations are based on specific types of grapes and if climate change forces the utilisation of other varieties, the foundations of the designation of origin associated to a product reflecting local land characteristics could be turn into question. On the other hand, the altitudinal warming of the Alps could also offer the possibility of growing plants where the length of the wintery season was preventing it. Thus, the configuration observed in the southern Alps could become a scenario of future development in the northern Alps, in spite of the good organization of dairy cow farmers.

In addition, climate change is likely to affect the seasonality and the quality of herbaceous species. The length of mountain grazing utilization by livestock could be extended in autumn with late

winters. Changes in grass growth period can modify the possibilities of grazing and can increase the cost of animal feeding. Also, alteration of forage quality associated with water stress could lead to animal feeding issues or lighter animals at the end of the grazing season. The role of sheep breeding under these new future conditions of mountain grazing will probably require more focus, as they are able to valorise poorer and dryer vegetation compared to cows. Modifications of the bioclimatic events sequence could disturb as well the reproduction calendars and the organisation of the alpine livestock farms utilising mountain grazing in summer (Bigot and Rome, 2010). Furthermore, the seasonal warming will probably lead to a recrudescence of animal diseases and an altitudinal climbing up of new invasive species (AFSSA, 2005). These elements deeply question the role and place of livestock in mountain areas with a real threat concerning forages production and production cycle organisation.

Irrigation will also become a main stake for agriculture, and the share of water between activities will probably have to be regulated. The question of the water in mountain grazing activities is also bound to be a challenge for the Alps, as streams drying up have already been observed and raised issues for animal drinking water supply.

From another point of view, agriculture in the Alps is closely associated with tourism activities. Indeed, the French Alps is the biggest ski resort of the world with more than 150 ski stations (Bigot and Rome, 2010). The global warming endangers this activity completely relying on climatic component such as the number of snow days. Indeed the rise in temperature observed since the 1980's has already forced ski resort to invest in artificial snow producing equipments. Nonetheless it does not represent a financially and environmentally viable solution, and the development of "4 season tourism" has to be envisaged. Already, some efforts have been put in the development of summer mountainous activities but the question of maintaining a strong touristic economy with declining winter tourism will have to be soon considered. This future challenge is even more important for agriculture because until now winter tourism has brought a great commercial outlet for local products but also permitted the pluriactivity and the survival of a large part of high-mountain farmers during the winter season. Further partnerships between agriculture and tourism could be then envisaged in order to develop new form or tourism.

6.2.3 The place of agriculture in the economic development of the Alps

The relation between agriculture dynamism and the regional economic development has been established during the previous analysis. Indeed, agriculture of the northern Alps could take advantage of tourism activities and their potentialities of employments and consumption. The northern Alps agriculture also benefited from the development of industrial activities bringing workers synonym of a local market but also infrastructures facilitating the modernisation of farming activities.

Consequently the new ITER project could represent an interesting opportunity of valorisation for agriculture of the southern Alps. The creation of thousands of direct and indirect jobs per se opens new market opportunities with some possibilities of proximity market development. The international cooperation aspect of the project is also interesting as it involves workers and

institutions of different counties. The immigration of international workers could fuel regional tourism and attract a new international clientele which has generally positive effects on agriculture.

Regarding the Lyon-Turin railway connection, the consequences on agriculture appear less positive. Indeed, the project has been strongly contested by farmer organizations as it requisitions large agricultural surfaces (about 500ha for the Savoie department according to a farmers union). Also the positive externalities on agriculture are less obvious as neither the construction site nor the project itself should bring employment or more tourism in the Alps. In addition, according to the difficulties for farmers located on the railway route to find agricultural land due to the important land estate pressure of the area, the consideration of destroying productive land is hardly acceptable by the agricultural community. The questioning about the real usefulness and efficiency of this project regarding its costs and environmental impact associated with the building works contributes to damage its credibility as well.

The Biovallée project is deeply associated with agriculture. This program will be used as a prototype of integration of sustainable development in the economic development of the territory. Thus, the project promoting local products, organic agriculture and creating commercial partnership between farmers or farmer organizations and the catering profession could be very positive for local farm dynamism. Indeed, the principle of short distribution circuits is based on the will of directly paying farmers for their products instead of unfairly sharing the added values with industries or retailers. On the other hand, the formation and communication actions implemented by this program should be very beneficial to the farms not enrolled in quality certification supply chains. For instance, the dairy farms of the 05 and 38 departments relying on low and volatile prices paid by big dairy industries could develop their own short circuit of commercialisation with organic or local demarcation. University research associated to the project represents a great opportunity of development for supply chain in difficulty, such as sheep meat production.

6.3 The challenges of the future CAP

The CAP represents a political tool that can be used to prevent or counterbalance undesirable evolutions of agriculture. Regarding the envisaged tendencies of regional evolutions according to three determining factors (demography, climate change, and regional economic dynamism), some threats and opportunities of development for agriculture have been foreseen.

First, a strong policy of conservation of agricultural land should be pursued in order to avoid agricultural land abandonment. Some measures could also be implemented in order to help farmers facing land parcelling and growing land estate pressure. The contribution of agriculture to landscape maintaining and attractiveness should stay remunerated as a positive externality of agriculture contributing to the enhancement of public good. This function could be publically promoted to emphasize the fundamental need of conserving a local agriculture. The future CAP could also help farmers to valorise their production by financing formations and help them positioning their products on evolving markets involving broader choices of diversification strategies. It would be particularly valuable in this alpine region where the local market is growing and still unsaturated but where the expectations toward food products keep evolving (organic agriculture, local products...)

Even if the data of the AC do not enable the study of this topic, the increasing support of the second pillar had a real effect on agrotourism. Indeed farmers have developed this activity because of the touristic potential of the region but it stays marginal and the potential of development is very broad. In the future, under climate change constraints, a restructuring of the winter touristic systems will have to be implemented in order to promote “four seasons tourism”, and in that framework, agrotourim will probably hold an important role. Projects trying to promote a closer association between tourism and agriculture have been undertaken, but the dominance of big tourism companies on the region and their economical value make the reorientation of regional budget dedicated to tourism difficult.

However, concerning landscape management, the increasing support from the second pillar under the requirements of animal loading, farm practices with agri-environmental measures and LFA payments have influenced the interaction between farms and their environment. In the alpine massif, the first role of second pillar supports is to maintain agriculture in a difficult territory, which is especially true in the southern Alps. Without this support and the encouragement of extensively using lands, the phenomenon of agricultural land abandonment would probably be even more visible. From that point of view, the increasing support of the second pillar of the CAP (LFA and agri-environmental payments) can be considered as a developing factor of a multifunctional agriculture. Regarding the propositions for the future CAP reform, these measures should be renewed and probably reinforced with new agri-environmental payments and consequently a multifunctional vision of the alpine agriculture as well.

The preponderant future role of the CAP will consist in accompanying farmers in the adaptation of their production system to more climatically adapted practices. Financing formations will be a first step to support and advice farmers dealing with the new environmental challenges Subsidies for the acquisition of new equipments for grasslands care or irrigations, the seeding of new varieties or adaptation of breeding system, for instance will be required as well. The increasing risk of climatic vagaries is a further consideration to include in the new CAP with the implementation of an insurance system providing agriculture with financial compensation for climatic damages on farm production (i.e. bad harvest, emerging diseases...), which are bound to be more frequent.

The study of the evolution of agriculture and the Biovallée project both emphasize the need for collective approaches in agriculture for mutual support between farmers, the share of agricultural practices, the development of common commercial strategies and the better added-values for their products. A part of the CAP payments could be devoted to financing the setting up this type of project.

