SWedish University of Agricultural Sciences
Faculty of Natural Resources and Agricultural Sciences
Department of Economics

Policies affecting the competitiveness of dairy production in Sweden, Denmark and Germany

Carl-Martin Andersson & Mattias Gotting

Master's thesis · 30 hec · Advanced level
Agricultural programme - Economy Specialisation
Degree thesis No 698 · ISSN 1401-4084
Uppsala 2011

Policies affecting the competitiveness dairy production in Sweden, Denmark and Germany

Carl-Martin Andersson & Mattias Gotting

Supervisor: Hans Andersson, Swedish University of Agricultural Sciences, Department of Economics

Examiner: Karin Hakelius, Swedish University of Agricultural Sciences, Department of Economics

Credits: 30 hec
Level: Advanced E
Course title: Independent project/degree in Business Administration
Course code: EX0536
Programme/Education: Agricultural Programme – Economy Specialisation

Place of publication: Uppsala
Year of publication: 2011
Name of Series: Degree project
No: 698
ISSN 1401-4084
Online publication: http://stud.epsilon.slu.se

Key words: policies, subsidies, taxes, dairy production, competitiveness

Swedish University of Agricultural Sciences
Faculty of Natural Resources and Agricultural Sciences
Department of Economics

Acknowledgements

We would like to thank the Swedish Dairy Association (Svensk Mjölk) for a good cooperation and interesting input in our work with this thesis. We send special acknowledgement to Håkan Rietz, Agneta Hjellström, Sofia Björnsson and Jonas Carlberg who assisted us and made this project possible.

The trip to Germany and Denmark we were given the opportunity to perform was important for the results and also gave us valuable experiences. We wish to thank the people who took their time to meet us for interviews, which let us visit their farms and showed interest in our topic. Thank you, Martin Hagemann, Johannes Thomsen, Joachim Becker, Denise Völker and Helma Möllgaard in Schleswig-Holstein, Germany. Furthermore we wish to pass on our acknowledgement to the people at the Knowledge Centre for Agriculture in Aarhus. We are especially thankful to Susanne Clausen who prepared meetings and made our visit in Aarhus really useful for our thesis. In Aarhus we also want to thank Martin Hestbech and Jørgen Korning for giving us useful information about Danish dairy farming.

In addition, we are grateful to our supervisor, Professor Hans Andersson at the Department of Economics at the Swedish University of Agricultural Sciences. Your engagement and our interesting discussions together were really helpful and inspiring in the performance of this thesis.

Carl-Martin Andersson & Mattias Gotting

Abstract

Denmark, Germany and Sweden are along with 24 other countries members of the European Union. Being part of the European Union also means being part of a European market. Within the union barriers for trade has been abolished in order to create more open market. This open market has also contributed towards a more globalized market for dairy products. What used to be a domestic market has become globalised with increasing trade among the members. The membership also includes a common agricultural policy (CAP) which regulates rules for animal welfare, the environment and subsidies. The common agricultural policy provides a framework for laws and legislation within the European Union. The idea of these common policies is to provide similar conditions for the market players irrespective of member country.

However, each member state applies the policies a bit differently but still within the framework which affect the conditions for the producers differently. In addition to the European framework each county has its own individual system of laws, taxation and reimbursements which affect the competitiveness. Subsidies and tax reductions given to dairy farmers can be viewed as cost reducers rather than ensuring a minimum income. The subsidies enable the farmers to maintain production even if the market price is lower than the variable costs. The effect from the subsidies then make the marginal cost lower which gives the farmers a competitive advantage in form of cost advantage.

The aim of this study is to investigate how subsidies and tax systems affects the competitiveness for dairy producers in Denmark, Germany and Sweden. To illustrate the effects of the different systems a case farm located in southwest Sweden has been used. The farm has 220 dairy cows and 205 hectares of agricultural land. The theory used to measure the effects from the three different systems has its basis from a dissertation by Ola Flaten (2001).

The results show that there are differences in the result for the case farm when the different rules are applied. The most profitable system when applied to the case farm is the German which generates a net farm income of 277 940 Euros. The second most profitable system when applied to the case farm is the Danish which generates a net farm income of 272 870 Euros. The Swedish system generates the lowest net farm income of 271 542 Euros.

In order to measure competitiveness the average cost per delivered ton milk has been used. The most competitive system when applied to the case farm is the Danish which has an average cost per delivered ton milk of 248,6 Euros. The second lowest average cost has the Swedish system which is 251,3 Euros per delivered ton milk. The highest average cost is generated by the German system which amounts to 256,3 Euros per delivered ton milk.

Sammanfattning

Danmark, Tyskland och Sverige är tillsammans med 24 andra länder medlemmar i den Europeiska Unionen. Medlemskapet i den Europeiska Unionen innebär också att man är del av den Europeiska marknaden. Inom unionen har handelshinder som tullar avskaffats för att skapa och gynna en mer öppen marknad. Denna öppna marknad inom EU har också medfört en mer öppen och globaliserad marknad inom mjölkproduktionen. Det som tidigare till stor del endast bestod av inhemska marknader har blivit mer globaliserade och istället lett till en stor gemensam marknad mellan medlemsländerna. Medlemskapet i EU innebär även en gemensam jordbrukspolitik för alla medlemsländer med regelverk för djurvälfärd, miljö och olika former av stöd och ersättningssystem. Den gemensamma jordbrukspolitiken ger ett ramverk för hur olika lagar och regler inom jordbrukspolitiken ska utformas. Tanken med detta gemensamma ramverk är att ge liknande förutsättningar för alla aktörer på marknaden.

Dock kan tillämpningen av reglerna skilja sig något länderna emellan men det sker ändå inom ramverket. Detta medför att förutsättningarna för producenterna kan skilja sig något mellan länderna. Utöver den gemensamma jordbrukspolitiken har varje land en nationell politik som styr lagar, skatter och ersättningar till lantbruket. Alla dessa varierande förutsättningar mellan länderna påverkar och skapar skillnader mellan ländernas konkurrenskraft. Stöd och andra ersättningar i form av skattereduktioner kan betraktas som kostnadsreducering och inte som ett stöd för att garantera en lägsta inkomst. Dessa stöd och ersättningar gör det möjligt för lantbrukaren att bibehålla produktion trots att marknadspriset är lägre än den rörliga kostnaden. Effekten från stöden och ersättningarna leder då till lägre en lägre marginalkostnad vilket medför en konkurrensfördel i form av kostnadsfördelar.

Denna studie syftar till att utröna hur bidrag och skattesystem kan påverka konkurrensen inom mjölkproduktionen för lantbrukare i Danmark, Tyskland och Sverige. För att illustrera vilka effekter de olika systemen kan medföra har en fallgård använts. Fallgården ligger vid Falkenberg i södra Sverige och har en produktion som omfattar 220 mjölkkor och 205 hektar jordbruksmark. Teorin som använts för att mäta effekterna mellan de tre olika systemen är baserade på en doktorsavhandling som gjorts av Ola Flaten (2001).

Resultatet från studien visar att vissa skillnader uppstår när de olika systemen appliceras på gården. Det tyska systemet tillämpat på fallgården ger den högsta lönsamheten. Med det tyska systemet generar gården en nettointäkt på 277 940 Euro. Det näst mest lönsamma systemet är det danska som genererar en nettointäkt på 272 870 Euro. Det svenska systemet är det minst lönsamma och genererar en något lägre nettointäkt på 271 542 Euro.

För att mäta konkurrenskraft har genomsnittskostnaden per levererat ton mjölk analyserats. Det mest konkurrenskraftiga systemet för fallgården är det danska som ger en genomsnittskostnad på 248,6 Euro per levererat ton mjölk. Den näst mest konkurrenskraftiga systemet är det svenska som ger en genomsnittlig produktionskostnad på 251,3 Euro per levererat ton mjölk. Det minst konkurrenskraftiga systemet är det tyska som ger en genomsnittskostnad på 256,3 Euro per levererat ton mjölk.

Table of Contents

Table of content Figures and Tables

1 Introduction

1.1 Problem background

In 1951 representatives of the states: Belgium, France, Italy, Luxemburg, the Netherlands and Germany signed a treaty called the Coal and steel community to unite Western Europe after the Second World War (Bernitz et al. 1998, p.23) (www, Europa, Gateway to the European Union 2011). This was the first step in creating the European Union. The collaboration was extended in 1957 with the Rome treaty which included enhanced economic cooperation (Bernitz et al. 1998, p.26). The intention of the treaty was to create a common market which facilitates trade and improve mobility between the group of countries. As Article 2 of the original treatment specifies:

" The community shall have its task, by establishing a common market and progressively approximating economic policies of Member States, to promote throughout the Community a harmonious development of economic activities, a continuous and balanced expansion, an increase in stability, an accelerated raising of the standard of living and closer relations between the States belonging to it" (Article 2, Rome treaty, 1957)

The community which was established was called the EEC, European Economic Community.

To gain control of the important food market EEC launched a common agricultural policy (CAP) beginning in 1961 (Dewatripont et al. 1999, p.85). The aim of the policy was to provide all farmers the same price for the same products. The aim was to secure food production but soon the pricing system caused overproduction.

In the 1960s the trade between the member states, but also among other countries in the world increased (Dewatripont et al. 1999, p.36). Tariffs between the member states were abolished for commodities which were traded between the countries. The member states also decided to use identical import duties towards non-member states.

Germany which is one of the three countries taking part in that study has applied the CAP since the start. In 1973 EEC was extended with the United Kingdom, Ireland and Denmark (Bernitz et al. 1998, p.29). After this expansion the collaboration was reinforced and measures to fight environmental problems were established. In 1974 a fund was introduced to strengthen rural development by redistributing money from richer regions to poor regions within the EEC (www, Europa, Gateway to the European Union 2011). During the following years the collaboration was extended and more countries decided to join.

In 1995 Sweden entered the European Union (EU) (www, Europa, Gateway to the European Union 2011). From that on the Swedish duties and other barriers for trade with other EU members were abolished (Jordbruksverket 2007). As a member of the EU, each member state is covered by the Common Agricultural Policy (CAP). In the dairy sector this means import duties to protect borders, milk quota system, export subsidies, public storage of butter and skim milk powder, private storage of butter, subsidies for the use of skim milk powder and milk powder as feed, subsidies for use of skim milk powder in production of casein and caseinates, and finally subsidies for milk in schools and trading standards (www, Jordbruksverket 1 2010). These changes in the policy towards milk producers have affected the Swedish dairy sector of today.

The introduction of milk quotas caused problems and insecurity in the sector which could be viewed as one of many explanations for the lower production that followed. The Swedish milk production have not fulfilled the quota and in 2007 the Swedish milk producers used only 93,9 per cent of the quota (Jordbruksverket 2007, p.130).

A more open market since the entry into EU has led to an increase in the export of Swedish dairy products (Jordbruksverket 2007, p.135). However, since the entry into EU the total production of milk in Sweden has decreased by 11 per cent from 3,28 million tons in year 1997 (Jordbruksverket 2007, p.130) to 2,93 million tons in 2009 (www, Jordbruksverket 1 2010). The more open market has also contributed towards an increase in import of dairy products. The main exporters of dairy products to Sweden are Denmark, Netherlands, Germany and Finland.

1.2 Danish dairy industry

Milk production has during the last ten years been subject to a substantial structural development. The number of dairy farms has decreased by more than 50 per cent and the number of cows has decreased by almost 20 per cent (Nygaard 2007). However, the production has not decreased but instead increased with 2 per cent. The farms have during this period become larger and the number of cows per dairy herd has almost doubled to 127 cows per herd which is the highest number in Europe, see
Table 1 (www, Danish Agriculture & Food Council 2011). The yield from the cows has since 1996 increased from 7 100 kilos to 8 800 kilos per year, see Figure 1(Hemme et al. 2010, p.93).

The Danish dairy production consisted in 2008 of about 4500 producers (www, Danishdairyboard 2011). In 2009 the total production of milk amounted to 4,74 million tons making Denmark the 9th largest producer in EU-27, see Figure 2 (Martins et al. 2010). The production in Denmark by far exceeds the consumption of milk and almost 2/3 of the milk is processed into products that are exported. This high export share makes Denmark one of the top five exporting countries in the world. The value of the exported dairy products was 1,75 billion Euros in 2006 (Winther-Rasmussen 2007). Although Denmark exports a majority of its dairy production about 25 per cent of the cheese and 20 per cent of the yoghurt consumption is imported annually (www, Danishdairyboard 2011).

Within the milk processing industry there are several actors but the dominating actor is the cooperative Arla Foods. Arla Foods is co-owned with Swedish dairy producers and processes more than 90 per cent of the Danish milk annually (Hemme et al. 2010, p.93).

1.3 German dairy industry

In the same way as in the two other countries analyzed in this study the agricultural sector has undergone a substantial structural development in Germany (Gurrath 2009, p.5). The number of dairy farms in 2010 was about 93500, of which 5260 farms were based in the region of Schleswig-Holstein (Wohlfarth & Pötzsch 2010, p.18)
.
Germany is one of the countries that contribute most to the total number of livestock in the EU with 13,5 per cent (Hemme et al. 2010, p.102). Germany dairy production accounts for 21,2 per cent of the total amount of milk collected in EU-27 2009 (Martins et al. 2010, p.102). This makes Germany the most important milk producer in the EU with an total production of 28,25 million tons, 2009.

The number of dairy cows has during the latest ten years decreased from about 4 500 000 in year 2000 to 4 200 000 in 2009 which corresponds to an reduction of 6,7 % (Wohlfarth & Pötzsch 2010, p.18). However if we go further back in time the number of cows has decreased with 22,3 per cent since 1992. The average herd size in Germany was 33,7 cows in the year of 2000 and in 2010 it had increased to 44,7 cows (Wohlfarth & Pötzsch 2010, p.19). If we examine Schleswig-Holstein during the same time period we note a change from 38,7 cows up to 68,6 cows.

German dairy production has gone through a structural change where dairy production tends to move to the northwest parts of the country (Thiele & Hargens 2008). Between 1991- 2005 has the dairy production in Schleswig-Holstein increased with 7,1 % and in Niedersachsen increased with 3,8 %. Northwest Germany, especially Schleswig-Holstein and Niedersachsen are regions where dairy production has a competitive advantage due to large areas of permanent pasture and less beneficial conditions for growing grain.

A comparison comparing farms among the German "Bundesländer" reveals a very different structure among them. Bavaria is the by far largest dairy producer in Germany with a production of 7 535 million tons in 2009 followed by Niedersachsen which produced 5 591 million tons (Wohlfarth & Pötzsch 2010, p.17). Schleswig-Holstein is the fourth largest, producing 2 589 million tons in 2009. The average cow herd also differs a lot within the country especially when former East and West Germany is compared. The average farm in former East is four times larger than the ones in former West (Wohlfarth & Pötzsch 2010, p.19). Differences can also be found when comparing northern and southern parts of the country where Baden-Württemberg and Bavaria have smaller farms then regions in the north. About half of the milk produced in Germany is exported to other countries (Hemme et al. 2010, p.102). The export market is very important for the economy of the German dairy industry (www, meine-milch 1, 2011). 45 per cent of the milk produced is used for cheese production. A large part of the production is exported. Germany is the biggest exporter of cheese within the EU but also the biggest producer. From year 1997 till 2007 the export of cheese increased with 70 per cent.

Germany has a lot of milk processors that are relatively large, in 2009 Nordmilch Konzern was the biggest one processing 4,1 million tons (Hemme et al. 2010, p.102). The ten biggest processors account for 58 per cent of the total milk delivered.

1.4 Swedish dairy industry

Swedish dairy production has during the last ten years experienced a downward spiral with decreasing production. Since the year 2000 the dairy production has decreased with more than 10 per cent (www, Jordbruksverket 1 2010) and the number of dairy cows has decreased with more than 15 per cent (www, Jordbruksverket 2, 2011). During this period there has been an increase in the yield from the cows and in 2009 the average cow produced 9486 kilogram ECM (Energy corrected milk) (www, Swedish Dairy Association 2011). The average herd size has during this period also increased and was in 2009 about 60 cows per herd.

During the last 15 years the number of dairy farmers has decreased substantially. In 1995 there were 17 700 dairy farmers and in 2010 the number has decreased to 5600 which corresponds to a decrease of 68 per cent (Jordbruksverket 2011a, p.6). Sweden were in 2009 the 11th largest producer within EU-27 with a production of 2,95 million tons (Martins et al. 2010, p.107). The Swedish dairy production is self-sufficient (Hemme et al. 2010, p.150). The import of goods from EU to Sweden has increased substantially. Since the year of 2000 the

imports have increased from 55 000 tons to 306 000 tons in 2009 to a value of 6 billion SEK (Statistics Sweden 2010, p.276). Export have during the same period increased from 56 000 tons to 95 000 tons to a value of 3 billion SEK.

Within the dairy processing industry, as in Denmark, Arla Foods is the dominating actor with a market share of more than 70 per cent. Other larger actors on the market are Skånemejerier, Milko, Norrmejerier and Falköpings Mejeri. These actors together process more than 90 per cent of the delivered milk (Hemme et al. 2010, p.150)

Table 1 Structural data describing dairy production in Denmark, Germany (Schleswig-Holstein) and Sweden

Measures	DK	DE (S-H)	SE
Average herd size 2010	127*	44,7 (68,6)**	61,9***
Average milk yield, 2009, IFCN	8800	7200	9100
No. Farms 2010	4100*	93497 (5260) **	5600***
Tot. milk produced (million tonnes) 2009, IFCN	5,05	30,19	3,26

*Sources: *(www, Danish Agriculture & Food Council 2011) **(Wohlfarth & Pötzsch 2010, pp.19, 20)(Jordbruksverket 2011a, p.6)(Jordbruksverket 2011a, p.6) ***(Jordbruksverket 2011a, pp.6, 7) (Hemme et al. 2010, pp.93, 102, 150)*

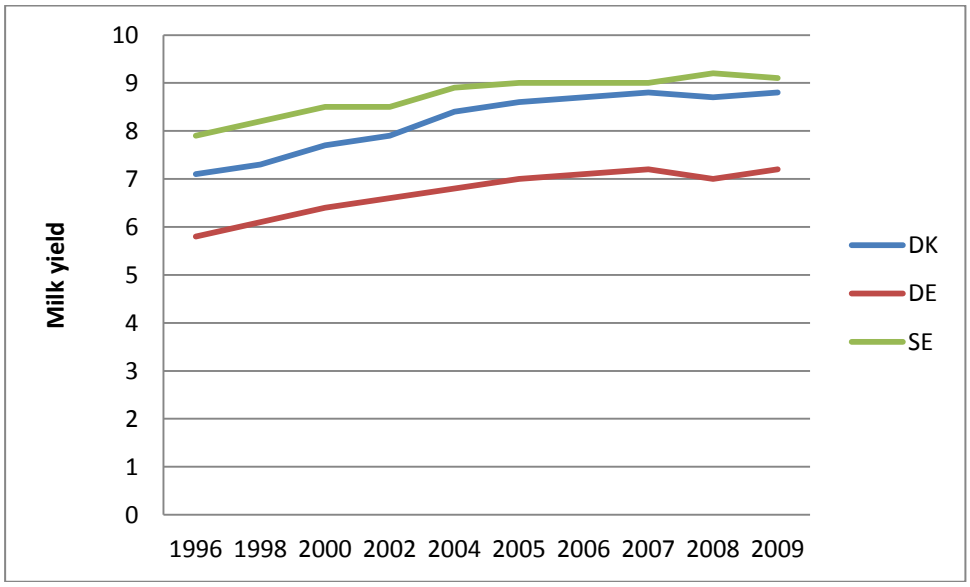


Figure 1, Milk yield over time in Denmark, Germany and Sweden

Source: (Hemme et al. 2010, pp.93, 102, 150)

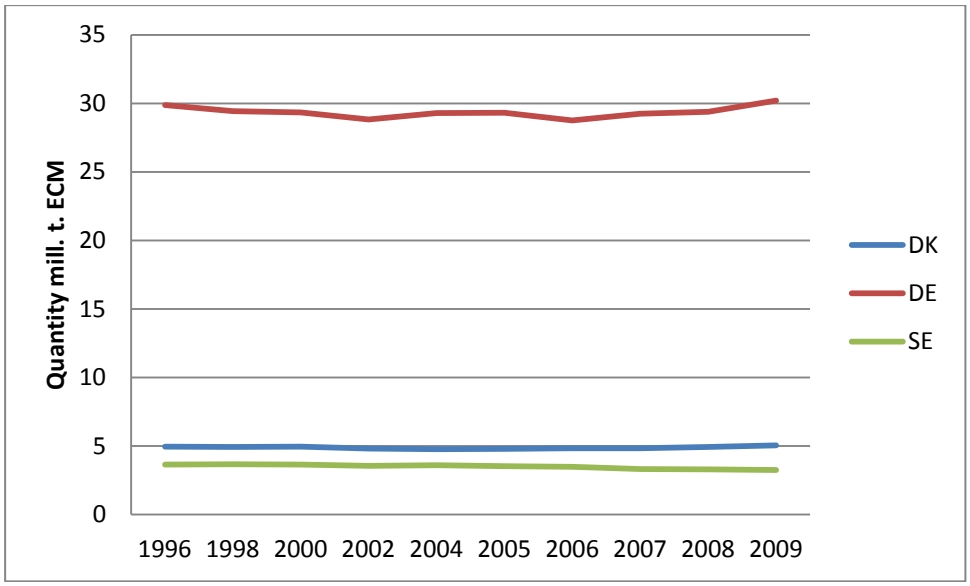


Figure 2, Milk production over time in Denmark, Germany and Sweden

Source: *(Hemme et al. 2010, pp.93, 102, 105)*

1.5 Problem

The dairy market in Sweden and Europe has become a lot more volatile and market oriented during the last years (Pers. com, Rietz 2011). This is a result of a more globalised market where the entire EU is becoming one market instead of separate markets in each individual country. Today all the members of EU adjust to CAP which regulates the production of agricultural products (Dewatripont et al. 1999, pp.85-90). CAP also defines a framework for laws and legislation within the agricultural sector. The regulations within CAP cover areas such as environment, budgets, subsidies, animal welfare and in some areas quantity produced. At a first glance the rules that affect the producers in each country appear to be very similar. However, countries apply the rules and regulations stated by CAP rather differently but still within the framework (Pers. com, Rietz 2011). Differences in appliance of the rules result in differences in terms of competitiveness among the producers. There are also national rules, legislations and taxation systems determined by each country in addition to the rules formulated by CAP (Jordbruksverket 1 2010). These differences can be noticed in many areas. As an example the Danish producers have a tax on their agricultural land (Jordbruksverket 1 2010, p.8). The German farmers face an heavily subsidized production of farm-sized digesters (Pers. com, Rietz 2011) and the Finnish farmers receive almost twice the amount of direct subsidies compared to Sweden (Jordbruksverket 1 2010, p.7). Each country has different priorities and the policies are different which also affect the competitiveness differently.

The problem can be divided into two categories, “direct monetary values” and “indirect monetary values”. The direct monetary values consist of taxes and subsidies which affect the farmers and the competitiveness directly. The indirect monetary values consist of rules regarding animal welfare and environment. These rules affect the farmers’ indirectly in the form of cost of production. Rules for animal welfare can affect the cost for constructing buildings and also ways to work. Taxes, duties or subsidies on production factors are along with rules guiding environment and animal welfare conditions important instruments to regulate the behavior and actions of the farmers and their operation.

1.6 Aim

The aim of this study is to identify how different policies create differences in the competitiveness between Danish, German and Swedish dairy producers. The study focuses on identifying differences which affect the "direct monetary values" such as subsidy levels and tax systems. Creating an inventory of existing taxes and subsides which could be applied at a dairy farm.

The measurements of competitiveness between countries are a complex matter and a controversial issue, (OECD 2010). There is a lack of definitions that are accepted as methods to compare competitiveness. Generally competitiveness at a national level could be defined as the ability of a country to produce goods and services that can meet competing products from other countries. The production must maintain and expand domestic real income and according to some also maintain the market share. A range of different ways of describing competitiveness end up in two underlying factors related to the theories of Porter (1985).

1. Relative costs and price differentials
2. Qualitative factors, ability to innovate

The second factor makes it possible for a country to export goods even when they sell them at a higher price than the competitors. These two factors can be related to the concept of competitive advantage (Porter 1985). Porter discusses a model which divides the qualities of a firm, consisting of weaknesses and strengths, into two important basic types of competitive advantages: low cost or differentiation.

Porter defines five forces that a firm has to cope with. If the firm is more successful in adapting to these forces than competitors it will become successful. Porters five forces are affecting the competitiveness of the firm is:

1. potential competitors entering the market
2. threat of substitutes
3. bargaining power of buyers
4. bargaining power of suppliers
5. rivalry among existing competitors
   Source: (Porter 1985, pp.4,5)

The concept of competitive advantage describes how a firm acts to achieve and sustain a competitive advantage by using a generic strategy (Porter 1985). How well the firm can gain a position compared to the industry average will determine the success of the firm. Porter defines three generic strategies, one of them is cost leadership. The fact that this study focus at policy differences affecting milk production puts comparative advantage in terms of cost leadership into focus.

The member states strive to keep job opportunities and stability in their own country. Different ideologies and politics among member states cause different objectives and disagreements of how the EU legislation should be implemented in each country. Due to political reasons taxes on labour and social security fees may also play an important role. Also other fiscal factors such as inheritance or gift taxes are of ideological concern. Furthermore the extent to which each country support their farmers with advisory services and also the way they control them may cause considerable disparities. To see countries as firms

competing to each other is an issue that is questioned (Krugman 1994). Striving to get market advantage compared to other countries can lead to unfavorable economic policies.

1.7 Objectives

Even though all three countries are members of the EU, which should be an open and free market with similar agriculture policies, the method of implementation may affect the competitiveness and result in advantages and disadvantages for the farmers. In order to identify factors which have an effect on the competitiveness two research questions will be answered.

> What are the implications for competitiveness depending on differences in Danish, German and Swedish subsidy systems?
>
> What are the implications for competitiveness depending on differences in Danish, German and Swedish taxation systems?

What effects do subsidies and taxes cause with respect to competitiveness when applying Danish, German or Swedish policies on a representative Swedish case farm? Will there be any differences which are measurable?

1.8 Delimitations

This study is based on a case farm located in Sweden. The structure of the farm is built up by Swedish data and the input prices are due to this based on Swedish market values. Input prices are different among the three countries but the differences between Swedish prices compared to Danish and German prices are not taken into consideration. The study focuses only on comparing a conventional farm. Aspects that not will be considered are:

- Organic production
- Animal welfare, due to the complexity of differences and lack of ways to make monetary evaluations.
- Buildings, different norms, social and rules for working conditions that affect the costs
- Differences related to location, climate and soil conditions that affect crop yields
- Wage claims due to different political systems and other reasons

1.9 Outline

In Figure 3 is an illustration of the outline presented. The first chapter provides the reader with a background and general information regarding Danish, German and Swedish dairy production. The chapter also gives an introduction to the study. Chapter two describes the theoretical basis used in when studying the differences in policies. In chapter three is the method section that clarifies how the study has been conducted. Chapter four gives background to the empirics consisting of earlier studies. Chapter five and six displays the result regarding the countries taxation systems and subsidies available for the dairy industry presented. In chapter seven the case farm is described. The case farm is used to illustrate the implications of each country's taxation- and subsidy system. After this follows the analysis and discussion in which the results from chapter five and six is analyzed. Chapter nine is the last chapter where the conclusions and final remarks are presented.

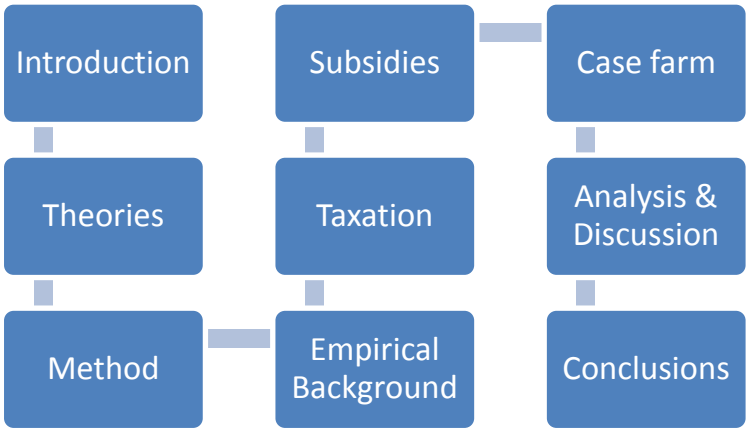


Figure 3, Illustration of the outline of the study

2 Theoretical perspective

Classical view of a firm

In the classical theory of a firm there are several assumptions made regarding the firm. The smallest firm is made up by an owner who owns all assets which are financed by borrowing and saving (Gravelle & Rees 1992, p.172). This is also the where the owner receives its income and controls and bears the risk related to the business.

