

Dairy farming in Barcelos region

An objective view on dairy farming in this region and proposals to create a more competitive way of farming after abolishment of the milk quotas



Graduation project

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Barcelos, May 2015

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COOPERATIVA AGRÍCOLA DE
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Foreword

This report represents the final work of my study Animal Husbandry at the CAH Vilentum University of Applied Sciences in Dronten. All the activities in order to write this report took place in Portugal. Cooperativa Agrícola de Barcelos is the agricultural cooperation where the graduation internship has been fulfilled. This agricultural cooperative is also the main target group for the results of this report.

It was a nice experience to focus on a dairy area in a foreign country. I have learned a lot from the way of farming in this region, even though the way of farming is completely different from the Netherlands. The most remarkable were the differences I experienced between dairy farms in this region. I visited farms with less than 20 cows but also a farm with 265 cows in production.

My level of the Portuguese language has been improved during my stay in Barcelos since the majority of the farmers don't speak English. I have improved my English writing skills by writing this report in the English language.

I would like to thank all the farmers I visited for their hospitality and their time. Furthermore I would like to thank the employees of Cooperativa Agrícola de Barcelos, and particularly those from the animal nutrition section, who helped me with a lot of practical issues. I would also like to thank the Universidade de Trás-os-Montes e Alto Douro (UTAD) and especially professor Maria José Marques Gomes. UTAD was the institution that made it possible to do my internship at Cooperativa Agrícola de Barcelos. Finally I would like to thank my on-site supervisor Ana Maria da Silva Torres and my educational supervisor Daan Westrik for the support, advices and tips related to this graduation project.

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Summary

This report covers proposals to create a more competitive way of dairy farming in the municipality of Barcelos after abolishment of the milk quotas in April 2015. In the future these dairy farms will have to face with more heavy fluctuations of the milk price. Also fluctuations in the price of concentrate feeds are likely to occur in the future. This will probably lead to a decrease in the amount of dairy farmers in this region, a development which already has been going on for a long time.

An intern and extern analysis of dairy farming in the municipality of Barcelos has been conducted. This analysis gave insight in the strengths and weaknesses of dairy farming in this region. The excellent growing conditions for corn silage make it possible to reach high forage yields of this crop. This makes an intensive farming method possible. On the other hand a certain amount of concentrate feed is required to complete the diet. This leads to relatively high feeding costs. This intensive farming method, in general without grazing, may also have negative influences on the social acceptance of the local dairy sector. Beside the intern and extern analysis an interview has been hold among 29 dairy farmers located in the municipality of Barcelos. This interview gave insight in the different future plans of the farmers and made it possible to distinguish farmers into different groups. Four different groups of farmers are characterized; the conservatives, small optimizers, optimal farmers and the growers. A remarkable outcome is that 25% of the interviewed farmers don't have a successor to take over the farm. The other farmers have a successor to take over the farm or for some farmers this is not relevant at this moment since they just took over the farm.

It became clear that for all groups of farmers there are opportunities to become more competitive in the future. For all of these farmers it is important to reduce the total production costs and to realize a higher total income. Examples of future strategies for the conservatives are savings of machine costs and expanding of the winery activities. For optimizers the strategy contains realizing a higher feeding efficiency and also this group of farmers can save machine costs. For the optimal farmers changes in the fodder management and crop differentiation can create a more competitive way of dairy farming. The growers are recommended to solve and prevent overpopulation in the barn and to realize a gradual growth in the amount of cows.

In the future extra research is needed for crops that can replace corn silage partly, without losses in forage yields and nutritional value. This crop differentiation is necessary in the future in order to fulfill the greening requirements of the Common Agricultural Policy. Despite opportunities for improvement, it is expected that the amount of dairy farmers in the municipality of Barcelos will decrease in the future. Partly due to farms without a successor, but also due to a small group of farmers which are not prepared for the future and thus are not competitive enough to compete with other farmers in the municipality of Barcelos and in Europe. However, the total milk production of the municipality of Barcelos is not likely to decrease since there will also be farmers that increase their total milk production and this will compensate for the farmers that quit their business.

1. Introduction

1.1 Abolishment of milk quotas

In April 2015 the milk quotas of the European Union will be abolished. This can have serious effects for the dairy farmers in the European Union. The competition between farmers will increase due to the end of market restrictions (Stocks, 2015). In the production year 2013/2014 eight countries in Europe were forced to pay milk quota fines due to exceeding the limits of the milk quota (Taverner, 2014). This is an indication for a possible potential expansion of the milk production in these countries after April 2015.

Portugal was not among these eight countries, the total milk production in Portugal during the production year 2013/2014 was 1.777.122 tons. The available quota for this period amounted 2.080.101 tons. So the total milk production was 302.979 tons below the given limitation (Waite and Chiriac, 2014). This resulted in not having to pay milk quota fines for farmers that exceeded the quota. There exists anxiety that many Portuguese dairy farmers have to end up their farm after abolishing of the milk quota due to the competitive position of the dairy farmers in Northern Europe (Luijmes, 2014). This is also relevant for the farmers in the municipality of Barcelos, a region in the North-West of Portugal where dairy farming is the most important way of agriculture (Cooperativa Agrícola de Barcelos, 2015).

1.2 Intensive farming method

The municipality of Barcelos and its region contains many dairy farms, many of these farms are relatively small and these farms are typical for an intensive method of farming. This means these farms produce a high amount of milk per hectare. A Portuguese study defined the scale of these farms located in North-West Portugal, a milk production of 24.360 kg/ha was defined as medium intensive, 34.240 kg/ha as intensive and 46.600 kg/ha as very intensive (Fangueiro et al., 2008). Since 1989 the number of dairy farms in this region has been decreasing due to specialization (Fangueiro et al., 2008). The North-West region of Portugal faced with a decline of 70% in the number of dairy farms between 1989 and 1999. The total amount of cows decreased with 10% during this period, but the milk production increased with 20% (Instituto Nacional de Estatística [INE], 1999). Consequently, this region contains many intensive farms.

This intensive method of farming is possible due to the climate, which makes high forage yields possible (Fangueiro et al., 2008). All farmers in this region make use of a double-cropping forage system. Corn silage is grown from May till October. In October Italian ryegrass is used as a winter crop. This winter crop is cut one time in May (Trindade et al, 2001). This rotation between corn and grass makes it possible to reach forage yields up to 30 tons dry matter/ha/year (Fangueiro et al., 2008). Consequently, it is possible to feed up to 5 cows per hectare (Chatellair and Pflimlin, 2006). The main component of the diet of the cows is corn silage. High corn silage rates in the diet carry an increased risk for metabolic diseases, in particular displaced abomasum and rumen acidosis (Van der

Knaap, 2005). Therefore extra attention to the quality of corn silage and a source of effective fiber in the diet is very important (Linn, 2003).

Total mixed rations prepared by an unifeed¹ are a common way of feeding the cows in the medium and above-medium scaled farms in this area. Due to the high availability of corn silage, concentrates and often straw are imported to create a balanced diet (Chatellair and Pflimlin, 2006). Furthermore a serious part of the farms in this area is small scaled or the facilities to keep the cows are old and outdated which can limit the efficiency of the production. So these factors can be a reason for existence of anxiety that many Portuguese dairy farmers have to give up their farm after abolishing of the milk quota due to the competitive position of the dairy farmers in Northern Europe (Luijmes, 2014). Therefore, the central question to be answered will be as follows:

How to create a more competitive way of dairy farming in the region of the municipality of Barcelos after the abolishment of the European milk quota in April 2015?

To answer this question the following sub questions are formulated:

What is the actual way of dairy farming in Portugal?

What are important differences between dairy farming in the municipality of Barcelos and dairy farming in Portugal based on internal aspects?

What are important differences between dairy farming in the municipality of Barcelos and dairy farming in Portugal based on external aspects?

What different types of dairy farmers can be defined in the municipality of Barcelos?

What are the future plans of the dairy farmers in the municipality of Barcelos?

What are possible strategies and scenarios for the future and which effects and consequences do they have?

What are the opportunities for improvement on operational farm management for farmers that have a strategy to optimize their farm?

1.3 Objective

The objective of this report is to give possible solutions, measures and advice in order to make dairy farms in the region of the municipality of Barcelos more competitive after the abolishment of the European milk quota in April 2015. These solutions, measures and advises will be formulated regarding to the actual situation of the farms and the types of farmers. These solutions, measures and advises are part of different strategies that are farm specific. The opportunities for improvement on operational level are suitable for farmers that want to optimize their farm, since there are still opportunities for improvement for many farmers in this region. The most important findings will be presented to Cooperativa Agrícola de Barcelos, and thereafter these findings can be distributed to

¹ Name of mixing-wagon used to prepare the ration of the cow

the clients of this cooperative. Most of the clients are visited once or twice a month by the cooperative, so the findings can be distributed to the clients quickly after presenting these findings. The clients can use this information to prepare or react to the situation after the abolishment of the milk quota. After the abolishment of the milk quota some farmers have to take action because otherwise their business might become unprofitable. An example could be doing some investments or start other activities to create a more profitable business.

1.4 Scope

The main target groups are the dairy farms in the region of the municipality of Barcelos. The scale of these farms is smaller than for example the farms in the south of the country. Though this research is not only focused on the dairy farms in Barcelos. It is also placed in a wider view. Dairy farming in Portugal and Europe will also be taken in account since the abolishment of the milk quota is relevant for all countries of the European Union. Attention will be paid to the improvement of the technical results of the farms, since the strategy for some farmers is to optimize their farm. Detailed insight in the actual financial situation of the farms is not strictly necessary in order to show up with good advices. But example calculations can be done to show the effect of implementing certain measures or choices.

1.5 Material and methods

To answer the question 'What is the actual way of dairy farming in Portugal?' several websites on the internet will be consulted. Eurostat offers statistical information about dairy farming in Europe, and also in Portugal. On the internet reports are available which contain information about the manure policy in Portugal. The website of 'Instituto Nacional de Estatística' contains more specific statistical information about the Portuguese agriculture. During the graduation internship several conferences have been visited. A congress hold by the main milk processor and a congress about animal science gave insight in actual issues of dairy farming in Portugal.

To investigate the important differences between dairy farming in the municipality of Barcelos and dairy farming in Portugal, data of dairy farming in the municipality of Barcelos will be collected. Agribar², the company where the graduation internship has been fulfilled has many clients in the municipality of Barcelos. Information, results and data of these farmers will be consulted to describe the actual way of dairy farming in this municipality. This is for example information about scale, intensity, crop rotation, distribution of milk and productivity. Agribar has also intern reports available about history and the development of the dairy sector in the municipality of Barcelos.

To distinguish different types of dairy farmers, a research of Van der Ploeg about different kinds of farmers and the choices they make will be consulted. To define these different kinds of farmers a small inquiry will be hold among the farmers that are visited during the graduation internship. The number of different farmers that are going to be visited will be around 30. The inquiry contains for

² Cooperativa Agrícola de Barcelos

example questions about investments over the past years, the intensity of the farms and the amount of working hours required to fulfill the activities on the farm. To obtain information about the future plans of these farmers, questions about future plans and the availability of somebody to take over the farm will also be included. These questions will be prepared in English but also in Portuguese. The formulation of these questions in Portuguese can be done in cooperation with Agribar.

In order to obtain information about future scenarios, information on the internet about speculations about the milk market after the abolishment of the milk quotas will be consulted. An analysis of the different farms in different situations will give insight in which strategy fits the best for each situation. Example calculations will be done to show the effect of implementing certain measures or choices. These are for example the reductions or savings in costs that are realizable after action has been undertaken.

In four farms a practical introduction period for more or less one week will be fulfilled to get insight in the daily management of these farms. During this period the management of these farms will be analyzed and this gives opportunities to formulate advices for farmers that have a strategy to optimize their farm in the future.

1.6 Structure

In the next chapters will become clear how farmers in the region of the municipality of Barcelos can create a more competitive way of dairy farming after the abolishment of the European milk quota. In the upcoming chapter the characteristics of dairy farming in Portugal are outlined. The third chapter focuses on dairy farming in the region of the municipality of Barcelos. Strong aspects will be outlined, but there will also be paid attention to weaknesses of the farmers in this region. Both internal and external aspects are analyzed. Chapter four describes the different future scenarios. Different scenarios after abolishment of the milk quotas are analyzed. At the end a SWOT-analysis has been conducted. The outcomes of this analysis are action points which help in forming future strategies for the farmers. Chapter 5 describes the different kinds of dairy farmers. For each group of dairy farmers a different future strategy has been formulated. In the discussion findings from this research are compared to references from the literature. This report ends with a conclusion and recommendations which answer the central question.

2. Dairy farming in Portugal

In this chapter the characteristics of dairy farming in Portugal will be discussed. Attention will be paid to the manure policy, the economical results, antibiotic policy, efficiency and productivity of the farms. These factors are compared on European level. Also the influences from the Common Agricultural Policy will be discussed in this chapter. The goal of this chapter is to get a bright view of dairy farming in Portugal. Later in this report the outcomes of this chapter will be compared to dairy farming in the municipality of Barcelos.

2.1 General information

The total milk production in Portugal during the production year 2013/2014 was 1.777.122 tons. The available quota for this period amounted 2.080.101 tons. So the total milk production remained 302.979 tons below the given limitation (Waite and Chiriac, 2014). This resulted in not having to pay milk quota fines for farmers who exceeded the quota. Portugal has different regions that are specialized in milk production. A division into different parts is showed in figure 2.1. The Norte is the biggest region for milk production with a total production of 704.640 tons of milk in 2013. The second biggest milk production regions with a total milk production of 596.549 tons are the Açores, an island group located in the Atlantic Ocean. The Algarve is the region with the lowest annual milk production. The milk production in this region contained 0,276 tons over the year 2013.

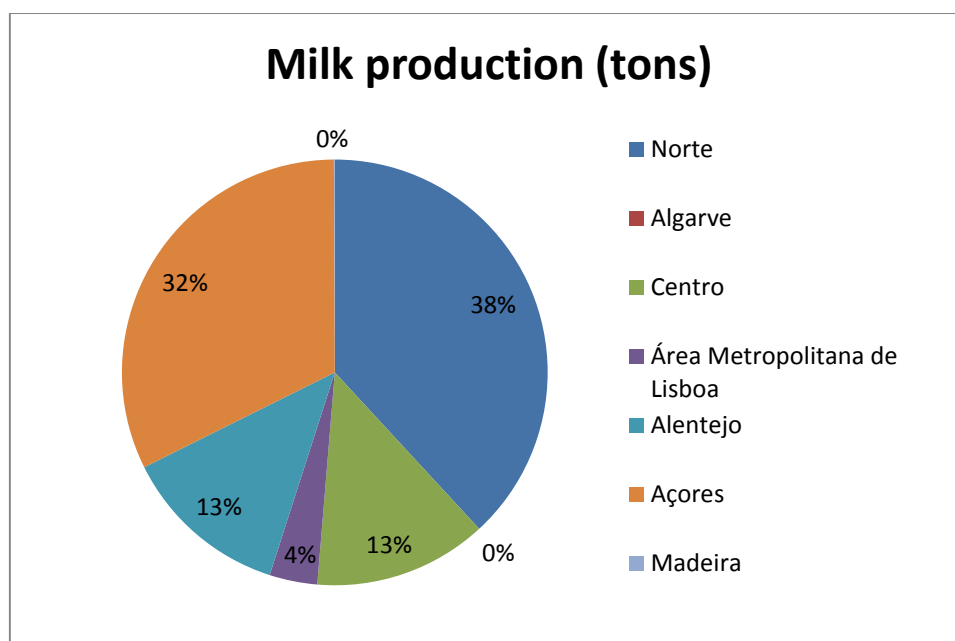


Figure 2.1 Milk production divided over different parts of Portugal (Eurostat, 2015b).

Figure 2.2 shows the distribution of milk quotas over the different areas of Portugal. The dark areas are the areas with higher milk quotas and consequently this are the areas where most of the dairy farms are located. According to figure 2.2 the dark part in the North-West of the country is the main part of the country for milk production. But most of the farms in this region are not big-scaled. An explanation for the high total production of milk is the high amount of farms in this region. The average annual milk production of these farms is 174 tons (Cardoso and Pimentel, 2008). The North-

West region of the country accounts for more than three quarters of all milk producers in Portugal and for more than two thirds of the total delivery of milk (Costa and Sottomayor, 2013). In the area of Lisbon the farms are larger. The average farm size in this region is 766 tons of milk delivered a year (Cardoso and Pimentel, 2008). In Alentejo the average scale of the farms is 687 tons of milk delivered a year (Cardoso and Pimentel, 2008).

Figure 2.3 shows the share of the dairy value over the total agricultural value. In the North-West there are regions where the share of the dairy value contains more than 40% of the total agricultural value (Cardoso and Pimentel, 2008). In other regions the dairy value is lower than 5%. These regions are often more known for other products with a high agricultural value like wine, fruit and vegetables (DG Agriculture, 2003). In total, milk forms 11,8% of the total agricultural output of Portugal (European Commission, 2014).