7 General discussion and conclusion

7.1 The limitation of the study method

Regarding the AC data used in this study, the first difficulty was inherent in the statistical secret. Indeed, by cutting the Alps in the 24 alpine regions, and by dividing these regions by types of production, the probability of having in one of the 24 alpine zones, less than three farms specialized in one production, or one farm representing at least 85% of one production, was greatly improved. Also by increasing the frequency of data under statistical secret, the agriculture reality was slightly distorted. It was particularly visible when indicator sums of the alpine entities were not equal to the actual alpine total.

In addition, some uncertainties remain about the consideration of collective and individual pastoral surfaces by the two censuses in 2000 and 2010. Indeed, the consistency of the classification of the collective and individual grassland areas was turned into question regarding the sheep farms in particular. It could have exaggerated the loss in sheep farm surfaces if some surfaces considered as individual in 2000 were classified as collective in 2010 and so not accounted for sheep farm surfaces. Nevertheless the drop in the number of sheep, and in the volume produced per region uphold the tendency of land abandonment by sheep farming, but the lost proportion stays more uncertain.

Considering the indicators, no farm economical indicator is supplied by the AC. The only indicators giving information on the value of the farm structure is the SGP. This indicator is calculated according to the number of hectares of each production on the farms, and the number of animals. Indeed, each agricultural is allocated a coefficient representing its economical value. Nevertheless this coefficient is regionalized and so it does not consider the variability of products valorisation. For instance, the SGP of the farm producing standard milk are calculated with the same coefficient than the farm selling milk under quality certification. Also this indicator is just giving a broad informative overview but has to be carefully considered.

The agricultural censuses data represent the most exhaustive gathering of information available to characterise agriculture in the EU. In spite of its limitation in terms of accuracy and disparities between questionnaires from one campaign to another, it still gives a good overview of the agricultural world. Indeed it represents a large work basis to characterise and analyze agriculture and its evolution, and it is broadly use professionals to orientate the EU and the national agricultural policies.

Finally, the evolutions of the French alpine agriculture study was based on data from the AC 2000 and 2010. The last hindrance of this work was the delay related to the data delivery. Indeed, the last set of data was delivered with two months of delay compared to the agreed time limit. Also the time that was planned for the data treatment was restricted and some analyses had to be omitted. In addition, data concerning organic agriculture were not available yet because of some inconsistencies noted in the AC-2010 numbers, also all the treatments planned on this topic had to be cancelled.

Similarly some incoherencies were noticed on the data dealing with short circuits of commercialization, and treatments had to be cancelled.

7.2 Conclusion

Agriculture orientations are the confluent results of territorial adaptations of farming activities and dynamics driven by sectorial organizations and particularly farm downstream organisation, market conjuncture, and consumers' preferences. Furthermore, agriculture is a particular stake in mountain territories as the alpine massif, but the difficulties inherent to the altitude and topography make farming activities more costly and less productive than in plain. However, the importance of maintaining agriculture in mountain zones resides in the enhancement of its essential and multifunctional role regarding the economical, social and environmental sectors. The different CAP reforms and the implementation of rural development policies aimed at remunerating the added-value brought by mountain agriculture in terms of non-importable goods (biodiversity, landscape, social cohesion...). Therefore, the characterisation of the evolutions of agriculture in mountain zones and the understanding of the driving forces behind these evolutions are a particular concern for policy makers in order to inflect on its future orientations.

This work aimed at distinguishing the territorial driving forces and the sectorial dynamics of evolution of the alpine agriculture. The second objective was to put these evolutions into perspective of the different contexts evolutions: economical, political, social, environmental, and to identify the main impacts of the CAP policy in order to anticipate the potential effect of the new CAP reform on agriculture orientations.

The Alpine agriculture is particularly diversified in terms of productions with a remarkable proportion of vegetal types of farming. Nevertheless, herbivorous breeding remains the most space occupying type of agriculture. Regarding the territorial adaptations of agriculture, the first observation is the comparable loss of farm units in the Alps compared to the national average, but the larger land abandonment. It reflects the difficulty of maintaining farming activities in a restrictive territory where land estate pressure has become an issues and topography limited the possibility of farms extension. The work productivity improvement is also limited in the Alps, due to the complicated mechanisation of steep lands. In addition, a second observation highlighted the distinct evolutions of the farms in the northern Alps compared with the southern Alps. Indeed, a gap was identified between the north and the south of the Alps in terms of climate, economic history, demography and dynamism. The climate differences between the two areas impact on the farming practices and production. Thus the mediterranean influence of the southern Alps incited farmers to orientate their specialization toward vegetal productions, and the to prefer annual or temporary pastures to permanent grasslands. As a result, between the northern and the southern Alps, differences in farms disappearance rate were observed according to their topographical zones. In high mountains of the north, more farms units were lost due to the disappearance of traditional small breeding farms. In the southern Alps, the plain farms were more affected by agriculture decline due to the crisis striking vegetal productions dominating this area, i.e. wine. It also explains why sheep farms of the high mountain zones of the south have a better resistance capacity in mountains. Indeed, livestock breeding cannot be replaced by vegetal productions due to the altitude. Complementarily, the restructuring phenomenon observed at the farm level is more important in the north than in the south. In 2000, the initial size of

southern farms was already larger than in the north. Indeed, the urbanisation pressure is stronger in the north due to its historic industrialisation starting at the beginning of the 20th century. Territories also convey their history and traditions. The historical cheese making tradition of some northern Alps departments permitted the definition of several PDO and PGI areas.

Considering the sectorial dynamics of evolutions, the study of three of the main alpine production revealed the importance of the sectorial organisation in survival capacities of the farm units. First between different types of production, the different contexts do not lead to the same constraints and assets. Indeed, sheep production is exposed to very unfavourable market on a long run perspective with low prices, low consumption and increasing international competition; however it benefits from very high CAP support due to special sheep premiums and less favoured area occupation, which resulted in a good maintaining rate of alpine farms compared to the national average.

On the other hand, wine market conjuncture has also undergone a crisis with a continuous decrease of consumption, increase of international competition and the centring of the sales on quality products. Also this production does not benefit from European financial support, and the rate of disappearance of alpine wineries followed the large loss of the national tendency. However one of the lessons drawn from the sectorial analysis is the prevalence of producers' strategies and organisation regarding production, demarcation and commercialisation.

The dairy cow production is a well-suited example to illustrate this conclusion. Indeed, the most organized milk production chain is the one of Beaufort (73HM). Its strict regulation of production in farming practices includes requirement in local land valorisation and volume production restriction and its collective structures organise mountain grazing and commercial circuits. Surplus of production are avoided and the prices paid to producers are regulated by cooperatives and permit to avoid the dependency on the market prices. Consequently its farms had the best resistance capacity and even increased their land occupation level. On the opposite, the standard milk entity of production had the largest decrease in number of holdings under the milk crisis pressure. The units have lost surfaces, workers and animals and the dismantling of the milk collect in some isolate mountain zones by the big dairy industries reinforced the decline of this production chain.

Finally, the CAP system of the period 2000-2010 has been particularly focused on the territorial role of agriculture and its function toward the environment and the society. One of the main stakes was the capacity of mountain agriculture to occupy and maintain land with the less favoured area support and the agri-environmental premiums. But the system revealed its limit since sheep production, one of the first recipients of the CAP support, has shown its incapacity of maintaining agricultural surfaces with the second highest rate of land abandonment.

7.3 Perspectives for the future CAP

7.3.1 Alpine agriculture prospects in regards to the propositions for the future CAP reform

The study of the evolutions of agriculture between 2000 and 2010 permitted to highlight the main stakes and challenges of the activity for the future. The main conclusions can be put in perspective of

the propositions of the future CAP reform for the period 2014-2020 to have a critical view on its future adequacy to the alpine agriculture challenges.

The first highlight of this work is the difficulty of preserving agriculture in less favoured areas, as mountain zones, and confirms the necessity of implementing particular policies and support to farmers in these territories. The future CAP reform plans to include a new payment as part of the second pillar to support farm located in areas of high natural constraints. One of the issues to be raised in the discussion should probably be focused on the modality of payments allocation according to the anticipated effect. The ceiling put on the 50ha of the LFA allocated per farm did not incite the sheep farm extension.