Due to the prior assumptions classical theory also assumes that the individual always tries to maximize its profit (Gravelle & Rees 1992, p.169). Additional assumption made by the theory is also that the owner, employees and board of directors always have access to full information regarding their market and when making decisions. Another assumption is also that the business always has access to the latest technology. However, some of these assumptions have been criticized as a company rarely has access to full information or always has access to the latest technology (ibid, p. 171).

Competitiveness as mentioned by (Porter 1985) is very dependant of cost leadership. Not having access to the latest technology or having full information affects how a firm acts and also the costs. There are various ways for gaining cost leadership; it can among others be gained through economies of scale, profit maximization, better access to raw material or improved technology. A producer able to produce at the lowest possible price but receives a similar price for the products will receive higher returns and therefore has a competitive advantage (ibid, p.13).

Production function

A way of illustrating a company's production is by using a production function. A production function describes the relationship when resources or inputs are combined into commodities, or outputs (Debertin 1986, p.15). The functions show how to combine inputs in order to maximize the output. The general way of defining a production function is.

$$y = f\ (x) \qquad (1)$$

In this function y represents the output and x the input when something is produced. The function is identifiable for all values of x equal or greater than zero where each values provides a solution for y. The equation (1) is very simple and assumes that the produced commodity only requires one input (Debertin 1986, p.20). Very few products can be produced in this way. Most products require several inputs. Function (2) is an example of a production that requires both flexible and fixed inputs.

$$y = f(x_i \mid u_i,) \qquad (2)$$

In function (2) above x_1 represent a variable input, for instance silage and u_1 represents fixed variables, for instance labour or machinery. How to determine wither an input should be considered variable or fixed can sometimes be difficult. A variable input is normally considered as an input where the manager can alter and control the use (Debertin 1986, p.20). A fixed input is normally defined as an input where the manager has no control over the available amount. Both these perspectives on inputs change depending on time. Over a long enough time period almost all inputs become variable. However, over a shorter period the possibility for controlling the input decreases and the inputs become fixed.

A fundamental assumption within production economics is the law of diminishing returns. The law of diminishing or as Debertin (1986, p20) labels it, the law of diminishing marginal returns, states that after a point when one additional variable input is added and all other inputs remain constant, each incremental unit added to the production process produce less and less output. The change in production can be calculated by differentiating the production function to gain the first derivative. The first derivative or marginal physical product (MPP) expresses how much of additional input of the variable inputs x_i is needed to produce one unit of additional output (ibid, p.24).

In order for a firm to maximize its profit it has to minimize the cost or the difference between outputs and inputs (Gravelle & Rees 1992, p.231). The company has to find the level of output that maximizes the revenues given the cost structure. A general way of expressing the profit maximization is;

$$\max \prod = P_Q * y - P_x * x_i - FC \qquad s.t.\ y \leq f(x_i \mid u_i) \qquad (3)$$

$$y \geq 0 \qquad x_i \geq 0 \qquad u_i \geq 0$$

where $\prod$ is profit, P_Q is the price that the producer receives for its product y, P_x is the cost for the variable input x_i. Profits are maximized subject to the conditions on y and it emphasizes the company's output decisions. The expression of the function $P_Q * y$ is an expression for the total revenues generated by the company, $P_x * x_i$ is an expression for the total variable costs related to the production of y and FC are the fixed costs related to production. When a theoretical model for a profit maximization problem is developed three assumptions are made; 1st, the problem is a continues and differentiable production function, 2nd, inputs and outputs are devisable, 3rd, inputs and outputs are homogenous of degree 1 (Flaten 2001, p.48).

Another way of expressing the maximization of the profit is to focus on receiving the maximum output from the inputs used in the production. In order to maximize the inputs $y = f(x_i \mid u_i)$. The maximization problem can now be formalized as;

$$\max \prod = P_Q f(.) - P_x x_i - FC \qquad (4)$$

with the same parameters as in (3). In order to maintain a profitable production in the long term the revenues have to be larger than the costs, $P_Q f(.) > P_x x_i + FC$ or:

$$P_Q > \frac{P_x x + FC}{f(.)} \qquad (5)$$

The expression in (5) shows that the received price for product P_Q is larger than the average production cost per unit (Flaten 2001, p.52). However, in the short term it might be profitable to maintain production as long as the variable costs per units are covered, $P_Q > \frac{P_x x}{f(.)}$. The excess generated from production can then cover some of the fixed costs and therefore decreases the loss that would be associated with having no production at all.

To find where the profit is maximized equation (4) has to be partially differentiated with subject to x_i. The first-order conditions provide information concerning the optimal level of production but also how the profits change when one additional unit of input is added.

$$\frac{\partial \prod}{\partial x} = P_Q f_x(.) - P_x = 0 \quad (6)$$

Equation (6) can be rewritten as

$$P_Q \mathrm{M}P_x = P_x \quad (7)$$

From equation (6) it is clear that the optimal level of production is not affected by its fixed costs, FC (Flaten 2001, p.51).

Production with subsidies

Within the agricultural sector in Europe there are several subsidies, both on a national level and EU. The form of subsidies differ and also the intention of them. The subsidies can be coupled (related to a specific production) or decoupled (unrelated). The subsidies related to dairy production are; direct subsidies, environmental subsidies, milk quotas and production related subsidies. The direct subsidies are intended as an income subsidy and are decoupled subsidies (Bäckstrand 2003, pp.5-6). The decoupled subsidies are given to the producers to ensure a minimum income to farmers independent of the level of production. The farmer however has to respect the rules that constitute "cross compliance" ("Good agricultural and environmental condition" and "Statutory management requirements") in order to receive the subsidy. The agri-environmental payments are also decoupled and do not have a direct effect on the choice of production.

The milk quota was introduced in 1984 in order to restrain an increasing production of milk (www, HM Revenue & Customs 2011). The quota restricts production at farm level and determines the maximum amount of milk a producer is allowed to produce annually. A farmer that expands production has to acquire additional quota to avoid penalties. By introducing a quota the rise in production was inhibited and the price of milk remained at a similar level.

The production related subsidies are a direct effect from a specific production. The coupled subsidies enable the farmer to produce at a lower price than the actual costs. This type of subsidies may also encourage less productive producers to maintain a production that otherwise would not be profitable.

Profit maximization with subsidies

Different subsidies have different effect on a farm's profit function. Depending on the type of subsidy the profit function will be affected differently. Equation (8) is an expansion of equation (3) where both the coupled and decoupled subsidies have been introduced.

$$\max \prod = P_Q f(.) + DS + ES - (P_x - H)x - FC \qquad s.t.\ y \leq f(.) \quad (8)$$

$$f(.) \leq MQ$$

DS in equation (7) is a decoupled subsidy which is independent of the production. ES is also decoupled but an environmental subsidy. H is a coupled variable subsidy and is therefore related to the specific enterprise. The program is solved subject to $f(.) \leq MQ$ where MQ is the milk quota. The production of milk therefore has to be less than or equal to the quota. The profit maximization problem may given the existence of a quota be formulated as a Lagrange-function (Flaten 2001, p.56).

$$L = P_Q f(.) + DS + ES - (P_x - H)x + \lambda(MQ - f(.)) - FC \quad (9)$$
s.t. x_i , λ

$$\frac{\partial L}{\partial x} = P_Q f_x(.) - P_x - H_x - \lambda f_x(.) = 0 \quad (10)$$

Equation (10) can be rewritten as

$$(P_Q - \lambda)\mathrm{M}P_x = P_x - H \quad (11)$$

$$\frac{\partial L}{\partial \lambda} = MQ - f(.) = 0 \quad (12)$$

The first order conditions in equation (11) and (12) show that the decoupled subsidies DS do not affect the level of production. The environmental subsidies ES which also are decoupled subsidies do not affect the production either. Both of these subsidies however affect the total economic result according to equation (9). The coupled subsidy has a direct affect on the choice of production. The subsidy decreases the variable costs related to the production thereby making it more profitable. This means that a less profitable production could be maintained due to the subsidy.

If the produced quantity of milk is less than the milk quota, MQ, the constraint is not binding. If the constraint is not binding the quota will have no affect on the choice of production and can therefore be disregarded. If however the quota is binding this will give an effect on the production decision.

$$\left(P_Q - \lambda\right) = \frac{Px - H}{\mathrm{M}P_x} = \mathrm{M}C \quad (13)$$

Equation (12) is rewritten from equation (10) and shows that when the quota is binding it can be viewed as a reduction of the price received which subsequent offers marginal cost MC. When the quota is binding it is more profitable to decrease the use of variable inputs or production level rather than maintaining a high production (Flaten 2001, p.56).

Profit maximization problem for a dairy producer

The production in equation (9) was limited to only one cow. In equation (14) a profit function for a dairy farm has been formulated which is an expansion of (Flaten 2001, p.57). In addition to adding more cows, land, which the farmers use has been added. The land is used for producing silage or grain. The feed grain may be sold while the silage cannot be sold in the market.

In equation (14) a Lagrangean-function has been formulated for a producer's dairy operation.

$$Max \prod = P_Q f\left(x_g, x_k, x_a, x_i\right)\mathrm{N} + DS + ES - \sum P_{x_a,x_i} N(x_i - T) - (KC - H)N + P_k(A_k * Y_k - N * x_k) - C_k * A_k - C_g * A_g - FC \quad (14)$$

$$\text{s.t.} \qquad N * x_g = A_g * Y_g \qquad y \le f(.)$$
$$A_g + A_k \le \bar{\mathrm{A}} \qquad f(.) \le MQ$$

N = Number of cows in production
$P_Q f(.)N$ = Total income from milk
DS = Decoupled subsidies
ES = Environmental subsidies
$\sum P_{xi} N x_i$ = Variable costs in dairy production
T = Variable subsidy due to tax reductions on inputs
KC = Capital costs per cow in production
H = Coupled subsidies related to dairy production
x_g = Kg of forage or silage per cow
x_k = Kg of feed grain per cow
x_a = Hours of labour per cow
x_i = Unspecified variable input per cow
Y_k = Yield of concentrated feedstuff kg per ha
Y_g = Yield of forage or silage kg per ha
A_k = Area of grain
A_g = Area of forage or silage
C_k = Variable cost per ha of grain
C_g = Variable cost per ha of forage or silage
P_k = Price of feed grain
λ_1 = Shadow price of milk if the quota is binding
λ_2 = Shadow price of land
$\bar{A}$ = Total land
FC = Total fixed costs

Based upon the program defined in (14) a Lagrange-function has been formulated for a producer's dairy operation. In this equation A_g has been substituted with $\frac{N*x_g}{Y_g}$ according to the program mentioned in (14). $\frac{N*x_g}{Y_g}$ is an expression for the cost for growing silage instead of grain. In addition to the milk quota, λ_1 a land constraint λ_2 has been added which is the maximum land the farmer can access.

(15)

$$L = P_Q f(x_g, x_k, x_a, x_i)\mathrm{N} + DS + ES - \sum P_{x_a,x_i} N(x_{x_a,x_i} - T) - (KC - H)N +$$

$$P_k(A_k * Y_k - N * x_k) - C_k * A_k - C_g * \frac{N * x_g}{Y_g} + \lambda_1(MQ - f(.)N) + \lambda_2(\bar{A} - \frac{N * x_g}{Y_g} - A_k)$$

$$-FC$$

$$Max\ N, x_g, x_k, x_a, x_i, A_k, \lambda_1, \lambda_2$$

Other outputs than milk are assumed to be constant such as breeding and slaughter of milk cows and calves. Coupled subsidies such as male bovine premium or other subsidies are assumed to reduce the production costs and therefore decrease capital costs with H (Flaten 2001, p.57).

Milk production also entitles the farmer for subsidies as reduced energy tax. This unlike the other subsidies, takes form of a tax reduction but still has the same effect as a coupled subsidy. These tax reductions, T, are included in the variable costs for the producer and have the same effect as a coupled subsidy.

As in equation (9) the production is restricted by the milk quota, MQ. If the producer does not have sufficient quota λ_1 will be positive and therefore become an efficient constraint that affects production. λ_1 can be interpreted as the shadow price or the value of producing one additional unit of milk that exceeds the quota (Flaten 2001, p.56).

The first order necessary conditions for equation (15) are formulated as follows:

$$\frac{\partial L}{\partial N} = P_Q f(.) - \sum P_{x_a,x_i}\left(x_{x_a,x_i} - T\right) - (KC - H) - P_k * x_k - \frac{C_g * x_g}{Y_g} - \lambda_1 f(.) - \frac{\lambda_2 * x_g}{Y_g} = 0 \quad (16)$$

$$\frac{\partial L}{\partial x_g} = P_Q f_{x_g}(.)N - \frac{C_g * N}{Y_g} - \lambda_1 f_{x_g}(.)N - \frac{\lambda_2 * N}{Y_g} = 0 \quad (17)$$

$$\frac{\partial L}{\partial x_k} = P_Q f_{x_k}(.)N - P_k * N - \lambda_1 f_{x_k}(.)N = 0 \quad (18)$$

$$\frac{\partial L}{\partial x_a} = P_Q f_{x_a}(.)N - P_{x_a}N + T_i N - \lambda_1 f_{x_a}(.)N = 0 \quad (19)$$

$$\frac{\partial L}{\partial x_i} = P_Q f_{x_i}(.)N - P_{x_i}N + T_i N - \lambda_1 f_{x_i}(.)N = 0 \quad (20)$$

$$\frac{\partial L}{\partial A_k} = P_k * Y_k - \lambda_2 = 0 \quad (21)$$

$$\frac{\partial L}{\partial \lambda_1} = MQ - f(.)N = 0 \quad (22)$$

$$\frac{\partial L}{\partial \lambda_2} = \mathrm{X} - \frac{N * x_g}{Y_g} - A_k = 0 \quad (23)$$

Equation (17) and (18) can be rewritten as:

$$f_{x_g}(.) - \frac{C_g}{Y_g} - \lambda_1 f_{x_g}(.) - \frac{\lambda_2}{Y_g} = f_{x_k}(.) - P_k - \lambda_1 f_{x_k}(.) \quad (24)$$

Simplifying equation (24) yields expression (25)

$$\frac{f_{x_g}(.)}{f_{x_k}(.)} = \frac{\frac{C_g + \lambda_2}{Y_g} + \lambda_1 f_{x_g}(.)}{P_k - \lambda_1 f_{x_k}(.)} \quad (25)$$

note: $\lambda_2 = P_k * Y_k$

Equation (25) show the cost for producing silage in the current production. $\frac{C_g + \lambda_2}{Y_g} + \lambda_1 f_{x_g}(.)$is an expression for the operational cost of silage. The operational cost for growing silage depends on the cost for growing and the loss of profits per hectare attributed to other land use. If the milk quota is restrictive the operational cost for growing silage increases. However, if the producer has sufficient quota and $\lambda_1 = 0$ the restriction has no effect on the operational cost. The alternative cost for land can in some areas be high and therefore lead to very

expensive feed (Flaten 2001, p.66). The subsidies for the growing of forage or silage as well as grain are included in the expression C_g and C_k respectively. The forage or silage subsidies are not subsidies directed to only dairy farming. However, in the formulated problem it is assumed that an external market for silage or forage does not exist and this crop is therefore only used if milk production exists. This makes the subsidy for grassland equivalent to a coupled subsidy.

Equation (16) can be rewritten as:

$$P_Q - \lambda = \frac{\sum P_{xi}(x_i - T) + KC - H + P_k * x_k + \frac{C_g * x_g}{Y_g} + \frac{\lambda_2 * x_g}{Y_g}}{f(.)} = AVC \qquad (26)$$

Equation (26) displays the average cost, AC for producing one unit of milk in the short term. In this expression the variable costs and capital costs related to milk production are included (Flaten 2001, p.57). The coupled subsidies, H and the variable subsidies, T_i, lower the costs with $(T_i + H)/f(.)$. These cost reductions have a positive effect on the producer's profit (Bjarby 2004, p.22). The price P_Q is only reduced if the quota is a limiting factor for the producer. If the producer has sufficient quota then $\lambda_1 = 0$ will therefore have no effect on the production.

The minimum received price for the milk has to be $P_Q - \lambda > AC$ in order to maintain production. However, the productions fixed costs, FC are not included in the expression and to maintain production in the long term the minimum price has to be $P_Q - \lambda > \frac{AC + FC}{f(.)}$ (Bjarby 2004, p.22).

Equation (17), (18), (19) and (20) can be rewritten as follows:

$$P_Q - \lambda = \frac{\sum P_{xi} - T - P_k - \frac{C_g * \lambda_2}{Y_g}}{f_{,x_i}(.)} \qquad (27)$$

$$P_Q - \lambda = \frac{\sum P_{xi} - T - P_k - \frac{C_g * \lambda_2}{Y_g}}{\mathrm{M}P_{xi}} = \mathrm{M}C_{xi} \qquad (28)$$

Equation (28) is an expression for the marginal cost of producing one additional unit of milk with variable inputs (Bjarby 2004, p.22). The expression also reveals that the coupled subsidies H do not affect the marginal cost. The tax reduction T_i however reduces the variable costs. This has the same effect as equation (26) where it lowers the cost and therefore increases the profitability.

MC is increasing since the marginal product for x_i is decreasing. The producer will then try to optimize production by minimizing the costs for the variable inputs when the production is restricted by a quota (Bjarby 2004, p.22). Due to the price of variable inputs being known so does the optimal production level of x_i. From the equations (26) and (28) it is clear that $AC = \mathrm{M}C$. This means that when the variable costs are minimized, MC equals the average cost, AC is also minimized and therefore profits are maximized. When MC intersects the minimum point of AC is the production optimal and the profit maximized, see Figure 4.

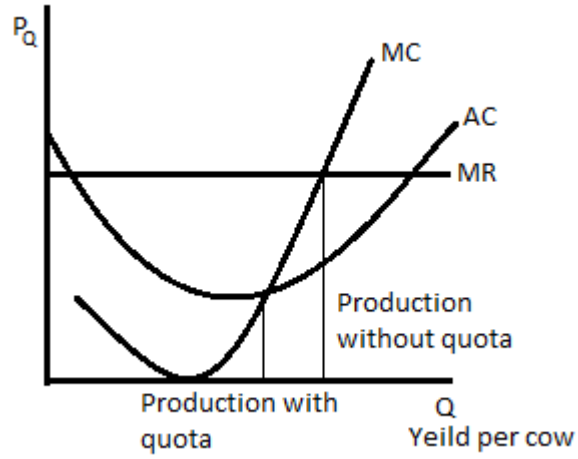


Figure 4, Optimal profit with and without quota

When the farmer has sufficient quota equation (17), (18), (19) and (20) can be reformulated as follows:

$$P_Q = \frac{\sum P_{xi} - T - P_k - \frac{C_g * \lambda_2}{Y_g}}{f_{x_g, x_k, x_a, x_i}(.)} \tag{29}$$

$$P_Q = \frac{\sum P_{xi} - T - P_k - \frac{C_g * \lambda_2}{Y_g}}{\mathrm{M}P_{xi}} = \mathrm{M}C_{xi} \tag{30}$$

The production when the quota is not binding will occur when $P_Q = \mathrm{M}C$. When producing in this situation the marginal revenue is maximized with respect to the marginal cost, see Figure 4. Producing in $MR = \mathrm{M}C_{xi}$ means that the profit is maximized with respect to the costs.

Subsidies and tax reductions given to dairy farmers can be viewed as cost reducers rather than ensuring a minimum income (Nalin 2000, p.20). The subsidies enable the farmers to maintain production even if the market price is lower than the variable costs. The effect from the subsidies then make the marginal cost lower which gives the farmers a competitive advantage in form of cost advantage.

3. Method

This chapter provides a presentation of the methods used in this study. To answer the research questions this project has been structured as a comparison of competitiveness. Explanation of how data has been collected, how it has been analyzed using the chosen theories and which delimitations that are chosen are examples of information that is included in this chapter. Disadvantages and problems that may occur when generalizations and other simplifications are conducted will be further discussed.

3.1 Approach of the study

The study has its basis in the comparison between dairy farms in Denmark, Germany and Sweden. The focus of the study is to exam the different aspects that affect the competitiveness of the farmers. Due to the complexity of this comparison a lot of factors have to be simplified. Competitiveness is a complex issue and there is a lack of accepted definitions and measures in order to evaluate the issue. (Kaspersson et al. 2002, p.33).

Competitiveness could be divided into two types (Porter 1985)(Kaspersson et al. 2002, p.33). The first type relates to qualitative factors such as relative price and cost variations, while the other second type relates to qualitative factors like innovation. Innovation can raise the qualities of the products and in a way that confront competitors with differentiation.

The OECD is commonly using the "Producer Support Estimate" to evaluate the monetary value of transfers from taxpayers to agricultural producers which is further described in section 4.2. In this study all values of policies are converted into Euro to facilitate a comparison. The conversion of values from national currencies to a common comparable currency is an important issue (OECD 2010, p.135). This study uses ECB (European Central Bank) as source for exchange rates, see Appendix 1.

The economic conditions are compared given the constraints defined by the policies in each country. The constraints consist of differences in subsidy payments and tax levels which affect net farm income. Rules for animal welfare and environmental issues also affect the production costs. Taxes and fees also affect the cost of inputs at the farm. Other national regulations, but also different implementation of EU-regulations, for instance the rules constituting cross-compliance may differ between countries. The effects of the constraints will be measured depending on the financial effects that the constraint cause.

When the effects of economic policies are measured they are often defined as static or dynamic. The static definition aims to analyze the effects of the use of resources at a certain time. There is a risk that policies cause inefficient use of resources. This is an effect of CAP which is further described by the Swedish Institute for Food and Agricultural Economics (SLI) in their report aiming to explain why the reform of the CAP was necessary (Nalin 2000, p.20). The dynamic effects the report refers to is competiveness between countries constitutes an important factor and force for the development and economic growth. The CAP is causing substantial trading barriers which probably lead to negative effects concerning productivity and economic growth (Nalin 2000, p.20)

3.1.1 Qualitative or Quantitative approach

Qualitative science aims to clarify the feature or nature of a phenomena (Widerberg 2002, p.15). The purpose of the quantitative method is as opposed to the qualitative method to show quantities aiming to define the extent to which characteristics and traits occur. The purpose of

questions asked in a qualitative study is on the other hand intended to explain the meaning of a phenomena (Widerberg 2002). The quantitative method to a larger extent focuses on verifying the occurrence of a phenomena and the relationship between them. The basic aim in quantitative research is to measure (Lundahl & Skärvad 1999, p.94). A country comparison of competitiveness contains a lot of measures such as subsidy and tax levels which are defined by a monetary value. The use of monetary values to measure competiveness is discussed in OECD´s report "Producer support estimate and related indicators of agriculture support" (OECD 2010, p.18). There are a lot of advantages of using monetary terms, percentages or ratios as methods for comparison. Most of the measures in the report are related to this type of methods. To compare countries is as already mentioned a complex issue and comparing monetary values is subject to certain risks. Important issues that are mentioned is the fact that size and structure of the agriculture sector, but also the inflation rate in a country affect the result of the studies. Comparisons between countries over time cause difficulties. In order to reduce the impact of these difficulties this study will be conducted as a static evaluation.

The aim of a qualitative study is to understand how individuals experience their surroundings (Kvale & Brinkman 2009). In a dialogue between two individuals leading questions should be avoided and the answers which are obtained should be related to the real world. The qualitative research method is associated with occasional risks due to the fact that the researcher controls the situation. This study is to a large extent based on data provided in other languages which increases the risk of misinterpretation. To avoid this kind of problem a validation is conducted containing interviews with experts in the field in Denmark, Germany and Sweden.

The study uses a lot of precise values for subsidies and tax rates that are expressed in quantitative terms. For instance, it becomes possible to evaluate which of the countries that has the highest subsidy for grassland. A more difficult issue is what effects this causes. This is because other factors related to each country influence without being easily detectable.

The aim of investigative work is mainly to produce knowledge (Lundahl & Skärvad 1999, p.9). This objective is met by drawing conclusions from data which has been collected, arranged and analyzed. According to (Lundahl & Skärvad 1999, p.14) the research could be separated into different categories depending on the purpose of it. The purpose may be to delineate, prepare decision making, solve conflicts, change or maintain status quo. To examine the effects of a decision that's been made an investigation can be suggested (Lundahl & Skärvad 1999, p.24). Investigations are often conducted at different stages in a decision process and for different types of decisions. The aim may be attributable to past time, present time or future. In order to investigate public decisions by authorities at government level is it vital to provide a link in controlling the processes in the society (Lundahl & Skärvad 1999, p.23). This study aims to create a static model at which different policies can be evaluated. The method is further described in section 3.3-3.9.

3.3 Case study approach

The aim of this study is to investigate the static effects of different agricultural policies used in Denmark, Germany and Sweden. The main purpose is not so much to static examine the impact upon decision making but more to evaluate the consequences for cost structure and net farm income. In order to more accurately depict the problem a case farm is used. The case farm used in this study is created according to the rules and methods of IFCN, see section 3.6-3.8. The case study is a useful method in scientific studies (Ejvegård 2003, p.33). The method could be more or less detailed. In this case the data is quite extensive and quantitative. A case study is a workable

approach to investigate a small fraction of a larger phenomena. With the help from the extended data, this small share describes reality by considering the data as representative for reality (Ejvegård 2003, p.33). By using this method it is possible to obtain substantial time saving in gathering data but also when describing the phenomena.

However, there are also difficulties associated with this type of method. The part of the study object that is examined cannot fully represent the real world (Ejvegård 2003, p.33). Due to this fact it is of great importance to remember to be cautious when making conclusions. Results can only be regarded as indications. The value of the results could be further discussed after other tests using different methods have been accomplished. Three different farm plans will be evaluated by applying the policies of Denmark, Germany and Sweden to the case farm given by IFCN. The effects of specific policies will be measured as differences in profits between the farm plans of the three investigated countries. The profit of the farms is calculated according to equation (14) and the measurements of competitiveness are calculated according to equation (26). To depict and draw general conclusions of the effect of the policies in each country will not be possible.

Case studies have two characteristics which are common (Asbjörn Johannessen & Tufte 2003, p.56). The first is to ensure the delimitations of the case, what is excluded and will not be considered? The second step is a detailed description of the case which has been defined according to the delimitations. Case studies may contain both qualitative and quantitative measures. A case study can be performed as a case study, or as a study of more than one cases which are compared and related to a main case. By using more than one case it becomes possible to examine unique characteristics while at the same time giving a more detailed image of similarities and differences (Asbjörn Johannessen & Tufte 2003, p.57). A case study is developed in close relation to the object of analysis (Ejvegård 2003, p.34). It is also common to use a more open-minded approach where understanding is viewed as the first step rather than explaining.

3.4 Descriptive and Comparative approach

Use of a descriptive method is the easiest way to explain or describe, the difficult part is the fact that the research process have to be conducted in a systematic rank of order (Ejvegård 2003, p.32). In order to submit a useful result it is necessary to scale information. The results of importance must be highlighted and information that is less interesting has to be deselected. The descriptive method is often used to answer common questions intended to give an overview of the situation.

A Comparative method is commonly encountered when research is conducted in the area of international politics (Ejvegård 2003, p.41). Comparative studies are often complex due to the fact that comparisons between societies and social phenomena are not easily done. The phenomenon's that the researcher are comparing to each other may be too different and result in a comparison without relevance when answering the study questions. When using this method it is really important to be aware of the below stated facts (Ejvegård 2003, p.41):

a. The units must be comparable
b. Before comparison can be made is it necessary to generalize the conditions
c. To depict the differences in a meaningful way is it necessary to transfer data to the same units. An easy example of this is that currencies have to be converted.
d. Both similarities and differences have to be described.