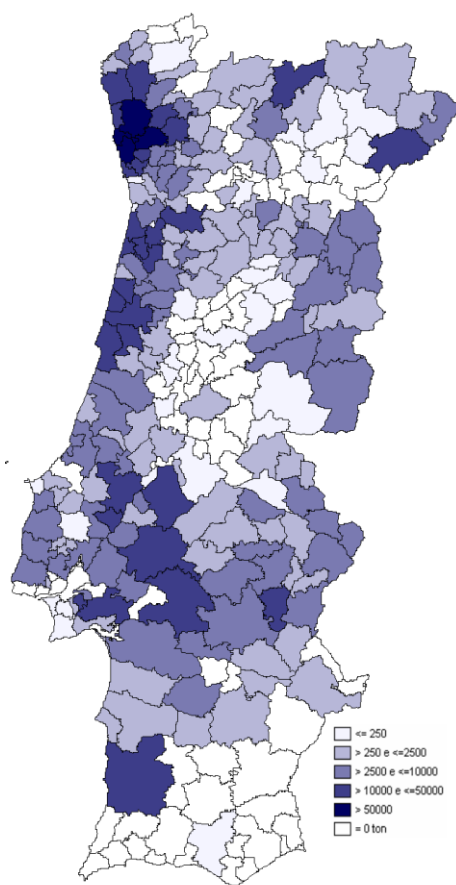


Figure 2.2 Quota distributions over different areas of the mainland of Portugal (Cardoso and Pimentel, 2008)

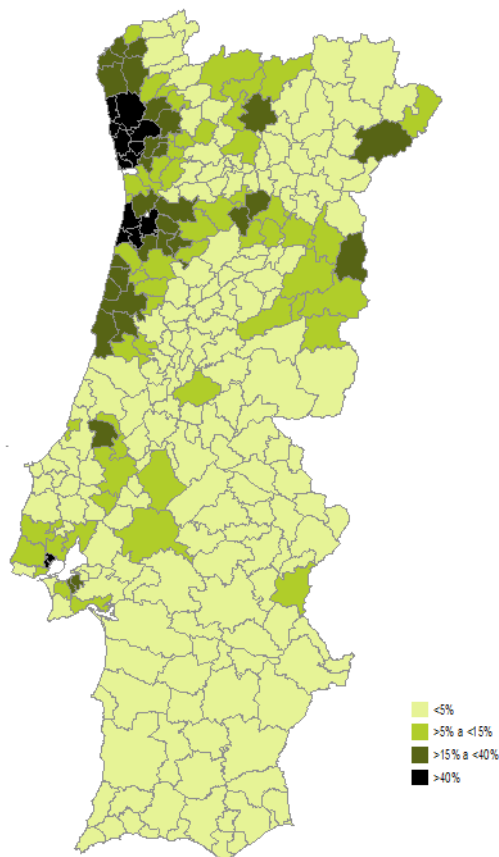


Figure 2.3 The share of the dairy value over the total agricultural value (Cardoso and Pimentel, 2008).

In the case of the milk that is delivered, there are differences in the composition. The fat content of the delivered milk in Portugal is by average 3,79%. The average fat content over all of the European countries is 4,04%. Also the protein content of the milk is lower than average. The average protein content in the milk delivered by Portuguese farmers is 3,26%, the average from the other European

farmers is 3,37% (Eurostat, 2015a). Yet, an average 305 day production of 7.874 kg milk per cow in Portugal is quite high. The milk production per cow in Portugal is for example higher than in the Netherlands, where a milk production of 7.537 kg is the average. In Europe only the Scandinavian countries Denmark, Sweden and Finland realize a higher milk production per cow than Portugal (Delaval, 2013).

2.2 Economical, market and distribution aspects

In 2011 the average consumption of liquid milk in Portugal per capita contained 77 kg. The milk consumption has been declining over the past 4 years. In 2007 the milk consumption contained 92 kg per capita (Chevalier et al., 2013). However, this is higher than in the European Union, where the average milk consumption contained 64 kg in 2011 (Chevalier et al., 2013). Portugal is self-sufficient in the production of raw milk. The self-sufficiency ratio is around 105% at this moment (Hanson, 2011). The dairy industry is focused on the production of milk for the national market, therefore a decline in milk consumption, as mentioned before, can have serious effects on the milk market in Portugal (Hanson, 2011). Portugal is known for cheese making, especially the Azores (Hanson, 2011). However, Portugal is not self-sufficient for cheese production. The self-sufficiency ratio for cheese amounted 64 in 2008 (Chevalier et al., 2013). Most of the imported cheese had its origin from Spain. Portugal exports cheese and milk to Spain, some African countries like Angola, Cape Verde, Morocco and Algeria but also to emigrant communities in France, Switzerland, Venezuela, the United States and Canada (Hanson, 2011). Spain is the main target country for export, 95% of all the exported milk fluids had their destination in Spain (Hanson, 2011). Also for cheese Spain is the main export country (Hanson, 2011).

The percentage of the milk produced by Portuguese farmers that has been delivered and processed by dairy enterprises amounted 87% in 2011 (Chevalier et al., 2013). This is higher than the average of the European Union, where 75% of the produced milk was delivered and processed by dairy enterprises (Chevalier et al., 2013). Therefore in Portugal the majority of the milk is processed by dairy enterprises and a small part is distributed by other channels, by for example direct sales. According to Chevalier et al. (2013), Portugal has a relatively strong and stable industrialized milk sector. The biggest processor, Agros, has a share of approximately 25% of the total milk market. In Europe, by average on national level, the biggest processor has a share of approximately 75% of the national milk market (Chevalier et al., 2013). Other smaller processors are also active in Portugal. Cooperatives play an important role in processing of milk in Portugal, more than 80% of the delivered milk has been processed by cooperatives (Chevalier et al., 2013). Private companies are from minor importance in processing of milk in Portugal (Chevalier et al., 2013).

2.3 Climate, land use and forage production

In Portugal there are differences in dairy farming between regions due to the climate. The climate has some influences from the Atlantic Ocean. The climate type is a Mediterranean climate. The winters are cool and rainy, but the summers are hot and dry (Weeronline, 2015). In the North there is more rainfall than in the South, where sometimes problems occur due to drought. The annual

rainfall in some parts in the South of the country is less than 406 mm a year (Interfarms, 2015). The mainland has higher temperatures in the summer than the Western-part of the country where a cooling sea wind is often present. In general, according to the climate, the conditions for dairy farming are the best in the North-West of the country. In the mainland in the South, dairy farming is also possible when the cows are protected for the high temperatures and when the farmer makes use of irrigation and a good manure management (Interfarms, 2015). Without irrigation in this region, seeding of new grassland is necessary every year (Interfarms, 2015). With irrigation the climate makes it possible to make use of a double cropping system. This means that it is possible to grow forage crops during the whole year. In the North-West of Portugal a common application of dual cropping is a combination between corn and Italian Ryegrass. Corn silage is grown from May till October. In October Italian ryegrass is seeded and functions as a winter crop. This winter crop is cut one time in April or May (Trindade et al, 2001). This rotation between corn and grass makes it possible to reach forage yields up to 30 tons dry matter/ha/year (Fangueiro et al., 2008). Consequently, it is possible to feed up to 5 cows per hectare (Chatellair and Pflimlin, 2006).

2.4 Use of antibiotics

In the European Union reduction of the use of antibiotics for farm animals is an important action point. Over the past years the sales of veterinary antimicrobial agents in Europe have been declining. Between 2010 and 2012 the overall reduction in the sales of veterinary antimicrobial agents in Europe contained 14,9% (ESVAC,2014). In Portugal, from 2010 to 2012 the total sales of veterinary antimicrobial agents in mg/PCU³ have been decreased by 12% (ESVAC, 2014). In contrast, in the Netherlands the reduction for this period was 49% (ESVAC, 2014). Sales of some antibiotics have been decreasing due to better housing and better animal welfare. Other explanations for a decline of the use of antibiotics in Portugal are an increase in the use of pre- and probiotics, more use of vaccinations, the use of newly market vaccines and a better control of the drinking-water quality (ESVAC, 2014). The total use of antibiotics for veterinary use in Portugal contained 157.1 mg/PCU, approximately 25% of these antibiotics were used in cattle (ESVAC, 2014). In figure 2.4 the differences in use of antibiotics in mg/PCU between several European countries are showed. Figure 2.4 shows that the sales of antibiotics in Portugal are much lower than in for example neighbor country Spain, where the total sales of veterinary antimicrobial agents contained 242,0 mg/PCU (ESVAC, 2014). But still, Portugal is at the seventh spot in total sales of veterinary antimicrobial agents and therefore there are reasons for reducing the antibiotic use in farm animals (ESVAC, 2014). For example, Norway has a total sale of veterinary antimicrobial agents of only 3,8 mg/PCU (ESVAC, 2014).

According to the European Surveillance of Veterinary Antimicrobial Consumption (ESVAC), a further reduction in the use of in particular the antibiotics fluoroquinolones and cephalosporins is important, since they are also important for human medicine (Benstetter, 2014). In the future Portugal has to focus on the reduction of the use of fluoroquinolones, since the use of this antibiotic increased over the period 2010-2012 and Portugal is the second country in the total sales of this type of antibiotics (ESVAC,2014).

³ In order to normalise the sale data, a population correction unit (PCU) is used (ESVAC, 2015)

At this moment Portuguese farmers have to register every use of antibiotics for farm animals. There are differences between antibiotics that are allowed to be used by the farmer and antibiotics that are used by a veterinary only. In the future a further decline in the use of antibiotics might be possible, since the Netherlands also succeeded in this (ESVAC, 2014). For example the implementation of the 'UDD-status' may cause a further reduction in the use of antibiotics. This UDD-regulation only allows the use of antibiotics by veterinarians. Only under certain conditions the farmers are allowed to provide antibiotics to the animals (De Groot, 2014).

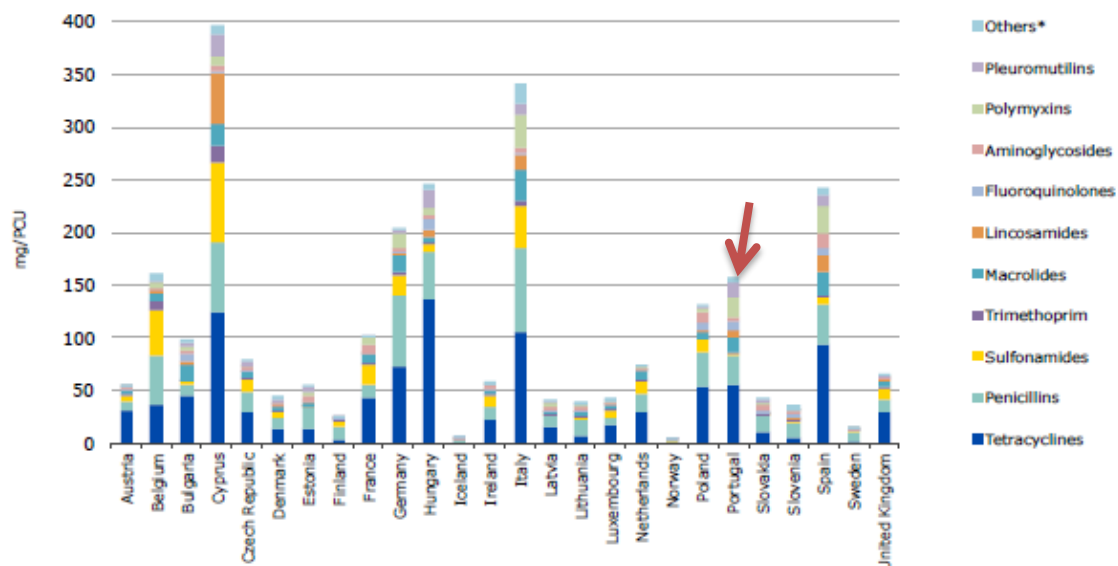


Figure 2.4 Sales of veterinary antimicrobial agents of different countries in the European Union (ESVAC, 2014).

2.5 Manure policy

2.5.1 Nitrates directive

Since Portugal is a member of the European Union, this country has to face with the directives and regulations from the European Union. The actual directives are described in the nitrates directive, the actual version of the nitrate directive is valid from 2014 till 2017. The main aim of the nitrates directive is to protect the water quality across Europe by preventing nitrates from agricultural sources polluting ground and surface waters and by promoting the use of good farming practices (European Commission, 2015b). One important goal is a maximum of 50 mg/l of nitrates in the groundwater (European Commission, 2015b). Nitrate vulnerable zones are designed to identify areas of land that are sensitive for pollution of nitrates. In these regions extra measures are necessary in order to maintain a good water quality. Examples of good farming practices are requirements for a minimum storage capacity for livestock manure or crop rotations and catch crops to prevent nitrate leaching (European Commission, 2015b).

2.5.2 NVZ-areas

The good farming practices are mandatory in the NVZ⁴-areas. Other measures that have to be implemented in NVZ-areas are limitations of organic- and mineral fertilizer applications. The manure application from livestock in these regions is limited to 170 kg N/ha (European Commission, 2015b). Portugal has 8 NVZ-areas, which form a total area of 3.039 km² and consist of 3,5% of the mainland area (Silva, 2007). These NVZ-areas are showed in figure 2.5. One NVZ (ZV5) is located east from Lisbon and is the biggest NVZ-area in Portugal. Figure 2.5 also shows some other small NVZ-areas located next to the west-coast, in the Algarve and in the central part in the South of the country.

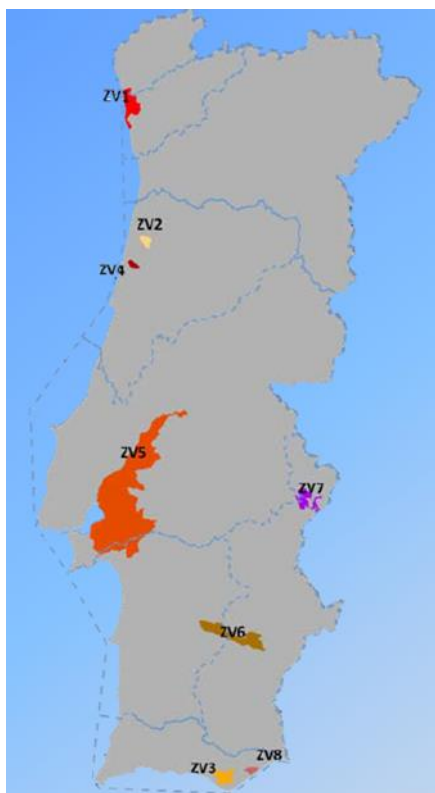


Figure 2.5 Map with Nitrate Vulnerable Zones in Portugal (Silva, 2007).

Some countries in the European Union like the Netherlands, Denmark and Germany are totally identified as NVZ-areas, therefore the manure policy in those countries is stricter than in Portugal (Schils and Velthof, 2011). In Portugal only farmers located in a NVZ-area have to comply with the Action Programme (Schils and Velthof, 2011). All Portuguese farmers have to record data on nitrogen management and they have to submit this data to the authorities (Schils and Velthof, 2011). Examples of submitted data are a fertilizer plan, manure management plan and a soil and crop analysis. Yet, the Portuguese government designed national legislation on cattle husbandry and environment in 2005 that covers the whole country. This legislation includes limitations for slurry use, also in non-NVZ areas. But there is still more information about nutrient use and nutrient management needed to define new strategies in the future to limit the environmental impact of dairy farming (Fangueiro et al., 2008). Outside the NVZ-areas for example, it is normal to spread the livestock manure without an injection system. This is allowed, but this way of application the manure

⁴ Nitrate Vulnerable Zones

isn't without risks, since many land is located in highly populated areas. So complaints about smell could arise by the local inhabitants.

2.5.3 Implementation in Portugal

The manure policy from the European Union has its effects on the agriculture in Portugal. For instance, the application of N by manure has decreased with more than 10% in Portugal over the period 2008-2011 (European Commission, 2013b). Over the period 2008-2011, approximately 20% of the sample points in Portugal reported a nitrate concentration above 50 mg/l in the ground waters. The European average for this period was approximately 15%. In Portugal approximately 65% of the sample points reported a nitrate concentration level in the ground waters lower than 25 mg/l (European Commission, 2013b).

The Portuguese government has established some standards/directives for the maximum application of nitrogen for different crops (Ministério da Agricultura, 2012). For ryegrass the maximum N-level for application is set at 150 kg/ha. This maximum is designed for a forage yield of 10 tons of dry matter per hectare. For every ton above this yield they recommend to increase the application of N with 25 kg/ha. For lower forage yields they recommend to discount 25 kg N per hectare. For corn yields of 60 tons per hectare (total yield), the recommended N application is 305 kg/ha. For every increase of 5 ton in forage yield, it is recommended to increase the N application with 25 kg/ha. The Portuguese government has also set up limitations for the time of application from the manure. For forage crops it is not allowed to apply livestock manure during the period from the first of November until the first of February (Ministério da Agricultura, 2012).

2.6 Animal health aspects

In Portugal the IBR-status is positive. This means that not all the farms are IBR-free. National eradication programs haven't been implemented yet (MSD Animal Health, 2015). Portuguese dairy farmers can tackle IBR by a voluntary program (Jorge, 2015). Also Portugal isn't free for the BVD-virus. Portugal has set up some herd-to-herd programmes to control the existence of the BVD-virus. Other countries in Europe, like the Scandinavian countries have set up national or regional programmes to eliminate BVD (Boehringer Ingelheim, 2015). Another difference between Portugal and the Scandinavian and other countries is the use of a voluntary or an obligatory program. Portuguese farmers are not obligated to join programs in order to prevent the occurrence of the BVD-Virus. On the other hand the farmers from some other European countries are obligatory to join these programs (Preto, 2015). Another infection disease that is in a certain way present among the Portuguese dairy cattle is Q-fever, a zoonosis that worldwide appears. In 2013/2014 a study from Ceva Animal Health over 305 Portuguese farms showed that 66% of these farms had animals with the presence of antibodies for *Coxiella Burnetti*, the causer of Q-fever (Pinho, 2015).