The planned suppression of dairy quotas will have probably different impacts according to the different supply chain organisation. Regarding the Beaufort area of production, the consequences should be an increase of herds size due to the limitation put on the milk production per cow. In other production zones, the effects are less easily predictable but an enlargement of the farm dimension and of the production can be expected. It could also be synonym of herd size enlargement and consequently of land space occupation due to the maximal animal load authorized per hectare by the agri-environmental payments.

The new risk management tools are still not very well defined. However, a functional system could prevent future price volatility crisis, like the viticulture crisis and become a securing measures to maintain agriculture in an environment where climatic vagaries are likely to become more frequent. Finally the repartition rules of the added-value among the supply chain appear very favourable for farmers enrolled in retailer commercialisation circuits. Regarding alpine production, meat, vegetables and fruits productions should be particularly benefiting of this measure, even if it seems positive for agriculture in general.

In addition, after this analysis, the decoupling systems of payments for some production can be deeply turned into question. Indeed, France is only producing 50% of the national sheep consumption (FranceAgrimer, 2011). The potential of production is very broad but the volumes produced have been constantly decreasing for the last past 20 years. Therefore measures coupled to production could help farmers to maintain their herd, in spite of the unfavourable economical conjuncture.

Finally, this work underlines the limitation of the CAP influence on the orientation of the production. But the necessity of having well structured professional organisations in the different agricultural sectors was underlined. This could be a source of inspiration for the CAP future reform.

7.3.2 The main expectations of alpine agricultural actors toward the future CAP reform

The specificities of the Alps environment and agriculture and the dependency of some productions on CAP payments make the CAP reform a very important concern for agricultural actors. Some important aspects of this reform can be underscored in view of the sustainable development of alpine agriculture.

The convergence of direct payments, i.e. national or regional homogenisation of the amount of direct payments received per hectare of agricultural land, will increase the support allocated to the alpine farmers. It can appear as a beneficial effect of the reform but a risk of enhancing the financial reliance of some farming systems on the CAP payments. Also, this measure is likely to create disparities and support low productive agriculture. Indeed, as the payments are attributed by hectare of lands, a farmer rearing 5 cows over 50ha will receive the same amount of direct payments than a farmer rearing 30 cows on the same surface. Also, the idea of homogenisation of payments per unit of land is not supported by professionals of the Alps and other options are envisaged, such as payments homogenisation per work unit.

The possibility of maintaining a percentage of coupled payments for the EU member states should be renewed. It can represent an opportunity for French sheep farmers to obtain a ewe premium 100% coupled to production. Indeed, the previous analysis showed that the partial decoupling of the ewe premiums had negative repercussions on the sheep production sector. Besides, the maintaining of the LFA payments is an essential point as it constitutes the recognition of the difficulty faced by mountain agriculture and corresponds to a substantial part of mountain farmer income.

According to the discussions on the future CAP, agri-environmental payments should be kept but the conditions of allocation have not been discussed yet. From the alpine agriculture point of view, the interest of this measure is to preserve grassland surfaces occupation by livestock with sustainable agricultural practices, as it permits to maintain landscape and prevents natural risks as avalanches or fires.

The future CAP should offer the possibility of creating sub-programs financed by the 2nd pillar budget. The alpine agricultural profession wants to propose the construction of a sub-program dedicated to mountain agriculture. The major levers of this sub-program proposition are centred on financing buildings construction, extremely expensive in sloping areas, financing professional trainings aiming at the creation of well-structured supply chains or financing agri-environmental measures.

Thus, this work has underlined the difficulty of comprehending the different stakes of agriculture at the alpine regional scale, due to its large diversity. Nonetheless the interest of this analysis is clear while deciding on the future policies accompanying agriculture. A good understanding of the driving forces leading to the different evolutions and representing threats, challenges and opportunities of the regional agriculture is essential to define priorities and efficient policies.

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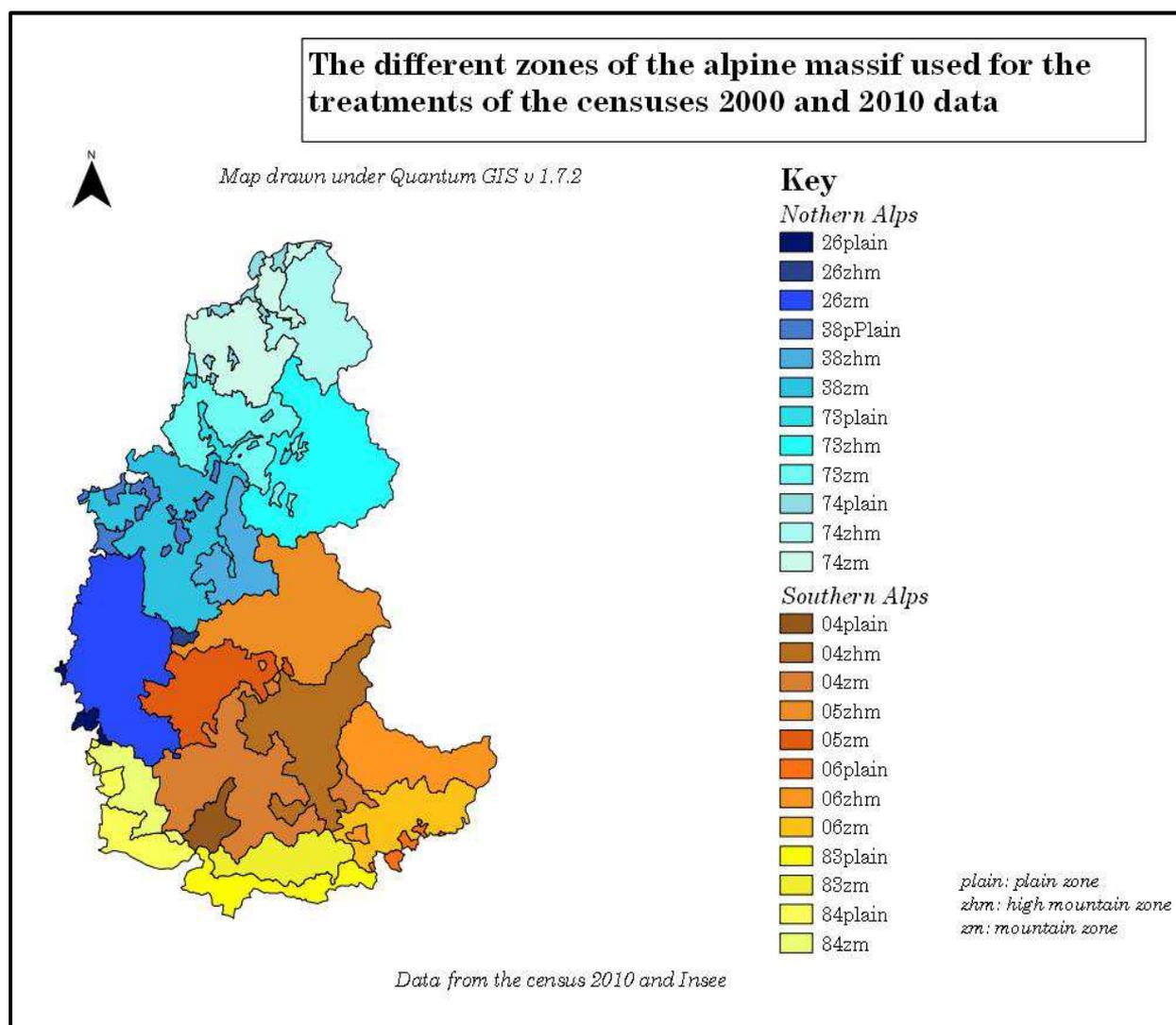


Figure A 1: Map of different geographical entities used for the treatments of the censuses data