These above mentioned statements can be related to this comparison of countries and as mentioned before, it implies a lot complexity to compare different countries (OECD 2010)(Kaspersson et al. 2002)

3.5 Data collection

This study uses a lot of statistical data. The data often consists of samples and to receive reliable result a description of how the selection has been conducted of great importance (Ejvegård 2003, p.67).

The research strategy of this study makes use of a deductive research method where governmental rules are applied to a case farm by using equation (14) as a basis for the calculation. The analysis is based on the rules and legislations that affect the competitiveness between dairy farmers in different countries.

Before initiating data collection a literature review is conducted. The literature review is based on earlier studies performed in the area of competitiveness and comparisons between different countries. The literature review provides information regarding the difficulties of comparing rules in different countries with each other. The reason for the difficulties when comparing single factors with each other is that they may give a distorted result. A farmis often affected by an entire system and not single factors.

Subsidies and legislations regarding the agricultural sector is a topic that concerns a large public. Different stakeholders may try to influence the result with biased information which has to be disregarded due to lack of credibility. Most of the sources used are governmental which increase the credibility of the information.

Table 2 display search terms and combinations of search terms used during both the literature review and the data collection process. In search of information on the Internet the main search engines has been Google and Google Scholar. Other databases such as Agriwise, and reference databases Jstor and Econlit have been used in order to find articles regarding various subjects. In addition, information has been found on government homepages such as Ministry of Tax and Board of Agriculture for Denmark, Germany and Sweden. European Commission and Euro stat has also been used in the process.

.

Table 2, search terms and combinations of search terms used during the data collection process.

Competitiveness		Subsidy		Denmark
Single Payment Scheme		Tax		Germany
Coupled		Premium		Sweden
Decoupled		CAP		
Property		European Union		
Dairy				
Quota				
Milk				
Investment				
Rural development	And		And	
Energy				
Slaughter				
Extensification				
Cross-compliance				
Health check				
Animal				
Capital				
Income				
Labour				

Source: (Own arrangement)

In order to analyze the information theories in chapter 2 was applied. The theory used in this study has its basis from a dissertation by Flaten in 2001.

3.6 IFCN

IFCN stands for International Farm comparison Network (Hemme et al. 2010, p.8). The aim of the network, which was established in 1997, is to link farm economic researchers together to facilitate the understanding of milk production in the world. In the IFCN-report from 2010 143 farms in 44 countries were analyzed. A total of 86 countries are represented in the network (Hemme et al. 2010, p.1). The countries included in the network account for 85% of the total world production of milk (Hemme et al. 2010, p.13). By using this network the participants want to access information that makes it possible to examine the competitiveness of different farm types, regions and countries.

3.7 How a typical farm is defined

Models created in IFCN are separated depending on production line, eg. dairy, beef and arable crops (www, IFCN, 2009). When a typical farm in the IFCN network is defined the aim is to find a farm which represents a significant number of dairy farms in a region. The farm should be representative in terms of size, crops and forage grown, livestock systems, labour organization and the technology in the production system. The process of selecting a typical farm starts with identification of the region in a country where milk production is most important in terms of density of dairy cows or volume produced.

In order to become classified as a dairy farm the majority of the farm income has to originate from milk. Milk production has to account for at least 50 per cent of the total gross-margin in the firm. IFCN usually strive to create two or sometimes three typical farms for each relevant farm type and country. One of the farms is average sized while the other one is an average of

values from larger farms. The larger average farm must represent a significant number of farms, account for a large share of production in the area and take advantage of economies of scale. Two of the types represent an average managerial performance while the third farm is an example of better management than average. Out of these issues size is the most important aspect, which is measured in number of cows at the farm.

The availability of reliable data is important to ensure the quality of the statistics concerning farm sizes (www, IFCN, 2009). In some regions where IFCN collects data problems to fulfill these goals may occur.

There are four different methods to collect data to make it possible to create a typical farm (Hemme et al. 2010, p.194). The first one, which also is found to be the most appropriate, is labeled the "panel approach". A reference group of local dairy farmers is chosen from the region with farms that are considered to have similar strategies, production and profits. The reference group also includes a local advisor. A person who is member of the IFCN network, or a person who is well-informed about the IFCN-model in combination with the reference group creates the typical farm. The farms created consist of extensive data according the structure of the farm including production results, income and expenses.

In the second method used by IFCN the typical farm built up by only statistical data (Hemme et al. 2010). Statistical data from for example accountancy records are used by advisors and experts to construct a typical farm for each region. An alternative third method is to only use data from one farm. This data is discussed and adjusted by advisors and experts. The fourth method is a single farm case where a farm which doesn't have to be typical may be selected.

The Swedish farm which is used in this study is developed by using the first mentioned method (Hemme et al. 2010). It is important to be aware of the fact that that the farms chosen by IFCN cannot be viewed as an average farm for a specific country (Pers com. Hjellström 2011). The typical farms are chosen according to conditions such as size, production and results. IFCN puts greater effort to show the origin of the data rather than using average values. It is also common that a typical farm achieves results that are above average in the region. The reason is that IFCN wants to study farms for a longer period of time and farms with low results are to a higher extent expected to experience liquidation.

3.8 Description of the farm

To compare the differences among dairy producers in the three countries a typical Swedish farm has been chosen to study. The farm has been provided by International Farm Comparison Network (IFCN) and has been evaluated using their standards. The farm is representative for its region and data is collected from several farms to represent an average farm in a specific area. The Swedish farm which is chosen is located in Falkenberg, Halland. It is a corporate farm with 220 cows. The farm will be used as a research object and differences in subsidies/taxes in accordance with equation (31) will be applied to study the effects.

3.9 Empirical Model

The model chosen for this study originates from Flaten (2001). The model has been chosen to assess the implication for different rules affecting the dairy farm. The model however differs a little from the original. In this model the farm is assumed to have sufficient quota and therefore the quota restriction has been removed from the planning problem. When milk production is not limited by the quota the restriction will lose its affect and it is therefore

removed. Another part of the equation that is different is the variable subsidy(T_z), see equation (30), and the decoupled environmental subsidies(ES_z) , see equation (31), which have been added. It should be noticed that this is a representation of program (31) which also results in equation (14) in order to create yearly results.

Profit maximization of the production function for a farm

$$Max\prod_z = P_Q f(x_g, x_k, x_a, x_i)\mathrm{N} + DS_z + ES_z - \sum P_{x_a,x_i} N(x_i - T_z) - (KC - H_z)N + P_k(A_k * Y_k - N * x_k) - C_k * A_k - C_g * A_g - FC \quad (31)$$

N	= Number of cows in production
$P_Q f(.)$	= Total income from milk
DS_z	= Decoupled subsidies and other subsidies not related to dairy
ES_z	= Decoupled environmental subsidies
$\sum P_{xi} N(x_i - T_z)$	= Variable costs in dairy production with a variable subsidy due to tax reduction
KC	= Capital costs per cow in production
H_z	= Coupled subsidies related to dairy production
Y_k	= Yield of concentrated feedstuff kg per ha
A_k	= Area of concentrated feedstuff
A_g	= Area of forage or silage
$C_k *$	= Variable cost per ha of concentrated feedstuff
C_g	= Variable cost per ha of forage or silage
P_k	= Price on concentrated feedstuff
FC	= Total fixed costs

In the model it is assumed that the typical Swedish dairy case farm is observed at the level where profits are maximized. In the analysis the effects of the different policies will be illustrated by the use of the case farm where the model is applied. In the analysis various subsidies and rules are compared to each other across the countries. The focus will be on the effects of government intervention. These effects can in the profit function be found in the decoupled subsidies (DS_z), decoupled environmental subsidies (ES_z), variable subsidies in the production (T_z), subsidies related to the dairy production (H_z) and in the fixed costs (FC), see equation (31).

When comparing the different rules/regulation and subsidies affecting the dairy farm the analysis initially focuses on one factor at a time. When comparing for instance the decoupled subsidies, (DS_z) among the different countries all other fixed and variable costs and revenues will remain constant independently of the different legislations. The only variable that affects profit for the farm is (DS_z). The different rules affect the profit differently and thereby the marginal cost for producing will be different. According to Porter (1985) having a cost advantage is one of three methods for gaining competitive advantage. Therefore, the legislation and subsidies which contribute the most to a higher profit will maintain production at the lowest marginal cost.

The analysis also includes an aggregated comparison between the three countries systems. This analysis examines what type of country specific system that produces the highest net farm income for the case farm. The scenario which results with the highest net farm income

produces with the lowest cost. According to Porter (1985) the scenarios with the highest profit represent a competitive advantage and considered the most competitive.

3.10 Reliability of the study

To validate and increase the quality of this study has interviews with experts in the field been performed. The data in this study have been discussed with Danish, German and Swedish farmers and leading advisors to increase the reliability.

4 Background for the empirical study

4.1 Exploring taxation in Europe

In 2005/2006 the Dutch Agricultural Economics Research Institute (LEI) prepared a study on behalf of the Dutch Ministry of Agriculture (van der Veen et al. 2007, p.7). The study is a comparison between ten European countries to evaluate the competitiveness of the Dutch agricultural sector. The focus of the study is to evaluate how the tax system in the ten countries (Belgium, Czech Republic, Denmark, France, Germany, Hungary, the Netherlands, Poland, Spain and the United Kingdom) affect the competitiveness. Some tax systems are more favorable than others regarding specifics for the agricultural sector or overall and these differences affect the competitive position. The study compares the differences from several criteria's that would define the system as more or less favorable. The competitive position was evaluated according to the following aspects in the study:

- the overall tax burden is lower
- investments and innovation is supported
- large farms are discriminated positively due to economies of scale and structural development
- successors pay a reduced price for a farm
- older farmers are motivated to leave the agricultural sector

When performing the study the authors found it close to impossible to assess and rank the different systems as favorable or unfavorable for the agricultural sector (van der Veen et al. 2007, p.66). Due to the differences among the different tax systems a ranking would not be possible. Within a country the farms are quite different and differ in profitability, size, and capital intensity etc. These differences result in the tax systems having different effects upon each farm type although it is the same within each country. For example, if a certain aspect of taxation is relatively favorable in one country, for instance value adding tax (VAT), the capital levy might be unfavorable. The effect of these beneficial and unfavorable taxes might have a positive effect for some farms and negative to others due to size or capital intensity etc.

The overall tax burden may also affect several other aspects such as the price of land (van der Veen et al. 2007, p.66). Another aspect is that higher taxes are often correlated positively with higher welfare, better infrastructure etcetera and does not necessarily have a negative effect on competitiveness. Therefore a ranking was not possible. However, the study provides insights into the different systems.

Despite the above shortcomings, the authors found several aspects that affect the competitiveness within the agricultural sector (van der Veen et al. 2007, p.67). All countries included in the study had rules and regulations that especially favored the agricultural sector and therefore affected the competitiveness positively. The Dutch system had certain features that were found rather favorable compared to other countries such as a reduced tax burden if the farm was operated as a partnership. Other rules regarded social security contributions and the total tax rates.

The study found that the analyzed countries could be categorized into three different groups with the first being: Countries which have legislation in order to reduce the overall tax burden but no special rules for small farmer (van der Veen et al. 2007, p.69). Nevertheless, the regulations support various incentives for investments. The countries in this category were; Belgium, France, the Netherlands and the UK.

The second category consists of countries that apply a moderately supportive system; the countries in this category are Denmark, Germany and Poland.

The third and last category represents countries which have a tax system that does not especially support its agricultural sector. The countries in this category are Czech Republic, Hungary and Spain.

4.2 Measuring support to agriculture

4.2.1 OECD indicators

In year 1987 OECD developed indicators to measure support to agriculture in order to create a common method for comparing, monitoring and evaluating changes in agricultural policies (OECD 2010)(OECD 1999, p.1)(OECD 1999, p.1). The agriculture policies of the OECD countries have changed and become more complex and extensive during the last years. To ease understanding OECD introduced a classification system grouping policy measures depending on implementation criteria. This is made regardless of the objectives and effects of the policies.

The members of OECD have agreed upon a policy towards liberalization of trade and a reduction of protection within the agricultural area (OECD 2010). To become successful in this work the OECD measures was developed. The indicator does not estimate measures for the individual countries within the EU, all countries are considered as one member of OECD. The indicators display the effectiveness and efficiency of policies by investigating if they fulfill the goals. Gross transfers from consumers and taxpayers to agriculture, which are caused by governmental policies that promote farmers, are considered as "support". Besides support that results in budgetary expenditures we find transfers that do not imply monetary disbursements. The OECD indicators cannot measure how a policy affects production, consumption, farm income, environment or trade. The different indicators are divided into three groups depending on the recipient of the support, which unit is used to measure and the type of aggregation. The EU countries use a relatively large amount of agricultural payments without requiring production compared to other OECD members (Le Thi 2010).

The OECD indicators are grouped into three main categories to analyze the agricultural policy transfers (OECD 2010), see Appendix 6. The three categories are 1.supports intend to be transferred to the individual producer (PSE), 2. to all producers collectively (GSSE) or, 3. to consumers individually (CSE). All the definitions are "arising from policies that support agriculture, regardless of their nature, objectives or impacts on farm production or income" (OECD 2010, p.17). The definitions are quoted below.

PSE (Producer Support Estimate): "The annual monetary value of gross transfers from consumers and taxpayers to agricultural producers, measured at the farm gate level." (OECD 2010, p.17).

GSSE (General Services Support Estimate): "The annual monetary value of gross transfers to general services provided to agricultural producers collectively (such as research, development, training, inspection, marketing and promotion)" (OECD 2010, p.17).
(transfers to individual producers are not included).

CSE (Consumer Support Estimate): "The annual monetary value of gross transfers from (to) consumers of agricultural commodities, measured at farm gate level"(OECD 2010, p.17).

4.2.1 Classification of CAP

The EU members are in a OECD perspective treated as one single member due to the fact that all countries apply the CAP (OECD 2010, p.19). Expenditures in the individual countries are classified as sub-national. The rural development policy in the EU is an example of support that partly is sub-national where EU member states have the possibility to add support at regional or local government level.

At an OECD seminar on monitoring and evaluation of agricultural policies in Braunschweig, Germany, 28-29th of September 2010 was the resent CAP reforms evaluated from an OECD perspective (Le Thi 2010). The evaluation clearly shows that the EU countries budget a larger share of support to agriculture in the form of PSE compared to the total share within the OECD, see Figure 5.

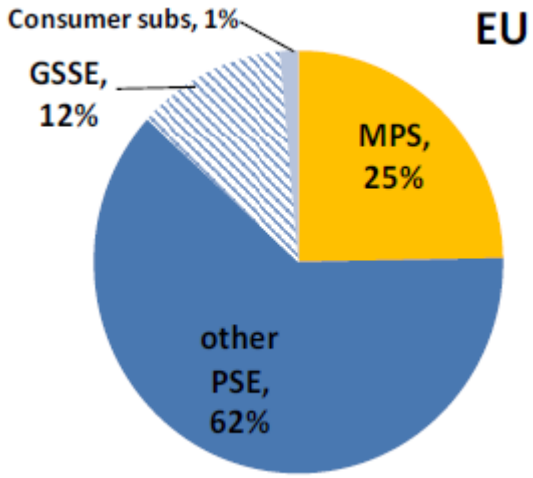


Figure 5 Total support in the EU, 2007-2009

Source: (Le Thi 2010, p.5)

The study is classifies some of the CAP supports using the OECD indicators. CAP consists of pillar 1, The European Agricultural Fund for Guarantee (EAFG) and pillar 2, The European Agricultural Fund for Rural Development. Support within pillar 1 is mainly classified as PSE consisting of the single payment which is classified as E. This means that the payment is based on historical production.

5. Taxation

This chapter investigates differences in taxation systems among Denmark, Germany and Sweden. First an overall introduction to the three systems is provided. The second section describes how income is taxed as well as how the dairy farms income is taxed. The third section describes how capital gains are taxed and the fourth section corporate taxation. The fifth, sixth and seventh sections contain information of the levels of tax on energy, land and fertilizer.

5.1 Taxation systems in the three countries

Denmark, Germany and Sweden do all have a tax-to GDP ratio which is higher than the average in the EU (European Union, 2010, p.59). In year 2008 the overall tax ratio in the EU-27 amounted to 39,3 per cent in the GDP weighted average (European Union, 2010, p.17), Figure 6. The EU tax levels are high compared to the other world economies, for example the tax levels in the United States and Japan are considerably lower (European Union, 2010, p.17). The overall tax ratio in EU has experienced an upward trend since the 1970s. Due to buoyant tax revenues in the late 1990s many countries took the possibility to lower the tax rates. The financial crisis, which increased in force in the second half of 2008, could be an explanation to the downward trend in total taxes during that year, see Figure 6 below. The data in Figure 6 below encompass the period up to year 2008 and therefore only show the effects in the beginning of the recession.

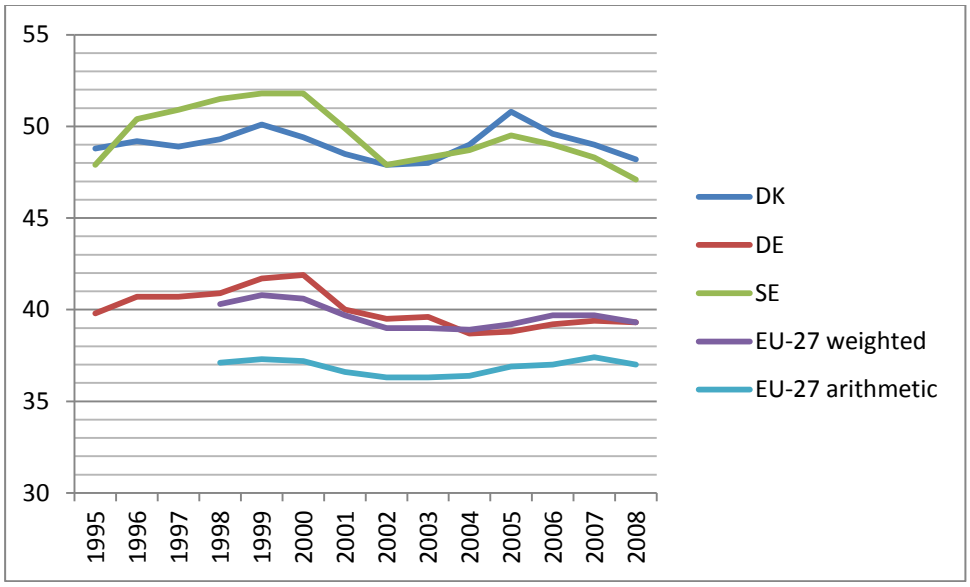


Figure 6, Total Taxes (including Social Security Contributions) as per cent of GDP.

Source:(European Union, 2010, p.290)

Out of the three countries compared in this study Sweden and Denmark are the most similar in terms of taxation. To facilitate the evaluation of how the tax burden is distributed, taxes may be categorized into taxes on consumption, labour and capital (European Union, 2010, p.376). In order to define taxes by structure and type they often are separated into direct and indirect taxes (European Union, 2010, p.381). A definition on direct and indirect taxes is:

> ” ´Direct taxes´ are defined as current taxes on income and wealth plus capital taxes including taxes such as inheritance of gift taxes. Income tax is a subcategory which

includes personal income tax (PIT) and corporate income tax (CIT) as well as capital gains taxes" (European Union, 2010, p.381).

" ´Indirect taxes´ are defined as taxes linked to production and imports i.e. as compulsory levies on producer units in respect of the production or importation of goods and services or the use of factors of production. They include VAT, import duties, excise duties and other specific taxes on services (transport, insurance etc.) and on financial and capital transactions. They also include taxes on production defined as ´taxes that enterprises incur as a result of engaging in production´, such as professional licenses, taxes on land and building and payroll taxes"(European Union, 2010, p.381).

Direct taxes are more easily "visible" to the voters because they consist of income taxes (European Union, 2010, p.19). The direct taxes are easier to use for redistribution by introduction of progressivity, which in some countries is practiced. This fact may be observed in Denmark were the share of direct taxes to total tax revenues is the highest in the Union. Germany is using a different system. Germany has one of the lowest share of direct tax revenues and instead a high share due to social security contributions.

The higher personal income tax (PIT) is 37,5 per cent on average in the EU (European Union, 2010, p.20). Of the three countries Sweden and Denmark has the highest with 56,4 per cent as maximum rate. Until the year of 2010 Denmark's rate has been lowered to 51,5 per cent. Sweden and Denmark is unlike Germany imposing a so called Dual Income Tax system. The Dual Income tax system was developed in the 1980: and 90:s (Arnaldur Sölvi Kristjánsson 2010, p.2). The system combines a progressive taxation of wage income with proportional taxation of capital income.

Sweden and Germany are similar in the way that they have a large share of municipal taxes and other sub-federal taxes (European Union, 2010, p.21). The implicit tax rate on labour has decreased substantially in Sweden and Denmark since 1995, Table 3, Figure 7. The implicit tax rate on labour includes: "direct taxes, indirect taxes and compulsory actual social contributions paid by employers and employees, on employed labour income" (European Union, 2010, p.381). The implicit tax rate on labour should be considered as a measure that by approximation summarizes an average tax burden on labour.

Table 3. Implicit tax on labour, 1995-2008, in per cent

	1995	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**95-08**	**00-08**
Den.	40,2	40,2	40,7	38,9	40,2	41	40,8	38,8	38,1	37,5	37,1	37,2	36,5	36,4	-3,7	-4,5
Ger.	39,4	39,6	40,6	40,6	40,4	40,7	40,5	40,4	40,4	39,2	38,8	38,9	38,6	39,2	-0,3	-1,6
Swe.	45,2	46,5	46,8	47,8	47	46	45,1	43,8	43,9	44	44,2	43,8	42,5	42,1	-4,9	-4,1

Source (taxation trends in the European Union, p109)

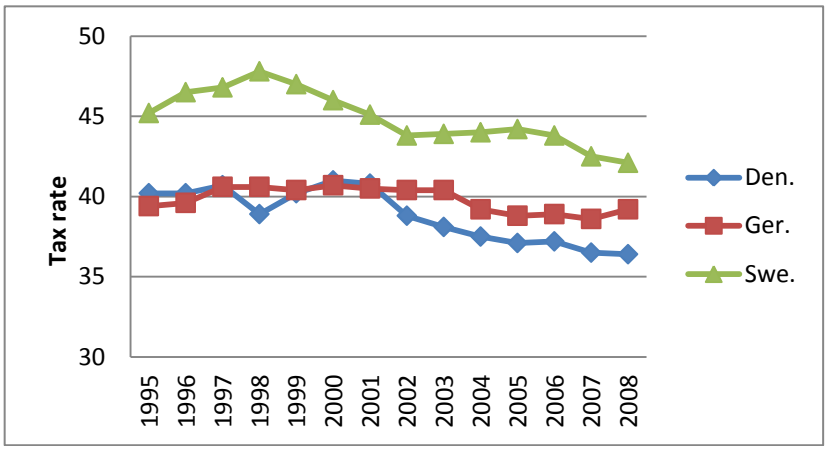


Figure 7. Implicit tax rate on labour, 1995-2008

Source (taxation trends in the European Union, p109)

5.2 Income taxation

Denmark, Germany and Sweden have developed the legislative system for income taxation in different ways. In the following section will it be showed how income are classified to make taxation possible.

Germany separate earnings into seven different types according to Einkommensteuergesetz §2 Umfang der Besteuerung, Begriffsbestimmungen, tax definition. (Anon n.d.)(Anon n.d.)

1. Income from agriculture and forestry (Einkünfte aus Land- und Forstwirtschaft)
2. Income from trade or business enterprises (Einkünfte aus Gewerbebetrieb)
3. Income from professional and independent personal services (Einkünfte aus selbständiger Arbeit)
4. Income from wages and salaries (Einkünfte aus nichtselbständiger Arbeit)
5. Income from capital investments (Einkünfte aus Kapitalvermögen)
6. Income from private property rentals (Einkünfte aus Vermietung und Verpachtung)
7. Other income according to §22, such as interest, rents of pensions, speculative transactions etcetera (Sonstige Einkünfte im Sinne des § 22)

Denmark separate income into three different types (Skatteministeriet 2008, p.10).

1. Personal income
2. Capital income
3. Share income

Sweden separate income into three other different categories (Gunnar Rabe 2007, p.10).

4. Income from Employment (Inkomst av tjänst)
5. Income from self-emplyment (Inkomst av näringsverksamhet)
6. Capital gains (Inkomst av kapital)

In Figure 8 below is Denmark's, Germany's and Sweden's tax rate for income illustrated.

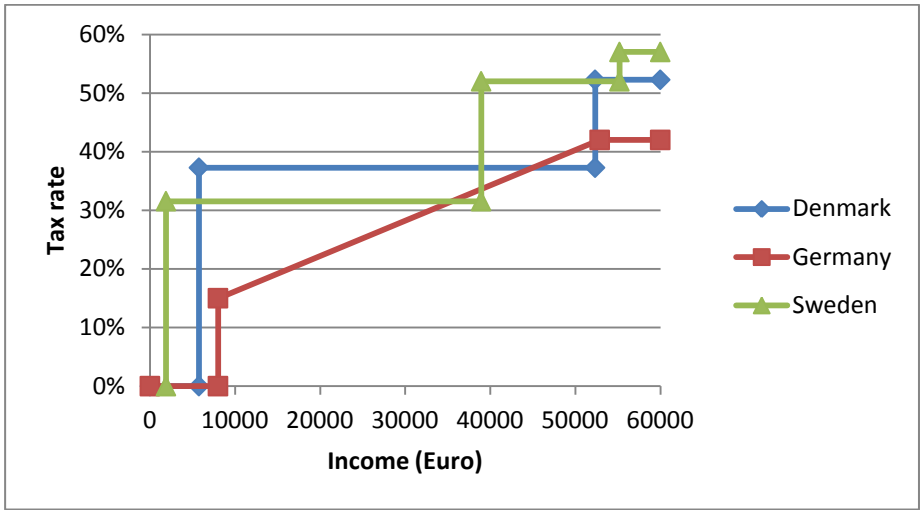


Figure 8, Tax rate of income in Denmark, Germany and Sweden depending on income

5.2.1 Denmark

The overall tax ratio in Denmark amounted to 48,2 per cent in 2008 which is the highest in the EU (European Union, 2010, p.181). High average and marginal tax rates are typical for personal income taxation in Denmark (European Union, 2010, p.182). An 8 per cent labour market contribution is paid for all personal income before deduction of any allowance.

In Denmark the shares of social security contributions to total tax revenues are relatively low (European Union, 2010, p.19), see Figure 9. The reason is that most of the welfare costs in the country are financed out of general tax revenues. This kind of system requires a high direct tax level, which can be noticed in the high taxes on income (European Union, 2010, p.181). Denmark has a system with a specific flat tax rate for each municipality. The average rate is 25,5 per cent given that the church tax is included (European Union, 2010, p.182).

Currently the Danish state income tax system is subject to a major change (European Union, 2010, p.182). The reform reduces two tax brackets were the bottom bracket is 3,76 per cent to which an 8 per cent health tax is added, see Table 4. Before the 11,76 per cent is subtracted from positive net labour and capital income it is reduced with labour market contribution (8 per cent) and a personal allowance of 5 760 Euro (DKK 42 900) or 4,25 per cent. If the positive net income exceeds the top threshold of 52 335 Euro (DKK 389 900) in year 2010 that part will be levied with an additional 15 per cent tax.