2.7 Common agricultural policy

The common agricultural policy has serious influence on the Portuguese agriculture and consequently also on the dairy sector. This already became clear after discussing the manure policy in a previous paragraph. The new CAP is valid during the period 2014 to 2020 and during these years the European Union will invest more than 8 billion euros in the Portuguese agricultural sector and rural areas (European Union, 2014). Portugal is given flexibility by the European Union in spending these 8 billion euros in direct payments and rural development programmes. The direct payments are now based on a payment per ha, instead of payments based on historical references (Jongeneel, 2015). On European level the direct payments in the new CAP will decrease by 3,2%, but for Portugal the 4 billion available for direct payments in the former CAP will be maintained in the new CAP (European Union, 2014). According to the European Union, only farmers that are currently active can benefit from the direct payments.

2.7.1 Greening

To obtain the full income support, farmers need to fulfil the requirements for 'greening'. The share of greening in the total of the direct payments is 30%. Greening contains mandatory practices which are beneficial for the environment and the climate (European Commission, 2015a). The three parameters of greening are: crop diversification, permanent grassland and ecological focus area (European Commission, 2015a). One of the goals is maintaining permanent grasslands. In order to maintain permanent grassland there is set up a ban on ploughing in designed areas. The crop diversification includes measures to increase the biodiversity. Farmers with less than 10 hectares of arable land are not being faced with these measures. However, when the arable land of a farm exceeds 10 hectares, farmers will have to grow at least two crops in order to fulfil the requirements of greening. Farmers with more than 30 hectares of arable land have to grow at least 3 crops. The main crop may cover at most 75% of arable land, and the two main crops may cover a maximum of 95% of the arable area (European Commission, 2015a). According to Westhoek et al. (2012) this implementation of greening won't have a high impact on European farmers. It is estimated that the measure will only impact around 2% of EU arable areas since most arable farmers already grow three crops or more (Westhoek, 2012). However, this implementation of greening will have serious impacts on some dairy farmers in Portugal. This will be described in the next chapter.

2.7.2 Young farmers scheme

For Portugal there is an opportunity for young farmers that invest in their business. They will receive 25% extra income support above the normal payments (European Union, 2014). This will be approximately 84 euros per hectare per year (DARD, 2015). To become a participant of this scheme it is necessary that the young farmer sets up a farm for the first time and this farmer has to be the head of the farm. Furthermore the participant has to be younger than 40 years old. The financial support is available in the first 5 years after the start-up of the farm (European Commission, 2013a). Another requirement is education. The farmer needs to have a qualification in agriculture or a related subject.

2.7.3 Small farmers scheme

Another option for direct income support is the small farmers scheme, which offers financial support for small farmers. Portugal makes use of this option. The small farmers scheme consists of a fixed payment between €500 and €1.250, regarding to the farm size (European Commission, 2013a). Furthermore these farmers will face with less stringent cross-compliance requirements, and are excluded from greening (European Commission, 2013a).

2.8 Conclusion

Portuguese farmers didn't have to pay milk quota fines since the quota was not exceeded over the last years. Though, Portugal is self-sufficient in the production of raw milk. The milk is produced in different milk production regions. The biggest regions for milk production are the North and the Açores. Around Lisboa and Alentejo the farms are the largest in scale. The average fat and protein content of the Portuguese milk is lower than in Europe, but the average milk production per cow is higher than the European average. Portugal is known for cheese making. Spain is the most important export country. Cooperatives play an important role in the processing of milk in Portugal. The climate conditions for dairy farming are the most favorable in the North-West part of the country. With a double cropping system high forage yields up to 30 tons of dry matter/ha/year can be realized. Regarding to the use of antibiotics, a reduction is possible since the total use of antibiotics in some other European countries is remarkable lower. Farmers located in a NVZ-area have to comply with the Action Programme from the European Union which contains limitations in slurry use and good agricultural practices. The common agricultural policy changed direct payments based on historical references into a payment per ha. To obtain full income support, farmers with more than 10 hectares of arable land are obligated to join greening activities. There are also schemes for small farmers and young farmers.

3. Dairy farming in Barcelos region

Instead of chapter 2, this chapter is more focused on dairy farming in the region of Barcelos. In this chapter the characteristics of dairy farming in the region of Barcelos will be discussed. Internal and external aspects will be distinguished. The analysis of the internal aspects like the production costs and management related aspects will get insight in the strengths and weaknesses of the farms in the municipality of Barcelos. Strong aspects will be outlined, but also the factors that may make this region less competitive for dairy production will be discussed. The analysis of the external aspects will show insight in the opportunities and threats dairy farmers in this region have to face with, now and in the future. The goal of this chapter is to give a clear view of dairy farming in the region of Barcelos.

3.1 Location

The region of Barcelos is located in the North-West of Portugal. It is part of the 'Norte' region where 38% of the total milk production of Portugal takes place (Eurostat, 2015b), like described in paragraph 2.1. The location of the municipality of Barcelos is displayed in figure 3.1, indicated by the blue circle. It's located in the North-West region of Portugal. According to figure 2.3 the share of the dairy value over the total agricultural value in the municipality of Barcelos is more than 40% (Cardoso and Pimentel, 2008). Therefore dairy farming is an important section of the agricultural sector in this region.

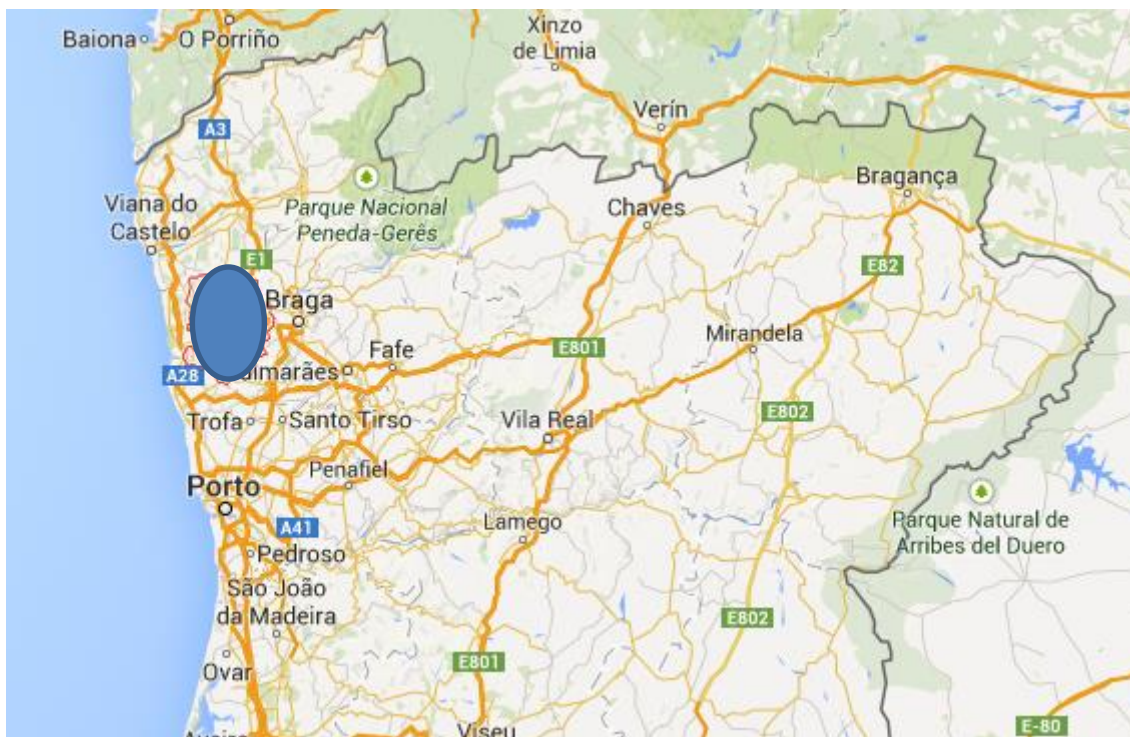


Figure 3.1 The location of the municipality of Barcelos in North-West Portugal.

3.2 Agricultural cooperation Agribar

Most of the dairy farmers in Barcelos deliver the milk to milk processor Agros. Agribar⁵ is the agricultural cooperative from the municipality of Barcelos. It forms the link between the farmers and the milk processor in the dairy chain. Figure 3.2 shows a schematic example of the most common dairy chain in the municipality of Barcelos.

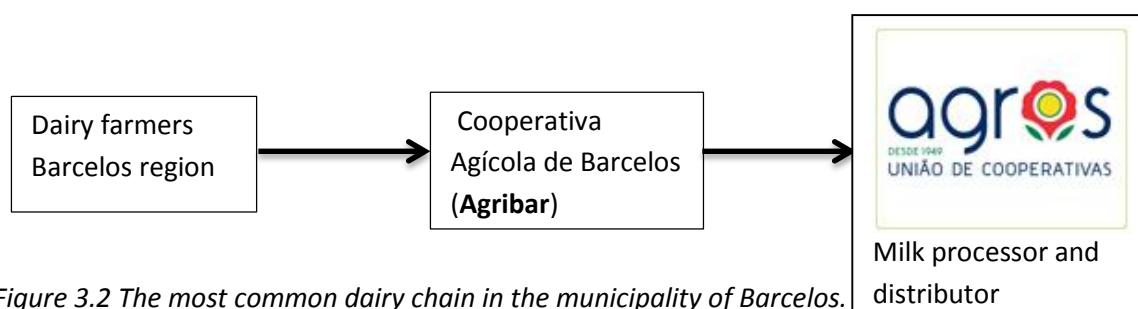


Figure 3.2 The most common dairy chain in the municipality of Barcelos.

Just like on country level the amount of dairy farmers in the municipality of Barcelos has been decreasing over the past years. However, the total amount of milk delivered by the farmers has been increasing over the past years. These developments are shown in figure 3.3 (Agribar, 2015b). The horizontal axis shows the developments over time from 1986 to 2014. The vertical axis shows the amount of producers (N ° produtores) and the total milk production from the member dairy farmers of the cooperative in litres (Produção leite). In 1986 around 48,6 million litres of milk were delivered by the member dairy farmers of the cooperative, in 2014 these deliveries contained more than 145 million litres of milk. Obviously is that since 1986 the amount of dairy farms has been decreasing. Figure 3.3 shows that the cooperative counted more than 4000 producers in 1986. In 2014 this amount has been declining to 403 producers (Agribar, 2015b). These 403 producers are not all the milk producers of the municipality of Barcelos. There are 10 to 20 other farms that deliver the milk to another milk processor than Agros, so these farmers are not connected to the agricultural cooperative of Barcelos.

Agribar is the biggest agricultural cooperation in Portugal, based on the delivered litres of milk by the farmers. The farmers in this region are relatively small. The average amount of milk delivered per member dairy farms is 321.123 litres. These farmers are smaller than for example the farmers in Lisbon area or Alentejo, with an annual milk production of respectively 766 tons and 687 tons (Cardoso and Pimentel, 2008). The produced milk of the dairy farmers in the municipality of Barcelos contained, on average, 3,88% fat and 3,27% protein (Agribar, 2015a). These values are slightly higher than the average of Portugal, with a fat content of 3,79% and a protein content of 3,26% (Eurostat, 2015a). The milk production per cow is higher than the national average. The average 305 day production of the cows in the municipality of Barcelos contained 9.213 kg milk in 2013 (ANABLE, 2013). For this year the national average was a 305 day production of 9.199 kg milk (ANABLE, 2013). The average milk price for the clients over 2014 contained €35,90 per 100 kg milk (Agribar, 2015b). This is a little bit lower than the European average of €37,12 per 100 kg milk over 2014 (European Commission, 2015c).

⁵ Cooperativa Agrícola de Barcelos

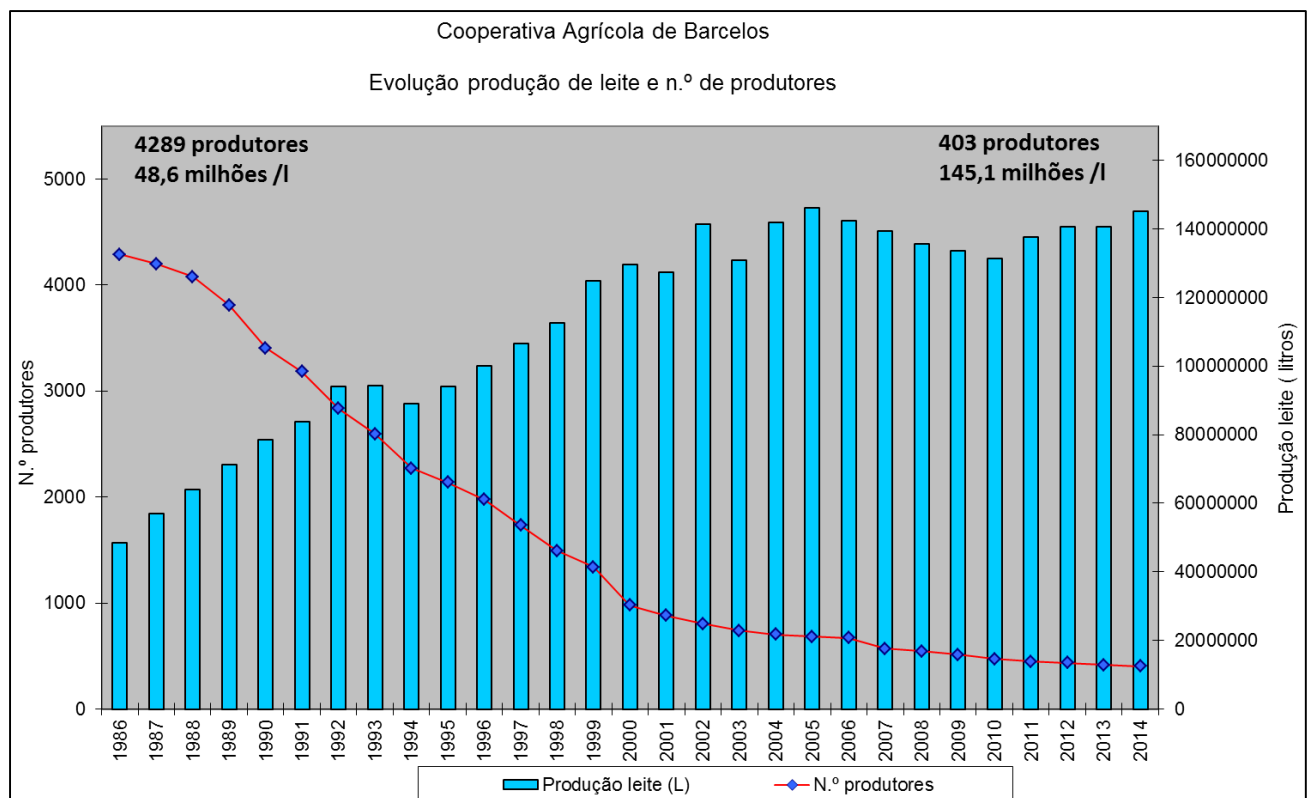


Figure 3.3 Overview of the development of the total milk production and the decrease of the amount of producers in the municipality of Barcelos (Agribar, 2015b).

3.3 Internal aspects of dairy farming

This paragraph describes the internal aspects of dairy farming in the region of Barcelos. Strong aspects and also weaker aspects of dairy farming in this region will become clear.

3.3.1 Forage production and diet

Compared to farms in other parts of Portugal and some other parts in Europe, the farms in the municipality of Barcelos have a strong position according to forage production. In the North of Portugal there is a lot of rainfall in the winter period. In the summer there is also more rainfall in the North than in the South. And when there isn't enough water available due to rainfall, there are enough possibilities to irrigate the crops. As already mentioned before, this means that forage can be grown during the whole year and this results in high forage yields (Fangueiro et al., 2008). The winter crop, Italian Ryegrass, is in many cases conserved in big bales because on the courtyard of the farms there is often not enough space to create a silage bunker for grass-silage. The big bales are stored on the fields and picked up when they are needed. A disadvantage of the forage production is that most of the fields are small in size and are separated by walls. This is the reason why grazing in the region of Barcelos is not very common. Besides that land is scarce and expensive in this region (Chatellair and Pflimlin, 2006). In some cases the Italian Ryegrass is cut twice, once in January and once in April/May. This can lead to higher forage yields and a higher nutritional value of the silage because the silage is cut at a less mature stage.

The main component of the diet of the dairy cows is corn due to the high yields of this crop. Most of the farmers are self-sufficient in forage production, but they have to buy high amounts of concentrate feeds to complete the diet of the cows. Also straw is often imported. The import of these feeding components results in high feeding costs for the farmers in this region. In the year 2003 the feeding costs for specialized dairy farms in the North of Portugal represented 104 euros per ton of milk. These costs were higher than in other European dairy production regions. The average feeding costs of dairy farms in Europe amounted about 80 euros per ton of milk over the year 2003 (Chatellair and Pflimlin, 2006). Grass silage is often only used for the young stock and this crop is in many cases not available during the whole year.

3.3.2 Good infrastructure and cooperation

Another strong aspect is the good infrastructure. The farmers located in the area of Barcelos are situated close to each other. Consequently the infrastructure for delivering the milk is good. The agricultural cooperation which is active in the region of Barcelos can deliver good services to the member dairy farmers, like dietary advices for the cows and help with registration issues or for example applying for subsidies. The cooperative can operate as a central organ, this makes it for example easy possible to communicate changes in the agricultural policy to the farmers. This is particularly relevant for the older farmers.

3.3.3 Labour efficiency and small scaled farms

It is hard to acquire employees that can handle with all the responsibilities of the farm. One dairy farmer with 105 cows in lactation said: "It is hard to find employees with certain responsibilities. I have one employee to do the additional work during the milking. Unfortunately this employee doesn't have the skills and responsibility to do the milking alone. That is why this employee earns €500 a month instead of €1.000 a month." Another aspect is labour efficiency. In some farms the labour efficiency is high due to automation and a good structure of the farm. However, some farms have barely 20 cows in lactation but still dairy farming is the main source of income on these farms. In these farms one or one and a half person takes care of the daily activities on the farm. Feeding the cows on these farms is sometimes done manually and the diet of the cows is not always accurate. Also in investments these farms can have small scale disadvantages.