Table A 1: The data of the two censuses are extracted by the RDAAF under tables form for required geographical units (indicators abbreviations are shortly explained)

Table	Grouping	Geographical zone	Indicators
T1.1	Per type of farming Per farm size	24 alpine zones, France and mountains France	NBF, UAA, AWU, SGP
T1.2	Per farm status Per farmer age	24 alpine zones, France and mountains France	NBF, UAA, AWU, SGP
T1.3	Per farmer age x farm status	24 alpine zones, France and mountains France	NBF, UAA, AWU, SGP
T2		24 alpine zones, France and mountains France	Type of surface (ha and holders): cereals, fallow, vineyard...
T3		24 alpine zones, France and mountains France	Animals (heads and holders): dairy cows, ewes, poultry...
T4	Per type of farming	24 alpine zones, France and mountains France	Labour (AWU): farm manager, spouse, employees...
T5		24 alpine zones, and mountains France	Collective grazing: surfaces, animals...
T6	Per products (milk, eggs...)	24 alpine zones, France and mountains France	NBF under quality signs
T7	Per sales brackets	24 alpine zones, France and mountains France urban-rural zones	NBF selling through short supply chains
T8.1	<i>Complement on irrigated surfaces</i>	24 alpine zones, and mountains France	UAA
T8.2	<i>Complement on succession</i>	24 alpine zones, and mountains France	NBF with a holder over 50years hold having a secure successor
T8.3	<i>Complement on pluriactivity</i>	24 alpine zones, and mountains France	AWU

NBF: number of farms UAA: unit of agricultural area, AWU: agricultural work unit; SGP: standard gross product

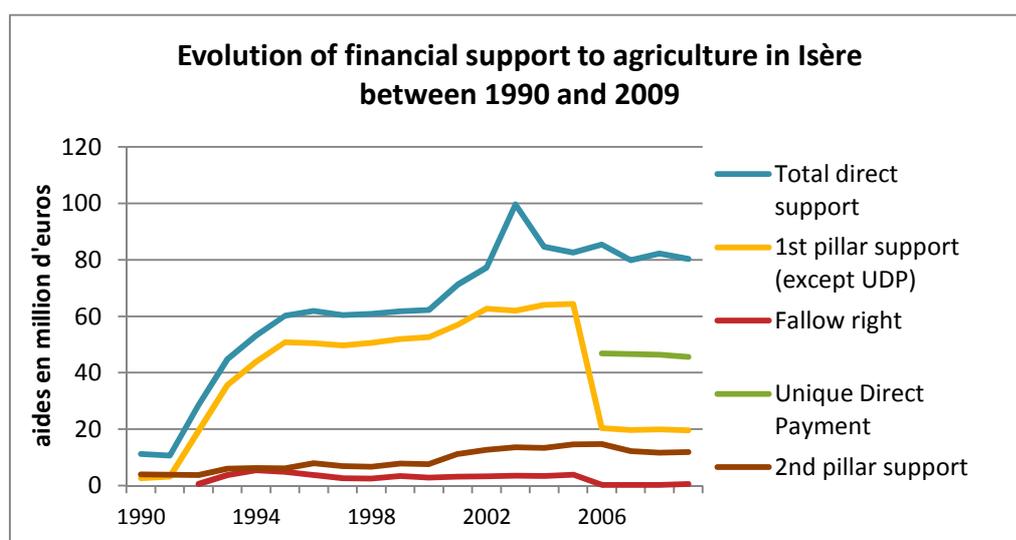


Figure A 2: Graph representing the evolution of the CAP support for the department of Isère over the period 1990-2009 (data from agricultural accounts, 2012)

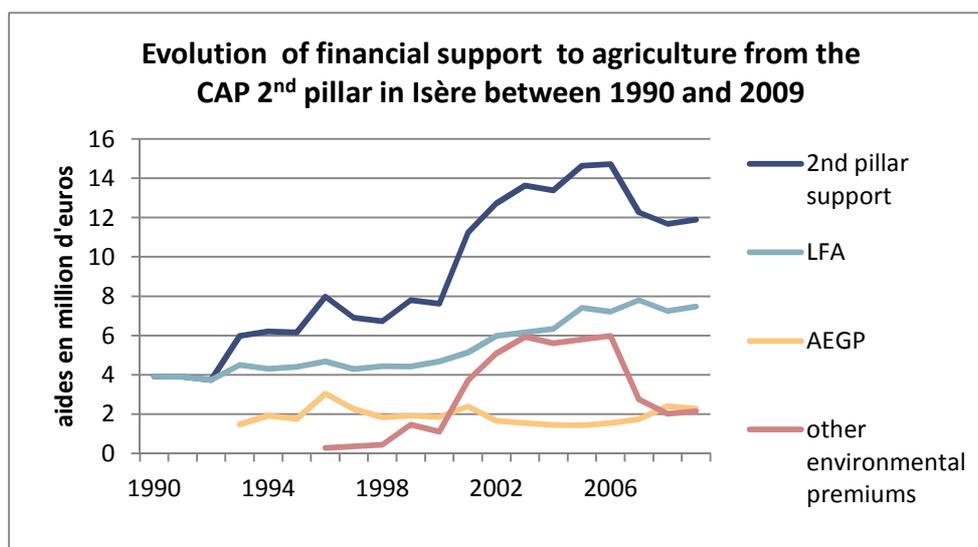


Figure A 3: Graph representing the detailed evolution of the CAP support from the 2nd pillar for the department of Isère over the period 1990-2009 (data from agricultural accounts, 2012)

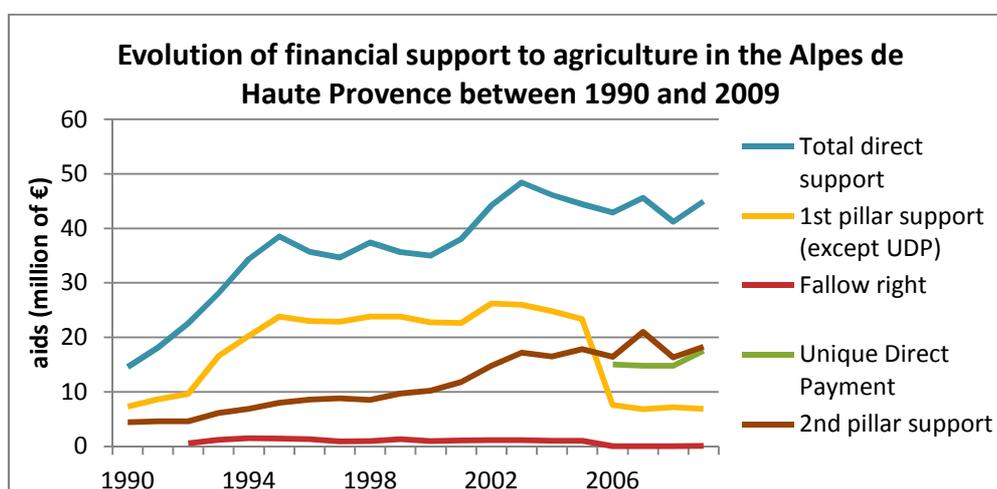


Figure A 4: Graph representing the evolution of the CAP support for the department of the Alpes de Haute Provence over the period 1990-2009 (data from agricultural accounts, 2012)