Table 4. Central government taxes and contributions in Denmark

Tax measure	**2007**	**2008**	**2009**	**2010**
Earned income tax credit	2,50%	4,00%	4,25%	4,25%
Ordinary income tax, low bracket	5,48%	5,48%	5,04%	3,76%
Additional income tax, medium bracket	6,00%	6,00%	6,00%	-
Additional income tax, top bracket	15,00%	15,00%	15,00%	15,00%
Healthcare contribution (ordinary income tax)	8,00%	8,00%	8,00%	8,00%
Labour market contributions	8,00%	8,00%	8,00%	8,00%

Source: (www, Skatteministeriet, 1, 2011)

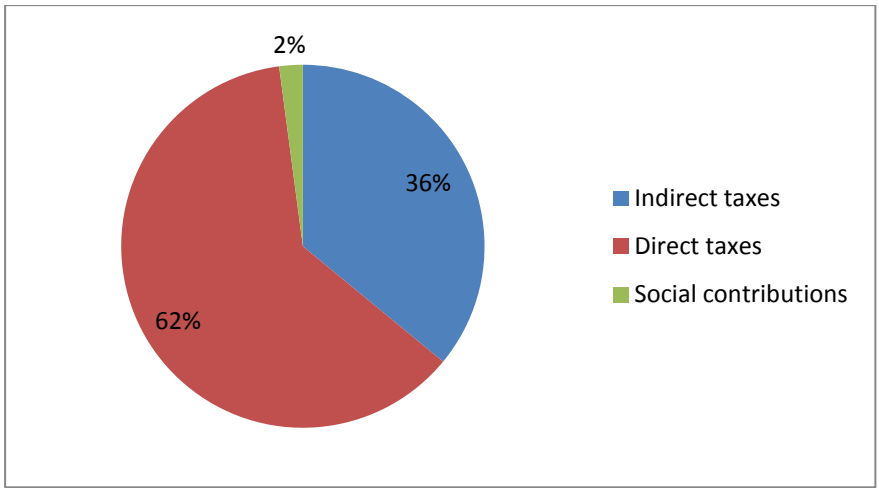


Figure 9. Tax structure in Denmark

Source (European Union, 2010, p.180)

5.2.2 Germany

The overall tax ratio in Germany is lower than Denmark but above the average in the EU-27 (European Union, 2010, p.197). The tax-to- GDP ratio in Germany amounted to 39,3 per cent in 2008. The social contribution in Germany accounts for a relatively high share of the total tax receipts, 38,6 per cent, see Figure 10. But when examined, the share of direct taxes and in particular the indirect taxes, the situation is the opposite. The shares are far below EU average. In year 2007 the trend was to shift from Social Security contributions to more direct and especially indirect taxes. The most pertinent example was a reduction in the unemployment insurance rate and an increase in the value added tax.

The German progressive income tax system consists of three brackets at which the tax rate increases from 14 percent to 45 per cent depending on income and allowance (European Union, 2010, p.198). On top of this tax is a 5,5 per cent solidarity surcharge levied, an example at the bottom tax rate: 14 % *1,055 = 14, 7 %. The German tax system has a basic allowance of 8 004 Euros in 2010 which is excluded from income tax. The lowest personal income tax rate, which as mentioned before is 14 per cent, was reduced from 15 per cent in 2009 (European Union, 2010, p.198). Income that exceeds the middle bracket of 52 882 Euro, is levied with a tax rate of 42 per cent. In the top bracket tax rate of 45 per was applied. The top bracket applied for income exceeding 250 730 Euros in 2010.

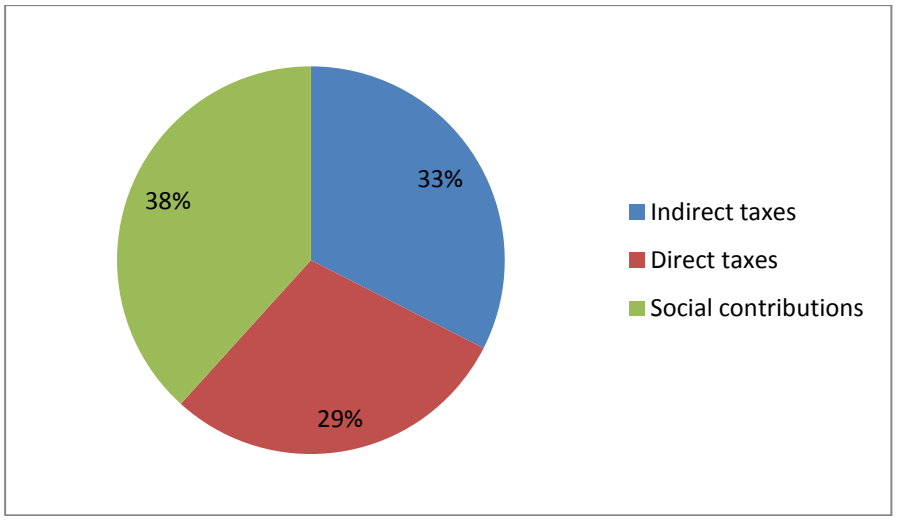


Figure 10 Tax structure in Germany

Source (European Union, 2010, p.196)

5.2.3 Sweden

The overall tax ratio in Sweden was 47,1 per cent in 2008 (European Union, 2010, p.261). The Swedish tax system has a higher share of indirect taxes then the Danish and German systems see Figure 11. Salaries in Sweden are subject to the employment tax which was introduced in 1960 as a percentage share of an employee's salaries (www, Ekonomifakta 1 2011). Since the 1970: s the employment tax has been more than 30 per cent and in the beginning of 1990: s it almost amounted 40 per cent. In 2009 the employment tax was set to 31,42 per cent which will remain the same until 2011. Depending on age of the employee the tax varies, see Table 5.

Table 5 Different levels of employment tax depending on age in 2010

Age of employee	Employment tax
< 25	15,49
25-65	31,42
<65	10.21

Source: (www, Swedish Tax Agency 2 2010)

Self-employed are instead of employment tax required to pay social security contributions. In the year 2011 the social security contributions are set to 28,97 per cent (www, Ekonomifakta, 2 2011).

Municipal taxes are proportional and depend on where in Sweden the people live (www, Ekonomifakta, 4, 2011). The average municipal tax is today 31,55 per cent, which amounts to more than double of 14,63 per cent which was the average in year 1960. Today the municipal tax rate varies between 28,89 per cent and 34,17 per cent. Sweden practices a relatively progressive taxation of labour income (European Union, 2010, p.262). The top marginal rate can amount to 57 per cent given an average municipal tax rate.

In 2007 the Swedish government introduced an in-work tax credit which during 2008, 2009 and 2010 was increased (European Union, 2010, p.262). For persons less 65 years old the maximum tax credit is 2071 Euro (21 045 SEK) and over 65 years it is 2953 Euro (30 000 SEK).

Individuals with an annual income exceeding 38 940 Euro (395 700 SEK) are required to pay state income tax in amount of 20 per cent in addition to the municipal tax (European Union, 2010, p.262). At this point the marginal tax amounts about 50 per cent (www, Ekonomifakta 3, 2011). If the personal income exceeds 55 200 Euro (561 00 SEK) the state tax increases by 5 per cent to a total of 25 per cent in addition to the municipal tax. These rules are same for all types of income, but for people which are older than 65 years the level is lower due to higher basic allowance at that age.

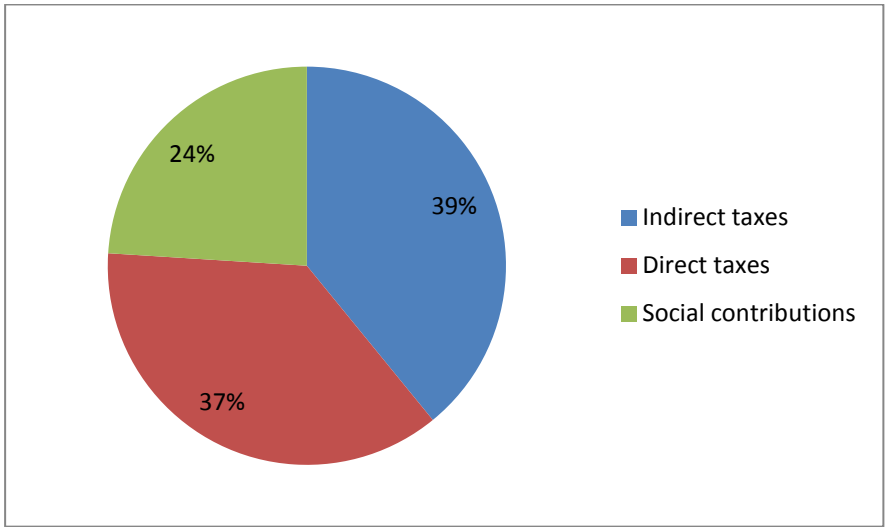


Figure 11. Tax structure in Sweden

Source (European Union, 2010, p.260)

5.3 Taxation of farm income

This section describes the most common way that the dairy farms are operated in Denmark, Germany and Sweden.

5.3.1 Denmark

In Denmark most dairy farms are operated as sole traders. However, instead of being taxed as personal income most farmers use an additional taxation scheme labeled company scheme (van der Veen et al. 2007, p.114). The company scheme enables the sole traders to choose a fiscal scheme that provides the same advantages as legal companies have. When using the company scheme all income and costs are included in the calculation. The most important benefit of the company scheme is that interest expenditures are fully deductible. The income from the business is then divided between business income and calculated capital gains. The amount which determines the capital gains is calculated by multiplying the net capital in the business with a short term interest rate. The rest of the income is taxed in the normal way. The company scheme however offers the possibility to save and carry forwards the capital income to activate later years.

5.3.2 Germany

The German farmer can organize the business as a sole trader or as partnership (Volkmar 2009). As a sole trader the farmer is personally responsible for the entire business. The sole traders within the agricultural sector are subject to special regulations due to the fact that they are organized a bit differently compared to other organizations.

If farmers decide to collaborate they may create a companionship which is regulated according to the corporate law (Gesellschaftsrecht). This corporate law regulates private companionships, which aim to achieve a common purpose, by establishment of a contract (Gesellschaftsvertrag) between the parties.

The corporate law allows six different organizational forms. The farm business runs according to private law or commercial law (Rydin & Nilsson 2000). Most common is to practice business in agriculture as partnership due to private law. It gives the regular family farm benefits by allocating profits to the members and also makes it possible for them to claim personal allowances.

The agricultural sector in Germany is allowed to use a different system concerning VAT (2, Landwirtschaftskammer Schleswig-Holstein 2010). The system is called "Pauschalierung" and means that the farmer when selling agricultural products is using a VAT of 10,7 per cent (LBD 2010). However, when purchasing inputs for the production the farmer is levied 7 per cent VAT on agricultural product such as grain and feed. When the farmer buys other products classified as non-agriculture a VAT of 19 % will be levied. The system implies that the farmer do not have to declare a difference for in- and outgoing VAT and in that way get a positive balance.

In certain cases e.g. when farmers do large investments is it possible to change system and make an account for in- and outgoing VAT (Option zur Regelbesteuerung). The farmers can change between the systems but only every five years, so when choosing one of the systems it remains for a period of five years.

5.3.3 Sweden

A vast majority of the dairy farms in Sweden are operated as sole traders. As a business is a sole trader tax is paid on the profits which are the businesses earnings minus costs (www, European Commision 3 2010). In this business form the farmer is allowed to make fixed deduction of up to 25 per cent for cost for social contributions. The amount after the deduction is labeled operating surplus. The farmer cannot be employed in his or her own business and can therefore not withdraw a salary. The amount of money that the farmer withdraws to personal expenditures from the business is defined as own withdrawals. Own withdrawals can be made from the surplus after self-employed contributions, municipal and state tax is paid. Another form of business is corporation which is described later in section 5.5.

5.4 Capital levy

Capital levy is a generic term for tax on income generated by dividends, interest income or other capital gains such as profits when selling shares (www, Ekonomifakta, 4, 2011). The set of rules regarding capital levy is often complicated and contain many exceptions and special cases. Many countries use progressive taxation when it comes to capital levy. A progressive taxation system implies that the tax rates increases as the income increases. Due to the complexity regarding comparisons of capital levies between countries become more difficult. However, a comparison of the highest and the lowest tax rates reveal some differences between the countries. In EU-27 the average maximum tax on capital levy was 25,7 per cent in 2008 (ibid.). The lowest average tax used in the EU-27 in 2008 amounted to 11,5 per cent.

5.4.1 Denmark

Denmark does not have a specific tax for capital levies. All income generated from capital gains are included in the taxable income and are therefore taxed at the normal tax rate (PKF International Limited 2010, p.94). However, one exception is regarding profits from shares. In 2009 profits from shares was taxed at three different levels depending on the size of the profit. The low bracket were in 2009 set at 48 300 DKK, profit up to the low bracket were taxed at a rate of 28 per cent (www, Skatteministeriet, 1, 2011). The medium bracket were set at 106 100 DKK so profits between 48 300 – 106 100 DKK were taxed at 43 per cent. The top bracket is all profits above 106 100 DKK and the tax at this level were 45 per cent. During 2010 the low bracket remained at 48 300 DKK and the tax at 28 per cent. At the same time the top bracket has been removed and the tax lowered. All profits from shares exceeding 48 300 DKK are taxed at a rate of 42 per cent.

5.4.2 Germany

In Germany the rules regarding taxation of capital levy changed in 2009. Prior to 2009 the legislation was full of exceptions and a standard tax rate was difficult to define. However, as of January 2009 the rules changed and a flat rate of 25 per cent was set for most income generated from capital gains. Exceptions and special cases do still exist but are fewer with the new legislation. Income generated from capital gains such as dividends, income from interest, bonds and profits from sales of shares are all taxed at 25 per cent plus a surcharge of 5,5 per cent of the tax (25%*1,055) if the ownership is lower than 1 per cent (PKF International Limited 2010, p.142). The total tax on capital gains then becomes 26,37 per cent which is 0,67 per cent higher than the average in EU-27. However, investments made prior to 2009 are not affected by the new rules and are taxed with the previous legislation even if the capital gains are realized after 2009. One exception with the new rules are sales from investments where the ownership exceeds 1 per cent. Capital gains from selling shares where the ownership exceeds 1 per cent are defined as taxable incomes. 60 per cent of the profits from capital gain are added to the individual's annual gross income (ibid, p.141). The remaining 40 per cent of the capital gain is not taxed.

5.4.3 Sweden

In Sweden the capital levy is 30 per cent. This is 4,3 per cent higher than the average in EU-27 and is applies in most cases regarding capital levy. However, one exception that is common pertains to closely held companies (fåmansbolag). Dividends and capital gains from closely held companies are taxed lower at a rate of 20 per cent which also is the lowest possible tax for capital gains in Sweden. Corporations in the agricultural sector are often owned by few owners and are therefore taxed accordingly to the rules regarding closely held companies. Capital gains generated from companies however are already taxed once when paying corporate tax. For instance, a company with a profit of 100 000 Euros first has to pay a corporate tax of 26,3 per cent. That leaves the company with 73 700 Euros. If the rest is divided among the shareholder as dividend additional tax are 22 110 (73 700 * 0,3) Euros leaving the shareholders with 51 590 Euros. The total tax in this scenario are 48,41 per cent. If the company instead is a closely held company the corporate tax remains the same and the profit shared among the owners the additional tax are 14 740 (73 700 * 0,2) Euros leaving the shareholders with 58 960 Euros and a effective tax rate of 41,04 per cent.

5.5 Corporate tax

5.5.1 Denmark

Denmark has gradually reduced its corporate tax rate between 2005 and 2007 from 30 per cent to 25 percent (European Union, 2010, p.183) which also remain the current rate in 2011

(www, Skatteministeriet, 2, 2011). Corporations in Denmark do not pay local taxes but instead a share of the corporate tax is transferred to municipalities. The tax depreciation for buildings used to be a straight line over a 20 years period (European Union, 2010, p.183). However, in 2008 the depreciation rate changed from 5 per cent to 4 per cent per year making the period 25 years. Depreciation for machinery and equipment is set to a maximum of up to 25 per cent annually making which makes the fastest depreciation 4 years. In the evaluation of inventories the FIFO, (First in first out) basis is used.

5.5.2 Germany

In Germany the corporate income tax has been reformed several times in recent years. Prior to 1999 there were rates of 45 per cent and today the tax has been reduced to 15 per cent (European Union, 2010, p.199). In addition to the 15 per cent a surcharge of the corporate tax is levied at a rate of 5,5 per cent (PKF International Limited 2010, p.140). In addition to the corporate tax all businesses pay a trade tax. However, this tax does not apply to agricultural operations or forestry establishment (European Union, 2010, p.199). The trade tax is determined independently by each municipality and the tax ranges from 7 – 17,5 per cent (PKF International Limited 2010, p.140) . The tax for businesses therefore varies but the corporate tax combined with the trade tax is normally around 30 per cent.

5.5.3 Sweden

The corporate tax in Sweden for a long period of time amounts to a flat rate of 28 per cent (European Union, 2010, p.263). However, in 2009 the tax was reduced and is now set at a flat rate of 26,3 per cent. Double taxation is eliminated or reduced for corporate shareholders. For individual shareholder of closely held companies a relief on dividends is granted. Corporations that generate capital gains are taxed as a regular income in the earnings statement.

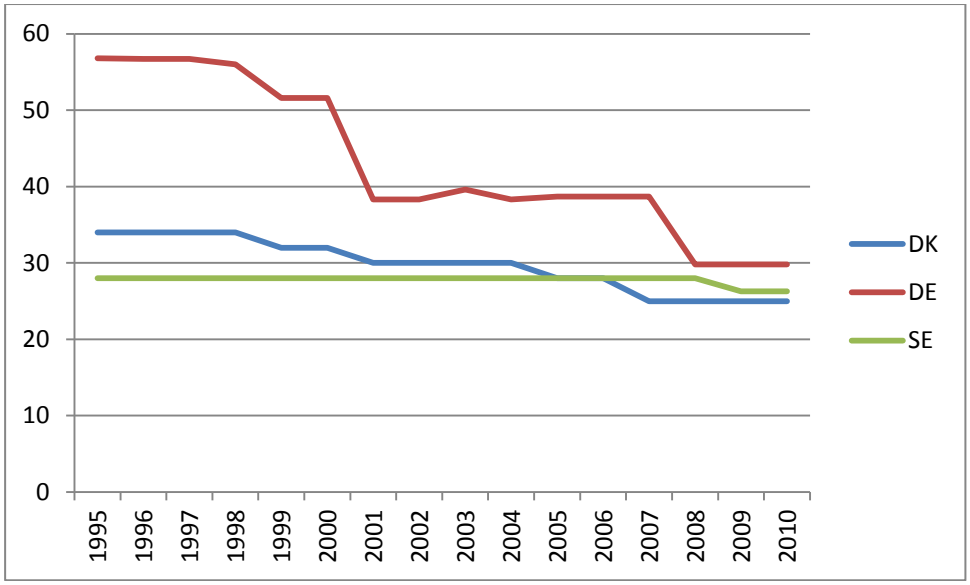


Figure 12 Adjusted top statutory rate on corporate income, 1995-2010

Source: (European Union, 2010, p.136)

5.6 Energy tax

The price of energy varies between all countries and so do the taxation of energy. All three countries however have tax reductions for the agricultural sector. Hence the cost of energy differs among the countries.

5.6.1 Denmark

The total energy tax in Denmark consists of two taxes, the energy tax and carbon dioxide tax. For these two taxes Danish farmers are provided a 100 per cent refund for the energy tax, but no refund on carbon dioxide (www, Skatteministeriet, 3 2011). In 2009 the total tax for electricity which includes energy tax and carbon dioxide tax was 9,2 cents/kWh of which 8 cents/kWh was refunded.

However in 2010 a new policy was initiated which changed the refund from 100 per cent to 98,2 per cent (www, Price Waterhouse Cooper 2011). At the same time the energy tax was increased and the carbon dioxide tax decreased. The tax in 2010 amounted to 9,7 cents/kWh of which 8,7 cents/kWh was refunded. In 2011 supplementary fees has been added for environmental impact and the total tax increased. The cost per kWh is illustrated in Table 6 below.

Table 6 Tax on electricity in Denmark excl. VAT. Euro/kWh,

2009: 1DDK = 7,446 Euro
2010 : 1DDK = 7,447Euro
2011= 1DDK = 7,455Euro

Measures / Year	2009	2010	2011
Energy tax	0,074	0,082	0,084
CO_2 tax	0,012	0,008	0,008
Total tax	0,086	0,091	0,092
Refund	0,074	0,081	0,082
Cost after reduction	0,012	0,010	0,010

Source: (www, Skatteministeriet, 3 2011)

A reduction in energy tax is also available for fuel oil and diesel used in the production. Both diesel and fuel oil are affected by the new policies and there is a substantial tax increase between the new and old policy (www, Skatteministeriet, 3 2011). The total tax for diesel amounted in 2009 to 38,3 cents/liter of which 34,9 were refunded making the cost/liter 3,4 cents. In 2010 the tax per liter increased to 39 cents and the reduction decreased to 32,7 cents making the tax per liter 6,3 cents, see Table 7

Table 7.Tax on diesel fuel in Denmark excl. VAT. Euro/litre

Measures / Year	2009	2010
Energy tax	0,349	0,333
CO_2 tax	0,034	0,055
No_x tax	0,000	0,001
Total tax	0,383	0,390
Refund	0,349	0,327
Cost after reduction	0,034	0,063

Source: (www, Skatteministeriet, 3 2011)

The situation for fuel oil is very similar to diesel, see Table 8. The new rules increase the tax per litre of fuel oil for the farmers with almost 75 per cent.

Table 8.Tax on fuel oil in Denmark excl. VAT. Euro/litre

Measures / Year	2009	2010	2011
Energy tax	0,258	0,276	0,281
CO_2 tax	0,034	0,055	0,056
Total tax	0,292	0,332	0,337
Refund	0,258	0,271	0,276
Cost after reduction	0,034	0,060	0,061

Source: (www, Skatteministeriet, 3 2011)

5.6.2 Germany

The tax for electricity in Germany is 0,0205 Euro/kWh. The agricultural sector however is subject to a reduction in tax with 0,00513 Euro/kWh making the total cost 0,01537 Euro/kWh, see Table 9 (Jordbruksverket 2, 2006, p.29). In order to be eligible for the tax reduction the agricultural business has to exceed a consumption of 48 000 kWh. In 2010 the tax refund was lowered from 0,0082 to 0,00513 Euros per kWh.

Table 9. Tax on electricity in Germany excl. VAT. Euro/kWh

Measures / Year	2008	2009	2010	2011
Energy tax	0,0205	0,0205	0,0205	0,0205
Refund	0,0082	0,0082	0,00513	0,00513
Cost after reduction	0,0123	0,0123	0,01537	0,01537

Source; (European Commission 1, 2011, pp.55-59)

The general tax for diesel in Germany is 0,4704 Euro/liter but for the agricultural sector a reductions exist. The reduction for the agricultural sector is 0,2148 Euro/liter making the total tax 0,2556 Euro/liter, see Table 10 below. (European Commission 1, 2011, pp.15-19).

Table 10. Tax on diesel fuel in Germany excl. VAT. Euro/litre

Measures / Year	2008	2009	2010	2011
Energy tax	0,4704	0,4704	0,4704	0,4704
Refund	0,2148	0,2148	0,2148	0,2148
Cost after reduction	0,2556	0,2556	0,2556	0,2556

Source; (European Commission 1, 2011, pp.15-19)

The tax on fuel oil in Germany is 59,99 Euro/1000 liter for business enterprises. For agricultural firms there exists a reduction of 8,18 Euro/1000 liter but it is only available if the tax for heating exceeds 511 Euro/year (Jordbruksverket 2, 2006, p.19).

5.6.3 Sweden

The tax on electricity in Sweden is subject only to energy tax. For the agricultural sector the energy tax that exceeds 0,00052 Euro/kWh (0,05 SEK) is refunded to the farmer (Jordbruksverket 2, 2006, p.21) making the tax close to nothing, see
Table 11.

Table 11. Tax on electricity in Sweden excl. VAT. Euro/kWh

Measures / Year	2008	2009	2010	2011
Energy tax	0,02808	0,02655	0,02934	0,03183
Refund	0,02756	0,02608	0,02882	0,03126
Cost after reduction	0,00052	0,00047	0,00052	0,00056

Source; (www, Swedish Tax Agency 2011)

Diesel fuel is, in addition to energy tax, also subject to a carbon dioxide tax. Between 2007 – 2010 79 per cent of the carbon dioxide tax was refunded but the energy tax was not refunded at all (www, Swedish Tax Agency 2011). As of January 1st 2011 the rules have changed. The refund for carbon dioxide tax on diesel fuel has been lowered to 70 per cent, see Table 12.

Table 12. Tax on diesel fuel in Sweden excl. VAT. Euro/litre

Measures / Year	2008	2009	2010	2011
Energy tax	0,159	0,150	0,166	0,201
CO_2 tax	0,300	0,283	0,316	0,339
Total tax	0,459	0,433	0,482	0,540
Refund	0,237	0,224	0,249	0,238
Cost after reduction	0,222	0,210	0,232	0,303

Source; (www, Swedish Tax Agency 2011)

Fuel oil as well as diesel fuel is also subject to both energy tax and carbon dioxide tax. Between 2007-2010 79 per cent of the carbon dioxide tax and 100 per cent of the energy tax was refunded (www, Swedish Tax Agency 2011). The rules for fuel oil also changed from the 1st of January 2011 which affected the refund. The refund on the carbon dioxide tax and the energy tax was lowered to 70 per cent makes the cost increase substantially, see Table 13.

Table 13. Tax on fuel oil in Sweden excl. VAT. Euro/litre

Measures / Year	2008	2009	2010	2011
Energy tax	0,079	0,075	0,083	0,090
CO_2 tax	0,300	0,283	0,316	0,339
Total tax	0,379	0,358	0,399	0,429
Refund	0,316	0,299	0,332	0,300
Cost after reduction	0,063	0,059	0,066	0,129

Source; (www, Swedish Tax Agency 2011)

5.7 Land tax

Taxation of agricultural land exists in both Denmark and Germany. However in Sweden, there is no tax on agricultural land and Sweden is therefore excluded from section 5.7.

5.7.1 Denmark

In addition to the other taxes Denmark has an annual national property tax (Ejendomsvaerdiskat) on owner-occupied dwellings. The tax is progressive and up to a official property value of 3 040 000 DKK the tax is 1 per cent. For the property value that exceeds 3 040 000 DKK the tax is 3 per cent. In addition to the property tax there is a land tax

(Grundskyld). However, if the land is used for agricultural production the tax rate is lowered (van der Veen et al. 2007, p.117).

Before 2007 the tax was divided into two different parts, county land tax and municipal land tax. Both were based on the official property value (www, Statistics Denmark 2011). As of today the county land tax has been incorporated into the municipal land tax but it is still based on the official property value. The official property value is evaluated by valuation authorities that are assisted by the tax authorities. The official value should be 80 per cent of the market value and this value is determined every other year (van der Veen et al. 2007, p.117). During the years prior to 2007 the agricultural sector experienced continuously lower county tax rates. Whereas the normal county land tax was fixed at 1 per cent of the official value, the tax rate for agricultural land was lowered and in 2006 it amounted to 0,1 per cent (www, Statistics Denmark 2011). The municipal tax rate was also reduced for the agricultural sector and before the change in 2007 the municipal tax rate for normal properties varied between a minimum of 0,6 per cent and a maximum of 2,4 per cent. For agricultural land the municipal tax was reduced and set at a minimum of 0,6 per cent and a maximum of 1,2 per cent.

In the rules from 2007 when the county tax has been incorporated, the municipal tax vary depending on municipality between 1,6 and 3,4 per cent (www, Statistics Denmark 2011). For agricultural land there is still a tax reduction which between 2007 – 2010 was 0,97 percent lower than the normal rate with a maximum of 1,23 per cent. For 2011 the rate has been lowered and is now reduced with 1,48 percentage of the normal rate with a maximum rate of 0,72 per cent.

5.7.2 Germany

In Germany there is a land tax which is charged by each municipality (www, World Bank 2003). The object of the land tax is building and domestic land including forestry and agricultural land. Public buildings and land, such as parks and hospitals are exempt from land tax.

The calculation of the tax rate varies between the different municipalities. The tax rate is determined by a "standard tax" which is set by the state tax administration and it is the same for all municipalities (ibid.). The standard tax rate is acquired by multiplying a "base rate" with a "ratable value". The base rate for forestry and agricultural land is 0,6 per cent. For all land registered in the cadastre an assessment of the ratable value is made. The "standard tax" is then the basis for the municipal tax. Each municipality applies a "leverage ratio" of which the standard tax is multiplied with.