In the North-West of Portugal service companies for conducting field work exist. These companies for example are consulted for the activities required for making grass silage, but these services are not as developed as in many other European countries like the Netherlands. For this reason many field work is conducted by the dairy farmers themselves. This leads to peak periods in the demand of labour. These peaks are the highest in specifically the end of April and in May when the winter crop is going to be harvested. Thereafter, the field has to be prepared for the seeding of corn. Many farmers have a corn seeder, so they don't need to consult a service company. At this moment there are arising more service companies in the North of Portugal, therefore in the future farmers could have more benefits from these initiatives. Furthermore these service companies are increasing in size.

3.3.4 Production costs

A study about the milk production in Atlantic areas compared the different production costs of dairy farms in these areas (Chatellair and Pflimlin, 2006). Mentioned before is that the feeding costs on average contain 104 euros per ton of milk for farmers in the North-West of Portugal. This is the main part of the total costs of the farmers in the North-West of Portugal. Secondly, the mechanisation costs are an important cost item. These contain approximately 60 euros per ton of milk.

Many dairy farmers in the municipality of Barcelos have their own machines to do most of the fieldwork. Therefore the replacement and maintenance of these machines are a source of the mechanisation costs. However, the mechanisation costs of dairy farmers in the North-West of Portugal are not higher than the average mechanization costs of European farmers (Chatellair and Pflimlin, 2006). The wages from the employment of non-family employees are low. Employees are cheap and many farms are not that big that they need to consult external employment, except for harvesting activities. The building costs for farms of the North-West of Portugal are more or less twice as low as the average of the other farmers in Europe (Chatellair and Pflimlin, 2006). Many buildings are old and many small farmers don't invest in new buildings. Figure 3.4 shows an example of one of the old buildings which characterizes many small dairy farmers in the municipality of Barcelos. Tie-stall housing is often the way of keeping the animals in these barns. However, important to mention is that there are also farms which recently invested in a new barn or a renovation of the barn. So not all the barns are like those in figure 3.4. Another factor which leads to low total production costs is the manure policy. The farmers located in the municipality of Barcelos don't have to dispose manure since they can use all the produced manure on their own land.

The total costs per ton of milk for farmers in the North-West of Portugal in 2003 were estimated around 265 euros. These costs are lower than the European average which represents around 330 euros per ton of milk. Remarkable is that these total costs are the lowest in Galicia, around 181 euros per ton of milk. Galician dairy farmers face with feeding costs which are comparable with the feeding cost of the North-West Portuguese farmers. However, the other costs in this Spanish region are lower than in North-West Portugal (Chatellair and Pflimlin, 2006).



Figure 3.4 Some small farms have cheap, outdated and old buildings which results in low building costs.

3.4 External aspects of dairy farming

This paragraph describes the external aspects. For example developments of the common agricultural policy can have influences on the dairy farmers in Barcelos, both positive and negative.

3.4.1 Intensive farming possible

A positive fact is that the farmers in the municipality of Barcelos are not located in a Nitrate Vulnerable Zone-area (Silva, 2007). Therefore the manure application from livestock is not limited in these areas (European Commission, 2015b). There are some simple regulations like for example recording data on nitrogen management and limitations for the period of application the manure (Schils and Velthof, 2011). So due to the high forage yields and the fact that the farmers in Barcelos don't have to face with a Nitrate Vulnerable Zone-area, it is possible to create an intensive way of dairy farming. One farmer for example has 105 cows in production but only has 20 hectares of forage area. The intensity of this farm is approximately 60.000 kg milk per hectare. However, this farmer hasn't got a manure surplus and can use all his manure for his own crops. The forage production on this farm is high enough to feed all the cows, but it is still necessary to import concentrate feeds to complete the TMR-ration on this farm.

A study about dairy areas near the Atlantic sea found out that the North-West of Portugal has the highest stocking rate of all the farms in this comparison (Chatellair and Pflimlin, 2006). The North-West of Portugal has an index of 280 for the stocking rate in grazing livestock units per hectare of main forage area. According to this study, regions in Ireland and the United Kingdom have stocking rates as low as an index of around 100. In Brittany and Aquitaine in France the index for the stocking rate is the lowest, in these areas the stocking rate is around 80. Therefore can be concluded that the North-West of Portugal has a very intensive way of dairy farming. This is possible due to the climate and due to the fact that most of the farms in North-West Portugal are not situated in a Nitrate Vulnerable Zone-area.

3.4.2 Common agricultural policy

In the previous chapter is outlined what the actual developments are related to the common agricultural policy of the European Union. The greening will have serious impacts on the dairy farmers in the region of Barcelos, in particular the parameter crop diversification. Farmers with more than 10 hectares of arable land will have to grow at least two crops in order to fulfill the requirements of greening (European Commission, 2015a). Farmers with more than 30 hectares of arable land have to grow at least 3 different crops (European Commission, 2015a). In the North-West of the country, also in the region of Barcelos, many farmers use a cropping system that is based on mainly corn between May and September in order to reach forage yields up to 30 tons dry matter/ha/year (Fangueiro et al., 2008). In the summer period, the majority of the dairy farmers use all their arable land to grow corn. So if these farmers implement the greening, they will need to grow one or two other crops besides corn. This could lead to a decline of the total forage yields, since other crops probably will have lower forage yields than corn. Consequently, the ability to feed up to 5 cows per hectare could be too ambitious in the future (Chatellair and Pflimlin, 2006). Possibly, the

prices for silage or land will increase. Some farmers that have just enough land to feed their cows at this moment may be not self-sufficient for forage production in the future. Therefore they need to buy extra corn from colleagues that have a surplus of corn silage, or they have to invest in extra land.

The common agricultural policy also offers benefits for the farmers in the region of Barcelos. The young farmers scheme is an opportunity for young farmers in this region, since they will receive 25% extra income support above the normal payments (European Union, 2014). This could convince potential takeover candidates to take over the farm and to do some necessary investments. Also the small farmers scheme is relevant for the farmers in the region of Barcelos. The many small dairy farmers in this region can count on financial support of a fixed payment between €500 and €1.250, dependent on the farm size (European Commission, 2013a). This can stimulate these farmers to invest in their farm and modernize their farm and make them more competitive.

3.4.3 Societal aspects

There are some societal aspects that could have an influence on dairy farming in the region of Barcelos. Firstly, grazing is not common among the farms in this region. The majority of the grassland is not usable for grazing since the size of the different pieces of land is usually small. Furthermore there aren't many pastures available in the summer period because many farmers have all their area utilized by corn silage. Some farmers have a small pasture close to their farm for dry cows or heifers. There are some exceptions of farms that have bigger pastures available for grazing.

The municipality of Barcelos consists of 61 villages. This makes this region highly populated and most of the farms are located around, between or even in these villages. The manure policy doesn't obligate farmers to use an injection system to apply the livestock manure on the field. But the current way of application the livestock manure causes, depending on the weather conditions, in some cases unpleasant smells of manure just after application. This can limit the social acceptance of the dairy sector.

3.5 Conclusion

The municipality of Barcelos is located in the North-West of Portugal. The dairy value in the region is more than 40% of the total agricultural value in this region. This region contains many small farmers with old facilities for dairy farming. The amount of farmers in this region has been decreasing over the last years but the total amount of milk produced has been increasing over the last years. In this region high forage yields are possible, but the feeding costs are high since the high amount of corn silage in the diet requires a certain amount of concentrate feeds to complete the diet. However, the total production costs are lower than the European average. The farmers are not located in a NVZ-area. In combination with the high forage yields, an intensive farming method is possible in this region. The greening will have serious impacts on the farms with more than 10 ha of arable land. They will have to grow another crop besides corn silage in order to benefit from all the direct payments. Farmers are often located around small villages. The current way of application the livestock manure can lead to limitations in the social acceptance of the dairy sector.

4. Future scenarios and SWOT-analysis

In this chapter the different scenarios for the future are described. Special attention will be paid to the different scenarios in the future after the abolishment of the milk quota. The threats and opportunities which arise from these different scenarios will be used to conduct a SWOT-analysis. In the previous chapter strengths and weaknesses were described and these will be used to complete the SWOT-analysis. Different action points are formulated after the analysis of the SWOT. In the next chapter these action points will be used in order to formulate strategies that will be defined for the different kinds of farmers.

4.1 Scenarios for the future

After the abolishment of the milk quotas there will be a free market for milk production in Europe. Farmers can produce milk without restrictions of quotas. This will lead to structural changes in the European dairy sector. Different visions and expectations of the European dairy sector after the abolishment of the milk quotas will be discussed in this paragraph.

4.1.1 Arise of a 'Milk belt'

After the abolishment of the milk quotas, some scientists expect structural changes in the regions for milk production. According to these scientists climate change and production costs are the cause for a migration of the main milk production to the middle of Europe. The location of this so called 'milk belt' is visible in figure 4.1. The milk production is likely to increase in Poland, Ireland, the Netherlands, Northern Germany, parts of France, Great Britain and Northern Italy.

The results of a study conducted commissioned by the European Commission shows an expectation of an increase in the availability of arable land in Scandinavian countries due to a better climate for farming in this region in the future (De Snoo, 2015). They also expect that the amount of suitable arable land in the south of Europe will decrease with approximately 0,7 million km² (De Snoo, 2015). Also mentioned in this report is that many arable areas of minor quality in Spain and Portugal are still used, only because of subsidies. Without subsidies, farmers in these areas can't compete with other farmers elsewhere in Europe since their production costs are too high. Therefore in these regions, extension of the milk sector is probably not possible. Extension is possible in the regions with the availability of many grassland and where grazing is possible (De Snoo, 2015). The costs per liter of milk are lower in these areas, since the majority of the diet consists of forages. These farmers are not that much dependent on fluctuating prices of concentrate feeds than farmers that have a high amount of concentrates in the diet of the cows. The lower costs of milk production make these farmers also less sensitive for fluctuations of the milk price in the future after the abolishment of the milk quota (De Snoo, 2015). It can be concluded that these farms with the availability of many grassland are more competitive than farmers in other regions.

Finnish research also predicts the arise of a 'milk belt' after the abolishment of the milk quotas (Jansik et al., 2014). Although the main development of the dairy sector will be situated in the area of

the 'milk belt' this doesn't mean that the milk production totally disappears in the regions outside the 'milk belt'. This research reveals a more detailed map of the location of this milk belt. Figure 4.2 shows that the location of the milk belt will be situated in the Northern coastal regions of the EU. The milk production will increase in countries where milk production has been constrained by the quota system. These are countries like the Netherlands, Poland, Germany and Denmark (Jansik et al., 2014). These regions that were forced to pay milk quota fines due to exceeding the limits of the milk quota have a financial benefit after abolishment of the milk quota, since they don't have to pay these fines anymore in the future. Portuguese farmers don't have this advantage, since the total milk production over the past years in Portugal was beneath the given limitation (Waite and Chiriac, 2014).



Figure 4.1 Scenario of the arise of a 'milk belt' which forms the heart of the milk production in Europe (De Snoo, 2015).



Figure 4.2 The location of the 'milk belt' according to Finnish research (Jansik et al., 2014).

4.1.2 Disappearance of dairy farms

The abolishment of the milk quota will lead to a further increase of the competition in the dairy sector. According to Costa and Sottomayor (2013) this will have influence on the Portuguese dairy sector. As a result of this many farms in Portugal will disappear, particularly in the North-West region. They also notice that the total dairy production in this country substantially will decline (Costa and Sottomayor, 2013). This disappearance of dairy farms is also visible in the municipality of Barcelos. Figure 3.3 in the last chapter showed that the amount of milk producers in this region has been declining over the past years. This development will probably continue. However, the total milk production in this region has been increasing over the last years.

4.1.3 Increase total milk production in Europe and decline of prices

According to a report of the European Union, the milk production of the EU-27 member states will increase with 4,4% after the abolishment of the milk quotas (IPTS, 2009). Furthermore this report predicts that the raw milk price will decline with 10%. Expected is that Spain, Austria, Belgium, the Netherlands and Ireland will increase their milk production significantly. This study expects, in contrast to De Snoo (2015), that the United Kingdom will show a reduction of the total milk production with 5,7%. This study predicts that regions with high quota rents will increase their milk production significantly in the future. An increase of the total milk production in Europe leads to lower milk prices in the EU-27 member state countries. This report mentions that this will lead to economic pressure on regions in Europe with low milk quota rents.

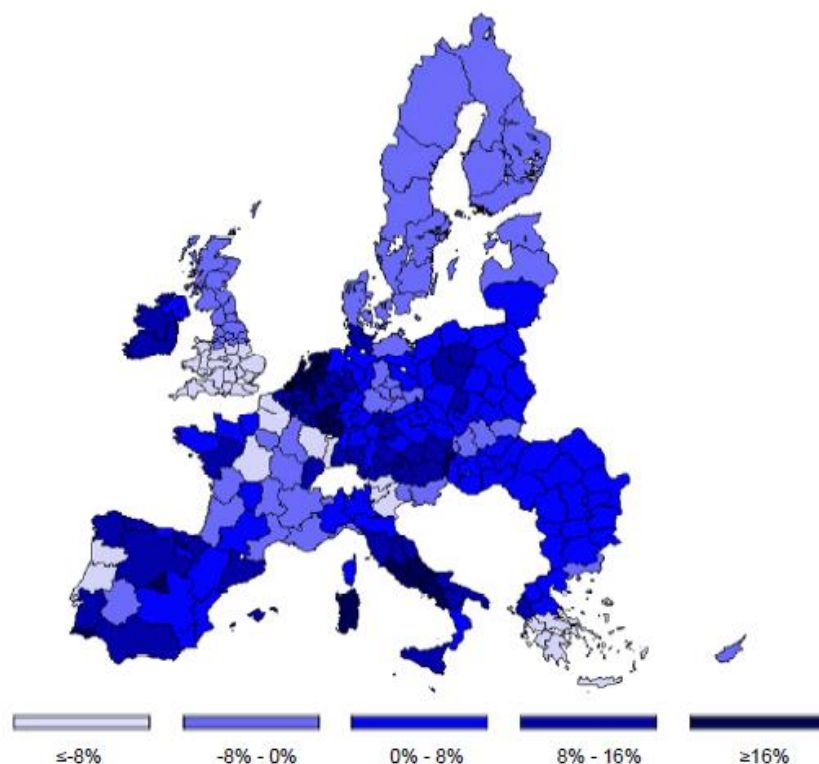


Figure 4.3 Change of the milk production in European regions after abolishment of the milk quotas (IPTS, 2009).

Figure 4.3 shows a map of the member states of the European Union with the expected change of the milk production in percentage after abolishment of the milk quotas. Clearly to conclude is that the Netherlands will expand its milk production by more than 16% in all its regions. Remarkable is that some regions in the north, like Scandinavia and the United Kingdom, are expected to produce less milk in the future. This is not in common with the arise of a 'milk belt' according to De Snoo (2015). Countries that will increase their milk production are Italy, Austria, Belgium and also parts of Italy and Spain. Therefore according to this research the milk production in some southern areas of Europe will also increase. In Portugal there are differences between the different regions. In the North, where the municipality of Barcelos is located, the milk production will decrease with more than 8%. In the Lisbon area the milk production will decrease with 13%, but in the Algarve an increase of 18% is expected (IPTS, 2009). This increase is remarkable since this region is not known as a region with favorable conditions for dairy production.

This increase of the total milk production in Europe is possible due to an increase of dairy cow herds in Europe. Nearly 70% of the regions show an increase in dairy cow herds. Regions with a significant increase in dairy cow herds are the Netherlands and some regions in Germany, Italy and Spain. In contrary, some European regions show a significant decrease in dairy cattle herds in the future. These are some regions in Greece and France but also regions in Portugal. In the North of Portugal a decrease in dairy cow herds of 12% is expected. This decrease and increase of the milk production over different areas is not a new development, these developments have been going on for the last 10 years (De Haan, 2013).

In the future losses in agricultural income are expected for dairy farmers in Europe due to lower milk prices and high non fodder feeding costs. The income losses for the dairy sector will be around 14% (IPTS, 2009).

4.1.4 Uncertainty regions and regions that will face with difficulties

According to Chevalier et al. (2013) the abolishment of the milk quotas will lead to a development of different clusters in terms of milk production. There will be regions with an increased milk production, regions with a decreased milk production, regions with an unchanged milk production and there are regions with 'uncertainty'. These uncertainty regions are characterised by a relatively old population of milk producers and in general with a low level of investments. It is predicted that the milk production of these farms will decrease, unless investments and structural development take place. These regions are located in France, Italy, Spain but also in Portugal. This study predicts that, between the year 2010 and 2020 the milk production in the Southern European countries will decrease with 13%.

This study also aims that the milk production after the abolishment of the milk quotas will be more intensive. This can have negative environmental influences, like for example an increased use of fertilizers and a more concentrated use of manure. This development can also have negative influences on the rural livelihood. Chevalier et al. (2013) think that these environmental factors will function as the limit for the milk production in the regions with competitive advantages like the Netherlands, North Germany, Belgium, Ireland and Denmark.

Regions in Southern Europe, the Baltic countries and some East European countries will face with difficulties since these regions contain many small farmers with low incomes and many parts of these regions have a high unemployment rate. Also mountainous regions could experience more difficulties. Furthermore some farms that are intensive are going to face with difficulties. These farms only have little arable land and have to buy a lot of concentrate feeds (Chevalier et al., 2013). Most of the farms in the municipality of Barcelos are intensive, but they are normally self-sufficient in forage production.