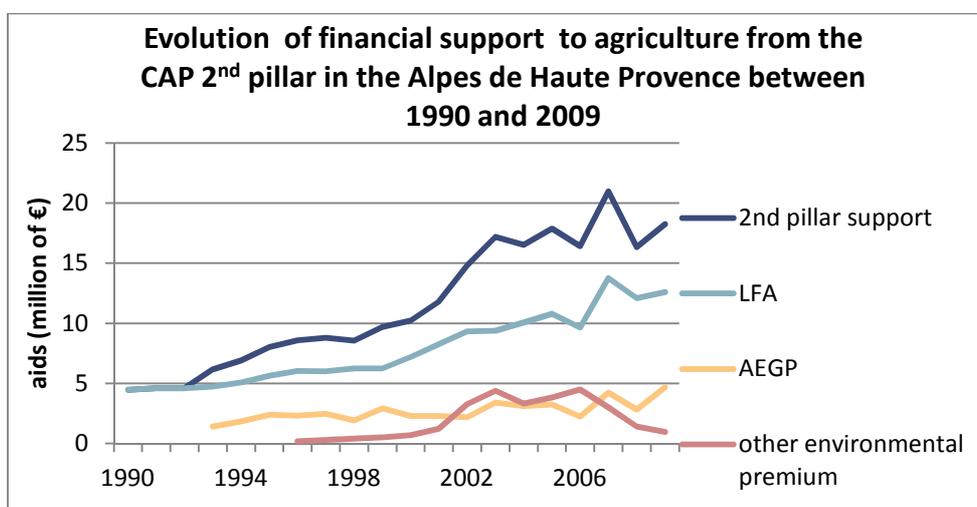


Figure A 5: Graph representing the detailed evolution of the CAP support from the 2nd pillar for the department of Alpes de Haute Provence over the period 1990-2009 (data from agricultural accounts, 2012)

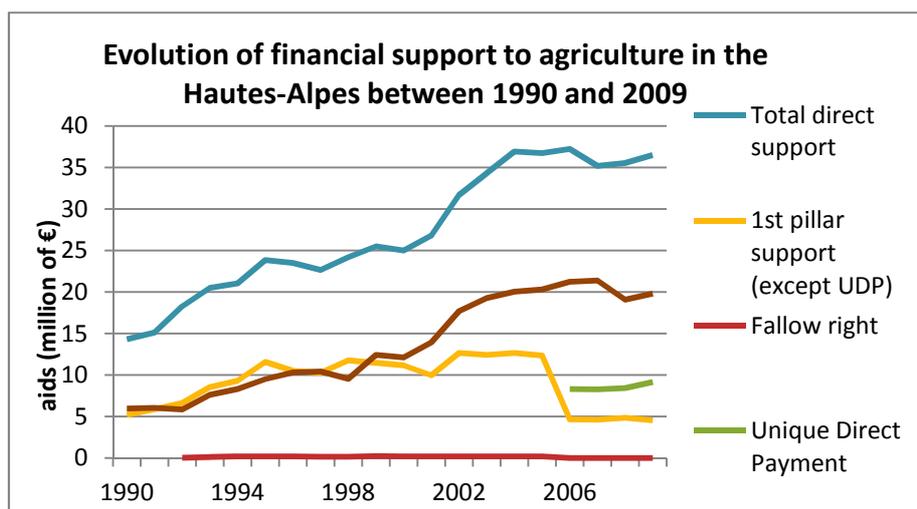


Figure A 6: Graph representing the evolution of the CAP support for the department of the Hautes-Alpes over the period 1990-2009 (data from agricultural accounts, 2012)

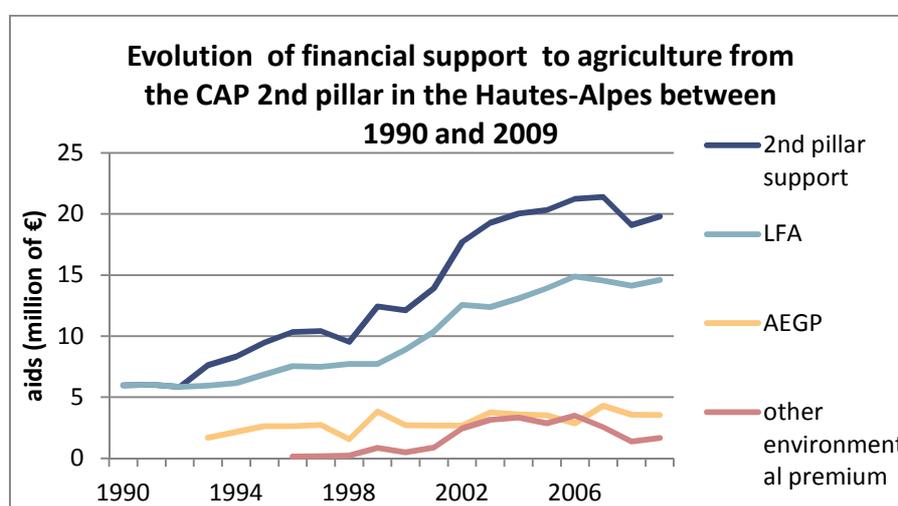


Figure A 7: Graph representing the detailed evolution of the CAP support from the 2nd pillar for the department of Hautes-Alpes over the period 1990-2009 (data from agricultural accounts, 2012)

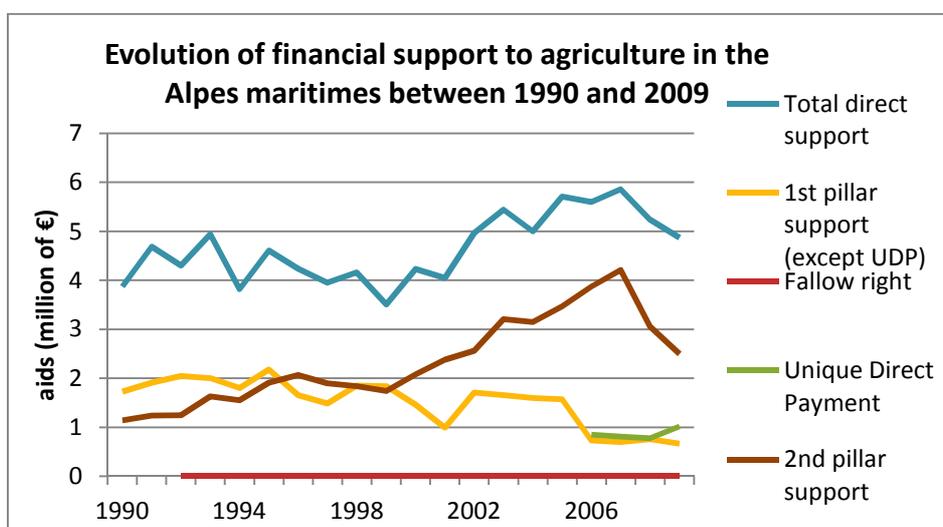


Figure A 8: Graph representing the evolution of the CAP support for the department of the Hautes-Alpes over the period 1990-2009 (data from agricultural accounts, 2012)

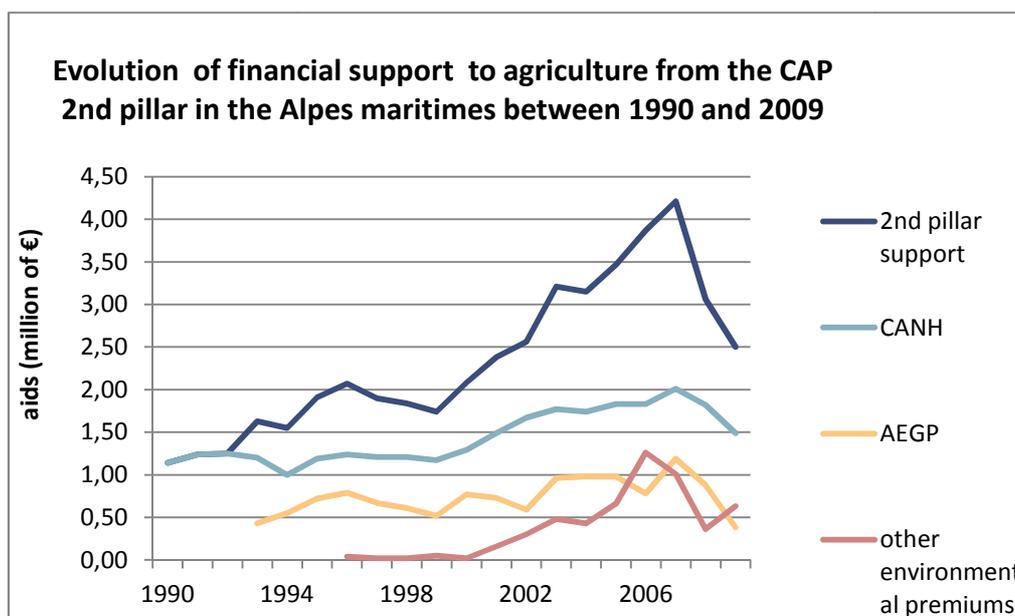


Figure A 9: Graph representing the detailed evolution of the CAP support from the 2nd pillar for the department of Alpes de Haute Provence over the period 1990-2009 (data from agricultural accounts, 2012)