Ratable value * Base rate = Standard tax (assessed base value)

Standard tax (assessed base value) * Municipal leverage ratio = Municipal land tax

There are two types of land tax, land tax A and land tax B. Land tax A includes not only agricultural land and forestry but also all business related objects such as buildings live-stock and machinery (ibid.). Land tax B includes ancillary structures, buildings, owner-occupied dwellings and leaseholds.

In 1964 there was a large census which also established ratable land values (ibid.). The values were obtained by gross-returns or construction values of land and buildings. The ratable value

for land in western Germany still remains the same as in 1964. For Eastern Germany a surrogate ratable value is used.

The leverage factor which is determined by each individual municipality is different for "Land tax A" and "Land tax B" (ibid.). In Schleswig-Holstein the leverage rate is 250 per cent for Land tax A and for Land tax B is it 303 per cent. In 2006 the average land tax in Germany was 12 Euro per hectare (Jordbruksverket 2, 2006, p.41).

5.8 Tax on fertilizer

In Germany there is no tax on fertilizer and it is therefore not discussed further in this section.

5.8.1 Denmark

The tax on fertilizer in Denmark is 0,67 Euro per kilogram of nitrogen (Jordbruksverket 2, 2006, p.33). Fertilizer which contains less than 2 per cent of nitrogen is exempt from the tax. The Danish system is based on fertilizer accounts. In the fertilizer account the farmer has to declare the use of nitrogen on the farm. The main purpose for the fertilizer account is to reduce the use of commercial nitrogen. Agricultural businesses with an annual turnover that exceeds 2 681 Euro and fulfills more than one determined criteria's has to keep a fertilizer account. Three of the criteria's is having more than 10 LU, having an animal density exceeding 1 LU per hectare or receiving more than 25 tons of manure annually (www, The Danish Food Industry Agency 5 2011). Farms may keep a fertilizer account on a voluntary basis. If the accounts are registered at "Plantdirektoratet" a farmer can apply to be exempt from the nitrogen tax which most farmers in Denmark are.

5.8.2 Sweden

Prior to 2010 there was a tax on fertilizer in Sweden. The tax is 0,19 Euro per kilo of pure nitrogen (Jordbruksverket 2, 2006, p.32). The tax was only administrated if the fertilizer contained more than 2 per cent nitrogen. In addition to the nitrogen tax there was a fee of 3,22 Euro per gram of cadmium in the fertilizer that exceeded five grams per ton of phosphor. However, as of 1st of January 2010 the tax on fertilizer was abolished.

6. Subsidies

The Common Agriculture Policy (CAP) of today is divided into two so called pillars, product and price support is referred as 1st pillar whereas rural development is referred as 2nd pillar, see Figure 13 (European Commission 2, 2011). Pillar 1 is totally supported by the EU budget while the 2nd pillar is financed through a multi-annual program where the member state has to partly finance the expenditures. The policies of the 2nd pillar are common for all member states and the objectives are determined at EU level. However, it is possible for the member states to design the programs at national or even regional level. This gives the states possibility to ensure that the programs reach their targets by taking specific local conditions into consideration.

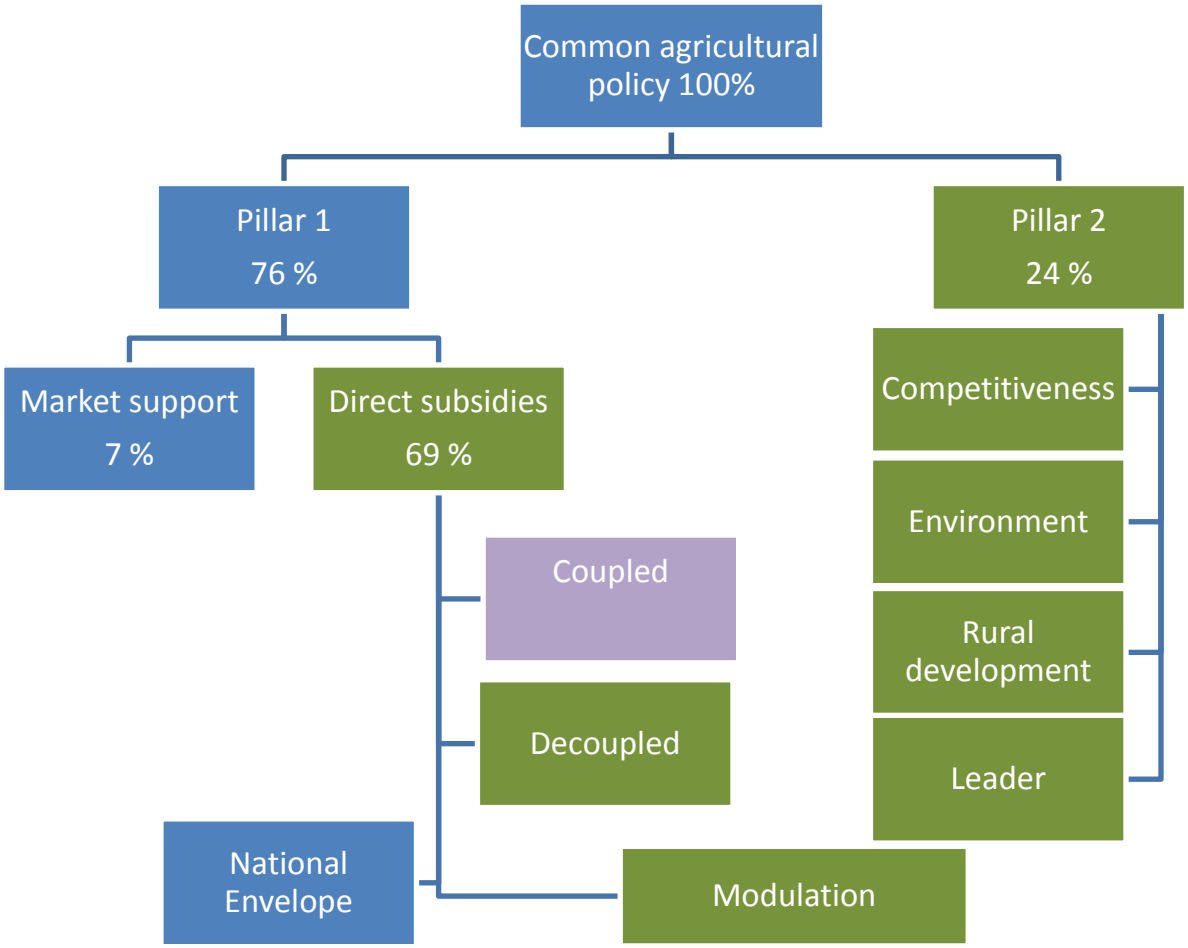


Figure 13, Description of the CAP,

Source: own arrangement of (Andersson et al. 2010)(European Commission 2, 2011, p.7)

6.1 Single Payment Scheme (SPS)

The system of single payments has it basis in the former "area aid scheme" which was introduced to adapt CAP to the market (Jordbruksverket 2 2010, p.5). In 1992 the intervention prices for agricultural commodities was reduced and partly replaced by direct payments (European Commission 2, 2011). These changes striving to make farming more market oriented are commonly labeled the Mac Sharry-reform (European Commission 3 2009). In the

year of 1999 a new reform called Agenda 2000 continued the development in this direction. The intervention prices were lowered with 15 per cent in two steps (Jordbruksverket 2 2010, p.41). In order to compensate farmers for the loss of income about half of the money was transferred to the area aid scheme.

The area aid payments were designed to reduce surplus production and forced farmers to "set-aside" some of their arable land (European Commission 4 1999). In the period of 2000-2006 farmers had to take 10 per cent of their arable land out of food production. The payment per hectare was dependent on the yield of grain in each region. This resulted in high payments for farmers in regions with good yields of grain (Brady et al. 2007). This connection to the actual production level was an important feature of the Mac Sharry-reform.

The Agenda 2000 initiated development of new objectives into CAP (European Commission 4 1999). But it was first in year 2003 real changes took place through the Mid-Term Review (MTR) (Martí Massot 2010). MTR resulted in the (Krugman 1994). which introduced changes in CAP (www, Europa, Summaries of EU legislation 2008). Before, payments were related to the farm coupled to the farm size, production and number of livestock. The new system aims at decouple payments from production and create a single payment scheme.

The payment each member state has previously received as support for production constitutes the reference amount which is used as a ceiling for the Single Payment Scheme (SPS) (Martí Massot 2010, p.2). By using this amount as a basis the Single Payment entitlement per hectare was calculated. The number of entitlements for each farmer is calculated depending on the number of qualified hectares of land he/she cultivates. The member states are obliged to keep a national reserve through the use of a linear deduction schedule that amounts 3% of the total funds intended for single payments. This reserve shall be used to compensate farmers who recently started or farmers with unusually low amount of entitlements e.g. newly established.

The Single Payment Scheme makes it possible for the farmers to adjust production to market demand without worrying of their sustenance (Martí Massot 2010, p.2). Decoupling all payments that corresponded to the former support is known as the historical model. The regional decoupling method implies that all farmers in a region receive the same level of payment per hectare. The payment consists of an equal share of the total payment in the region during the reference period. Another possibility for the member states is to combine the two models either by applying different systems in different regions of the country or by using a system which partly uses historical data and partly use a fixed rate.

The hybrid model may vary over time depending on the ongoing implementation of the single payment scheme resulting in a dynamic or static model. Countries that introduced a dynamic hybrid model are aiming to change to the regional model over time (Jordbruksverket 2 2010, p.7). Those who use the static hybrid model have the possibility to maintain different levels of regionalization in their models. The new member states apply a simplified single area payment scheme (SAPS) due to the fact that they do not have any historical reference points. However, the new member states are forced to convert and adapt their systems to the single payment scheme. Each countries choice of model is specified in Table 14.

Table 14. The EU-15 countries choices of model for single payment scheme

Historical:	Austria, Belgium, Spain, France, Greece, Ireland, Italy, Netherlands and within the UK, Scotland and Wales
Regional:	Malta, Slovenia
Hybrid :	Dynamic: Germany, Denmark, Finland, England Static: Luxemburg, Sweden

Source: (Jordbruksverket 2 2010, p.7)

Most countries converted to this new system in 2005 or 2006 with an exception of the new member states (Jordbruksverket 2 2010, p.7). Denmark, Germany and Sweden converted in 2005. To prevent land from becoming unused the member states had some possibilities to decide how fast they want to implement the single payment scheme (BMELV, 1, 2006, p.15).

The MTR reform in 2003 implies a full decoupling of CAP (Martí Massot 2010). The health check of the CAP in 2009 confirmed the idea of decoupling and states that those countries who have kept some payment schemes coupled will have to remove them before the year of 2012. Specific support systems which still are linked to production will therefore be reduced gradually and disappear. The premium for suckling cows, ewes and goats is excluded from the reform and may be kept.

There are five objectives that a member state could refer to as a justification for altering subsidies to become coupled again (Martí Massot 2010, p.3). It is possible to keep up to 10 % of the national envelop for this purpose. The objectives to which a country can refer to are (Martí Massot 2010, p.3):

1. Environment, quality or marketing of products.
2. Addressing to geographical or sectoral handicaps
3. Revaluing of decoupled payments per hectare in areas were risk for abandonment of agriculture occurs
4. Partly payments to ease insurance premiums covering risks in arable crop sector.
5. Contributes to mutual fund purposing to defend against plant and animal diseases.

Cross-compliance

The MTR reform of 2003 also contains provisions of cross-compliance, which require farmers to comply with certain environmental and agricultural conditions which are stipulated by each member state (Martí Massot 2010, p.3). The conditions should be fulfilled whether the farmer actually produces anything or not at the land. The rules should be stipulated in a way that restrict soil erosion, maintain soil structure, soil organic substance levels and ensure that the farmers maintain the land above the minimum level of maintenance.

In order to receive the payments, rules concerning environmental issues, maintaining good standards on the land, and to comply with the rules of public health, animal welfare, crop protection and environmental-friendliness, have to be considered according to Council Regulation (EC) No 1782/2003 (www, Europa, Summaries of EU legislation 2008).

If a farmer, due to negligence, does not comply with the rules the payment might be reduced by 5 % (www, Europa, Summaries of EU legislation 2008). However, if the farmer does it by purpose the reduction may exceed 20 % and the farmer might be completely excluded from any payments.

According to Council Regulation (EC) No 1782/2003 all member states are obliged to implement a system for advisory services not later than January 1, 2007. The advisory services are purposed to help producers to comply with the cross-compliance rules.

In 2009 the relevance of the rules of cross-compliance was questioned and in the new (Council regulation (EC) no 73/2009 n.d.)some of the rules from 2003 changed. A farmer should keep cautious about following rules of five categories: 1. Environment, 2. Public and animal health, identification and registering of animals, 3. Public-, animal health and crop protection, 4. Registration of diseases, 5. Animal welfare. These five concerns are followed by requirement of keep maintenance of agriculture land fulfill environmental concerns.

Modulation

During the period from 2005 until 2012 the Single payments are reduced every year in entire EU except some payments to farmers in the outer zones and islands in the Aegean Sea (www, Europa, Summaries of EU legislation 2008). The reduction of payments is called modulation and aim to allocate assets among member states to be used in 2nd pillar, the European Rural Development Fund, see section 6.2. At first the Agenda 2000 reform made it optional for member states to apply modulation voluntary. When regulation (EC) No1782/2003 came into force modulation became compulsory for all farmers within the EU-15. Farmers receiving less than 5000 Euro are not affected.

At least 80 % of the amount deducted due to modulation will be distributed among the member states to be used for rural development through the European Agricultural Fund for Rural Development (EAFRD) (www, Europa, Summaries of EU legislation 2008). Some countries retrieve 90 % of their modulated amount due to the crisis in the rye sector. Germany is the superior rye producer within the EU-15 and due to this receiving back 90 % (BMELV, 1, 2006, p.12). The extra funds received shall exclusively be used for arrangements in regions where rye usually is cultivated. The remaining 10 - 20 % is distributed among the 15 countries according to the objectives concerning area farmed, agricultural employment and GDP/capita in terms of purchasing power (Martí Massot 2010, p.4).

After the "health check" in 2009 some arrangements in the modulation scheme were changed (Martí Massot 2010, p.4). The initial modulation rate rose from 5 % in 2008 to 12% in 2012, see Table 15. Payments above 300 000 Euros become subject to an additional reduction of 4 % per year. Funds removed by this extra reduction will be used within each country for specific rural development policies.

Table 15. Modulation of SPS in EU 2005-2012

Year	2005	2006	2007	2008	2009	2010	2011	2012
Modulation	-3%	-4%	-5%	-5%	-7%	-8%	-9%	-10%

Source: (BMELV, 1, 2006, p.73)(www, ZID, 2011)

Disbursements

The Single payments are disbursed between 1 December and 30 June the year following the application (www, Europa, Summaries of EU legislation 2008). Some additional payments could be postponed as long as until 30 September. The maximum total payment for each country is specified in Table 16.

Table 16. Maximum single payment for each country in millions Euro

Year	2006	2007	2008	2009	2010
Denmark	1015	1021	1027	1030	1030
Germany	5647	5696	5744	5770	5744
Sweden	671	755	760	763	763

Source: (www, Europa, Summaries of EU legislation 2008)

Each country is obliged to keep reserves to prevent land from becoming unused and uncultivated, but also to support new farmers that enter and finally to overcome other special circumstances.

The SPS payments are based on former payments during a reference period. Most common is the period from 2000 until 2002, but in some cases the period 1997-1999 applies. The base for the payments are former payments related to land, premiums to reduce seasonal differences, slaughter premium, special premium for male bovines, suckling cow premium and premium for dairy products.

6.1.1 Basic payment entitlement

This section clarifies which basic amounts of Single Payments farmers in Denmark, Germany and Sweden receive for cultivating their land.

6.1.1.1 Denmark

The main subsidy in Denmark is as in the two other countries the "Single Payment Scheme" (Enkeltbetaling) which in 2005 replaced the "Area Aid Scheme" (Hektarstøtten) (Ministry of Food, Agriculture and Fisheries 1 2010, p.4). In order to receive subsidies in form of the Single Payment Scheme (SPS) the recipient has to control agricultural land and have payment entitlements. The SPS is only valid for areas used as productive agricultural land or land kept in good agricultural- or environmental condition. The size of the SPS varies depending on the value of the payment entitlements.

The payment entitlements may be traded directly between farmers without the involvement of Ministry of Food, Agriculture and Fishery (MFAF). However, when traded MFAF has to be informed and the reason being that the payment entitlements have to be registered to the farmer applying for the SPS. The values of the basic payment entitlements are specified in Table 17.

Table 17. Value of basic payment entitlements per hectare in Denmark

Measures / Year	2010	2011
Cultivated / uncultivated land	299,13€/ha	302,14€/ha
Pasture land	282,40€/ha	295,84€/ha

Source: (Ministry of Food, Agriculture and Fisheries 1 2010, p.29)

6.1.1.2 Germany

Single payments (Direktzahlung) and other forms of subsidies are of considerable importance to German farmers (www, Ministerium für Landwirtschaft, Umwelt und ländliche Räume 1 2011). The EU single payment scheme accounts for the largest share of all payments. In addition a tax relief on diesel fuel for the agricultural sector exists.

Single payment scheme

The reform of the agricultural policy decided by EU in 2003 was introduced in Germany 2005 (BMELV, 1, 2006, p.5). Germany took the possibility to decouple all the premium payments such as milk supplement and livestock supplement for suckling cows, ewes and male bovines (www, meine-milch 2, 2011). The regional acreage premium in Schleswig-Holstein before the historical "top ups" was added was 304.61 Euro/ha for arable land and 79, 80 Euro/ha for permanent grassland, see Table 18 (van Stolk et al. 2006, p.6).

Table 18. Regional area payments per hectare without additive entitlements based on historical production,2005

Region	Arable land €/ha	Grassland €/ha
Baden-Würtemberg	303,82	72
Bayern	298,46	88,34
Berlin/Brandenburg	269,65	68,49
Hessen	300,39	61,58
Mecklenburg-Vorpommern	308,5	59,84
Niedersachsen/Bremen	255,12	99,75
Nordrhein-Westfalen	267,7	104,95
Reinland-Pfalz	276,89	48,45
Saarland	280,55	53,86
Sachsen	309,76	111,2
Sachsen-Anhalt	317,18	97,69
Schleswig-Holstein/Hamburg	304,61	79,8
Thüringen	322,1	80,52

Source: (www, Federal Ministry of Food, Agriculture and Consumer Protection 2011)(www, Federal Ministry of Food, Agriculture and Consumer Protection 2011)(BMELV, 2, 2011)

Germany chose to decouple subsides by using a dynamic hybrid model until 2009. This model is 65% based on historical values and 35 % regional values. During the period 2009 until 2013 the dynamic hybrid model is gradually transferred into a regional model.

All extra entitlements are to be transferred to the SPS and final regional premium for 2013 as calculated, see Table 19. This conversion results in a totally decoupled production and regional model in 2013.

Table 19. Final value per hectare using regional model 2013 for the Single payment (Direktzahlungen) .

Region	Final reference value 2013, €/ha
Baden-Würtemberg	308,05
Bayern	354,55
Berlin/Brandenburg	300,3
Hessen	299,58
Mecklenburg-Vorpommern	329,44
Niedersachsen/Bremen	352,38
Nordrhein-Westfalen	359,44
Reinland-Pfalz	294,54
Saarland	258,96
Sachsen	357,26
Sachsen-Anhalt	354,97
Schleswig-Holstein/Hamburg	358,83
Thüringen	346,35

Source: (www, Federal Ministry of Food, Agriculture and Consumer Protection 2011)(www, Federal Ministry of Food, Agriculture and Consumer Protection 2011)(www, Federal Ministry of Food, Agriculture and Consumer Protection 2011)(BMELV, 2, 2011)

The conversion from the dynamic hybrid model to a regional model provides all farmers within each "Bundesland" with the same payment per hectare independent of what they produce 2013 (www, meine-milch 2, 2011). The difference between the individual farmers' payments in 2009 and the reference values in Table 19 are modulated until 2013. The modulation amounts to 10 % in 2010, 30% in 2011, 60 % in 2012 and 100% in 2013. The average payment at a German farm is expected to amount to 340 Euro per hectare in 2013 (www, meine-milch 2, 2011).

Schleswig-Holstein

In year 2008/2009 the average level of national and EU supported subsidy payments in Schleswig- Holstein was **394 Euro** per hectare utilized agricultural area, UAA (www, Ministerium für Landwirtschaft, Umwelt und ländliche Räume 1 2011). The single payment accounts for **359 Euro** (91 %) of the subsidies. The average farm in Schleswig-Holstein consist of 81 hectares of agricultural land with a subsidy level which in 2008/2009 amounts to 32 000 Euro per farm. The level of the payment is less than average in Germany which is 429 Euro. In the southern part of Germany, Bayern and Baden-Württemberg, the payment is much higher. It amounts to 508 Euro respectively 444 Euro, after all types of subsidies are included.

6.1.1.3 Sweden

All agricultural land in Sweden has the possibility to qualify for the single payment (Jordbruksverket 2011b, p.23). To be eligible for payment, entitlements to the land are needed, these also accounts for the value of the payment (www, Jordbruksverket 1 2011). The entitlements can be rented or traded directly between farmers. It is also necessary to keep the land in good condition free from bushes, trees and to maintain good drainage to fulfill the rules of cross-compliance.

The payment entitlements are destined to a specific region which means that you can only use them in that region (www, Jordbruksverket 1 2011). The values of the entitlements depend on the region where they are located, see Table 20 and Table 21.

Table 20 Payments per hectare for arable land per region in Sweden

Region	2008	2009	2010	2011
1.	276 €/ha	276 €/ha	278 €/ha	280 €/ha
2.	239 €/ha	239 €/ha	242 €/ha	243 €/ha
3.	200 €/ha	200 €/ha	202 €/ha	204 €/ha
4.	158 €/ha	158 €/ha	160 €/ha	161 €/ha
5.	126 €/ha	126 €/ha	128 €/ha	128 €/ha

Source; (www, Jordbruksverket 1 2011)

Table 21 Payment per hectare for pasture land per region in Sweden

Region	2008	2009	2010	2011
1.	143 €/ha	149 €/ha	145 €/ha	146 €/ha
2.	122 €/ha	122 €/ha	125 €/ha	126 €/ha
3.	123 €/ha	123 €/ha	126 €/ha	126 €/ha
4.	126 €/ha	126 €/ha	129 €/ha	129 €/ha
5.	126 €/ha	126 €/ha	128 €/ha	128 €/ha

Source (www, Jordbruksverket 1 2011)

6.1.2 Individual payment entitlements

The value of payment entitlements may vary as a result of coupled subsidies becoming decoupled. The payment entitlement is therefore increased by coupled subsidies such as livestock supplement, milk supplement and sugar supplement (Ministry of Food, Agriculture and Fisheries 1 2010, p.29). As a result of more decoupled animal subsidies many payments have been transferred from coupled subsidies to individual payment entitlements. (Ministry of Food, Agriculture and Fisheries 1 2010, p.29). In 2000-2002 there was a reference period for production subsidies related to livestock production.

6.1.2.1 Denmark

The value of the individual payment entitlements cannot exceed 5000 euro per hectare.

Livestock Supplement

Between the period 2005 – 2008 the annual payment amounted to 100 per cent of the supplement value for decoupled male bovine premium, slaughter premium and extensification premium (Ministry of Food, Agriculture and Fisheries 1 2010, p.29). Between 2009 – 2012 there is an annual reduction of 14,06 per cent on the share of decoupled entitlements that relate to the former livestock premiums, see Table 22. The reduction of the payment is transferred to payments for grassland.

Table 22. Annual reduction of livestock supplement in per cent in Denmark

Supplement 2005-2008	Supplement 2009	Supplement 2010	Supplement 2011	Supplement 2012
100 %	85,94 %	71,88 %	57,81 %	43,57%

Source; (Ministry of Food, Agriculture and Fisheries 1 2010, p.29)

Livestock units
In order to use individual payment entitlements without land these may be exploited as long as a production of at least 50 per cent of the requirement is quota of livestock units (LU) which was set in 2005 is fulfilled (Ministry of Food, Agriculture and Fisheries 1 2010, p.32). If the livestock production is lower than the requirements the farmer will no longer be eligible for the payments. Livestock units are measured as follows:

- Male animals (bulls and steers) and heifers from 24 months, dairy cows and suckling cows: 1 LU
- Male animals (bulls and steers) and heifers from 6 months to 24 months: 0,6 LU
- Bovine under 6 months: 0,2 LU

Slaughter premium
In 2000 a slaughter premium for bovine was introduced. This premium included bulls, steers, cows and heifers, eight months or older (Jordbruksverket 2006, p.133). There was also a slaughter premium for calves younger than 7 months or a weight below 152,5 kg. The premium for adult animals older than 8 months was 80 Euro per animal and for calves 50 Euro per animal. However, in 2005 the slaughter premium was transferred from a coupled subsidy to a decoupled subsidy. The payments were subsequent transferred to an individual payment entitlement and the value of the entitlements was based on the average number of delivered animals during a reference period. The reference period was between the years 2000-2002.

Extensification premium
In 2000 an extensification premium was introduced as an additional subsidy for producers who were recipients of male bovine premium or suckler cow premium (www, European Commision 2 2002). To qualify for this subsidy the density of the production had to be less than 1,4 LU per hectare of feed area per calendar year. The payment from the extensification premium amounted to 100 Euro per delivered animal. In 2005 the extensification premium was like many other subsidies transformed from a coupled subsidy to a decoupled subsidy. The payment was just like the slaughter premium transferred to individual entitlements. The amount transferred to individual entitlements was based on the average number of livestock delivered during a reference period between the years 2000-2002.

Animal subsidies (Coupled)
The main production related subsidy in Denmark is a special premium for male bovine. This is one of few remaining production related subsidies and it is also an EU-related subsidy.
The male bovine premium were in 2010 for bulls 157,5 Euro/bull and for steers with one male bovine premium 112,5 Euro/steer, with two male bovine premiums 225 Euro/steer.

6.1.2.2 Germany
In 2005 the following premium payments existed with the exception of a milk premium and livestock premium for suckling cows, ewes or male bovines condensed to one entitlement (www, meine-milch 2, 2011).

Livestock Supplement
All cattle supplements (premium for male bovine, slaughter premium and extensification supplement) were decoupled in 2005 (Jordbruksverket 2007, p.48). The values of individual payment entitlement were based at the average production the farmer had during the reference period 2000-2002 (BMELV, 1, 2006, p.16). Male bovine, slaughter and suckler cow premium was transferred to the single payment which is related to the land.

Slaughter premium
Same as Denmark, see 6.1.2.1
Calves which were younger than 7 months or weighed below 152,5 kg: 50 Euro/animal
Adult cattle: 80 Euro/animal
Reference period: 2000-2002

Extensification premium
Same as Denmark, see 6.1.2.1

Animal subsidies (coupled)
All coupled animal based subsidies for cattle are abolished in Germany.

6.1.2.3 Sweden
Livestock Supplement
An additional value is placed upon the entitlement depending on extra payments allocated in 2005 due to historical payments in the years 2000-2002 (www, Jordbruksverket 1 2011). Some farmers also received some extra subsidies from a national reserve. Those are primarily intended to support farmers who rented out their land since 2002 or earlier and therefore did not apply for entitlements in the year of the introduction, 2005 (www, Jordbruksverket 2 2011).

Slaughter premium
Same as Denmark, see 6.1.2.1
Calves which were younger than 7 months or weighed below 152,5 kg: **50 Euro**/animal
Adult cattle: **80 Euro**/animal
Reference period: 2000-2002

Extensification premium
Same as Denmark, see 6.1.2.1

Animal Subsidies
The only production related subsidy in Sweden is a premium for male bovine (www, Jordbruksverket, 3 2011). The male bovine premium was in 2010 111 Euro per bull and for heifers with one entitlement were 111 Euro per steer and with two entitlements 222 Euro per steer. In 2012 the male bovine premium will be decoupled and is transferred to payment entitlements as "top ups". The magnitude of the "top ups" will be decided from the average number of animals delivered during a reference period 1st of October 2009 – 31st of December 2011.