4.1.5 Milk price fluctuations

The absence of milk quotas, subsidised exports and import protections will lead to more fluctuations of the milk prices. (Chevalier et al., 2013). These fluctuations of the milk prices can also lead to fluctuations in the income of the dairy farmers. This leads to a greater challenge for European farmers. The milk price may fluctuate in the future, but according to Van Gruisen (2015) the milk price won't collapse after the abolishment of the milk quotas. At this moment there are no milk- and butter surpluses and there is a worldwide growing demand for dairy products (Van Gruisen, 2015). The world population is not only growing, but also the milk consumption per capita will increase (Wauters, 2014).

The most important measure to be more resistant against these price fluctuations is a good craftsmanship of the farmers. Dairy farmers which can realize a good profit from their farm are less likely to face with problems when the milk price is low (Koopman, 2015). Not only milk prices will fluctuate, also feed prices are sensitive for price fluctuations in the future (Rabobank, 2015). The farmers in the municipality of Barcelos are sensitive for these fluctuations, since they normally have a high amount of concentrate feeds in the diet of the cows.

4.1.6 Agricultural income losses in dairy regions

The European Union expects that the losses in agricultural income will be the highest in regions which are specialized in milk production (IPTS, 2009). These regions have a high share of milk production, compared to the total agricultural production. These are regions in Scandinavia, Ireland, Germany but also the North of Portugal. For this region an agricultural income reduction of more than 3% is expected. Therefore expected is that also the total agricultural income of the municipality of Barcelos will decrease, since dairy farming is the most important way of agriculture in this region (Cooperativa Agrícola de Barcelos, 2015). Regions with high quota rents, however, will face with a positive development of the total agricultural income (IPTS, 2009).

4.2 SWOT-Analysis

In chapter 3 the strengths and weaknesses of the dairy farms in the municipality of Barcelos were discussed. Combined with the opportunities and threats discussed in chapter 3 and in the last paragraphs, a SWOT-analysis is conducted. The outcomes are showed in the SWOT-matrix in

Appendix I. The main conclusions from the outcomes of the SWOT-analysis are discussed here. These outcomes are useful for the forming of different strategies for the different kind of farmers.

4.2.1 Make use of the small farmers scheme

The European Union offers direct income support for small farmers. Since the municipality of Barcelos contains many small farmers, this direct support is relevant for these farmers. These small farms often have low incomes and small scale disadvantages. The direct income support is in the future probably the only certainty of a stable income for these farms. The milk price will fluctuate in the future and will have a serious effect on the income of these farms. Furthermore feed price fluctuations will lead to fluctuations in the costs of these farms. Despite the small farmers scheme, the question is if these farms are still able to raise a good income in the future, because of the increase of the milk production in the more competitive regions in Europe. A strong aspect is that the local agricultural cooperative can help these small farms in implementing the small farmers scheme.

4.2.2 More fieldwork conducted by service companies

Another opportunity is conducting more field work by service companies. Many farms have peaks in the demands of labor during harvesting, mowing and seeding periods. This kind of work can be conducted by service companies, what will lead to fewer peaks in the demands of labor. Another benefit of this opportunity is a possible decline in the total costs per ton of milk. The costs of external labor will increase, but the mechanization costs of the farmers are likely to decrease. When fewer machines are needed, the costs of investments in machines will reduce. Also the costs for the maintenance of these machines will reduce.

4.2.3 Implementation of greening

The implementation of greening is necessary for farmers with more than 10 hectares of arable land, in order to receive the maximum amount of income support. This can lead to lower forage yields, since a land use of 100% corn is not possible under this policy. But this also leads to new opportunities, new crops can be implemented in the crop rotation plan and these can have other possible benefits for the farmers. A substitution crop for corn needs to have high yields, since land is scarce and expensive.

4.2.4 Further reduction in costs for milk production

The average costs for milk production of the farmers in the municipality of Barcelos are lower than the European average (Chatellair and Pflimlin, 2006). However, the more competitive regions for milk production in Europe will increase their milk production and have scale advantages. The milk price and feeding prices will fluctuate in the future, therefore a further reduction in the costs for milk production is necessary in order to maintain a normal income and a buffer for less favorable periods.

4.2.5 Maintain social acceptance

In the future, the milk production of the farms in the municipality of Barcelos is likely to increase, which will lead to even more intensive farms. In order to maintain the social acceptance of the sector it is important to use good agricultural practices that limit the disturbance of the normal way of living on the countryside.

4.3 Conclusion

The abolishment of the milk quotas will lead to structural changes in the European dairy sector. Expected is that the main milk production areas from the future are those regions with many grassland and where grazing is possible. These farms are not that dependent on fluctuating prices of concentrate feeds than farmers who don't have the availability of many forages. Some studies expect the disappearance of less competitive dairy farmers in the North of Portugal and they expect income losses for the agricultural sector. This development is not new in the municipality of Barcelos. Over the past years the amount of dairy farms has already been declining in this region but the total amount of milk produced has been increasing over the last years. There are different speculations about the milk price after abolishment of the milk quotas. Some experts expect a decline of the milk price and on the other hand some experts don't predict a collapse of the milk prices after April 2015. It is clear that milk price fluctuations in the future will occur. Also feeding prices will fluctuate in the future.

In the future it is important to make use of the small farmers scheme as a small farmer. There are also possibilities by conducting more fieldwork by service companies. Furthermore the implementation of greening is an important action point. To become more competitive the farmers will have to reduce their costs for milk production. This can also lead to buffers in less favorable periods. Finally, it is important not to forget to implement measures that maintain the social acceptance of the sector.

5. Typifying of dairy farms, future plans and strategies

Different kinds of farmers are typified in order to formulate suitable strategies for each group of farmers. The characterization of dairy farms according to Van der Ploeg is used to typify these farms. There has been hold a small inquiry to get an overview of the different farms and to discover the future plans of these farmers. The goal of this chapter is to give different strategies that fit for the different groups of farmers.

5.1 Characterizing of different dairy farmers in the municipality of Barcelos

The municipality of Barcelos contains more than 400 dairy farmers. All these farmers are different, but different types of farmers can be distinguished from each other since some groups of farmers have similarities. The different kind of farming styles are studied by Van der Ploeg, the characteristics of these farming styles are described. Hereafter the different kinds of dairy farms in the municipality of Barcelos are described. Some inquiries are conducted among the different farmers in Barcelos in order to distinguish different kind of farms. These findings are compared to the different farming styles according to Van der Ploeg. At the end the different dairy farmers are placed into groups. Later different strategies will be formed for different groups.

5.1.1 Types of dairy farmers according to Van der Ploeg

According to Van der Ploeg (1990) there are different parameters to distinguish different kind of farmers. Different kind of farmers can be distinguished by for example the milk production per cow and the total amount of cows per person (Van der Ploeg, 1990). Farmers with a high milk production per cow and a high labor efficiency are called business farmers or economically orientated farmers. Farmers with a lower production per cow but with a high labor efficiency are called 'machine farmers' or 'take it easy' farmers. Farmers with a high milk production per cow but with a lower labor efficiency are typified as 'cow farmers'. To the final group belong the hobby farmers or the farmers that are looking for a second branch (Van der Ploeg, 1990).

Another way to distinguish different kind of farmers is by intensity and scale (Van der Ploeg, 1990). Farms with a high intensity have a high milk production per hectare, large scale farms have many cows. Farmers that are big in scale and have a high intensity are typified as optimal farmers. The machine farmers have a low intensity and have more cows than average farms according to Van der Ploeg (1990). The 'cow farmers' are small scaled but have a high intensity. Farmers with a low intensity and a low amount of cows are typified as finishers, in other words farmers that are going to end up their farm in the future. A simplified version of this way of typifying different dairy farms is illustrated in figure 5.1.

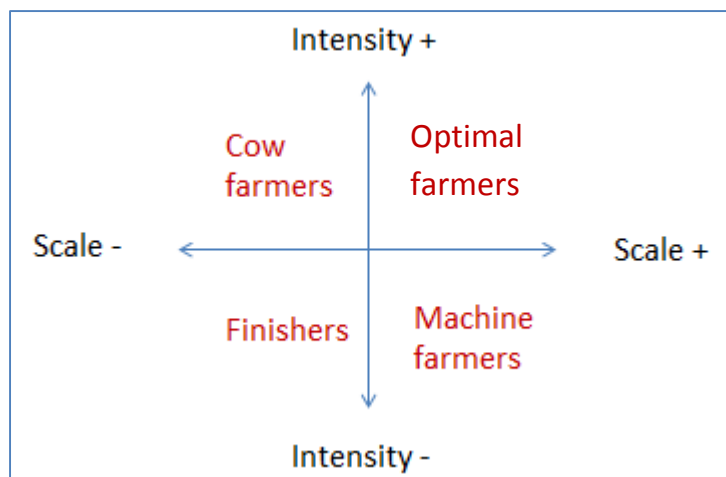


Figure 5.1 Different kinds of farmers typified by scale and intensity (Van der Ploeg, 1990).

A more recent study also typifies roughly four kinds of farmers (Dirksen et al., 2013). The ‘cost savers’ are characterized by low costs and a relative low production intensity and a relative low milk production per cow. They also normally have lower feeding costs. The ‘scale enlargers’ have relatively many cows, hectares and many cows per working unit. This study also distinguishes the ‘cow farmers’, these farmers have a high production per cow, high costs for genetic improvement, a high concentrate level for the cows and are relatively intensive. The ‘labor savers’ have many cows and hectares per working person and the concentrate level and milk production is relatively low (Dirksen et al., 2013).

5.1.2 Differences between dairy farmers in the municipality of Barcelos

Among dairy farmers of the municipality of Barcelos has been hold a short interview in order to get a clear view of the different kind of dairy farmers. This interview contains questions about farm size, milk production, working efficiency, future plans and investments. The structure of this interview is showed in appendix II. The outcomes are displayed in appendix III. The total amount of farmers that has been interviewed is 32. This is not even 10% of all the dairy farmers located in the municipality of Barcelos. But this interview is representative since the group of interviewed farmers is very diverse. This group represents for example small farmers, big farmers and farmers from different towns in the municipality of Barcelos.

The first remarkable outcome is the scale of the different farms. There are very small farms with only 15 cows in production, on the other hand the biggest farm interviewed has 265 cows in production. Figure 5.2 shows a graphical overview of these differences in scale. Many farms with less than 50 cows have been interviewed, but also 7 farms with more than 100 cows in production have been interviewed. Figure 5.3 and figure 5.4 also show the differences between these farms. Figure 5.3 shows a tank of 800 liters which is big enough for the smallest farms in the municipality. In figure 5.4 the modern barn of the biggest farm interviewed is showed. The average size of the interviewed farms is 75 cows in production. The average size from all the farmers in the municipality of Barcelos is smaller, since there are still many small farms that have not been interviewed.

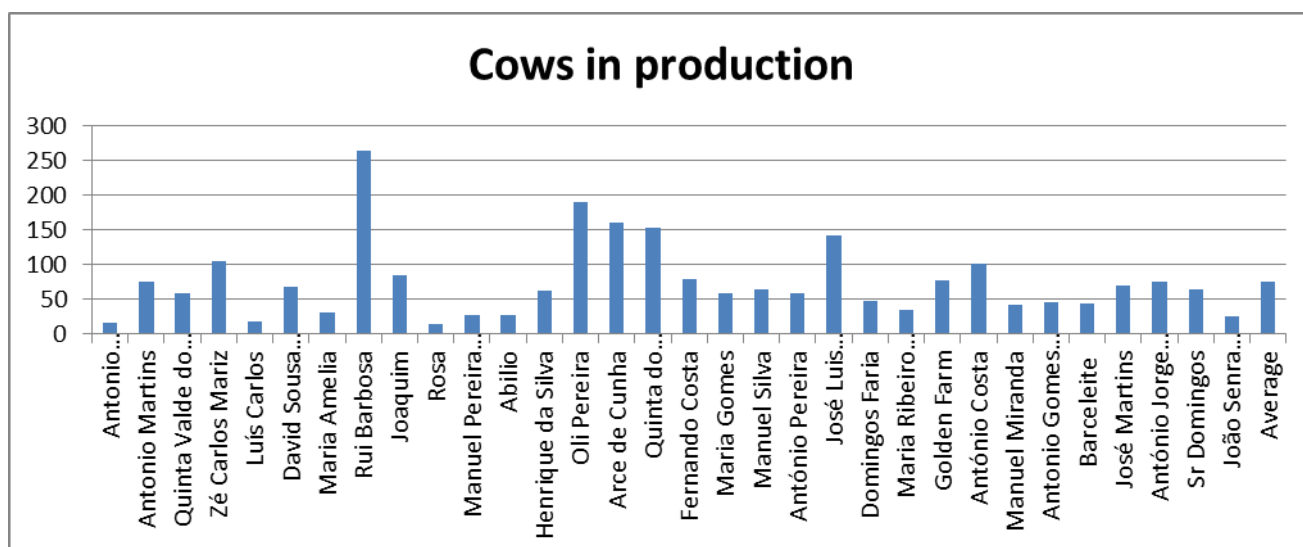


Figure 5.2 The differences in size of the farms that have been interviewed.



Figure 5.3 A small milk tank of 800 liters is big enough for the smallest farms of the municipality.

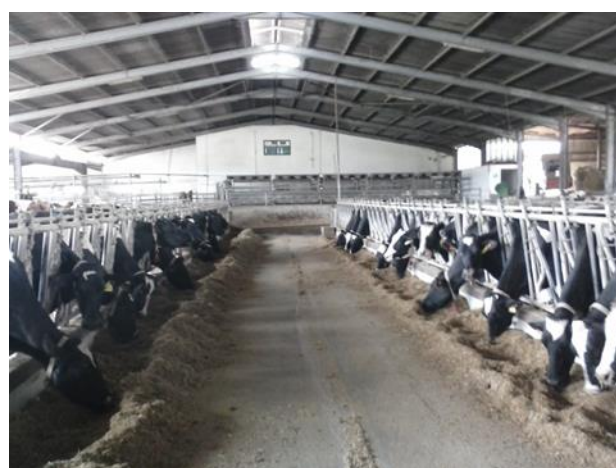


Figure 5.4 The biggest farm interviewed has modern installations and a high working efficiency.

The farms also differ in milk production. The milk production of the different farms varies from 16 to 35 liters a day. In general the small farms have a lower milk production than the farms with more animals. The average milk production of the interviewed farms is 28,1 liters a day. The total milk annually produced on the smallest farms is around 100.000 kg milk, and up to 2.600.000 kg on the biggest farm. The average is 721.020 kg milk produced annually.

Remarkable is that the small farms are the most extensive farms. They have relatively much arable land compared to the total amount of milk produced. The intensity of the farms varies from 10.500 kg milk/ha to 60.000 kg milk/ha. The average intensity of the farms interviewed is 31.703 kg milk per hectare. Figure 5.5 shows these differences of the intensity between the interviewed farms. There can be concluded that almost half of the interviewed farms have an intensity of more than 30.000 kg milk per hectare. According to Van der Ploeg (1990), and visible in figure 5.1, the farms with a high intensity and a big scale are the optimal farmers. This is a good characterization of these farms since

these farms generally also have a higher milk production, thus they have an optimal farming method. However, Van der Ploeg (1990) also mentions that the small scaled farms and the farms with a low intensity are called the finishers. This is in general not the case since most of these farms are planning to continue their business in the future. Most of the farms namely have a successor in the future. Only 8 of the 32 farms (25%) that have been interviewed indicated that they at this moment don't have a successor to take over the farm in the future. However, only one farmer indicated that he already plans to stop with his business on the short term. Those farms without a successor are not only small farmers, there are also bigger farmers that don't have a successor in the future. In some farms this is not relevant at this moment since the owner in these cases just took over the farm or the children are still young.

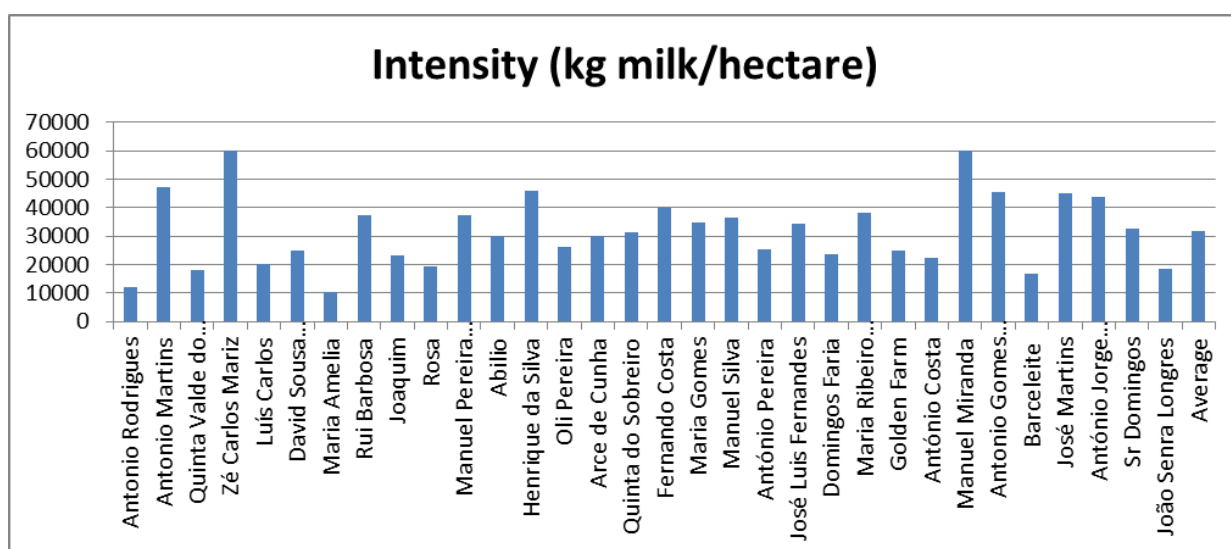


Figure 5.5 Differences in intensity of the interviewed farms.