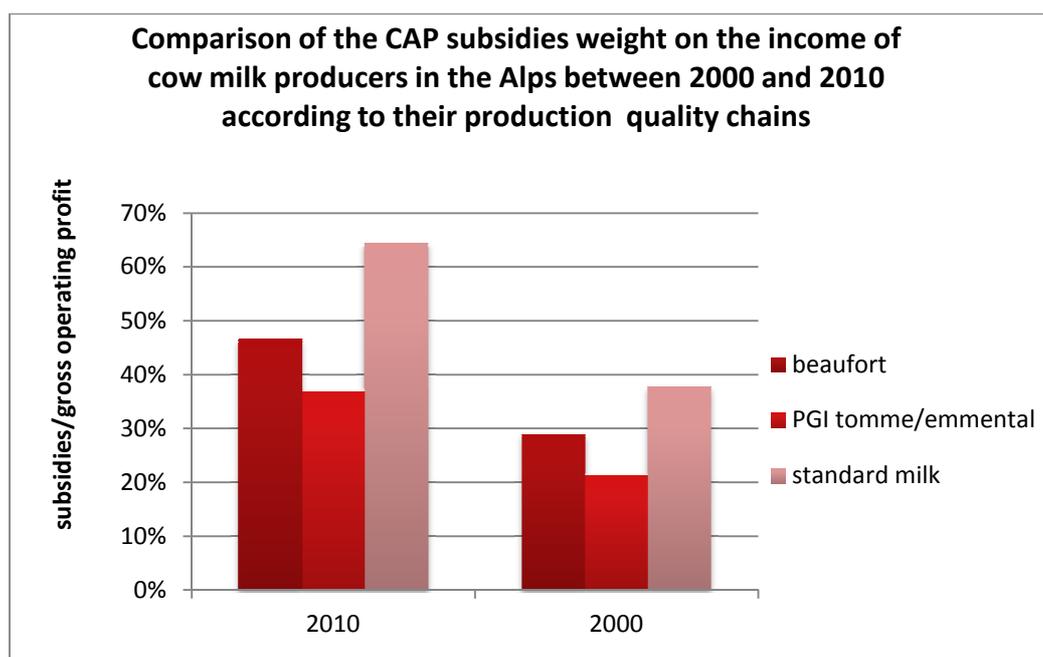


Figure A 10: Evolution of the proportion of the CAP financial support in the dairy cow farms income, expressed as the gross operating profit, between 2000 and 2010 for some alpine quality chains: the Beaufort PDO, the Tomme/Emmental PGI and the standard milk (data from agricultural accounts, 2012 and "réseau d'élevage", 2000 and 2010)

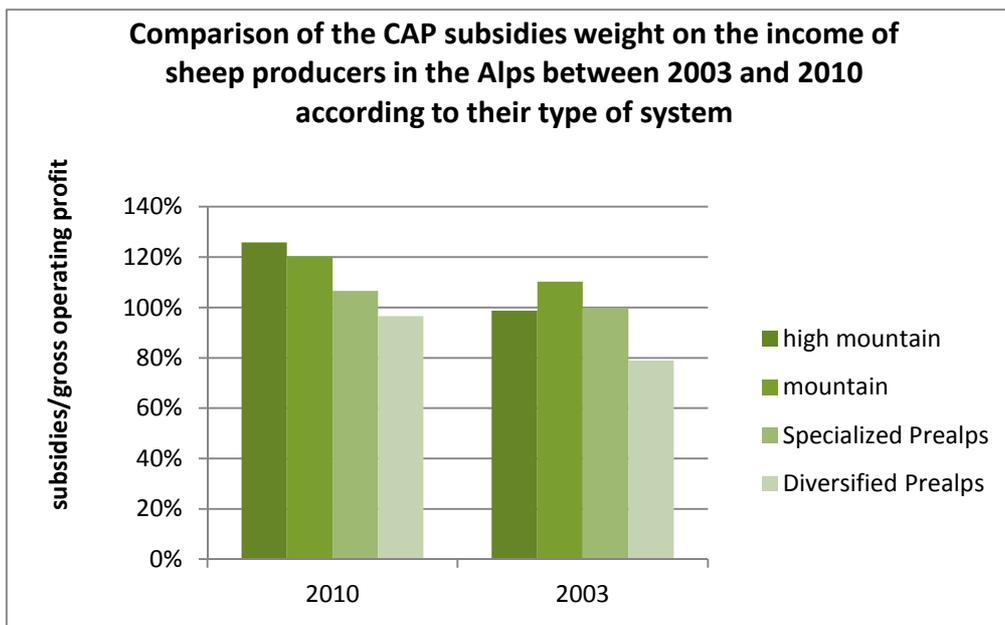


Figure A 11: Evolution of the proportion of the CAP financial support in the sheep farms income, expressed as the gross operating profit, between 2000 and 2010 for the main alpine sheep farming systems: the farms located in high mountains, in mountains areas, the specialized systems of the Prealps or the diversified farms of the Prealps (data from agricultural accounts, 2012 and "réseau d'élevage", 2003 and 2010)

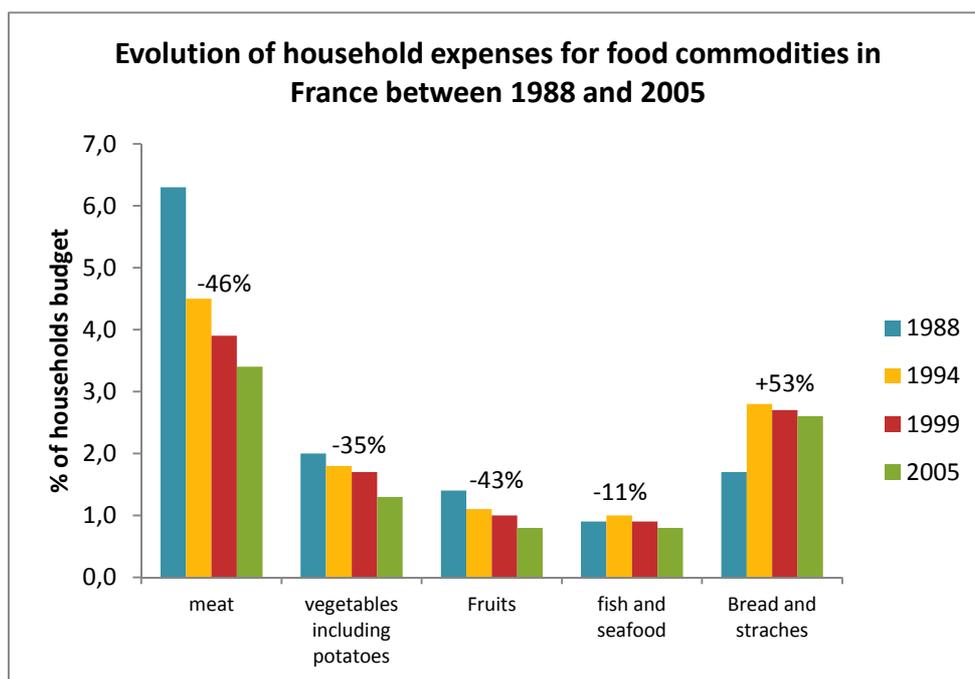


Figure A 12: Evolution of household expenses for food commodities in France between 1988 and 2005 and their percentages of evolution 1988-2005. Data from INSEE, 2008