6.1.3 Milk premium
In 2004 as a result of the 2003 CAP reform it was decided to reduce the intervention prices for butter and skimmed milk (www, European Commision 2011). As a result of lowered

intervention prices the market would react with a reduction of the market price. Therefore, a support payment was introduced. The payments were paid out per calendar year and consisted of two elements, dairy premiums and additional payments. The dairy premium was equal for all milk producers but the additional payment was decided by each member state which also defined individual criteria for the additional payment.

When the new payment was introduced it was decided that the dairy payments had to be included in the Single Payment Scheme. The SPS could be introduced in either 2005, 2006 or 2007 and the dairy payments had to be included by no later than 2007 (www, European Commision 2011). When introducing the SPS each member state was given a "national ceiling" which determined a total amount for the SPS. A member state however was allowed to retain up to 10 per cent of the national ceiling. These 10 per cent could then be redistributed under certain conditions to the same sector and therefore resulting in different payments. The values in this section have been recalculated to Euro according to exchange rates in Appendix 1.

6.1.3.1 Denmark

In 2004 the Danish premium were 1,14 cent/kg where 0,8 cent was the milk premium and 0,34 cent a supplement (www, The Danish Food Industry Agency 1 2011). The payment was only disbursed in 2004. In 2005 the milk premium was replaced with a milk supplement. The new milk supplement was based on the previous milk premium and the payment for 2005 which amounted to 1,41 cent/kg quota see Table 23 (www, The Danish Food Industry Agency 2, 2011). In 2006 and forward the milk supplement payment was decoupled and included in the individual payment entitlements. The value of the payment in 2006 and onwards was determined to 2,59 cent/kg quota (www, LandbrugsInfo, 1, 2011).

Table 23 Value of milk premium in Denmark

Year	Payment
2004	1,14 cent/kg
2005	1,41 cent/kg
2006	2,59 cent/kg

Source: (www, The Danish Food Industry Agency 2, 2011)

6.1.3.2 Germany

A subsidy for milk producers was introduced in 2004 (www, meine-milch 2, 2011). In 2006 the payment was decoupled and transferred to individual payment entitlements. The current payment is based on a reimbursement for each kilo of milk quota that the farmer owned in 2006 when the premium became decoupled, see Table 24.

Table 24. Value of milk premium in Germany

Year	Payment
2004	1,182 cent /kg
2005	2,386 cent/kg
2006	3,55 cent/kg

Source: (www, meine-milch 2, 2011)

6.1.3.3 Sweden

The Swedish Milk Premium was decoupled later than both Denmark and Germany. In 2007 the milk premium was altered from being production based and transferred to the single

payment scheme. The value of the milk premium which was transferred was **2,27** cent/kg of quota held in March 2007, see Table 25 (www, Jordbruksverket 4 2011).

Table 25. Value of milk premium in Sweden

Year	Payment
2004	1,18 cent /kg
2005	1,60 cent/kg
2006	2,27 cent/kg

Source:(Regeringen 2004)

6.2 Rural development

The 2nd pillar is as mentioned in section 6.1 containing the rural development policies according to Council Regulation (EC) No 1698/2005. The subsidies in the 2nd pillar are co-financed between national and EU level (European Commission 2, 2011). The aim of the European Rural Development Fund is to make it possible to address measures to support certain purposes. The objectives are determined in EU level but implemented through national or regional programs that run for seven years. Existing programs thus runs for the period 2007-2013 which coincides with the multi annual framework for the European Union. Each program contain three themes often referred to as the three "axis", see Figure 13:

1. Improving competiveness by investing and modernizing
2. Maintaining rural environment
3. Improving quality of life in rural areas and encourage diversification.

The member states are also obliged to ensure that the so called "Leader approach" is implemented. The approach has to include all the axis and encourage local development were local people are engaged in the projects.

The member states have the possibility to choose how they want to spend their funds. But the Council Regulation (EC) No 1698/2005 stipulates a minimum spending level for each axis: 25 % agri-environmental measures (and measures for less favored areas), 10 % competitiveness and 10 % rural development, see Figure 13.

The money transferred from 1st pillar to 2nd pillar, the so called modulation, has increased since the start in 2003. The modulation is strengthening the rural development fund (EAFRD).

The values in this section have been recalculated to Euro according to exchange rates in Appendix 1.

6.2.1 Agri-environmental measures

The agri-environmental measures, part of axis 2, stand for the largest share of the rural development measures.

6.2.1.1 Denmark

All agri-environmental measures which are financed through the rural development program are based on commitments that extend for five year periods (Ministry of Food, Agriculture and Fisheries 2 2010, p.6).

Extensive farming
Payment for extensive farming in 2010 and 2011 are **110€/ha**. In order to be eligible for extensive farming subsidies the land has to be cultivated in a certain manner, see Table 26. No pesticides, herbicides or fungicides are allowed unless if they are allowed for organic production (Ministry of Food, Agriculture and Fisheries 2 2010, p.6). The use of nitrogen has to be decreased and a "Nitrogen plan" has to exist.

Table 26 Value per hectare for agri-environmental subsidies in Denmark

Preservation of permanent grassland	2010	2011
When area is grazed	188€/ha	188€/ha
When area is harvested	108€/ha	108€/ha
Area with selected environment with difficulties to reach and commitment to grazing	445€/ha	-
Area that is designated as bird friendly an annual supplement can be added	80€/ha	-

Source: (Ministry of Food, Agriculture and Fisheries 2 2010, p.6)

Permanent pastureland is land that is used for growing grass or other forage on either natural or cultivated basis (Ministry of Food, Agriculture and Fisheries 2 2010, p.20). However, the land has to have been kept outside the farms crop rotation for at least five years. Land that has been used for growing grass or other forage crops during the last five years is also included.

Support for reducing nitrogen leaching
The Danish regulation requires all farms that exceed a certain size to attain and register for a so called fertilizer account (Ministry of Food, Agriculture and Fisheries 4 2010, p.3). All farmers who are part of this accountancy system are obligated to grow catch crops at a minimum of 10- 14 % of the total area which is subject to the rules of catch crops (Ministry of Food, Agriculture and Fisheries 4 2010, pp.34-35).

Riparian strips
A subsidy for riparian strips exists and in order to apply the nearby lake or open stream has to be larger than 100 m^2 (Ministry of Food, Agriculture and Fisheries 3 2010, p.19,). The riparian strip has to be at least 10 meters wide but not wider than 20 meter. The used area may not be used for production or grazing. The subsidy for establishing fallow riparian strips 2010 are **160€/ha**

6.2.1.2 Germany
The federal and state level jointly arranges subsidies for agricultural and coastal preservation (Gemeinschaftaufgabe der Agrarstruktur- und Küstenschutzes, GAK stands for a substantial part of the payments (www, Ministerium für Landwirtschaft, Umwelt und ländliche Räume 1 2011).The funds are intended to provide support to investments in the agricultural sector, but also to support farms in the less favored areas (LFA) and to encourage environmental protection.

The German landscape is rather variable in terms of population density and size of farms, but the economic conditions are also different in former East- and West- Germany (www, Europa 2007). Due to the fact that Germany has a federal structure the rural development policy implemented at regional level by 14 regions arranged according to the 16 "Bundesländer"

were Berlin-Brandenbrug and Niedersachsen/Bremen present joint programs. This study focuses on the rural development programs of Schleswig-Holstein.

Support to improve environment and nature
In order to be eligible for support aiming to improve environment and landscape farmers have to make a commitment lasting for five years (Landwirtschaftskammer Schleswig-Holstein 1 2010).

Support for reducing nitrogen leaching
Areas which are located inside the area protected by the water framework directive of Schleswig-Holstein are eligible for payments for growing catch crops (Landwirtschaftskammer Schleswig-Holstein 1 2010). The subsidy for catch crop for conventional farmers amounted to **125 €/ha** in 2010. The subsidy for catch crops on an organic farm amounted to **80 €/ha** in 2010. In 2011 will these measures become mandatory at certain fields which are sensitive to erosion, but no subsidies will be available (Pers. com., Thomsen 2011).

Support for buffer strips
The applicant is committing to maintain buffer strips along fixed borders of the field in order to receive this kind of payment (www, Ministerum für Landwirtschaft, Umwelt und ländliche Räume des Landes Schleswig-Holstein 2, 2010, p.24). The buffer strip should be between 6 and 24 meters wide and exist during five years along surface water, close to buildings or roads. The buffer strip must be located in the same area during this period. All acts except those who aim to support maintenance of the buffer strip are forbidden. The payment for buffer strips in 2010 were **600 €/ha**. In 2011 will these measures become mandatory for everyone that farms fields close to open water. However all farmers will be compensated (Pers. com., Thomsen 2011).

Improved N-utilization from liquid manure.
Support for spreading of liquid manure from the farm using slurry tankers with trailing shoes, trailing hose or shallow slurry spreading systems is available (www, Ministerum für Landwirtschaft, Umwelt und ländliche Räume des Landes Schleswig-Holstein 2, 2010, p.24). If the work is conducted by contractor a document which confirms date of spreading, the quantity of manure and the proceeding of the actions are required. The subsidy is based on a reference area which receives a payment of **30 Euro.** The reference area is calculated: (livestock unit * 0,5ha).

Livestock units are calculated depending on the type of animal. Young cattle age less than one year represents 0,3 LU, one till two years 0,7 LU (www, Proplanta 2011). Bulls used for breeding and steers represent 1,2 LU. Cows, heifers and fattening animals are considered as one LU. From 2011 is this subsidy no longer available (Pers. com., Thomsen 2011).

Natura 2000 –premium
Farms that have minimum 2 hectares of land within "Natura 2000" areas or other protected areas can apply for this kind of subsidy (Landwirtschaftskammer Schleswig-Holstein 1 2010). It is required that you have grassland on the farm. When renewing forage you are not allowed to practice deep cultivation like plowing etc. If drainage is added to the field it must be done in a manner that doesn't change the dewatering effect. Measures that aim to maintain trenches and drainage are allowed. The subsidy amounts to **80 Euro**/ha and year. Areas selected as bird sanctuary where special birds occur may be eligible for a subsidy up to 150 Euro/ha.

Permanent grassland program (Dauergrünland-Programm)
This program is intended to support farms dominated by grassland (Permanent grassland minimum 2/3 of arable land) (Landwirtschaftskammer Schleswig-Holstein 1 2010). The program is nationwide with the exception for small islands in the North sea.

Protection by species promoted by choice is used to protect ground nesting birds and amphibians in springtime. From 1 of April until 15 of May cultivation, spread of manure and the spreading of chemical plant protection substances are prohibited. If ground nest birds or amphibians still stay on the field the period could be prolonged until 31 of May. The subsidies amount a payment of **35 Euro**/ha per year. This amount could be added to the Natura 2000-premium and subsidies for use of organic farming methods. The commitment period lasts for five years.

Contractual nature conservation (Vertragsnaturschutz)
Land managed by farmers or other land managers like authorities in areas that are subject to the Natura 2000-premium, other Natural protected areas or areas with similar conditions that for example contain areas with special amphibians and ground birds nest (Landwirtschaftskammer Schleswig-Holstein 1 2010) .

The land should be managed according to special rules protecting species and biotopes. The payment amounts to between **60** and **650 Euro**/ha and might be combined with the "Natura 2000-premium", see appendix 4. The period of commitment lasts for five years.

6.2.1.3 Sweden
There are several Agri-environmental measures and they are all based on five year commitments.

Riparian strips
A subsidy for riparian strips adjacent to water exists. The riparian strip has to be at least 6 meter wide but not exceed 20 meters width (www, Jordbruksverket, 4 2011). The area adjacent to water has to be at least 20 meters long. The farmer is allowed to harvest the grass on the riparian strip but not before July 15th. The support level for establishing a riparian strip amounted to **314 €/ha** in 2010.

Reduced nitrogen leaching
In areas where the nitrogen leaching is considered high there are possibilities to receive subsidies for measures that reduce nitrogen leaching, see Table 27 (www, Jordbruksverket, 5 2011). There are two ways to gain this subsidy. One is to grow catch crops on at least 20 per cent of the tillable area planted by spring crop. The other method is through spring cultivation of a minimum of 20 per cent of the area planted by spring crops.

Table 27. Payment per hectare for reduced nitrogen leaching in Sweden

Measure / Year	2010
Catch crop	94 €/ha
Spring cultivation	52 €/ha
Spring cultivation and spring crop on the same land	157€/ha

Source: (www, Jordbruksverket, 5 2011)

Grassland
Tillable land that is used for grassland is subject to a subsidy (vallstöd), see Table 28. The grassland can be harvested or grazed but has to remain uncultivated for at least three winters in a row to be eligible for the subsidy (www, Jordbruksverket, 6 2011). In support areas 1-5 it is possible to receive a supplementary payment if there is a certain number of LU per hectare in production.

Table 28. Payments per hectare for grassland and supplements in Sweden

Support Area	2010
Basic payment in support area 1-5	32 €/ha
Basic payment in support area 9	52 €/ha
Supplementary payments	
Support area 1-3	210 €/ha
Support area 4	94 €/ha
Support area 5a and 5b	47 €/ha
Support area 5c and 5m	63 €/ha

Source: (www, Jordbruksverket, 6 2011)

Semi-natural pastures and mown meadows
Additional subsidies for permanent pasture land are also available, see Table 29. Depending on the type of pasture land different subsidies are available depending on if the land is grazed or harvested by use of certain methods designed to maintain biodiversity (www, Jordbruksverket, 7 2011). The subsidies can be divided into land with general values and land with particular values. Land with general values is defined as land which is grazed and is suited for grazing. The land is not appropriate for plowing. Mown meadows should be harvested each year and the land cannot be forestland. Land with particular values is determined by the County Administrative Board and can include land which in addition to the general values also may include rules that govern: when to graze or harvest, restrictions against supplement feeding, rules regarding vegetation and specific cultural values.

Table 29 Payments per hectare for pasture land in Sweden

Measure / Year	2010
Grazed land with general values	131 €/ha
Grazed land with particular values	278 €/ha
Mown meadow with general values	152 €/ha
Mown meadow with particular values	440 €/ha

Source: (www, Jordbruksverket, 7 2011)

6.2.2 Less favored areas

6.2.2.1 Denmark

In addition to the environmental subsidies a subsidy for less favored areas exist. This subsidy may be is combined with the environmental subsidies and applies to farmers located on small islands (Ministry of Food, Agriculture and Fisheries 5 2010, p.38). Since the subsidy is combined with the environmental subsidies the commitments extend for a period over five years (Council Regulation (EC) No 1698/2005) and the farmer has to have a minimum of 5 hectares of land. The subsidy for farmers on islands were in 2010 **64€/ha.**

6.2.2.2 Germany *(Förderung landwirtschaftlicher Betriebe in benachteiligten Gebieten)*
Farms with a minimum of 3 hectares of eligible agricultural land on the islands without connection to mainland are eligible for this subsidy. Payments are not fulfilled if the applicant for example has off-farm income in excess of 40 000 Euro if the farmer is married, if not married, 30 000 Euro. The level of the subsidy in 2010 was **117 €/ha** for grassland and **58 €/ha** for arable land. The maximum payment is 10 000 Euro. In addition special payments are available for farmers on the small islands in the North Sea who keep cattle, sheep or horses.

Germany has 19,1 million hectares of utilized agricultural land, about 5 % of them are classified as less-favored areas (www, Europa 2007).

6.2.2.3 Sweden
The LFA-support in Sweden is complemented by national support (Jordbruksdepartementet 2010). The aim of the subsidies is to support less favored areas and to ensure that production is maintained in the areas. The value of the subsidies varies depending on area, see Table 30. The subsidy in table 31 is given to grazed and permanent pasture land, tillable land and also the dairy production. The LFA-support, as part of the Rural Development Program, is financed by both EU (46,7 %) and the Swedish government (53,3 %). The national support is financed entirely by the Swedish government. Other subsides are available but has been disregarded due to having no relation to dairy production.

Table 30 Subsidies available for less favored areas in Sweden

Subsidy areas	F	1	2a	2b	3	4a	4b	5a	5b
Grassland and pastureland €/ha									
0-90 ha	283	283	283	283	283	283	115	157	94
above 90 ha	141	141	1350	1350	1050	1050	58	79	47
Grain €/ha									
0-90 ha	105	105	105	105	105	52	-	-	-
above 90 ha	52	52	52	52	52	26	-	-	-
Milk production €/kg	-	0,14	0,08	0,07	0,02	-	-	-	-

Source:(www, Jordbruksverket, 8 2011)

6.2.3 Investment subsidies

6.2.3.1 Denmark
The budget for investment subsidies (in axis 1) in the Danish Rural Development is slightly above 800 million Euros (www, The Danish Food Industry Agency 3 2011). Other subsidies within the program aim to support investments in new technology for sustainable environmental development such as renewable energy, recycling of heat in barns (Pers com. Korning 2011).

The payment level of the subsidy varies depending upon which area the investment takes place such as renewable energy or business development (www, The Danish Food Industry Agency 4 2011). The maximum payment level is 40 per cent of the investment. However, for most investments a minimum investment of 40 000 Euros is required in order to apply. The maximum payment a recipient can receive is approximately 265 000 Euros, thus 40 per cent of 670 000 Euros.

6.2.3.2 Germany

Schleswig-Holsteins Rural Development Program aims to support a sustainable and competitive agricultural sector (www, Ministerium für Landwirtschaft, Umwelt und ländliche Räume, 2 2011). The program supports a wide variety of investments and the main share is investments to improve competitiveness, environmental improvements and diversification of agricultural businesses.

Subsidies for investments targeted to the development of farm businesses can be granted for constructing new buildings, storage or greenhouses (www, Ministerium für Landwirtschaft, Umwelt und ländliche Räume, 3 2011). The investment cost however has to be a minimum of 175 000 Euros, and may not exceed 500 000 Euros in order to be eligible for support. If these requirements are met the subsidy can be granted in form of a lump-sum payment of 25 000 Euros. The subsidy however can only be received once per recipient during the period of 2007-2013.

Schleswig-Holstein has decided to ensure the competitiveness for dairy farmers in the region (ibid.). Therefore an investment subsidy for the expansion of new dairy barns and the expansion of existing barns is available. If the investment cost is a minimum of 120 000 Euros and does not exceed 600 000 Euros a recipient may receive a subsidy of 30 000 Euros.

6.2.3.3 Sweden

In Sweden the Rural Development Program aims to support the development of various agribusinesses, to increase the quality of production, adjust to new conditions, enhance the competitiveness, and to ensure environmental and animal welfare improvements (Jordbruksdepartementet 2010). The rural development program contains several investment subsidies. Currently there is an extra focus on supporting investments that are related to reduce environmental effects. Other areas that the program focuses on are improved energy efficiency and production of renewable energy. There are also funds available for farmers who are modernizing their dairy production.

The maximum amount a recipient normally can receive is 30 per cent of the investment (ibid.). However, in some sparsely populated areas in the northern part of Sweden can the amount be up to 50 per cent of the total investment. The maximum payment an applicant can receive varies depend on the region. In Hallands region the subsidy is circa 75 000 Euro (Länsstyrelsen Halland 2008, p.12). In Scania the subsidy is around 155 000 Euros and investments within dairy or renewable energy can receive an additional 50 000 Euros (Länsstyrelsen Skåne 2011). In Västergötlands region the maximum amount is circa 210 000 Euro and if the investment involved several applicants the amount could be doubled but not exceeding 30 per cent of the total investment (Länsstyrelsen Västra Götaland 2011)

6.3 Emergency aid

During 2009 the dairy sector in Europe was in a financial crisis. As a result of this the European Commission decided to grant an additional aid package to improve the financial situation of dairy producers' (www, Jordbruksverket 2, 2010). The total size of the aid package was 280 million Euros and the farmers had to receive the money before the end of June 2010. The size of the payment each country received was based on the national quota. How the money was to be distributed within each country was decided on a national level. The values in this section have been recalculated to Euro according to exchange rates in Appendix 1.

6.3.1 Denmark

The emergency aid in Denmark was divided depending on the individual quota which the farmer owned. The payment in Denmark was 2,01 Euro per ton of quota the farmer owned 1st of January 2010 (Ministry of Food, Agriculture and Fisheries 6, 2010). In order to be a recipient the farmer had to have delivered milk during the period from 1st of April 2009 – 31st of December 2009. The total grant Denmark received amounted to 9,86 million Euros.

6.3.2 Germany

The emergency aid in Germany was based divided across all grassland (Pers com. Möllgaard 2011). For each hectare of grassland the farmer received 20 Euros. The total grant Germany received amounted to 61,2 million Euros.

In addition to the emergency aid Germany provided two national subsidies which are complementary to the European emergency aid (ibid.). The aim of both subsidies was to improve the dairy farmers' financial situation. The first subsidy was also based on grassland and was financed from both EU and Germany. The payment was 38 Euro per hectare and is available during 2010 and 2011.

The second national subsidy is a payment is a cow-payment. This payment is based on the number of cows the farmer has. The payment is 21 Euros per cow and is available during 2010 and 2011 (ibid.).

6.3.3 Sweden

The emergency aid in Sweden was divided depending on the amount of milk delivered during the period from 1st of April 2008 – 31st of March 2009 (www, Jordbruksverket 2, 2010). The farmers received 2,35 Euros per delivered ton milk. The total grant Sweden received amounted to 6,43 million Euros.

7. Case farm data

From the data given by the IFCN, see method, were a case farm and a farm plan designed. Some data which was needed for the farm was not included in the material provided by the IFCN typical farm. The missing data was supplemented with help from data found in the farm planning program of the Swedish University of Agricultural Sciences (Agriwise, 2011).

The IFCN farm data used consist of values from 2009. Prices for production inputs are taken from Agriwise and are referred to October-September in 2010 (www, Agriwise, 2, 2011). The values obtained from the above mentioned sources were introduced into a farm plan in order to create a model to which the agriculture policies can be evaluated based upon equation (26) and (31).

7.1 Description of the case farm

The case farm used in this study has 220 dairy cows with 205 hectares of agricultural land and is located close to the south west coast of Sweden.

7.1.1 Milk production

The dairy herd has a recruitment percentage of 37% which implies that 81,4 dairy cows has to be replaced every year. In the farm plan 81,4 heifers are kept to replace dairy cows while the rest of the calves are sold. The average yield per cow in the case farm is 9873 kg ECM milk. It should be noticed that IFCN calculates ECM: 4,0 % fat and 3,3 % protein, while Sweden use: 4,2 % and 3,4 %. The total amount of milk sold at the market is 2103 tons in year 2009 according to data from the IFCN farm. All milk produced is not sold at the market and therefore is the amount sold per cow in the farm plan adjusted to 9559 kg ECM. Some milk is used for feeding of the calves.

7.1.1 Crop production for feed demand

To depict the case farm a crop rotation plan and a balance of feed consumption was created. The data acquired from the IFCN includes data about the crops grown at the farm and also feed consumption per dairy cow per day. The data describing which crops are cultivated and to what extent, are displayed in Table 31. A yield of 5 ton/hectare is obtained for grain grown on the farm. The yield of forage is based on a system using three or four harvests. The case farm is based on three harvests where the total amount of forage is estimated to about 9,5 tons dry matter independent of the number of harvests. The yield of corn silage is estimated to 11,5 tons per hectare and for barley silage 6,5 tons. The yields might be considered as normal for a conventional farm in this region of Sweden. The forage is grown for three years and then renewed by reseeding in barley. The second year the barley is harvested as silage. Ten hectares of arable land are used for the cows during summer time because the farm is forced to let the cows graze during summer.

The permanent grassland is estimated to produce 2500 kg dry matter per hectare and amounts 55 hectares. There are two type of permanent pasture at the farm, 35 hectares are not fertilized while the remaining 20 hectares are. All land is classified as permanent pasture in the study, thus the land is considered to have payment entitlements for permanent pasture.

Table 31 Crop rotation at case farm

Crop rotaion	Area (ha)	Yield (kg)	TOTAL
Forage I-III	60,0	9,5	570
Barley	28,0	5	140
Barley silage	20,0	6,5	130,0
Corn	32,0	11,5	368
Pasture (paddock)	10,0	0	0
Permanent pasture	20	2,5	50
Semi-natural pasture	35	2,5	88
TOTAL	205,0		

Source: (Own arrangement)

7.2 Feed consumption

The crops grown on the case farm are adjusted in order to satisfy feed consumption of the dairy cows. The cows are fed with grass/corn silage, grain, concentrates, straw and some minerals. The heifers are fed with grass/barley, straw, minerals but also feed from the pastures. The farm produces most of the feed except from about 375 tons of concentrate (mainly grain) which is purchased for feeding the dairy cows. For more information see appendix 2

7.3 Application of Model to case farm

The fact that the case farm is Swedish causes some difficulties when applying the Danish and German system. To validate the reliability of this study interviews with experts in the field were performed, see chapter 3, section 3.10. The interviewees provided information about how farmers apply for subsidies and to which extent they are used. The conditions for farming vary between the countries which makes the comparison more difficult. The crop rotation which is used at the case farm is adapted to the climate and agricultural policy system in the south west of Sweden where the farm is located. By keeping the crop rotation constant when applying the Danish and German system the economic effects due to changes in crops and crop rotation are disregarded. For example the ratio of forage at the case farm might be an effect of the Swedish subsidy for growing forage during a period of three years at the same field. The 55 hectares of pasture consist of 35 hectares semi-natural pastures which are a common type of agricultural land in Sweden but not in Denmark and Schleswig-Holstein.

The data from IFCN describes which subsidies the case farm apply for which gives some guidelines about how the Danish and German subsidy system could be applied on the case farm. For example some subsidies that the farm may have possibility to apply for are not applied. The same reasoning was common among farmers visited and interwied in Denmark and Germany.

7.3.1 Denmark

The Danish dairy farmers do not apply for agri-environmental subsidies to the same extent as the case farm of this study given that the Swedish system is applied. According to (Pers com. Korning, 2011) these possibilities are not given due to the fact that the agricultural landscape is different. Another reason is that Danish dairy farmers often have large herds and need all land to produce feed for the animals. The stock density is often high at the Danish dairy farms. The regulations allow maximum 1,7 LU/ha to reduce the environmental effects such as nitrogen leaching. But if a farmer makes sure that s/he grows permanent grass or similar at 70

% of the total agricultural area, their stock density could be increased to 2,4 LU/ha. The environmental subsidies require certain measures that decrease the crop yield, which for a dairy farmer is it mostly uneconomical. But if a farmer has land that is impossible to plough, like the semi-natural pasture of the case farm, s/he would probably apply for environmental measures.

The case farm uses about 50 per cent of the arable land to grow grass for silage and pasture. If the case farm would be located in Denmark it would probably grow a larger share grass which would make it possible to increase the number of dairy cows.

7.3.2 Germany

The farmers of Schleswig-Holstein usually do not apply for agri-environmental subsidies (Pers. com., Thomsen, 2011). In other regions of Germany these kinds of payments are much more important for the dairy production. The increasing rules for cross-compliance make farmers thinking of disclaiming subsidies due to the risk of potential reductions of payments and their cupping effect on land productivity, facing on the other hand increasing land costs (Pers. com., Hagemann 2011).

The funds for the 2nd pillar measures have decreased in Schleswig-Holstein as an effect of the financial crisis (Pers. com., Thomsen, 2011). Instead of paying farmers to implement measures that improve agriculture in a more sustainable direction the authorities instead tend to change the legislation to force measures into effect.

Schleswig-Holstein is at the moment in the middle of a "biogas boom" (ibid.) A lot of biogas plants are constructed in the area which cause an increased demand for bio material and then mainly corn silage. The biogas plants together with solar panels are a result of German policies aiming to increase sustainable production of electricity. The measures are favorable to farmers because they have buildings to put solar panels on and material to use in a biogas plant. These policies largely affect the dairy sector of Schleswig-Holstein. The biogas plants compete with dairy production in order to use the land for production of corn/grass silage. A large share of the agricultural land in Schleswig-Holstein is therefore used for production of corn silage. The large share of land used for one crop causes problems which the authorities try to handle by applying new measures and policies.

The case farm in this study grows a larger share of forage compared to corn. If the case farm would be located in Schleswig-Holstein the farmer would probably grow as much corn as possible due to high demand for corn silage. In most cases corn is preferred to all other crops. The only limit is the German legislation that prohibits farmers to plough permanent grassland and use for other crops. The case farm is not growing corn in all arable land due to the fixed values of the model. The areas used for different crops remain unchanged regardless of which is most profitable.