Between these different farms there are also remarkable differences in regarding to working efficiency. The annual milk production divided by the workload in persons per day shows remarkable results. The smallest farms have in general a lower working efficiency than the bigger farms. This efficiency varies from 45.625 kg milk per person to 650.000 kg milk per person. The average working efficiency of the farms that have been interviewed is 266.651 kg milk per person. Important to notice is that some small farms also have some winery, but this activity is not the main activity. Furthermore some farms have employees that don't work fulltime. On all the farms milk production is the main activity. The owners always have a dairy farm as their full time job, except one farm where the employees do most of the activities. Therefore the characterization of the farmers with a low labor efficiency and a low milk production per cow as hobby farmers is not suitable for these farms. These farms don't keep cows for a hobby but the production of milk is their main source of income.

Almost all the farms (91%) have done investments over the past years. The size of these investments varies from purchasing a few cows to bigger investments like for example building a new barn. Remarkable are also the investments in machines, roughly 50% of the interviewed farmers has been invested in machines over the past years. Several farmers have many machines to do much of the fieldwork themselves. Some small farmers have three tractors, which is much for small farms with less than 30 cows. According to Van der Ploeg (1990) the machine farmers are those farms that are bigger scaled, but in the municipality of Barcelos both the big and small farms have relatively many

machines. Beside the investments in machines, many farms have invested in improvement of the barn construction. In many cases this was a renovation of the roof construction.

5.1.3 Different future plans

In the interview is also asked about the future plans of the farmers. Different options were suggested; expand the farm, no extra investments but make the farm more efficient, start side activities and as last option continue with the current way of farming. Concluded can be that most of the farmers are planning to make the farm more efficient in order to realize a higher milk production per cow, 53% of the interviewed farmers has this strategy. These farms are not growing in the amount of cows since they often don't have enough hectares to feed extra cows. These farmers will only invest in improvements of the production efficiency, like for example renovate the feeding rack or new cubicles.

A few farmers (19%) plan to keep more cows in the future, to realize this they often have to invest in extra land. These growths in the amount of cows are not big, on average around 20%-30%. An example is a farm with two brothers that will run the farm together in the future. Now there are 60 cows in lactation, in the future they will expand the farm to 80 cows. According to them this amount of cows is enough to run the farm with two persons. Another example contains a farmer who is planning to extend the barn in order to solve the overpopulation in the barn and consequently wants to realize a higher milk production. These farms are typified as scale enlargers according to Dirksen et al., (2013), with a high working efficiency and many cows and hectares. But this characterization is not totally correct in this situation, since the working efficiency is not remarkable high on every farm that plans to keep more cows in the future.

Among the interviewed farms there are some farmers (25%) who are planning to continue with the current way of farming. Most of the farms with this strategy are small scaled farms. Although they know improvements are possible and it's better to change the current way of farming, they keep continuing with their current way of farming. Many of these farmers will work on the farm until their retirement. In many cases their level of education is low and therefore there are only few opportunities to do other jobs than farming. There was one farmer (3%) that indicated that he is planning to stop with his business on the short term.

5.1.4 Types of dairy farmers in the municipality of Barcelos

The results of the interviews show that the dairy farmers of Barcelos cannot completely be placed into the different groups mentioned in subparagraph 5.1.1. In general, small farmers with less than 50 cows can be divided into two groups based on the future plans of these farms. These are on one hand the farmers that want to improve the production efficiency of their farm and by this way want to increase the milk production per cow. These farmers can be typified as small optimizers. On the other hand this group of small farms contains farmers that continue their current way of farming and are not planning to make changes. These farmers can be typified as conservatives. The question related to this group is how long it will be possible to generate a good income out of these farms. Both groups of farmers mentioned have a more extensive farming method than the larger farmers. These bigger farmers, with more than 50 cows, can also be divided in two groups.

The first group contains farmers that don't plan to do big investments in the future, but want to make the farm more efficient and reach a higher milk production per cow. These farmers can be typified as optimal farmers. Therefore these farms already have the size they want to have in the future. The second group contains farmers that want to invest in land and/or want to keep extra cows in the future, these farmers are the growers. The farms with more than 50 cows are more intensive and have in general a higher working efficiency than the small farms. Therefore in general the different types of farmers are based on scale and future plans. A schematic view of the typifying of these different farmers is showed in figure 5.6.

Small scale farmers <50 cows in production		Bigger farmers >50 cows in production	
Conservatives	Small optimizers	Optimal farmers	Growers

Figure 5.6 Typifying of different dairy farmers in the municipality of Barcelos.

For the different types of dairy farmers of figure 5.6 there are set up different strategies. These strategies are formulated with the help of the action points which resulted from the SWOT-analysis in chapter 4. Also the future plans of the different types of farmers have been taken into account. Some strategies will have some overlapping aspects. This means that certain measures are important for more than one group of farmers mentioned in figure 5.6. It is clear that all strategies for the different farmers contain measures to reduce costs and measures to increase the income out of the farm in order to become more competitive in the future.

5.2 Strategy for conservatives

This group of small farmers has plans to continue with the current way of farming. Although some of them know it might be better to do some changes in the future, they prefer to continue their current way of farming. An advantage is that these farmers are not planning to do big investments, therefore they won't have to face with financing problems of big investments. But the main question is if these farms are competitive enough in order to face with milk price fluctuations in the future. Another uncertainty is the status of the outdated buildings. In the future these could be needed to be replaced or renovated.

5.2.1 Crossbreeding

Part of the strategy for these farms could be crossbreeding. The outdated buildings of these farms are often too small and not comfortable enough for a modern Holstein Frisian dairy cow. Therefore for these farmers it could be interesting to breed a more resistant cow. These crossbreeds have an improved health and fertility (Ferris et al., 2014). The reduction in milk production due to crossbreeding will in many cases remain limited, since in many of these small farms the maximum potential production of the Holstein Frisian cows cannot be reached in the current circumstances.

Another advantage of crossbreeding is a higher value of the male calves and cull cows. All these benefits mentioned can have positive financial aspects for these farms.

Examples of breeds that can be used for crossbreeding are Jersey, Brown Swiss or Fleckvieh. A breeding combination between two of these breeds with the Holstein Frisian cows leads to a heterosis effect. This 3-way crossing raises offspring that have good secondary characteristics, which have a low heritability. Therefore a genetic improvement in fertility, claw- and udder health, calf vitality and somatic cell count is possible (Xsires, 2015). But important to notice is that crossbreeding is not a way of solving management problems (Ferris et al., 2014). Therefore the effect of crossbreeding will be minimal for farms with serious management problems.

5.2.2 Save machine costs

This group of farmers is also typified by the amount of machines they have. The majority of these farms have invested in machines over the past years. For this group of farmers it might be interesting to conduct more fieldwork by service companies. This means that these farmers don't need to do big investments in machines anymore. Therefore this can lead to lower mechanization costs.

Additionally, conducting more fieldwork by service companies leads to fewer peaks in the demand of labor. Even the harvesting of corn silage is at some farms done without the help of service companies. In some cases the quality of the corn silage is not optimal since the kernel processor wasn't adjusted properly. This leads to visible undigested corn kernels in the manure of the cows from these farms and consequently the starch digestibility of the corn silage is lower, which leads to a lower nutritional value of the corn silage (Nolles, 2014). These problems can be prevented by consulting service companies that have experience in harvesting, so a good adjustment of the kernel processor can be guaranteed.

Another option could be starting a small cooperation regarding to mechanization. Since these small farms only have small amounts of arable land, many machines are only used occasionally. When these farmers work together, they won't need as much machines as they have at this moment. This means less maintenance costs and fewer investments in machines.

5.2.3 Winery

The conservatives indicated that they are not planning to start side activities in the future. However, many of these farms have already a small winery. This wine is in most cases only for home consumption. In the future it could be an idea to expand this activity. For many small farms it is possible to use land for this activity since often not all the amount of land is needed for the small amount of cows. Extra incomes from winery can make these farmers more resistant to milk price fluctuations in the future. A disadvantage of expanding the winery is that more labor hours are required in peak periods. Beside extra income support from the small farmers scheme, winery incomes of these farms can form the buffer for periods with low milk prices. But still the question is, even with these two other forms of income, if these farms are totally ready for the future. In many cases more than one person works on these farms, therefore the total income has to be divided over more than one person.

5.3 Strategy for small optimizers

Instead of the conservative farmers, these farmers are willing to improve the production efficiency of their farm and by this way increasing the milk production per cow. On these farms the working efficiency in kg milk per person is relatively low compared to the bigger farms in the municipality of Barcelos. Also the milk production on most of these farms is relatively low. Therefore an increase in the milk production per cow will lead to a higher working efficiency of these farms. The smallest farmers from this group can benefit from the small farmers scheme from the new Common Agricultural Policy.

5.3.1 Barn construction

For these small farms there are often improvements possible related to the construction of the barns. The light intensity in these small barns is often not satisfactory due to lack of the possibility of daylight entering the barn. A light intensity of 150 to 200 lux for 16 hours is desired (Agrilight, 2015). This means that in some farms changes are necessary to achieve this light intensity. A higher light intensity leads to less reproductive problems, better disease detection and a higher milk production per cow (Agrilight, 2015). In many cases there are also improvements possible related to the comfort of the cows. Tie-stall housing of dairy cows is the housing type for some of the farmers of this group. In all these farms with this type of housing the cows lie on the slatted floor, there is no rubber or straw bed available. This limits the lying comfort of these cows significantly. In many freestall barns the lack of comfort from the cubicles results in cows lying on the slatted floor. The cubicles are in some cases too small, which also results in cows lying on the slatted floor. The minimal total length of the cubicles required is 2,20 m. For the width of the cubicles, 1,10 to 1,15 meter is normal (Hammer, 2011). In these farms with lack of comfort from the cubicles cows take too much time to lie down. Normally this won't take more than 6 seconds (Montessori, 2009). In some cases the majority of the cows were ruminating in a standing position. This is also an indication that there are improvements possible related to the cow comfort since normally cows prefer to lie during ruminating (Montessori, 2009). Therefore for this group of farmers some simple renovations of the construction of the barn can lead to a higher milk production of the cows. Also providing extra sawdust or other materials to improve the lying comfort will have positive effects.

For the housing of the heifers there are also improvements possible. The conditions in which the heifers are kept are often not ideal. The buildings are often small without cubicles. In many cases there is a lack of natural light in these buildings. This limits the animal welfare but also the growth and the reproductive results of this group of animals. For these farms it is better to substitute these old and small buildings by more modern buildings.

5.3.2 Feeding management

Another point of improvement for some farms is related to the feeding management. Not all of these farms have the availability of an unifeeder with a weighing system. They feed the cows often manually. For these farmers it is hard to feed the cows accurately, since they don't know the exact kilograms of each feed they give to each cow. Furthermore the feed is not mixed well, and

consequently selection of the feeds by the cows will take place. With a more outbalanced diet it is easier to feed the cows regarded to their dietary necessities. This will lead to a higher milk production and a higher feeding efficiency which consequently leads to lower feeding costs per kg milk. It also makes it possible to realize a higher working efficiency since the above mentioned feeding method is more efficient and demands less manual labor than the current method of manual feeding. This offers opportunities for feeding the cows twice a day. Twice a day distributing the feed gives twice a day fresh feeds in the manger and will increase the intake. This is necessary particularly in the summer period when environmental temperatures are high.

5.3.3 Other measures

As well as for the conservatives, this group of farmers can save mechanization costs. Conducting more fieldwork by service companies or starting a small cooperation regarding to mechanization equipment can save mechanization costs.

5.4 Strategy for optimal farmers

This group of farmers is more intensive than the two groups of smaller farmers. This group is already kind of prepared for the period without milk quotas. These optimal farmers already have the desired amount of cows and have enough land to be self-sufficient in forage production. But they still see possibilities for improvement. There are possibilities in cost reduction but there are also possibilities in realizing a higher total income.

5.4.1 Fodder management

Most of these farmers only cut the grass one time in April or May. In some cases the grass is cut in a late stage. This realizes high dry matter yields for one cut, but when the grass is cut it is also already in a mature stage. This leads to high NDF-levels in the silage, but also to a nutritional value which is not as high as when the grass is cut at an earlier stage. It could be an option to cut the grass two times a year. The climate makes this possible since the grass is also growing during the winter period. The two cutting moments will then be around January/February and April/May. This will probably lead to higher total dry matter yields and a better quality of the grass silage. Higher dry matter yields are favorable for the more intensive farms, it makes it possible to feed more grass silage to the cows in production. When grass silage is added to the diet of the producing cows, the total crude protein content out of roughage sources in the diet will increase. Corn silage has a lower crude protein content than grass silage, respectively 6-7% towards roughly 16% (Blgg, 2015). Therefore adding grass silage to the diet leads to a lower demand of expensive concentrate feeds with a high protein content.

Another advantage is a better spreading of the application of the manure. The manure in this situation can also be deposited in February after the first cut. Less application of manure at the same time can lead to a higher manure efficiency. Disadvantages of cutting the grass two times a year are the extra requirements of labor. This problem can be solved by contracting a service company.

5.4.2 Crop diversification

For the optimal farmers it is necessary to implement the greening measures, otherwise they won't receive 30% of the direct payments. During the summer season the main crop is corn, in many cases this crop forms 100% of the total area. The greening contains a measure of crop diversification which persuades farmers with more than 10 hectares of arable land to grow more than 1 different crop. Farmers with more than 30 hectares of arable land will have to grow at least 3 different crops. Therefore there is a need for another crop with high forage yields, although the conditions are perfect for growing corn silage. One option is to grow permanent grassland on some fields. Firstly, this limits the seeding costs for corn, since less area has to be seeded with corn annually. But this means also more cuts and more labor requirements. Another advantage of permanent grassland is the possibility of grazing. Besides welfare benefits for the cows, this has also benefits related to the social acceptance of the dairy sector. At this moment grazing is only rarely seen in this region.

For the farms with more than 30 hectares of arable land it is necessary to grow at least 3 crops. So besides corn silage and grassland there is another crop needed. Sorghum is an option for a third crop to complete the crop diversification. This tropical crop is ideal for growing on the dryer fields since this crop has a higher water use efficiency than corn (Hoover, 2013). Thus this crop can be utilized for the fields that are located higher, since on this fields drought occurs more often than on the other fields. A disadvantage of this crop is a lower total digestibility than corn, since corn contains less lignin and more grain (TheCropSite, 2015). There are different types of sorghum species. For dairy cows the photoperiod sensitive sorghum fits the best (TheCropSite, 2015). A big advantage of sorghum is its regrowth potential, sorghum can be harvested multiple times (Brouk and Bean, 2010). Beside silage production sorghum can be used as hay production and grazing pasture.

When sorghum is used as a silage, the forage yields are comparable to the forage yields of corn silage (Brouk and Bean, 2010). Corn in the diets of dairy cows can be replaced by sorghum. Sorghum contains more crude protein than corn and also contains more fibers. Though, sorghum can also be used as an energy source in the diet. The net energy content of sorghum is only slightly lower than the net energy content of corn. The ideal harvest stage of sorghum is at a stage with a dry matter content between 63% and 68%. The ideal chopping length of sorghum silage is 3/8 to 1/2 inch, in other words 1,0 to 1,2 cm (Roth and Harper, 2015). Some studies showed that diets which contain sorghum don't have to lead to a lower milk production compared to diets that contain corn silage. A requirement here is that that the sorghum is well processed. Feeding sorghum is also suitable for heifers, sorghum is even more ideal than corn. Instead of sorghum, corn silage often contains too much energy for the heifers (Brouk and Bean, 2010).

Sorghum is a crop which, just like corn, requires a large amount of nutrients from the soil. A soil pH above 6,0 is necessary for good growing conditions. The total input costs for sorghum are lower than for corn silage, mainly due to lower seeding costs. This results in lower variable costs for sorghum compared to corn silage (Roth and Harper, 2015). Therefore sorghum could be a good alternative for corn silage for the optimal farmers. A disadvantage is that growing sorghum as a forage crop is not common yet in the region of Barcelos. Therefore there is at this moment a lack of experience regarding to the application of this fodder crop.

5.4.3 Improve production efficiency

A higher total income can be realized by a higher total milk production per cow. This leads to higher milk incomes per cow but also to lower costs per cow. When the milk production per cow increases, there is less maintenance feed needed per kg milk. A higher milk production per cow makes it also possible to produce more milk out of the available barn space. A Dutch study showed what the effects are of a production increase from 7000 kg milk per cow to 9000 kg milk per cow per year on the feeding balance (Van Zessen, 2015). The group that contained cows with an average milk production of 9000 kg milk per year had higher total revenues, basically due to higher milk incomes. The concentrate feed costs per 100 kg milk were equal between both groups, but for the group with a higher milk production the concentrate costs per cow were lower. The roughage costs of the group with the highest milk production were lower than those of the group with a lower milk production. This was the case for both the roughage costs per cow and the roughage costs per 100 kg milk.

Consequently, the feeding balance was higher for the farms with a higher milk production per cow. For the farms with the high producing cows the feeding balance was 17,68 euro per 100 kg milk. The farms with cows with a lower milk production realized a feeding balance of 16,79 euro per 100 kg milk. The feeding balance per cow amounts 1.592 euro per cow for farms with high producing cows and 1.175 euro for farms with a lower milk production per cow (Van Zessen, 2015). Therefore a higher milk production per cow has serious positive impacts on the feeding costs. Consequently a higher milk production per cow can improve the competitiveness of the optimal farmers.