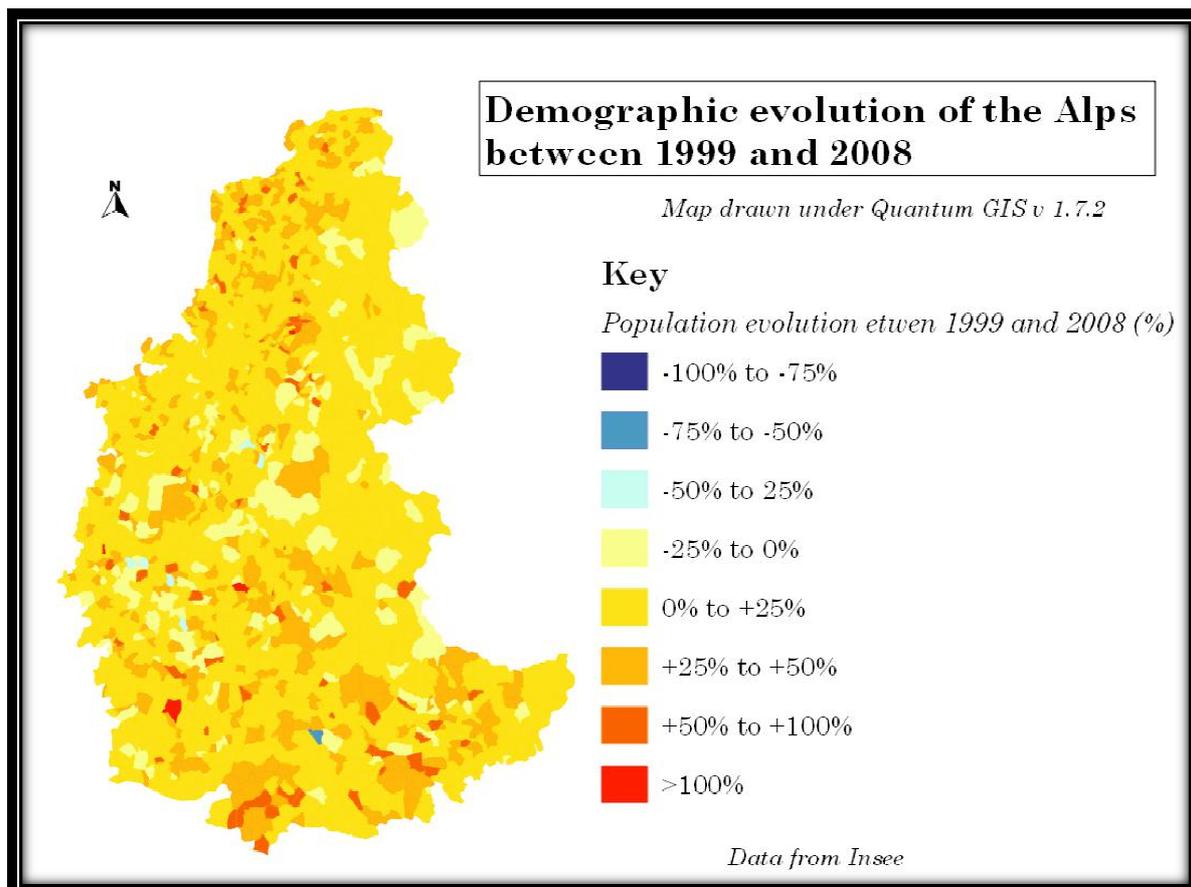


Figure A 13: Map of the demographic evolution of the Alps area over the period 1999-2008, based on the data of the last two national censuses (1999 and 2008)

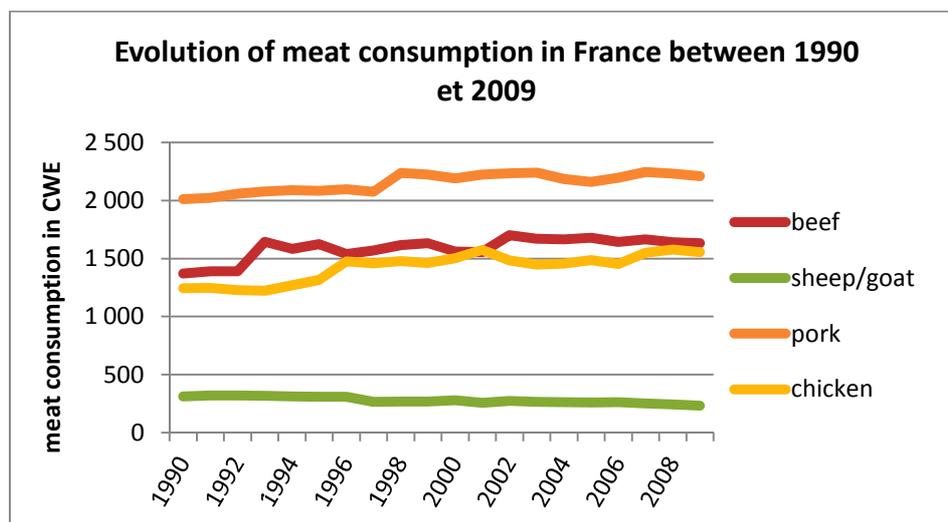


Figure A 14: Evolution of the consumption of different meats, expressed in carcass weight equivalent, over the period 1990-2009 in France (data from Insee)

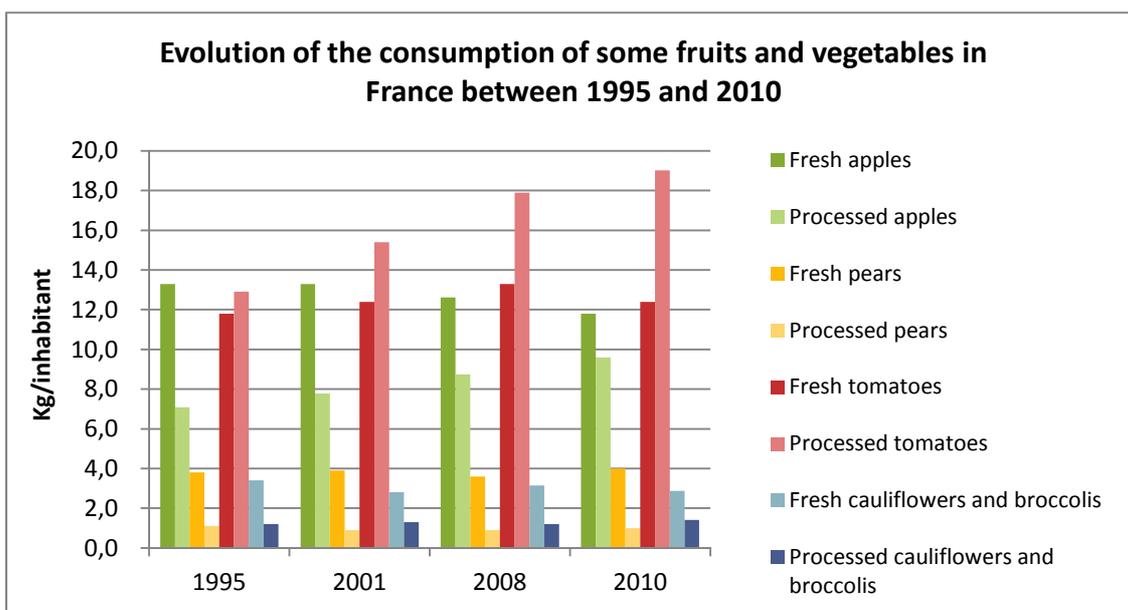


Figure A 15: Evolution of the consumption of some fruits and vegetables in France over the period 1995-2010 (data from Insee)