7.3.3. Sweden

Since the data for the case farm is based on data from Swedish farms is it possible to examine a typical farm in a certain region of Sweden, which kind of subsidies are applied and which kind of crops are grown. Many effects of the Swedish policies may be illustrated through the structure of the farm operation.

8. Analysis with policies of the countries

This section consists of a comparison of the policies of Denmark, Germany and Sweden applied at the farm model. The three policies applied in the comparison are:

Danish policy: The whole country has two levels of payment; one for arable land and one other for pasture land. Denmark is the country with the most similar conditions and least variation.

German policy: Schleswig-Holstein has been chosen as focus for this study due to the fact that it is the "Bundesland" which is closest to Denmark and Sweden. Schleswig-Holstein has comparable conditions in terms of climate and soil type, especially to Denmark.

Swedish policy: Region 3 has been chosen due to the fact that the agricultural conditions in this region are close to the other two countries. In addition, a realistic farm model was developed for that region with a lot of useful data to facilitate a comparison between the countries.

8.1 Single Payment

A comparison of the competiveness between Denmark, Germany and Sweden results in some difficulties. The countries have different soil and climate conditions which are reflected in the crop yields. This is important to mention even though the single payment scheme is almost totally decoupled from production in all three countries. Nevertheless the payment is to a large extent based on historical production. The magnitude of the payment in the former area aid scheme was based on income from crops sold. Intervention prices for agricultural commodities combined with crop yields formed the basis for the payment. By connecting the payment as an entitlement to land EU wanted to suppress a production system that caused a large surplus. Regions with good soils and climate received higher payments due to high yields of grain. The payment worked as compensation related to lower intervention prices. Farmers who receive high yields of grain would otherwise face a proportionally larger loss in terms of income. The fact that the three countries are not entirely equal yields different values to the single payment caused by the various climate and soil conditions.

An analysis of the single payment scheme, subsidy by subsidy, reveals how they affect the average cost of delivered milk at the case farm. The values in Table 32 and Table 33 are based on the case farm with 150 hectares of arable land and 55 hectares of permanent grassland. The case farm in the study is located in Falkenberg in the south west of Sweden which belongs to region 3 according to the Swedish system for single payments. The basic level of payment in this region is 203 Euros per hectare for arable land and 126 Euros per hectare for permanent pasture. Table 32 displays the payment for arable land applying the policies of the three countries on the case farm. Table 33 displays the payment for permanent grassland. The German system yields the highest value for arable land while Sweden yields the lowest. When payments for permanent grassland are compared it is revealed that Germany has the lowest and Denmark the highest payment. If the average payment per hectare of total land, arable land and permanent grassland land, is calculated another picture emerges. Denmark receives the highest value, 291 Euro per hectare, Germany receives 209 Euro per hectare and Sweden 164 Euro per hectare.

Table 32. Value of single payment related to arable land, before modulation

Arable land on the farm (150 ha)	Euro/ha	Total payment	Decrease of average cost/delivered ton milk
Denmark	299,13	44870	21,34
Germany	310,03	46505	22,11
Sweden	202,87	30431	14,47

Source: (Own arrangement)

Table 33. Value of single payment related to permanent grassland, before modulation

Permanent grassland on the farm (55 ha)	Euro/ha	Total payment	Decrease of average cost/delivered ton milk
Denmark	282,40	15532	7,39
Germany	107,70	5924	2,82
Sweden	125,63	6910	3,29

Source: (Own arrangement)

8.2 Supplement entitlements

A supplement is added to the payment of arable land and permanent grassland. This supplement is related to historical production and is calculated differently depending on how each country implemented the CAP reform. To facilitate the analysis and calculations of the supplementary entitlements of the case farm in this study is set as a constant which has not changed since the year 2000. Year 2000 until 2002 were the years when the reference period that determined the magnitude of the supplement entitlements for Denmark, Germany and Sweden.

8.2.1 Livestock premiums

The case farm has never raised bulls or steers during the reference period and therefore the farm has not qualified for the male bovine premium. Nor was the farm qualified to receive the extensification premium since the density of animal was too high compared to the access to land. The rules set at maximum of 1,4 livestock units (LU) per hectare (www, European Commision 2 2002). The area of land at the case farm is 205 hectares which means that it can bear 287 LU which is less than the actual stock.

Table 34 displays the payments relating to the former slaughter premium and how much value it adds to the production of one ton milk. Since Germany did chose to include the slaughter premium along with the extensification premium into the regional premium for permanent grassland the individual farmer will not benefit from historical production. These payments will be shared equally between all the areas of permanent grassland in the region.

Denmark and Sweden chose to provide individual entitlements to each farmer related to their historical production. Denmark decided to reduce these entitlements from 2009 as a step against total decoupling of the system (Ministry of Food, Agriculture and Fisheries 1 2010, p.29). This means that the farmers in 2010, which is the year investigated in this study, will receive their entitlements for historical slaughter premiums between 2000 and 2002 although reduced by about 28 %. The payment entitlements displayed the same values between 2005 and 2008, but due to the Danish modulation the differences increase until the year of 2012. In 2012 the Danish payments will be about 56 % lower per ton of delivered milk compared to the Swedish.

This means that by comparison the slaughter premium the Swedish system gives the largest reduction of average costs per ton delivered milk due to the fact that payments from historical slaughter premiums maintain the original individual value.

Table 34.Value of single payment related to slaughter premium during reference period 2000-2002, before modulation

Average slaughtered animal 2000-2002 on the farm (71,3)	Euro/animal	Total premium	Decrease of average cost/delivered ton milk
Denmark	57,50	4 100	1,95
Germany	0,00	0	-
Sweden	80,00	5 704	2,09

Source: (Own arrangement)

8.3 Milk Premium

The milk premium that was introduced in 2005 has a large impact on the value of the SPS in all three countries. The payment which was transferred to special payment entitlements varies depending on the amount of quota the farmer owned at the time the premium was decoupled. The case farm has a total quota of 2200 tons which has been the basis for the calculation of the payment.

In Denmark in 2006 the milk premium became decoupled and transferred to special payment entitlement. The payment per kilo of quota amounted 0,0259 Euro. When applied to the case farm the total value transferred to special payment entitlements is 56 980 Euro, see Table 35. Germany is the country with the highest milk premium. When the milk premium was decoupled in 2006 the payment amounted to 0,0355 Euro per kilo of quota. However, in 2010 as a affect of the regional model which Germany will apply the payment was reduced by 10 per cent. The total payment with the German system is 70 290 Euro. Sweden was the last country among the three countries to decouple the milk premium but also the country with the lowest payment. The payment is Sweden is 0,0227 Euro per kilo of quota. When the Swedish system is applied the value of the payment is 49 940 Euro.

Due to the fact that the milk premium is decoupled it is not directly related to dairy production in its current form. If a farmer exits dairy production he or she would still receive the payment. However the short term economic effect of the payment for a dairy producer is substantial and when the German system is applied the average cost decreases by 33,42 Euro per ton of delivered milk. When the Danish system is applied, which has the second highest payment, the average cost decreases with 27,09 Euro per ton of delivered milk. Sweden is the country with the lowest payment. The average cost for the case farm decreases by 23,75 Euro per delivered ton milk due to the milk premium.

Table 35. Value of milk premium transferred to SPS

Total quota on the farm (2200 tons)	Euro/kg	Total premium	Decrease of average cost/delivered ton milk
Denmark	0,0259	56 980	27,09
Germany	0,0320	70 290	33,42
Sweden	0,0227	49 940	23,75

Source: (Own arrangement)

The milk premium is associated with large economic values for the producers. However, the payment is based on historical production during a reference period and it is given to farmers who have been dairy producers for some time. If a farmer enters dairy farming he or she will not receive the same reimbursement. The same effect occurs if a farmer wants to expand an existing dairy herd. The payment would not increase. Therefore, expansion of dairy production may be inhibited due to not receiving the same payments as other dairy producers.

8.4 Implications of the single payment scheme

The total single payment entitlements including the individual entitlements of the case farm when the three policies are applied are calculated in Table 36. The calculations reveal that the different systems affect the case farm quite differently and they have a substantial influence on the cost per ton delivered milk. The fact that the three countries decouple the subsidy system in different ways causes some different effects in terms of competitiveness during the period 2005-2013. Both Germany and Denmark started a modulation of the individual entitlements in 2009 lasting till 2013.

Germany chose to decouple all payments directly in 2005 and began to modulate all individual entitlements related to historical production from 2009. Denmark used a different method and kept 75 % of the male bovine premium in the same way as Sweden, but from 2009 they started to modulate the premiums while Sweden kept them at the same level until 2012. The first deduction of 25 % is added as a supplementary entitlement to the individual payments.

Denmark and Sweden has continued to pay extensification premiums and slaughter premiums to farmers which received these payments during the reference period 2000-2002, as individual entitlements. Germany chose another way by including these two payments into the payments for permanent grassland and distributed them equally to all area within the region. This means that all farmers in each German region receive a share of the slaughter and extensification premiums.

Table 36. Total single payment entitlement in Euro

Single payments 2010	DK	DE	SE
Arable Land (150)	44 870	46 505	30 431
Permanent pasture (55)	15 532	5 924	6 910
Slaughter premium (71,3)	4 100	0	5 704
Milkpremium (2200)	56 980	70 290	49 940
Total	121 480	122 718	92 983
After modulation 8%	112 162	113 301	85 944
Decrease of average cost/ton delivered milk	53,33	53,88	40,87

Source: (Own arrangement)

8.5 Agri-environmental measures

A comparison of the environmental subsidies in the three countries causes some difficulties due to the fact that the rules are rather different. In some areas the countries force

environmental measures by legislation and in other cases motivation is achieved by subsidies or tax reliefs.

In this section subsidies that have a similar purpose and comply with similar rules are compared to each other. The comparison starts with the subsidies that have the most similarities with each other. These are considered as most important for the study by calculating an effect which in relative terms is easier to measure and use for comparisons. There are a lot of different measures with environmental objectives as well as in the areas of rural development.

8.8.1 Reduced nitrogen leaching

The first environmental subsidy compared in Table 37 is subsidies for catch crops. Germany and Sweden motivate the use of catch crops by subsidies while Denmark applies a legislative system which requires catch crops and winter cover crops, see 6.1.2. All three countries have legislation that stipulates a minimum area covered by crops during winter.

The fact that all Danish farmers have to arrange a balance sheet for their nitrogen application, in this study referred to as nitrogen account, is an important issue to discuss. The nitrogen account helps the farmer to optimize the nitrogen ratio for each crop which could reduce costs. But it could also lead to higher costs due to the fact that the system may force a suboptimal us of nitrogen.

The subsidy in Sweden is divided into two parts which makes it possible to just partly participate in the program for reducing nitrogen leaching. Separately these subsidies amount to 94 euro per hectare and 52 euro per hectare. The higher level applies to catch crops and the other refers to spring cultivation. If both methods are combined the farmer receives a slightly higher payment, 157 Euros.

Germany has one subsidy for catch crops which requires that land remains green during winter which means using both catch crop and spring cultivation. The crop rotation used by the case farm in this study will not be affected of this difference. Corn is the only crop that could be followed by a catch crop due to the fact that the barley which is grown is followed by reseeding forage in the same year.

Table 37. Value of subsidies for reduced nitrogen leaching

Hectares for catch crop on the farm (corn 32ha)	Euro/ha	Total premium	Decrease of average cost/delivered ton milk
Denmark	0,00	0	
Germany	125,00	4000	1,90
Sweden	52-->157	5024	2,39

Source: (Own arrangement)

Germany has a special subsidy that encourages improvement of techniques for spreading of manure at the farm. Denmark and Sweden do not have this type of subsidy. They regulate the issue by legislation, advisory services and other policies. The level of payment depends on the number of livestock units (LU) which at the case farm is 301,4 LU. According to Table 38 this gives the farm a payment of 4 521 Euro.

Table 38. Value of subsidies for improved N-utilization

Reference area LU*0,5ha (150,7 ha)	Euro/ha	Total premium	Decrease of average cost/delivered ton milk
Denmark	0,00	0	
Germany	30,00	4521	2,15
Sweden	0,00	0	-

Source: (Own arrangement)

8.5.1 Subsidies for grassland & forage on arable land

An analysis of the environmental subsidies for grassland shows that they are constructed in a different manner in the three countries. This study does not measure the differences in costs implementing the different rules for grassland. In Sweden grassland is often used in the ordinary crop rotation while German farmers often have two separate crop rotations. Some fields are used for growing corn and barley while some are permanent grassland. These subsidies are to a large extent related to the land structure which causes some difficulties for a comparison due to the fact that a Swedish farm is used as a basis.

In this study is the farm expected to use the same crop rotations and crops independently of the applied policy. A crop rotation containing three years of forage followed by one year barley is suitable in a Swedish system. Without a subsidy that implies growing of forage for continuous three years, could a more suitable crop rotation be two years of forage. But due to the fact that consumption of feed are constant, a large amount of forage has to be part of the crop rotation to maintain high yields and to secure the supply of high quality feed. The feed ration and quality affects the milk yield which is also assumed to be fixed. Due to the fixed values in the model, the possibilities to implement environmental subsidies in different ways and thereby maximizing profit according to the design of environmental subsidies not possible.

Table 39. Value of payment for growing forage

Forage on arable land (60 ha)	Euro/ha	Total premium	Decrease of average cost/delivered ton milk
Denmark	-	-	-
Germany	-	-	-
Sweden	79,00	4740	2,25

Source: (Own arrangement)

An analysis of the payments for permanent grassland indicates that all countries have subsidies within this area. The comparison assumes that the 35 hectares of permanent grassland may be adapted to the regulation in each country without affecting the costs of the farm or yields of the grassland. Table 40 shows that Denmark and Germany support the use of permanent grassland to a larger extent than Sweden. The Danish and Swedish systems result in a larger decrease of average cost per delivered ton milk.

Table 40. Value of payment for permanent grassland

Permanent grassland (35 ha)	Euro/ha	Total premium	Decrease of average cost/delivered ton milk
Denmark	188,00	6580	3,13
Germany	280,00	9800	4,66
Sweden	131,00	4585	2,18

Source: (Own arrangement)

The farm is located in an area labeled 5a, see appendix 5, which in Sweden is classified as a less favored area. In the comparison it is assumed that the farm has 115 hectares of grassland which is eligible for compensation see Table 41. This compensation is not available when the Danish or German system is applied both countries only will have LFA subsidies on islands. The reimbursement has a large effect in the Swedish system and decreases the average cost per delivered ton milk with 7,66 Euro.

Table 41, Value of compensation for less favored areas on grassland

Compensation for less favored areas (115 ha)	Euro/ha	Total premium	Decrease of average cost/delivered ton milk
Denmark	0,00	-	-
Germany	0,00	-	-
Sweden	157-->79	16 105	7,66

Source: (Own arrangement)

8.6 Diesel

The diesel consumption at the farm is calculated by synchronizing the values from the IFCN farm and farm plan with data from Agriwise. The estimated consumption of diesel at the farm amounts to 23 400 litres. The diesel consumption from the IFCN farm was somewhat higher than the data from Agriwise. The refund for diesel costs with the Danish system is 0,327 Euro per litre making the total tax 0,063 Euro per litre. When applying the German system the total tax amounts to 0,256 Euro per litre making the total cost 5998 Euros in tax. In Sweden the refund is 0,249 Euro per litre which makes the total tax 0,232 Euro per litre diesel, see Table 42. As the diesel reduction is a variable reduction the refund can be related equation (26) and equation (30).

The Danish rules provide the highest tax reduction for diesel fuel. Denmark has the lowest initial tax rate making the tax after reduction 0,063 Euro per litre. What is noteworthy is that the Danish tax after reduction is significantly lower than in both Sweden and Germany. Sweden is the country with the second highest reduction. Initially Sweden has the highest tax but after the reduction the second highest. Germany has initially the second highest tax rate but the lowest reduction making the tax after reduction the highest of all three countries.

Since the diesel tax is a variable input the reduction of diesel fuel also becomes variable depending on the use. A calculation reveal that the Danish tax reduction increase the average cost for milk with 0,70 Euro per ton delivered milk for the case farm. Given the Swedish system, the average cost increase with 2,59 Euro per ton of delivered milk. When applying the German system, which has the lowest reduction, the average cost increase with 2,85 Euro per ton.

Table 42 Total tax for diesel consumption, estimated use at farm is 23 400 litre

Total tax on diesel at the farm	Tax after reduction (Euro / Litre)	Total Cost	Increase in average cost/delivered ton milk
Denmark	0,063	1 470	0,70
Germany	0,256	5 998	2,85
Sweden	0,232	5 451	2,59

Source: (Own arrangement)

8.7 Electricity

The estimated electricity consumption at the farm is 265 210 kWh. The refund provided by the different systems reveal a broad variety. The Danish system yields a tax reduction of 0,081 Euro per kWh with a total tax of 0,00981 Euro per kWh. The Swedish system yields a reduction of 0,0289 Euro per kWh with a total tax of 0,00052 Euro. Germany is characterized by the lowest reduction of the three countries with 0,0051 Euro per kWh. The German system has the highest total cost which amount to 0,01537 Euro per kWh and a total cost of 4 076 Euro. The refund for electricity can be related to equation (26) and equation (30).

Initially, the tax on electricity is the lowest in Germany but due to the lowest reduction the German farmers are charged with the highest tax rate, see Table 43. Initially the tax rate in Denmark is substantially higher tax rate than both Sweden and Germany. The rate is 4,4 times higher than the German tax rate but due to the reduction the tax is the second highest. Sweden with the second highest reduction is left with a substantially lower tax after the reduction which is close to zero.

The refund from electricity tax is important for dairy production which consumes a lot of energy. The refunds represent a variable subsidy and affect the marginal as well as average cost of dairy production and thereby also the optimal yield per dairy cow, see equation (26) and (30). The Danish system with the highest reduction increase the average production cost with 1,24 Euro per ton delivered milk. The Swedish system which has the lowest tax experience increased costs which amounts to 0,07 Euro per delivered ton milk. Germany with the lowest refund has the highest tax which increase the average costs with 1,94 Euro per delivered ton milk.

Table 43, Total tax on energy and average cost for milk, estimated consumption at farm is 265 210 kWh

Total tax on electricity at the farm	Tax after reduction (Euro / kWh)	Total Cost	Increase in average cost/delivered ton milk
Denmark	0,00981	2 601	1,24
Germany	0,01537	4 076	1,94
Sweden	0,00052	139	0,07

Source: (Own arrangement)

8.8 Land Tax

The land tax in Denmark is calculated based on the market value of land. The case farm does not own all land. The farm rents 40 per cent of the arable land and 40 per cent of the pasture land. The land tax is only charged on the land owned and not for the land which is rented, but it may affect the rent. The market value for tillable land is 14 335 Euro per hectare and for

pastureland the market value amounts to 3 144 Euro per hectare. The taxable value is 80 per cent of the market value with a total taxable value about 1 077 000 Euro, see Table 44.

The tax in Denmark varies depending on the municipality. However, the maximum tax for 2010 with the reductions for the agricultural sector is 1,23 per cent and a minimum tax of 0,63 per cent. The municipality with the lowest tax has a base rate of 1,6 per cent and the municipality with the highest tax has a base rate of 3,4 per cent. The value used for the case farm is determined by the average of the highest and lowest tax rates and amounts to 2 per cent. Given the applicable reductions for agricultural of 0,97 per cent, the land tax amounts to 1,03 per cent of the taxable value. The total land tax for the case farm with the Danish tax is thereby 11 097 Euro.

Table 44, Land tax for the case farm with the Danish system

Measure	Euro	Owned land (hectare)
Arable market value/hectare	14 335	90
Pasture market value/hectare	3 144	18
Total market value of land	1 346 746	
Taxable value	1 077 397	
Total Tax 1,03 %	11 097	

Source: (Own arrangement)

The land tax in Germany has remained the same for a long period of time and therefore the average payment of 12 Euro per hectare is applicable to the farm. The total cost for land tax is then 1296 Euro per year. There is no tax on land in Sweden. The land tax is considered a fixed cost and can therefore be related to equation (14).

When a comparison of the land tax is conducted between the three countries it is clear that the tax affect the Danish farmers the most. The tax is not solely related to dairy production but agriculture as a whole. However, for an existing dairy producer the tax represent a cost. Given Danish rules the tax increases the cost of production with 5,28 Euro per ton of delivered milk. For Germany the tax increase the cost of production with 0,62 Euro per ton of delivered milk. Since there is no land tax in Sweden production costs are not affected, see Table 45

Table 45, Increase of average cost for milk due to land tax

Country	Total tax in Euro	Increase in average cost/delivered ton milk
Denmark	11 097	5,28
Germany	1 296	0,62
Sweden	0	0

Source: (Own arrangement)

8.9 Fertilizer

Denmark is the only country which still has a tax on fertilizer. The tax in Denmark is 0,67 Euro per kilo of pure nitrogen. The case farm has access to manure which therefore reduces the need for additional fertilizer. The use of additional nitrogen is estimated to approximately 25 000 kilo. When applying the Danish system costs increase with 16 750 Euro. The increase in the cost of fertilizer affects the average cost negatively which increases with 7,96 Euro per

ton of delivered milk. However, as mentioned in section 5.7.1 farms can be excluded from the tax if a fertilizer account is registered at "Plantedirektoratet" and apply for exemption for fertilizer tax. If a farm receives the exemption the Danish system is the same as in Germany and Sweden which do not tax fertilizer.

8.10 Emergency aid

All three systems received emergency aid from EU which was given to the dairy producers. The basis for the payment varies which also results in different levels of payments among the countries. The most profitable system is the Swedish system which is based on the delivered amount of milk during a reference period. This payment decreases the average cost per delivered ton milk with 2,35 Euros, see Table 46. The German system which is based on grassland results in the lowest payment among the emergency aid packages from EU. However, in addition to the emergency aid from EU Germany has two national payments which in total makes the German system the most favourable with a decrease in average cost which amount to 3,71 Euros per delivered ton milk. The Danish system results in the lowest payments for the case farm with a decrease in average cost which only amounts to 2,10 Euros per delivered ton milk.

Table 46, Total value of the emergency aid, both EU and national subsidies included

Country	Emergency aid	Decrease in average cost / delivered ton milk
Denmark	4 422	2,10
Germany	7 810	3,71
Sweden	4 942	2,35

Source: (Own arrangement)

8.11 Cost for labour

The cost for labour in the three countries varies not only on due to different levels of taxation but also due to salary levels. In order to illustrate the differences in costs for labour for the case farm the wage payment in Sweden is set as a standard. From the IFCN data describing the cost of salary for an employee per year a net income was calculated by detracting all Swedish income taxes. The cost of having an employee at the case farm with an annual net income of 16 784 Euros is the highest in Germany where the total cost is 31 489 Euros, see Table 47. In Sweden is the annual cost for an employee 30 074 Euros which is the second most expensive. Denmark has the lowest cost per employee with an annual cost of 26 438 Euros. The cost for labour is a can be related to equation (26) and equation 30.

Germany compared to Sweden faces an increase in average cost per delivered ton milk of 2,82 Euros per ton. Denmark with the lowest cost receives a decrease in average cost with 7,26 Euros per delivered ton milk.

Although Denmark has the highest overall tax pressure in the EU the cost for labour is the lowest of the three countries. This is an effect of rather low social security fees which are paid by the employer. Germany which has the lowest overall tax pressure of the three countries has rather high social security fees. The fees in Germany amount to 39,1 per cent while the payment in Denmark is 8 per cent. Sweden's payments for social security amount to 31,42 per cent.

Table 47 Cost for having a full time employee with the same annual net income in the three countries, the average cost is calculated using 4,2 employees

Measure	Net Income per employee	Cost per employee	Difference per employee	Increase in average cost / delivered ton milk
Denmark	16 784	26 438	-3 636	-7,26
Germany	16 784	31 489	1 415	2,82
Sweden	16 784	30 074	0	0

Source: (Own arrangement)

8.12 Summarizing analysis

The summarizing result of each individual component is calculated in Table 48. The aggregated results in Table 49 show that the German system when applied to the case farm faces the most decrease in the average cost. However, when the Danish system is applied and the farm has been exempt from fertilizer tax this system produces an even larger decrease in average cost per delivered ton milk which amounts to 58,61 Euro per delivered ton milk. The Swedish system affects the cost the least but Sweden is also the country with the lowest payments within SPS. However, the Swedish system provides the highest environmental payments which also results in the cheapest feed for the dairy cows. The land tax in the Danish system has a large negative influence on the cost. The Danish system affects the case farm with a lower tax on diesel as well as a much lower cost for labour. The tax on electricity is close to nothing in Sweden while the cost in Germany amounts to 1,94 Euro per delivered ton milk.

Table 48, Summarizing effect of subsidies and taxes, decrease of average cost / delivered ton milk

Measure	SPS after modulation 8%	Agri-environmental measures	Tax on diesel	Tax on electricity	Land tax	Fertilizer tax	Emergency aid	Labour
Denmark	53,33	3,13	-0,70	-1,24	- 5,28	- 7,96	2,10	7,26
Germany	53,88	8,71	-2,85	-1,94	- 0,62	-	3,71	- 2,83
Sweden	40,87	14,48	-2,59	-0,07	-	-	2,35	-

Source: (Own arrangement)

Table 49, Aggregated effect from subsidies and tax reductions on the case farm with the three systems without fertilizer tax

Measure	Total Decrease of average cost / delivered ton milk
Denmark	58,61
Germany	58,06
Sweden	55,04

Source: (Own arrangement)

The total income for the case farms calculated according to equation (31) with the different systems is presented in Table 50. The case when the Germany system is applied yields the highest net farm income of 277 940 Euro. The German system corresponds to an average cost of 256,3 per delivered ton milk. The German system faces the highest average cost among the three systems but a higher income making the production the second most profitable. The Danish system without the fertilizer tax yields the lowest average cost per delivered ton milk which amount to 248,6 Euro per delivered ton milk and generates a net farm income of

272 870. An example of the farm income statement is available in appendix 5. The Swedish system applied to the case farm results in the lowest net farm income of 271 542 Euros. However, the Swedish system produces the second lowest average cost of 521,3 Euros per delivered ton milk but the larger costs making it the least profitable.

Table 50 Economic result for the case farm with the three different systems

	Denmark	Germany	Sweden
Total Income	925 178	946 496	929 335
Total Operational Costs	522 845	538 940	528 476
Gross Margin	402 332	407 557	400 859
Net Farm income	272 870	277 940	271 542
Average cost / delivered ton milk	248,6	256,3	251,3
Gross margin / delivered ton milk	191,3	193,8	190,6

Source: (Own arrangement)

8.13 Discussion

The European countries strive according to Article 2 of the Rome treaty 1957 to establish a common market within the EU. Issues like stability and harmonization is often mentioned in discussions concerning the common agricultural policies, CAP. Agricultural policy is an area which has a lot of supranational features. All the interventions should reasonably well reduce differences in competitiveness between EU members. But the European system regulating agriculture is complex and difficult to overview. The subsidy system is changing from production related subsidies to an increased focus on rural development and environmental care. This change is balancing to not risk the situation of the farmers.

Denmark, Germany and Sweden are closely related markets both politically and geographically. All are northern European counties and has relatively similar conditions compared to each other. Germany and Sweden contains various nature and climate while Denmark is more homogenous and dominated by agricultural land. By choosing to compare regions of Schleswig-Holstein and southern Sweden within these countries which are similar to the conditions in Denmark makes it possible to reduce this effect. Differences in competitiveness related to disparities in climate and soil condition will be reduced as much as possible. The case farm is when the Swedish system is applied receiving compensation, LFA, to reduce the affect of less beneficial conditions. It is common that Swedish dairy farms receive these payments. To study a Swedish farm which does not receive this type of payment should not be relevant, because they represent a minority of the Swedish dairy farms.

Comparing farm structure show that the average farm size differs a lot between the countries with the average Danish farmer keeps 127 dairy cows the German 44,7 cows. Looking at Schleswig-Holstein are the differences smaller, the average farm has 68, 6 cows. The structural change from smaller to bigger farms is a ongoing development in all three countries. Dairy industries merge into larger units across the borders making farmers in Sweden, Denmark and Germany selling milk to the same buyer. The heterogeneity among the German dairy producers causes difficulties when comparing to other countries. The dairy production in Germany is moving to the southwest parts of the country due to high share

permanent grassland and less beneficial conditions for growing grains. This gives a lover cost of silage and leads to a competitive advantage. The increasing dairy production in the Northwest Germany is interesting from a Danish and Swedish point of view though its geographically close to their markets.