In some cases this higher milk production per cow can be realized by a higher level of concentrate feeds. But the effectivity of this measure is dependent on the milk price and the price of concentrate feeds in each situation. Other management measures will be more effective. One example is creating groups for lactating animals in different production levels. This is effective for the TMR ration diets which are common among the optimal farmers. Separation of the animals into different groups leads to more accurate feeding and a higher feeding efficiency (De Lange, 2015). The efficiency of the diet is the amount of milk that the cows produce out of 1 kg dry matter. In practice this parameter varies from 1,1 to 1,7 (ForFarmers Hendrix, 2015). With an improvement in the efficiency of the diet, farmers can reach better economical results due to lower feeding costs.

5.4.4 Improve animal health

With an improvement of the animal health there are cost reductions possible. Preventing udder problems is an important action point. This starts with improvements in the hygiene of the farms. An example calculation has been conducted in order to show the effects of improving the udder health. A calculation model is filled in to get insight in the annual costs of mastitis for an example situation. This example calculation is done for a farm with 105 cows in production, a 305 day production of 10.370 kg milk and a total of 20 cows with clinical mastitis a year. The average somatic cell count on this farm is 235. The outcomes of the calculation model are showed in table 5.7. For this farm the total annual costs for mastitis are around 9.000 euros. The biggest losses are due to subclinical production losses. The clinical production losses are 1.244 euro. Other costs are the cows that will go out of the farm because the infection is not healing. The costs of separated milk also have

to be taken into account. Important to notice is that this calculation contains some estimations. Estimated is that, by every case of clinical mastitis, 5% of production losses occur. Standard values are used by calculating the costs of medicines and the veterinarian (UU, 2009). The costs per cow with clinical mastitis are around 245 euros. Concluded can be that cows with mastitis have negative economic consequences, therefore it is worth it to take measures to improve the udder health.

Table 5.7 Outcomes of the calculation model for a farm with 105 cows in production (UU, 2009).

Mastitis costs according to a calculation model (UU, 2009)	
Production losses clinical (€/year)	€ 1.244,40
Production losses subclinical (€/year)	€ 4.094,08
Separated milk (€/year)	€ 693,60
Veterinary (€/year)	€ 20,00
Medicines (€/year)	€ 400,00
Labor (€/year)	€ 150,00
Culled cows (€/year)	€ 2.400,00
Total annual costs mastitis	€ 9.002,08
Costs per cow with clinical mastitis	€ 245,40

Improvements in the fertility of the cows also have financial benefits. When the heifers calve at an earlier age, the total feeding costs, the total labor costs and other rearing costs will be lower. A Dutch study showed that, by rearing costs of €1,50 per animal per day, €1.800 can be saved when the first day of calving occurs 2 months earlier (Veldman, 2012). Therefore a better heat detection and an outbalanced diet for the heifers are necessary in order to save rearing costs.

Additionally, a short interval between calvings has economic benefits. This means fewer inseminations per cow and savings for insemination costs and savings for the costs of sperm. A shorter interval between calvings furthermore means more calving cows per year and more peak productions, which results in a higher total milk production. A calculation model can show the financial benefits of a shorter time between calvings (Steenefeld, 2011). An example calculation has been conducted with a farm of 76 cows in lactation, an average 305 day production of 8845 kg and an actual time between calvings of 426 days. When the time between calvings improves with 26 days, the time between calvings will be 400 days. This will lead to €1.209 of extra income per year. Important to notice is that this calculation assumes that there is a milk quota and that the calculation is done with average values of the costs for milk production losses, cost for diseases after calving, and average costs of labor around calving.

5.5 Strategy for growers

This group of farmers wants to expand the farm. They want to invest in land and/or they want to keep extra cows in the future. There are no farmers that have plans for a big growth in the amount of cows. The maximum is a growth in the amount of cows of around 35%. As well as the optimal

farmers these farms are more intensive than the groups of smaller scaled farmers. Besides growing, the growers also have goals to reach a higher milk production per cow. Crop diversification is, just like for the optimal farmers, necessary for this group of farmers in order to maintain the full income support. So when the farm contains more than 30 hectares of arable land, permanent grassland and sorghum are crops that are suitable for these farms to grow in the future. Also a change in the fodder management might be useful for this group of farmers. Since there will be kept more cows in the future, more roughage is needed. The best option to realize higher amounts of roughage is to cut the grass more frequently. In the previous paragraph was mentioned that this could lead to higher dry matter yields and a better quality of the grass silage.

5.5.1 Solve or prevent overpopulation in the barn

These farms are planning to keep more cows in the future. Important to mention is that many of these farms at this moment don't have the facilities to keep more cows in the future. In some cases there is already overpopulation in the barn. In other words, there are not enough feeding places and cubicles for all the lactating cows. Therefore it is not possible that all the cows eat and lie at the same time. In the future it is for these farms important to invest in extra barn space in order to prevent overpopulation.

Especially animals lower in rank suffer from overpopulation. They have to wait longer before they can eat or lie. This can lead to stress and more suffering of the claws because the animals stand more and longer. Research shows that cows in farms with 9% overpopulation lie one hour less than the cows in farms without overpopulation (Fregonesi et al., 2007). If farms at this moment don't have enough feeding places for all the cows it is important to feed the cows at least two times a day. This is a measure that increases the dry matter intake of the lower ranked animals but it doesn't solve the main problem.

Overpopulation leads also to an overload of the claws since cows stand too long when they have to wait to lie down. This increases the incidence of claw problems like white line defects and sole ulcers. Overpopulation has negative effects for the fertility of the cows too. It leads to less space for each cow and consequently the heat expression will be limited. This leads to lower heat detection results and consequently to an increased time between calvings. When there are not enough feeding places available, heat expression also might decrease. Some cows lower in rank will not take in all the desired nutrients and minerals. In particular vitamin E and selenium are important nutrients for a good fertility (DKAVV, 2010).

Furthermore overpopulation in the barn has negative aspects for the udder health. After milking it is important that the cows stand for more or less 15 to 20 minutes, instead of immediately lying in the cubicles. Shortly after milking the teat ends could still be open, since the sphincter is not closed properly yet and part of the keratin has been disappeared. When there are not enough feeding places, some cows will lie down directly after milking and this can lead to leaking of milk out of the teats with a risk for mastitis (UGCN, 2011).

It is clear that overpopulation is not favorable according to animal health and it has also negative impacts on the overall income of the farm. However, at this moment there are still farms that are

facing with a serious level of overpopulation. Therefore in the future these farms have to expand their farm in order to solve overpopulation.

5.5.2 Improve working efficiency

When the growers are planning to keep more cows, it is important to improve the working efficiency. In some farms there are improvements possible related to the working efficiency. A higher milk production per cow will lead to a higher working efficiency, since every extra kg milk produced normally doesn't demand extra time. For less peak demands for labor, it could be better for these farms to consult a service company for field work when this is not the case at this moment. This also leads to less time for maintenance of the own machines of the farm. Outsourcing of the calf rearing management could also be a measure in order to save time. More expensive methods of improving the working efficiency could be investments in automating or expanding the milking facilities.

5.5.3 Life production and replacement rate

The best way to realize a gradual growth in the amount of cows is realizing a high life production per cow and a low replacement rate. This makes it possible to grow in the amount of cows with minimal investments in buying cows from extern farms. The life production and the replacement rate of the herd are some indicators of the animal health. Therefore a good animal health is important. With a high replacement rate, relatively many cows are replaced by heifers. Often this is because of health problems of the older cows. The replacement rate is equal to the amount of heifers that are present in the dairy herd. In normal situations the replacement rate is around 28% (Achten, 2010). When many cows are replaced by heifers this has a negative impact on the life production of the cows and this can have a negative economic impact. Among the growers there is a farm with a replacement rate of 50%. This farm chooses to replace many cows to get rid of problem cows or even old cows in order prevent problems in the future. Despite the high replacement rate, the average live production of 35.100 kg from the cows on this farm is not low since the average value for this parameter is around 30.999 kg (CRV, 2014).

A higher life production leads to lower calf raising costs per kg milk. Only in the second lactation of a cow, the calf raising costs are earned back due to the milk production. Therefore a higher life production leads to fewer costs, since less young stock is present at the farm to replace older animals. And a higher life production leads to a higher income because of a higher total milk production per cow (Achten, 2010).

The use of sexed semen can also lead to more heifers, and consequently this makes a growth in the amount of cows in the future possible. A disadvantage of sexed semen is the higher price than conventional semen.

The purchase of cows from extern farms is also an option for increasing the dairy cattle herd. Many farmers already made use of this option. But this way of expanding the dairy cattle herd is not without risks. Farmers have to be sure to buy cows from farms that are BVD and IBR free. The current status of Portugal is IBR positive (MSD Animal Health, 2015). Also the BVD status of Portugal is positive (Boehringer Ingelheim, 2015). Therefore the best way of growing in the amount of cows is by

the other methods mentioned above. When it is for a farmer really necessary to buy cows from an external farm, there are options in the Scandinavian countries and for example Switzerland and Austria. These countries are stated free of IBR (MSD Animal Health, 2015).

5.5.4 Arable land

Some farmers have enough land available to feed more cows in the future. An adjustment in the forage management can in some cases be sufficient in order to realize enough forage yields. Already described was that cutting the grass more frequently can lead to higher forage yields and a better nutritional value of the forages. But some farmers will have to buy extra land in the future in order to feed the extra cows they want to keep in the future. This is a serious investment since the prices of agricultural land can rise up to €20 per m². In some cases it is necessary to buy extra land, otherwise the farm will become too intensive. A too intensive farming method is in the future not desirable since the manure policy may become stricter and due to implementation of greening measures lower total forage yields are expected. Also in relation to the social acceptance of the sector more intensive farming methods are not desirable.

5.6 Conclusion

Van der Ploeg uses different parameters to distinguish different kind of farmers. Unfortunately these characterizations of dairy farmers cannot completely be implemented for the characterization of the different farmers in the municipality of Barcelos. Also another more recent study about typifying different dairy farmers is not fully useful since the farmers in the municipality of Barcelos differ significantly from each other. These farms differ in size, intensity, future plans and also in the production efficiency. Obviously is that the interview among the farms showed that there aren't farms with plans to start side activities in the future.

Finally the farmers in the municipality of Barcelos are typified by scale and future plans. This leads to roughly four different kind of dairy farmers. These are the conservatives, small optimizers, optimal farmers and growers. The conservatives are small farms with plans to continue with the current way of farming. The small optimizers have plans to improve the production efficiency of their farm and want to increase the milk production per cow. The size of these farms is also small. There are two groups of farmers that are bigger in size, the optimal farmers and the growers. The difference between these groups is that the optimal farmers already have the size they want to maintain in the future. The growers, on the other hand, want to increase the amount of cows in the future. Not all the farmers in the municipality of Barcelos fit perfectly in these four groups but in general this division into four groups represents most of the farmers.

For the conservatives there are opportunities for crossbreeding and savings in machine costs. Also for these farms there is the option to start or extend the winery activities. Improvements in the feeding management and the barn construction are possible for the small optimizers. This group of farmers can also save machine costs. The strategy of changing the fodder management and crop diversification and an increase of the production efficiency and animal health fits for the optimal farmers. For the growers it is important to solve or prevent overpopulation in the barn and to improve the working efficiency. Increasing the life production of the cows is important in order to make a gradual growth in the amount of cows possible.

Discussion

The new Common Agricultural Policy (CAP) contains measures that contain mandatory practices which are beneficial for the environment and climate. One parameter of this greening measure is crop diversification. The crop diversification includes measures to increase the biodiversity. Farmers with more than 10 hectares of arable land have to grow two different crops. When a farm has more than 30 hectares of arable land, this farm has to grow at least 3 different crops. According to Westhoek et al. (2012) this implementation of greening won't have a high impact on European farmers since most arable farmers already grow three crops or more. But most of the dairy farmers in the municipality of Barcelos grow only one crop during the summer season. This is the high producing corn crop. Therefore the new Common Agricultural Policy will probably lead to lower total forage yields of these farms. New crops like sorghum or permanent grassland can appear in the future as a summer crop.

Research pointed out that the amount of dairy farmers in North-West Portugal, where the municipality of Barcelos is located, will decline in the future (Costa and Sottomayor, 2013). Therefore the development over the past years, which shows that many dairy farmers in the municipality of Barcelos end up their farm, will continue in the future. Remarkable was that the interviews among the dairy farmers in the municipality of Barcelos pointed out that most of the dairy farmers have a successor in the future. Therefore a sharp decline in the amount of farmers of the municipality of Barcelos on the short term is not likely to happen. Another research predicts a decline of the total milk production by more than 8% in the North of Portugal (IPTS, 2009). Probably other regions in the North of Portugal will be responsible for this decline. Because the interviews among the farmers of the municipality of Barcelos pointed out that many farmers are planning to continue with the current amount of cows and want to realize a higher milk production per cow, or even expand in the amount of cows. Therefore, a decline of the total milk production by more than 8% in the municipality of Barcelos is not likely to happen.

There have been analyzed different methods to distinguish different types of dairy farmers. Van der Ploeg (1990) talks about a typifying by on one hand the milk production per cow and on the other hand the total amount of cows managed per person. In this method, machine farmers are typified as farmers with a lower milk production per cow and a high labor efficiency. This method of typifying cannot be used for the farmers in the municipality of Barcelos, since in this region a relatively large group of farmers can in fact be typified as machine farmer. Another method for typifying is by intensity and scale. This method could be useful, but for this method of typifying small scaled farmers with a low intensity are called finishers. This could give a wrong picture of these farmers since most of them are planning to continue their business in the future. Dirksen et al., (2013) uses a method which is not fully useful. This method is more useful for more developed farms in North-West Europe. Therefore, finally a combination of these different models described is used and the farmers are distinguished in scale and future plans.

This typifying of farmers is not completely reliable since there are always farmers that not completely fit in one of the four groups formed. Also only roughly 8% of all the farms in the municipality of Barcelos have been interviewed. But supposed can be that these farms form a good representation of the rest of the farmers since this group of interviewed farmers is very diverse.

Conclusions and recommendations

The abolishment of the milk quotas in April 2015 in the European dairy sector will on the long term lead to structural changes in the European dairy sector. The dairy farms located in Northern coastal regions of the EU, like the Netherlands, Belgium, Germany, Poland and Denmark, will have a competitive position in the future. In these areas, with dairy farms that have the availability of much grassland, an extension of the dairy sector is possible. The farmers in these areas have lower feeding costs since the majority of the diet from the dairy cows consists of forages. Therefore these farms are not that much dependent on price fluctuations of concentrate feeds in the future. Furthermore they will be more resistant to milk price fluctuations which will occur more often in the future.

On the other hand there are also regions in Europe where the total milk production is likely to decline. These are regions with less favorable conditions for milk production and therefore the production costs are higher for the farmers in this region. In general due to less favorable climate conditions and higher feeding costs since the diets of the cows contains a certain amount of concentrate feeds. Also Portugal is among these regions. The amount of dairy farmers in this country will decline too.

Also the amount of dairy farmers in the municipality of Barcelos is going to decrease in the future. This is a development which has been going on for the last 30 years. But expected is that this decline in the amount of milk producers will be moderately. Out of the interviews which have been hold among a group of dairy farmers in the municipality of Barcelos can be concluded that the majority of these farmers have a successor to take over the farm in the future. Furthermore this region has, beside the less favorable aspects mentioned, also some positive aspects that can definitely be hopeful for the future.

For these farms corn silage forms the main component of the diet of the cows. The conditions in the region of Barcelos are optimal for growing corn silage. This leads to high forage yields and makes it possible to feed up to 5 cows per hectare. Therefore import of roughage is for most of the farms not necessary, even when these farms are very intensive. On the other hand a certain amount of concentrate feed is required to complete the diet. This leads to relatively high feeding costs. Although the high feeding costs, the total production costs are lower than the European average. Furthermore the farmers in the municipality of Barcelos are not located in a NVZ-area. This leads to a competitive position compared to other regions and countries in Europe that are located in a NVZ-area. These regions and countries located in a NVZ-area are facing with extra limitations according to manure management in order to ensure a good ground water quality. The high forage yields and the fact that the farmers in the municipality of Barcelos are not located in a NVZ-area make it possible to have an intensive farming method. Disposal of manure is despite of the intensive farming method not necessary. The farmers in this region don't have a manure surplus since the application standards are not as strict as in countries located in a NVZ-area.

Yet there are also some extern aspects that will have less favorable effects. The greening stimulates farmers to use a form of crop diversification. Farmers with more than 10 hectare of arable land will have to face with the requirements of crop diversification. They will have to grow at least two different crops. Farms with more than 30 hectares of arable land have to grow at least three

different crops. At this moment at the majority of the farms only corn is used as summer crop. Therefore changes in the crop rotation plan are likely to occur in the future. It is also important to keep in mind that many farms are located in or next to small villages. A social acceptance of the dairy sector in the future is important, so good agricultural practices according to manure management are important in the future.

In the municipality of Barcelos there are different types of dairy farmers. Most of them are willing to implement changes in the future in order to create a more competitive way of dairy farming. Yet there is also a small group of mainly small farmers that prefer to continue with their current way of farming. But also for these conservative farmers it is possible to improve their business without big investments or changes. Crossbreeding for example can lead to cows with an improved health and fertility. But important to mention is that this is not a way to solve management problems on these farms. Part of the strategy for these farmers is savings in machine costs. It may be interesting to conduct more fieldwork by service companies. This means that these farmers don't need to do big investments in machines anymore which will save machine costs. Starting a small cooperation regarding to mechanization has comparable effects. The smallest farmers from this group can benefit from extra direct income support, the small farmers scheme. For many of these small farms there is also an opportunity to expand the winery activities. This can lead to an extra income buffer for periods with low milk prices.