Table A 2: Evolution of the wolf attacks in the alpine department between 2004 and 2009 from the number victims (95% are sheep, 2% are bovines and 2% are goats) (data from <http://www.loup.developpement-durable.gouv.fr>)

Department	2004	2009	Evolution 2004-2009
26	151	219	45%
38	189	234	24%
73	395	346	-12%
74	13	239	1738%
04	687	378	-45%
05	301	277	-8%
06	1411	1088	-23%
83	41	476	1061%
84	0	4	-

Table A 3: Evolution of the different types of agricultural surfaces in the northern and southern Alps between 2000 and 2010 according to their topographical localisation (HM+M= high mountain + mountain) (data from AC-2010 and AC-2000)¹

zone	Northern Alps				Southern Alps			
	HM+M		Plain		HM+M		Plain	
Surfaces (ha)	2010	2000-2010	2010	2000-2010	2010	2000-2010	2010	2000-2010
Other permanent crops	514	40%	252	10%	439	-18%	341	9%
Other fruits	144	100%	43	4%	60	-60%	70	-9%
Other vineyards	652	-41%	694	-18%	833	-9%	6467	25%
Cereals	33902	-7%	16300	-8%	31780	-15%	14287	-11%
Industrial crops	478	-34%	272	-40%	399	-42%	323	-21%
Flowers	93	126%	16	-62%	45	-31%	235	-9%
Annual forages	6253	-17%	1482	-16%	2614	62%	227	199%
Stones fruits	2403	-12%	893	-20%	3142	-13%	3353	-14%
Pips fruits	829	-10%	244	8%	3746	-11%	906	-35%
Fallow	1682	-56%	1150	-47%	4098	-47%	2806	-44%
Vegetables	613	34%	427	-21%	1247	22%	1019	-23%
Walnut	4976	9%	3745	14%	89	-16%	4	-77%
Oil and proteins crops	2574	-36%	2841	-10%	3323	-28%	2677	24%
Aromatic and medicinal plants	3455	-12%	202	2%	12649	-1%	1171	1%
Artificial/temporary pastures	40999	3%	4895	12%	39498	13%	3446	62%
Permanent pasture	152224	-4%	13576	-6%	36422	-9%	788	-32%
Low productive grassland	127567	-10%	3411	-10%	150531	-22%	8325	-15%
Quality vineyard	3572	4%	4529	-4%	1760	-15%	8372	-32%
Total	383323	-6%	55275	-7%	294734	-15%	54907	-13%

Table A 4: Evolution of the LSU (livestock units) number in the different topographical zones of Alps between 2000 and 2010

Region	zone	LSU2010	Evolution 2000-2010
Northern Alps	High-mountain	42931	-2%
	Mountain	213648	-5%
	Plain	30357	-24%
	All zones	288760	-6%
Southern Alps	High-mountain	57315	-9%
	Mountain	60300	-16%
	Plain	6552	-40%
	All zones	124882	-14%
Alps	High-mountain	100629	-6%
	Mountain	274057	-7%
	Plain	39989	-22%
	All zones	414675	-9%
France	(high) mountain	3513339	-4%
	Plain	18630226	-6%
	All zones	158909720	-2%

Table A 5: Evolution of the rate of pluriactivity in alpine agriculture between 2000 and 2010, expressed as the proportion of farm holders or co-farmers having another living out of the total number of farms (data from AC-2010 and AC-2000)

Region	Zone	Pluriactivity (in %)	
		2000	2010
	<i>year</i>		
Northern Alps	High-mountain	67%	43%
	Mountain	54%	31%
	Plain	52%	31%
	All	55%	33%
Southern Alps	High-mountain	48%	31%
	Mountain	48%	22%
	Plain	55%	22%
	All	51%	24%
France	Mountain	40%	24%
	All	40%	23%

Table A 6: Evolution of the number of alpine farms (NBF) according to their administrative status (EARL, GAEC or individual) and their topographical localisation, between 2000 and 2010 and comparison with France (data from AC-2010 and AC-2000)

Region	Alps								France			
Zone	High-mountain		Mountain		Plain		All		(high) Mountain		All	
Status	NBF	2000-2010	NBF	2000-2010	NBF	2000-2010	NBF	2000-2010	NBF	2000-2010	NBF	2000-2010
EARL	95	150%	783	73%	389	31%	1267	61%	6051	53%	78611	41%
GAEC	277	25%	982	2%	176	-17%	1435	3%	8486	15%	36784	-11%
Individual	2713	-34%	9423	-35%	4284	-33%	16420	-35%	63991	-30%	339898	-37%
All	3144	-29%	11674	-30%	5205	-29%	20023	-29%	80713	-23%	490079	-26%

Table A 7: Evolution of the number of farms (NBF) according to the farmers age, holding size and topographical localisation in e the Alps between 2000 and 2010, and comparison with France (data from AC-2010 and AC-2000)

Alpine zones		High-mountain		Mountain		Plain		France	
Age (in year)	Dimension	NBF	2000-2010	NBE	2000-2010	NBE	2000-2010	NBE	2000-2010
Less than 35	Small	137	-46%	351	-44%	128	-32%	9335	-46%
	Medium	195	-28%	432	-54%	157	-41%	14300	-56%
	Big	33	10%	238	-42%	108	-51%	18377	-49%
35 to 44	Small	322	-45%	837	-49%	285	-45%	22500	-48%
	Medium	345	-24%	948	-38%	325	-39%	33711	-47%
	Big	59	28%	497	-22%	336	-12%	46553	-23%
45 to 54	Small	564	-32%	1509	-38%	558	-33%	41559	-37%
	Medium	473	16%	1317	-20%	493	-23%	55109	-27%
	Big	86	110%	604	29%	403	4%	61872	17%
55 to 64	Small	614	-12%	1747	-23%	741	-26%	54170	-12%
	Medium	276	49%	946	6%	439	2%	40914	9%
	Big	42	-	314	79%	250	19%	31894	90%
65 and more	Small	305	-49%	1355	-51%	949	-39%	50247	-43%
	Medium	22	5%	107	-36%	110	-25%	6499	-24%
	Big	0	-	21	0%	44	10%	2953	11%

Table A 8: Number of dairy cow farms (NBF) selling their milk under quality certification in the Alps and the ratio with the number of dairy cow owners in 2010 (data from AC-2010)

Entities	NBF	Ratio 2010	Ratio 2000
04/05/26/38	263	34%	19%
73HM	361	90%	88%
74HM	249	77%	84%
73/74 M	1129	83%	78%
Alps	2161	71%	61%
France	35104	43%	16%

Table A 9: Number of alpine farms (NBF) selling sheep meat under quality certification and the ratio with the number of sheep owners in 2010 (data from AC-2010, data from 2000 not available)

Entities	NBF	Ratio
38/73/74	34	3%
04/05/06/26HM	106	9%
04/05/06/26/83/84 M	186	28%
Alps	327	10%
France	7836	14%

Table A 10: Evolution of the number of alpine farms (NBF) selling wine under quality certification, and the ratio with the number of vineyard owners between 2000 and 2010 (data from AC-2010 and AC-2000)

Entities	NBF	Ratio 2010	Ratio 2000
73/74	379	64%	47%
04/26/83/84	1937	55%	48%
05/06	20	21%	17%
Alps	2384	55%	44%
France	69490	69%	76%

Table A 11: Evolution of the total surfaces of vineyards in the different basins of production in the Alps between 2000 and 2010 (data from AC-2010 and AC-2000)

Entities	UAA (ha)	Evolution
	2010	2000-2010
73/74	2150	-6%
04/26/83/84	24443	-12%
05/06	119	-34%
Alps	26921	-12%
France	788662	-11%

UAA: unit of agricultural area,