For the group of farmers that are also small scaled but are willing to improve the production efficiency and by this way increasing their milk production there are also opportunities to create a more competitive way of farming in the future. There are opportunities for improvements of the barn construction that can lead to a better fertility and health of the cows on these farms. Related to the feeding management there are as well opportunities for improvement. For some farms it is recommended to invest in an unifeeder with a weighing system. This makes it possible to feed the cows more accurately and this can prevent selection of the different feeds. Consequently a higher feeding efficiency and a higher milk production lead to lower feeding costs per kg milk. Also for this group of farmers there are opportunities to save mechanization costs by conducting more fieldwork by service companies or by starting a small cooperation regarding to mechanization equipment.

On the other hand there are the larger farmers. These farmers are in general more intensive than the smaller farmers. One group is already kind of prepared for the period without milk quotas. These optimal farmers already have the desired amount of cows and have enough land to be self-sufficient in forage production. But they still see possibilities for improvement. There are possibilities in cost reduction but there are also possibilities in realizing a higher total income. Changes in the fodder management can create a more competitive way of dairy farming. Cutting the grass more frequently can lead to higher yields of this crop. Furthermore the nutritional value of the silage will be more suitable for feeding grass silage to the dairy cows. The high level of crude protein of this silage is advantageous since it will lead to a lower demand of protein rich concentrate feeds to complete the diet.

For these optimal farmers crop diversification is necessary in order to receive the maximum income support from the Common Agricultural Policy. Permanent grassland is an option as a second summer crop. This offers also opportunities for grazing during the summer period. A third crop which could fit in the crop rotation of these farms is sorghum. This crop has a higher water use efficiency than corn.

Although this crop has a lower total digestibility than corn silage, it has potential since it contains more crude protein than corn and the energy content is only slightly lower than the energy content of corn. Also the total input costs for sorghum are lower than for corn silage. A disadvantage is that growing sorghum as a forage crop is not common yet in the region of Barcelos.

For the optimal farmers there are possibilities to improve the production efficiency by realizing a higher milk production per cow. A higher milk production per cow will lead to lower feeding costs per cow due to a higher feeding efficiency. Most of the farms don't have different groups for lactating animals in different production levels. Separation of the animals into different groups leads to more accurate feeding and a higher feeding efficiency and consequently this leads to lower feeding costs. Another part of the strategy for this group of farmers is an improvement of the animal health. When the udder health improves, the occurrence of mastitis will be lower. This will lead to lower mastitis costs. Improvement of the udder health starts with an improvement of the hygiene of the farms. A better heat detection and an outbalanced diet for the heifers are necessary in order to save rearing costs. Furthermore a short interval between calvings is a way to realize cost reductions and optimize the farm.

The other larger farmers are typified as the growers and have a strategy that contains plans to expand the farm. They are planning to keep extra cows in the future and/or are planning to invest in extra land. Also an increase of the milk production per cow belongs to the goals of these farmers. For these farmers crop diversification is also necessary in order to maintain the full income support. Therefore also for these farms permanent grassland and sorghum are two forages that could fit into the crop rotation plan. Since there will be kept more cows in the future, more roughage is needed in the future. Therefore cutting the grass more frequently is an option in order to realize higher dry matter yields. Purchasing extra land is expensive, but this is in some cases necessary otherwise these farms will become too intensive. For the growers it is also important to solve any problems of overpopulation before they grow in the amount of cows. Overpopulation in the barn is not favorable according to the animal health and it has also negative impacts on the overall income of the farm. In order to achieve a gradual growth in the amount of cows it is recommended to realize a high life production of the cows and a low replacement rate. In this way it is possible to grow without purchasing a lot of livestock from other external farms.

Additional research is needed for the implementation of new fodder crops that can replace corn silage partially. The majority of the farmers don't have experience with other summer crops except corn silage. But it is clear that there is potential for the growth of other crops like sorghum, regarding to the favorable climate.

The final conclusion is that there are opportunities for the farmers to become more competitive in the future. These opportunities are a reduction of the total production costs and realizing higher total yields. The question is if all the farms will be competitive enough in the future, especially those small farms which are planning to continue with their current way of farming. These farms will be highly dependent on the milk price, which is expected to fluctuate in the future. A substantial decline in the total milk production of the farmers in the region of Barcelos is not expected. Expected is that a number of dairy farmers will disappear in the future. But farmers that increase their milk production will compensate for this loss in milk production.

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Appendices

- I SWOT-matrix
- II Short interview dairy farmers
- III Outcomes interviews

Appendix I SWOT-Matrix

	S1/High forage yields possible	S2/Good infrastructure	S3/Cooperation	S4/Total costs per ton of milk	W1/Often small fields, only a few farms with grazing	W2/Land is scarce and expensive	W3/High feeding costs	W4/Labour efficiency	W5/Many small scaled farms
O1/Young farmers scheme	0	0	+	0	0	+	0	0	0
O2/Small farmers scheme	0	0	+	0	0	+	0	0	++
O3/Arise of service companies	0	+	0	++	-	0	0	++	+
O4/Reduction in antibiotic use possible	0	0	+	0	0	0	0	0	0
T1/'Greening'	++	0	+	0	0	--	-	0	0
T2/Increase of milk production in more competitive areas in Europe	+	+	+	+	0	-	-	-	--
T3/Milk price fluctuations	0	0	0	++	0	0	-	0	--
T4/Feed price fluctuations	+	0	0	++	0	-	--	0	--
T5/Social acceptance	0	0	0	0	--	0	0	0	0

Appendix II Short interview dairy farmers

Nome do Proprietário da Exploração/ Name owner _____

Localização/ Location _____

Nº de Animais em Produção/ Number of animals in production _____

Quantidade de leite em L/dia por animal (média)/ Milk production/cow _____

Produção de leite por ano/ Milk production/year _____

Área/ Area (ha's) ____

Intensidade (kg leite/ha)/ Intensity (kg milk/ha) _____ -

Quantas pessoas trabalham na exploração agrícola ?/ How many people work in the farm? _____

Está a trabalhar nesta exploração agrícola o seu trabalho em tempo integral?/ Is working in this farm your fulltime job?

- ☐ Sim/ Yes
- ☐ Não, também tenho outro emprego em outro lugar/ No, I also have another job elsewhere

Você tem um sucessor para assumir a fazenda no futuro?/ Do you have a successor to take over the farm in the future?

- ☐ Não/No
- ☐ Sim/Yes
- ☐ Não é relevante neste momento/ Not relevant at this moment

Você já fez investimentos na exploração agrícola ao longo dos últimos anos?/ Have you done investments in the farm over the last years?

- ☐ Não/No
- ☐ Sim, Eu investi em _____ Yes, I invested in

Qual é a sua estratégia após a abolição das quotas leiteiras/ What is your strategy after the abolishment of the milk quota?

- ☐ Expandir a fazenda/ Expand the farm
- ☐ Nenhum investimento extra, mas fazem a fazenda mais eficiente para realizar uma maior produção de leite por vaca. No extra investments, but make the farm more efficient to realize a higher milk production per cow
- ☐ Comece outras atividades ao lado da fazenda de gado leiteiro. Start other activities beside running the dairy farm
- ☐ Continue com a forma atual da agricultura./ Continue with the current way of farming.
- ☐ Outro _____ / Other....

Outcomes interviews

Appendix III

Name/farm	Location	Cows in production	Milkproduction/day (l)	Milkproduction/year	Area (ha)	Kg milk/ha	Workload (persons)	Kg milk/person	Fulltime job
Antonio Rodrigues	Ucha	17	16,5	110.000	9	12222	1,5	73.333	Yes
Antonio Martins	Maceira de Rates	76	29	613.633	13	47203	3	204.544	Yes
Quinta Valde do Rio	Remelhe	60	30,5	540.000	30	18000	3	180.000	Yes
Zé Carlos Mariz	Maceira de Rates	105	34	1.200.000	20	60000	2	600.000	Yes
Luís Carlos	Balugães	19	21,5	140.000	7	20000	2	70.000	Yes, but in future maybe another side job
David Sousa Flouciredo	Lisó	68	27,4	618.000	25	24720	2	309.000	Yes
Maria Amelia	Lisó	32	18,3	210.000	20	10500	3	70.000	Yes
Rui Barbosa	Manhente	265	32	2.600.000	70	37143	4	650.000	Yes
Joaquim	Acrozeiro	85	27	700.000	30	23333	4	175.000	Yes
Rosa	Cossourado	15	20,5	115.000	6	19167	2	57.500	Yes
Manuel Pereira Barbosa	Aborim (Barcelos)	27	28,5	260.000	7	37143	3	86.667	Yes
Abilio	Carreira	28	28	255.000	8,5	30000	2	127.500	Yes
Henrique da Silva	Maceira de Rates	62	33	640.000	14	45714	2	320.000	Yes
Oli Pereira	Minhotões	190	32	1.700.000	65	26154	4	425.000	Yes
Arce de Cunha	Minhotões	161	29,6	1.600.000	53	30189	3	533.333	Yes
Quinta do Sobreiro	Ucha	154	31	1.500.000	48	31250	5	300.000	Yes
Fernando Costa	Ucha	80	32	800.000	20	40000	2	400.000	Yes
Maria Gomes	Bastuço S. João	60	32,6	696.000	20	34800	2	348.000	Yes
Manuel Silva	Bastuço S. João	64	24,6	584.000	16	36500	2	292.000	Yes
António Pereira	Viatodos	60	30	657.000	26	25269	3	219.000	Yes
José Luis Fernandes	Cristelo	142	30	1.368.750	40	34219	3	456.250	Yes
Domingos Faria	Vila frescainha de S. Martinho	48	26	540.000	23	23478	2	270.000	Yes
Maria Ribeiro Gomes	Viatodos	35	35,1	380.000	10	38000	2	190.000	Yes
Golden Farm	Silveiros	78	32	750.000	30	25000	2	375.000	Yes
António Costa	Minhotões	102	28,5	900.000	40	22500	2	450.000	Yes
Manuel Miranda	Viatodos	43	25	360.000	6	60000	2	180.000	No
Antonio Gomes Ferreira	Alvelos	47	32,2	547.500	12	45625	3	182.500	Yes
Barcelite	Barcelinhos	44	22,7	500.000	30	16667	2	250.000	Yes
José Martins	Maceira de Rates	70	27	675.250	15	45017	3	225.083	Yes
António Jorge Rebelo Miranda	Cossourado	75	29,5	790.000	18	43889	4	197.500	Yes
Sr Domingos	Aborim (Barcelos)	65	27,5	540.000	16,5	32727	2	270.000	Yes
João Senra Longres	Carvalhal	25	26,4	182.500	10	18250	4	45.625	Yes
Average		75	28,1	721.020	24	31.709	2,7	266.651	

Name/farm	Location	Successor in future	Investments
Antonio Rodrigues	Ucha	Not relevant at this moment (young children)	Yes, invested in buying animals and some reparations of the barn and invested in machines
Antonio Martins	Maceira de Rates	Yes	Yes, in a new milk tank, a second hand milking parlour (2x7 Manus) and machinery
Quinta Vaide do Rio	Remelhe	Yes	Yes, invested in the infrastructure of the farm
Zé Carlos Mariz	Maceira de Rates	Not relevant at this moment (just took over the farm from parents)	Yes, invested in machines and the farm is quite new
Luís Carlos	Balugães	Not relevant at this moment (just took over the farm from parents)	Yes, invested in a new roof construction for the barn of the cows in lactation
David Sousa Floucredo	Lisó	Yes	No
Maria Amelia	Lisó	Yes	Yes, in the roof construction of the farm
Rui Barbosa	Manhente	Yes	Yes, installations and buildings (for young stock) and machines
Joaquim	Acrozelio	Yes	Yes, in cubicles and feeding rack
Rosa	Cossourado	Yes	Yes, in tractor and other machines, milking system
Manuel Pereira Barbosa	Aborim (Barcelos)	Yes	Yes, in machines and land
Abilio	Carreira	No	Yes, in several machines
Henrique da Silva	Maceira de Rates	Not relevant at this moment (young children)	Yes, built a new barn, invested in extra comfort for the cows, new tractor
Oli Pereira	Minhotões	Not relevant at this moment (young children)	Yes, invested in a new roof construction for the barn of the cows in lactation and in machines
Arce de Cunha	Minhotões	Not relevant at this moment (young children)	Yes, the farm is new
Quinta do Sobreiro	Ucha	No	Yes, in farm equipment (machines etc.)
Fernando Costa	Ucha	Not relevant at this moment (young children)	Yes, barn is only 4 years old
Maria Gomes	Bastuço S. João	No	Yes, in housing of heifers
Manuel Silva	Bastuço S. João	Yes	Yes, renovation of milking parlour and other small renovations
António Pereira	Viatodos	Yes (the son will take over the farm within 3 months)	Yes, in housing of the dry cows
José Luis Fernandes	Cristelo	Yes	Yes, in a concentrate silo, machines, tractor and some renovations
Domingos Faria	Vila frescainha de S. Martinho	Yes	Yes, in cubicles, machines and roof construction
Maria Ribeiro Gomes	Viatodos	Yes	Yes, in roof construction of the farm
Golden Farm	Silveiros	No	Yes, farm is started up in 2012 (completely new)
António Costa	Minhotões	Yes	Yes, in machines
Manuel Miranda	Viatodos	No	Yes, in extension of the farm for dry cows and cows in lactation
Antonio Gomes Ferreira	Alvelos	Yes	Yes, in cubicles and new feeding manger
Barcelite	Barcelinhos	Yes	Yes, in cubicles and extension of the barn
José Martins	Maceira de Rates	Yes	Yes, in milktank and other renovations of the barn
António Jorge Rebelo Miranda	Cossourado	No	No
Sr Domingos	Aborim (Barcelos)	No	Yes, in milking parlour and box for concentrate feeding
João Senra Longres	Carvalhal	No	No

Name/farm	Location	Strategy	Notions/remarks
Antonio Rodrigues	Ucha	Continue with the current way of farming	Has also a small vine-yard
Antonio Martins	Maceira de Rates	Expand the farm to 80-90 cows, invest in more land and realize a higher production per cow	Overpopulation in the barn
Quinta Valde do Rio	Remelhe	No extra investments, but make the farm more efficient to realize a higher milk production per cow	Has also a small vine-yard
Zé Carlos Mariz	Maceira de Rates	Invest in extra boxes and feed places for the cows in lactation to solve the overstocking and realize a higher milk production per cow	Intensivity of 60.000 kg milk/ha, but not necessary to dispose manure or import forages
Luís Carlos	Balugães	No extra investments, but make the farm more efficient to realize a higher milk production per cow	Will renovate the roof, invest in a new feedrack for the dairy cows and cubicles for dry cows
David Sousa Floucredo	Lisó	No extra investments, but make the farm more efficient to realize a higher milk production per cow	
Maria Amelia	Lisó	Continue with the current way of farming	
Rui Barbosa	Manhente	No extra investments, but make the farm more efficient to realize a higher milk production per cow	All the fieldwork by own employees, also harvesting
Joaquim	Acrozelo	Continue with the current way of farming	Has 3 sons which are candidate to take over the farm because they can't find work elsewhere
Rosa	Cossourado	Continue with the current way of farming	Uses a 4 row corn harvester for harvesting all the corn
Manuel Pereira Barbosa	Aborim (Barcelos)	No extra investments, but make the farm more efficient to realize a higher milk production per cow	1 internship runner
Abilio	Carreira	Continue with the current way of farming	
Henrique da Silva	Maceira de Rates	No extra investments, but make the farm more efficient to realize a higher milk production per cow	Has his own machine for harvesting which is used for 3 farms
Oli Pereira	Minhoães	No extra investments, but make the farm more efficient to realize a higher milk production per cow	Milking with 3 milking robots
Ace de Cunha	Minhoães	No extra investments, but make the farm more efficient to realize a higher milk production per cow	Not all 5 workers work fulltime on the farm
Quinta do Sobreiro	Ucha	No extra investments, but make the farm more efficient to realize a higher milk production per cow	Received EU support for the investment in the new barn
Fernando Costa	Ucha	No extra investments, but make the farm more efficient to realize a higher milk production per cow	
Maria Gomes	Bastuço S. João	No extra investments, but make the farm more efficient to realize a higher milk production per cow	
Manuel Silva	Bastuço S. João	No extra investments, but make the farm more efficient to realize a higher milk production per cow	
Antonio Pereira	Viatodos	No extra investments, but make the farm more efficient to realize a higher milk production per cow	
José Luis Fernandes	Cristelo	Expand the farm (more cubicles and feeding places) and grow 10-20% in the amount of cows	
Domingos Faria	Vila frescainha de S. Martinho	Continue with the current way of farming	
Maria Ribeiro Gomes	Viatodos	No extra investments, but make the farm more efficient to realize a higher milk production per cow	
Golden Farm	Silveiros	Fill the space of the barn, now 78 cows in future 140 cows in production	Received EU support for the investment in the new barn, has 2 milking robots
António Costa	Minhoães	No extra investments, but make the farm more efficient to realize a higher milk production per cow	Cows in pasture from April till October (only when the weather conditions are good)
Manuel Miranda	Viatodos	Continue with the current way of farming	The owner is 70 years old, but has two employees that do the main activities on the farm
Antonio Gomes Ferreira	Alvelos	No extra investments, but make the farm more efficient to realize a higher milk production per cow	
Barcelheite	Barcelinhos	Grow in the amount of cows and finally keep 60-70 cows, and realize a higher milk production per cow	Many cows imported from the Netherlands
José Martins	Maceira de Rates	No extra investments, but make the farm more efficient to realize a higher milk production per cow	
Antonio Jorge Rebelo Miranda	Cossourado	Expand the farm	
Sr Domingos	Aborim (Barcelos)	Continue with the current way of farming	
João Senna Longres	Carvallal	Stop with dairy farming	