Dairy products are transported across the borders between the three counties in a larger extent each year. This makes a comparison of the conditions for production to an important issue. When the farmers of the three countries sell their products at the same market will the one with the lowest marginal costs get highest profit. This is the discussed by Porter (1985). If the farmer cannot achieve a cost advantage is the other possibility to diversify. The dairy market including the three countries shows both phenomena. But due to the fact that most farmers are selling their milk with the same payment within the three countries eliminates the possibility for them to differentiate. This study is comparing the competitiveness by assuming same product prices. Under these conditions are the average costs of the farm the measures that determine the competitiveness. However, this way of comparing competitiveness between countries is questioned by Krugman (1994).

The decoupling of subsidies in the three countries was initiated in 1999 due to the Agenda 2000 reform. The fact that the system still contains some parts of the former politics leave differences between regions that refer to higher or lower grain yields. When livestock premiums went through the decoupling process in 2005 the premiums were handled differently by the countries. Germany chose to transfer payments from slaughter and extensification premiums to the permanent grassland and by doing so distribute all payments equally between all farmers in the region. By specifying that the payments should relate to the grassland is it somehow anyway likely that farmers will keep animals to ensure that they comply with the rules to achieve the payments. Denmark and Germany strives towards a similar goal which is to level off differences ending up in a regional system where the pasture and arable land attain two separate values.

The agri-environmental payments cause most difficulties when the comparison is made in this study. There are subsidies aiming to reduce nitrogen leaching by similar methods in Germany and Sweden, while Denmark has a legislative use making it compulsory. Subsides which encourage farmers to grow forage and use extensive methods are causing interesting effects at the internal feed prices within the farm plan. The fact that the model used in this study is relatively fixed, delimits the possibilities to investigate how national differences in crop rotation affects the price of feed.

As mentioned by van der Veen (2007) and OECD (2010) there are great difficulties when comparing different systems with each other. There are always aspects which are difficult to fully cover and when comparing them differences will occur.

In addition to the tax and subsidy systems which in the beginning were labled as “direct monetary values” the “indirect monetary values” plays an important role when comparing competitiveness. Rules for animal welfare well as the rules for environment vary between the countries and both of these have a large impact on the competitiveness. The rules concerning animal welfare affect the farmers with different costs for buildings as well production. One way of comparing the rules regarding animal welfare is by comparing costs for constructing barns. With increased animal welfare the costs for constructing barns tend to increase and can therefore be measured as cost for capital.

9. Conclusions

The aim of this study has been to indentify how policies affect the competitiveness between Denmark, Germany and Sweden. The study also consists of two objectives.

> What are the implications for competitiveness between Danish, German and Swedish subsidies?
>
> What are the implications for competitiveness between the Danish, German and Swedish taxation systems?

The effects from the three different systems show a wide range of implications for the case farm. Denmark has the largest positive effect from the political system with a decrease in average costs by 58,61 Euro per ton of delivered milk for the case farm. Germany has the second highest effect with a decrease in average costs by 58,06 Euro per delivered ton milk. However, if the Danish farm has no exemption from the fertilizer tax the Danish system has the lowest effect on the case farm with a decrease in average cost of 50,65 Euro per ton delivered milk. The Swedish system experiences the lowest impact on the costs. The decrease in average cost amounts to 55,04 Euro per delivered ton. The Swedish system provides the lowest SPS among the three countries but the highest payment for environmental measures.

The tax system in Denmark is considered most favorable as is has the most positive effect on the average production cost per delivered ton milk. Denmark has the lowest tax on diesel after the reduction but a substantially higher cost for land tax. However, the lower cost for labour compensates for the high land tax and makes the system most favorable for the case farm. The Swedish system with a very low tax on electricity and a similar tax on diesel as Germany is considered the second most favorable system. The German system has the largest negative affect the production cost and is therefore considered the least favorable for the case farm. The German system has the highest taxes after the reductions on diesel and electricity as well as increased cost for labour and land tax.

Overall the analysis shows that the Danish system on the case farm results in the lowest average cost which amount to 248,6 Euros and therefore it is to be considered the most competitive system. The German system has the highest average cost which amount to 256,3 Euros and should therefore be the least competitive. However, the German system results in higher income which make the system the most profitable. This differs from the assumptions by Porter (1985) which is that the lowest marginal cost would be considered the most competitive. The Swedish system gives the second lowest average cost which amount to 251,3 Euros and would be the second most competitive system. But due to the fact that the Swedish system generates the lowest gross margin makes it the least profitable and least competitive.

There are substantial difficulties in comparing different systems with each other. Although all three countries act on the same market the differences in specific areas are quite large due to the political systems. The differences in the political systems also result in differences in the economic conditions for the dairy farmers However, overall when comparing the three systems the result reveals that the differences between the systems are fairly small. The study which compares several rules still does not cover the full implications from the political systems. Differences in the political system affect the market prices within a country, for example a subsidy. Having higher subsidies on land increases profitability and therefore also

the market price of land, thereby increasing capital costs compared to a country with a lower subsidy. Market prices tend to adjust to the conditions within a country and therefore the differences in the political systems can be leveled to some extent.

Bibliography

Andersson, M., Lehorst, C. & Holstein, H., 2010. *Presentation: Möte med SB SAM -CAP efter 2013*, Stockholm, Sweden.

Anon, *Einkommensteuergesetz (EStG)*,

Arnaldur Sölvi Kristjánsson, 2010. *Redistributive effects in a dual income tax system*, University of Iceland.

Asbjörn Johannessen & Tufte, P.A., 2003. *Introduktion till samhällsvetenskaplig metod*, Malmö: Liber AB. ISBN 91-47-06534-6

Bernitz, U. et al., 1998. *EU idag*, Stockholm, Sweden. ISBN 91-7450-714-0

Bjarby, A., 2004. *Reformen av EU:s jordbrukspolitik 2003 - En statisk analys av konsekvenserna för svensk mjölkpolitik*, Uppsala: Nationalekonomiska Institutionen.

BMELV, 1,, 2006. *Die EU-Agrarreform- Umsetzung in Deutschland, Ausgabe 2006*, Berlin.

BMELV, 2,, 2011. *Informationen zur Einbeziehung weiterer Beihilfenin die Betriebsprämienregelung im Jahr 2012und zur Anpassung der Werte der Zahlungsansprüche*, Berlin.

Brady, M. et al., 2007. *Några aspekter på en reformering av EU:s jordbrukspolitik*, Lund.
Bäckstrand, A., 2003. *Halvtidsöversynen av den gemensamma jordbrukspolitiken - en konsekvensanalys*, Lund: Livsmedelsekonomiska institutet. ISSN 1650-0105

Bäckstrand, A., 2003. *Halvtidsöversynen av den gemensamma jordbrukspolitiken - en konsekvensanalys*, Lund: Livsmedelsekonomiska institutet.

Debertin, D., 1986. *Agricultural Production Economics*, New York: Macmillan Publishing Company.ISBN 978-0023280603

Dewatripont, M. et al., 1999. *EU:s framtida struktur*, Stockholm, Sweden. ISBN 91-7150-763-9

Ejvegård, R., 2003. *Vetenskaplig metod*, Lund: Studentlitteratur. ISBN 91-44-02763-X

European Commission 1,, 2011. *Excise Duty Tables*, Brussels.

European Union,, 2010. *Taxation trends in the European Union, data for the EU Member States, Iceland and Norway*, Luxembourg. ISBN 978-92-79-15801-8

Flaten, O., 2001. *Økonomiske analyser av tilpassinger i norsk mjølkeproduksjon*, Agricultural University of Norway: Depatment of Economics and Social Sciences. ISBN 82-575-0449-1

Gravelle, H. & Rees, R., 1992. *Microeconomics* 2nd ed., London: Pearson Education Limited. ISBN 0-582-02386-6

Gunnar Rabe, 2007. *Skattelagstiftning 08:1*, Stockholm, Sweden: Gunnar Rabe och nordstedts Juridik AB. ISBN 978-91-39-20469-5

Gurrath, P., 2009. *Landwirtschaft in Deutschland und der Europäischen Union 2009*, Wiesbaden: Statistisches Bundesamt.

Hemme et al., 2010. *IFCN Dairy Report 2010, International Farm Comparison Network*, Kiel, Germany.

Jordbruksverket, 2006. *Jordbruksstatistisk Årsbok 2005*, Jönköping.

Jordbruksverket 2, 2006. *Jordbrukets kostnader för produktionsmedel i EU*, Jönköping.

Jordbruksverket, 2007. *Marknadsöversikt -animalier*, Jönköping.

Jordbruksverket 1, 2010. *Kostnader och intäkter i svenskt jordbruk -en jämförelse med Danmark och Finland*, Jönköping.

Jordbruksverket 2, 2010. *Marknadsöversikt - vegetabilier*, Jönköping.

Jordbruksverket, 2011a. *Husdjur i juni 2010 -Livestock in June 2010*, Jönköping.

Jordbruksverket, 2011b. *Nyheter och översikt 2011, stöd till landsbygden*, Jönköping

Kaspersson, E., Rabinowicz, E. & Schwaag Seger, S., 2002. *EU Milk Policy after Enlargement - competitiveness and Politics in Four Canidate Countries*, Lund: SLI. ISSN 1650-0105

Krugman, P., 1994. Competitiveness: A dangerous obsession. *Foreign Affairs*, 73, p.28-44.

Kvale, S. & Brinkman, S., 2009. *Den kvalitativa forskningsintervjun* 2:4 ed., Lund: Studentlitteratur. ISBN 978-91-44-05598-5

Landwirtschaftskammer Schleswig-Holstein 1, 2010. *Infoblatt, Fördermassnahmen zur Verbesserung der Umwelt und Natur*, Rendsburg.

Le Thi, C., 2010. *Recent CAP reforms - Evaluation from OECD perspective*, Braunschweig, Germany: OECD.

Lundahl, U. & Skärvad, P.-H., 1999. *Utredningsmetodik för samhällsvetare och ekonomer*, Lund: Studentlitteratur. ISBN 91-44-01003-6

Länsstyrelsen Halland, 2008. *Hallands genomförandestrategi för landsbygsprogrammet 2007-2013*,

Länsstyrelsen Skåne, 2011. Investeringsstöd - Länsstyrelsen i Skåne län.

Länsstyrelsen Västra Götaland, 2011. Modernisering av jordbruks- och trädgårdsföretag - Länsstyrelsen i Västra Götalands län.

Martí Massot, A., 2010. *The first pillar of the CAP: II Direct aid to farms*, Brussels.

Martins, C. et al., 2010. *Agricultural Statistics, Main reults - 2009-09*, Luxembourg. ISSN 1830-463X

Ministry of Food, Agriculture and Fisheries 1, 2010. *Vejledning om Enkeltbetaling 2010*, Copenhagen. ISBN 978-87-7083-772-9

Ministry of Food, Agriculture and Fisheries 2, 2010. *Vejledning om Særlig miljøstøtte under artikel 68*, Copenhagen. ISBN: 978-87-7083-797-2

Ministry of Food, Agriculture and Fisheries 3, 2010. *Vejledning om tilsagn til 5-årige miljø- og økologiordninger 2010 samt eksisterende tilsagn*, Copenhagen. ISBN: 978-87-7083-703-3

Ministry of Food, Agriculture and Fisheries 4, 2010. *Vejledning om gødsknings- og harmoniregler*, Lyngby. ISBN 978-87-7083-417-9

Ministry of Food, Agriculture and Fisheries 5, 2010. *Vejledning til Fællesskema 2010*, Copenhagen. ISBN 978-87-7083-669-2

Ministry of Food, Agriculture and Fisheries 6,, 2010. *Høringsnotat om bekendtgørelse om støtte til mælkeproducenter i forbindelse med en særlig markedsstøt-teforanstaltning i mejerisektoren*, Copenhagen.

Nalin, E., 2000. *Varför bör CAP- EU:s gemensanna jordbrukspoltik reformeras?*, Lund. ISSN 1650-0105

Nygaard, H., 2007. Farming and milk production in Denmark.

OECD, 1999. *Methodology for the measurement of support and use*, Paris.

OECD, 2010. *OECD's producer support estimate and related indicators of agricultural support, concepts, calculations, interpretation and use (The PSE Manual)*, Paris.

PKF International Limited, 2010. *Worldwide Tax Guide 2010*, Fairfax, Virginia.

Porter, M.E., 1985. *Competitive advantage -Creating and Sustaining Superior Performance*, New York. ISBN 0-02-925090-0

Regeringen, 2004. *Svensk författningssamling 2004:760*, Stockholm

Skatteministeriet, 2008. *Tax in Denmark 2008*, Copenhagen.

Statistics Sweden, 2010. *Yearbook of agricultural statistics*, ISBN 978-91-618-1527-2

van Stolk, C. et al., 2006. *German Introduction of Single Farm Payments*, Cambridge: RAND.

van der Veen, H. et al., 2007. *Exploring agricultural taxation in Europe*, The Hauge. ISBN 978-90-8615-145-5

Widerberg, K., 2002. *Kvalitativ forskning i praktiken*, Lund: Studentlitteratur. ISBN 9789144018287

Winther-Rasmussen, K., 2007. Danish dairy board brief.

Wohlfarth, M. & Pötzsch, K., 2010. *Milchindustrie-Verband e.V. Beilage zum Geschäftsbericht 2009/2010Zahlen – Daten – Fakten*, Berlin.

Internet Sources

www, Danish Agriculture & Food Council, 2011. Danish Dairy Industry. Available at: http://www.agricultureandfood.dk/Danish_Agriculture_and_Food/Danish_dairy_industry.aspx [Accessed May 11, 2011].

www, Danishdairyboard, 2011. Danish Dairy Board - Danish dairy industry. Available at: http://www.danishdairyboard.dk/smcms/danishdairyboard_dk/Press_room/At_a_glance/Dairy_industry/Index.htm?ID=5952 [Accessed February 10, 2011].

www, Ekonomifakta 1, 2011. Arbetsgivaravgift | Skatterna förklaras | Skatter | Fakta och statistik | Ekonomifakta.se. Available at: http://www.ekonomifakta.se/sv/Fakta/Skatter/Skatterna-forklaras/Arbetsgivaravgift/ [Accessed March 15, 2011].

www, Ekonomifakta, 2, 2011. Kommunalskatter | Skatterna förklaras | Skatter | Fakta och statistik | Ekonomifakta.se. Available at: http://www.ekonomifakta.se/sv/Fakta/Skatter/Skatterna-forklaras/Kommunalskatter/ [Accessed March 16, 2011].

www, Ekonomifakta 3,, 2011. Marginalskatt | Skatterna förklaras | Skatter | Fakta och statistik | Ekonomifakta.se. Available at: http://www.ekonomifakta.se/sv/Fakta/Skatter/Skatterna-forklaras/Marginalskatt/ [Accessed March 16, 2011].

www, Ekonomifakta, 4,, 2011. Kapitalinkomstskatt | Skatterna förklaras | Skatter | Fakta och statistik | Ekonomifakta.se. Available at: http://www.ekonomifakta.se/sv/Fakta/Skatter/Skatterna-forklaras/Kapitalskatt/ [Accessed March 15, 2011].

www, EU 1,, 2011. EUROPA - EU - en översikt - Europeiska unionens historia - 1959. Available at: http://europa.eu/abc/history/1945-1959/index_sv.htm [Accessed February 1, 2011].

www, EU:s webbportal, 2008. Sammanfattning av EU-lagstiftningen, Samlat gårdsstöd. Available at: http://europa.eu/legislation_summaries/other/l11089_sv.htm [Accessed May 5, 2011].

www, European Commision, 2011. The milk sector. Available at: http://ec.europa.eu/agriculture/capreform/infosheets/milk_en.pdf [Accessed May 3, 2011].

www, European Commision 2, 2002. CAP reform - A policy for the future. Available at: http://ec.europa.eu/agriculture/publi/fact/policy/an2_en.htm [Accessed May 14, 2011].

www, European Commision 3, 2010. Taxes - Your Europe - Business. Available at: http://ec.europa.eu/youreurope/business/managing-business/paying-taxes/sweden/index_en.htm [Accessed July 4, 2011].

www, Federal Ministry of Food, Agriculture and Consumer Protection, 2011. BMELV - Direktzahlungen - Informationen zur Einbeziehung weiterer Beihilfen in die Betriebsprämienregelung im Jahr 2012 und zur Anpassung der Werte der Zahlungsansprüche. *Informationen zur Einbeziehung weiterer Beihilfen in die Betriebsprämienregelung im Jahr 2012 und zur Anpassung der Werte der Zahlungsansprüche*. Available at: http://www.bmelv.de/SharedDocs/Standardartikel/Landwirtschaft/Foerderung/Direktzahlungen/BetriebspraemienWeitereMassnahmen.html [Accessed April 9, 2011].

www, HM Revenue & Customs, 2011. Milk quotas. Available at: http://www.hmrc.gov.uk/manuals/vfoodmanual/vfood9950.htm [Accessed April 17, 2011].

www, IFCN,, 2009. How do we define typical farms? *How do we define typical farms?* Available at: about:blank [Accessed April 26, 2011].

www, Jordbruksverket 1, 2010. Mjölk och mejeriprodukter - Jordbruksverket. Available at: http://www.jordbruksverket.se/amnesomraden/handel/politikochframtid/eusjordbrukspolitik/mjolkochmejeriprodukter.4.6beab0f111fb74e78a78000989.html [Accessed February 1, 2011].

www, Jordbruksverket, 2, 2010. Jordbruksverket betalar 67 miljoner kronor i stöd till mjölksektorn - Jordbruksverket. Available at: http://www.jordbruksverket.se/formedier/nyheter/nyheter2010/jordbruksverketbetalar67miljonerkronoristodtillmjolksektorn.5.76ca33bb127af0b508c80007994.html [Accessed July 8, 2011].

www, Jordbruksverket 1, 2011. Jordbruksverket- Villkor för gårdsstödet. *Villkor för gårdsstödet*. Available at: http://www.jordbruksverket.se/amnesomraden/stod/gardsstod/villkor.4.14121bbd12def92a9178000526.html [Accessed May 5, 2011].

www, Jordbruksverket 2, 2011. Jordbruksverket - Nationella reserven. Available at: http://www.jordbruksverket.se/amnesomraden/stod/gardsstod/stodratter/nationellareservenforstodratter.4.6beab0f111fb74e78a780002016.html [Accessed May 5, 2011].

www, Jordbruksverket, 3, 2011. Bidraget i kronor - Jordbruksverket. Available at: http://www.jordbruksverket.se/amnesomraden/stod/handjursbidrag/bidragetikronor.4.67e843d911ff9f551db80009072.html [Accessed May 21, 2011].

www, Jordbruksverket, 4, 2011. Villkor - Jordbruksverket Riparian strips. Available at: http://www.jordbruksverket.se/amnesomraden/stod/miljoersattningar/skyddszoner/villkor.4.207049b811dd8a513dc8000210.html [Accessed May 13, 2011].

www, Jordbruksverket, 5, 2011. Villkor - Jordbruksverket Reduced Nitrogen Leaching. Available at: http://www.jordbruksverket.se/amnesomraden/stod/miljoersattningar/minskatkvavelackage/villkor.4.207049b811dd8a513dc8000140.html [Accessed May 13, 2011].

www, Jordbruksverket, 6, 2011. Villkor - Jordbruksverket Grassland. Available at: http://www.jordbruksverket.se/amnesomraden/stod/miljoersattningar/vallodling/villkor.4.7c909d4211d6c23487380004800.html [Accessed May 13, 2011].

www, Jordbruksverket, 7, 2011. Villkor - Jordbruksverket Grazed and Harvested Land. Available at: http://www.jordbruksverket.se/amnesomraden/stod/miljoersattningar/betesmarkerochslatterangar/villkor.4.45fb0f14120a3316ad780001756.html [Accessed May 13, 2011].

www, Jordbruksverket, 8, 2011. Vad kan jag få kompensationsbidrag för? - Jordbruksverket. Available at: http://www.jordbruksverket.se/amnesomraden/stod/kompensationsbidrag/vadkanjagfakompensationsbidragfor.4.4b00b7db11efe58e66b80001293.html [Accessed June 9, 2011].

www, LandbrugsInfo, 1,, 2011. EU-støtten afkobles i 2005. Available at: http://www.landbrugsinfo.dk/Jura/Enkeltbetalingsordningen/Sider/EUstoetten_afkobles_i_2005.aspx [Accessed May 3, 2011].

www, meine-milch 1,, 2011. Deutscher Milchmarkt: Import- und Exportstrukturen | Markt | Meine Milch. *deutscher Milchmarkt: Import- und Exportstrukturen*. Available at: http://www.meine-milch.de/artikel/deutscher-milchmarkt-import-und-exportstrukturen [Accessed February 17, 2011].

www, meine-milch 2,, 2011. Die Direktzahlungen der EU an die Milcherzeuger | Politik | Meine Milch. *Die Direktzahlungen der EU an die Milcherzeuger*. Available at: http://www.meine-milch.de/artikel/die-direktzahlungen-der-eu-an-die-milcherzeuger [Accessed April 16, 2011].

www, Ministerium für Landwirtschaft, Umwelt und ländliche Räume 1, 2011. Schleswig-Holstein – Überblick Bundesländer. Available at: http://www.schleswig-holstein.de/UmweltLandwirtschaft/DE/LandFischRaum/04_AgrarberichtStatistik/04_FoerdermittelAgrarsektor/00_UeberblickFoerder/ein_node.html [Accessed April 6, 2011].

www, Ministerium für Landwirtschaft, Umwelt und ländliche Räume, 2, 2011. Schleswig-Holstein – Zukunftsprogramm ländlicher Raum. Available at: http://www.schleswig-holstein.de/UmweltLandwirtschaft/DE/LandFischRaum/11_ZPLR/ein_node.html [Accessed May 17, 2011].

www, Ministerium für Landwirtschaft, Umwelt und ländliche Räume, 3, 2011. Schleswig-Holstein – Zukunftsprogramm ländlicher Raum – Modernisierung landwirtschaftlicher Betriebe. Available at: http://www.schleswig-holstein.de/UmweltLandwirtschaft/DE/LandFischRaum/11_ZPLR/Schwerpunkt1/Agrarinvestitionsfoerderung.html#doc647632bodyText1 [Accessed May 17, 2011].

www, Ministerum für Landwirtschaft, Umwelt und ländliche Räume des Landes Schleswig-Holstein 2,, 2010. *Richtlinien für die Förderung einer markt- und standortangepassten Landbewirtschaftung (MSL) als Gemeinschaftsaufgabe "Verbesserung der Agrarstruktur un des Küstenschutzes,"* Kiel. Available at: http://www.schleswig-holstein.de/cae/servlet/contentblob/647982/publicationFile/MSL_Richtlinie.pdf.

www, Price Waterhouse Cooper, 2011. PWC. Available at: http://e-books.pwc.dk/PricewaterhouseCoopers/Tax/LandbrugNyeafgiftsregler/?Page=2 [Accessed May 5, 2011].

www, Proplanta, 2011. Umrechnungsschlüssel für Tierbestände in Vieheinheiten (VE) nach dem Futterbedarf. Available at: http://www.proplanta.de/Fotos/Umrechnungsschluessel-fuer-Tierbestaende-in-Vieheinheiten-VE-nach-dem-Futterbedarf_Bild1212060004.html [Accessed May 22, 2011].

www, Skatteministeriet, 1,, 2011. Basic amounts, limits, etc., 2007-2010. Available at: http://www.skm.dk/foreign/facts_and_figures/1600.html [Accessed March 16, 2011].

www, Skatteministeriet, 2,, 2011. Section 2: How is income taxed? *Tax in Denmark 2008, section 2: How is income taxed?* Available at: http://www.skm.dk/foreign/english/taxindenmark2008/section2howisincometaxed/ [Accessed March 10, 2011].

www, Skatteministeriet, 3, 2011. SKAT: Forhøjelse af energiafgifter. Available at: http://www.skat.dk/SKAT.aspx?oId=1813939&vId=0 [Accessed May 5, 2011].

www, Statistics Denmark, 2011. Ejendomsbeskatningen - Varedeklaration - Danmarks Statistik. Available at: http://www.dst.dk/Vejviser/dokumentation/Varedeklarationer/emnegruppe/emne.aspx?sysrid=871 [Accessed March 22, 2011].

www, Swedish Board of Agriculture 1, 2011. Tabell: Husdjur i riket efter djurslag. År 1981-2009. Available at: http://statistik.sjv.se/Dialog/varval.asp?ma=JO0103R1&ti=Husdjur+i+riket+efter+djurslag%2E+%C5r+1981%2D2009&path=../Database/Jordbruksverket/Husdjur/&lang=2 [Accessed February 16, 2011].

www, Swedish Board of Agriculture 2,, 2011. Frikoppling av mjölkbidraget 2007. Available at: http://www2.sjv.se/webdav/files/SJV/trycksaker/Jordbruksstod/JSI71.pdf [Accessed May 3, 2011].

www, Swedish Dairy Association, 2011. Koantal och mjölkavkastning - Svensk Mjölk. Available at: http://www.svenskmjolk.se/Statistik/Mjolkforetaget/Koantal-och-mjolkavkastning/ [Accessed February 16, 2011].

www, Swedish Tax Agency, 2011. Energi- koldioxid- och svavelskatt | Skatteverket. Available at: http://www.skatteverket.se/foretagorganisationer/skatter/punktskatter/allapunktskatter/energiskatter.4.18e1b10334ebe8bc8000843.html [Accessed May 9, 2011].

www, Swedish Tax Agency 2, 2010. Belopp och procent - inkomstår 2009/taxeringsår 2010 | Skatteverket. Available at: http://www.skatteverket.se/privat/skatter/beloppprocent/2009.4.6d02084411db6e252fe80007428.html#Arbetsgivaravgift [Accessed July 5, 2011].

www, The Danish Food Industry Agency 1, 2011. Mælkepræmien udbetales for første og sidste gang fra fra mandag! - Fødevareministeriet. Available at: http://ferv.fvm.dk/Default.aspx?ID=38870&PID=228501&year=&NewsID=3705 [Accessed May 3, 2011].

www, The Danish Food Industry Agency 2,, 2011. Mælkepræmie erstattes af et mælketillæg, når EU's landbrugsreform træder i kraft næste år - Fødevareministeriet. Available at: http://ferv.fvm.dk/Default.aspx?ID=38870&PID=228501&year=&NewsID=3076 [Accessed May 3, 2011].

www, The Danish Food Industry Agency 3, 2011. English - Rural development - Fødevareministeriet. Available at: http://www.landdistriktsprogram.dk/rural_development_programme.aspx?ID=42277 [Accessed May 16, 2011].

www, The Danish Food Industry Agency 4, 2011. Tilskuddets størrelse - Ministeriet for Fødevarer, Landbrug og Fiskeri. Available at: http://www.landdistriktsprogram.dk/tilskuddets_stoerrelse.aspx?ID=58585 [Accessed May 16, 2011].

www, The Danish Food Industry Agency 5, 2011. Offentliggjorte gødningsregnskaber - Fødevareministeriet. Available at: http://pdir.fvm.dk/offentliggjorte_goedningsregnskaber.aspx?ID=8970 [Accessed May 21, 2011].

www, World Bank, 2003. Land Taxation in Germany. Available at: http://www1.worldbank.org/publicsector/decentralization/June2003Seminar/Germany.pdf [Accessed May 18, 2011].

www, ZID,, 2011. Zahlungsansprüche (ZA). Available at: http://www.zi-daten.de/infoZA.html#Modulation [Accessed May 21, 2011].

Personal messages

Agneta Hjellström
Milk Policy Division Expert, Swedish Dairy Association
Personal meeting 2011-01-10

Helma Möllgaard
Farmer and advisor at Nordfriesland e.V. Landwirtschaftliche Unternehmensberatung
Personal meeting 2011-06-16

Håkan Rietz
Milk Policy Division Expert, Swedish Dairy Association
Personal meeting 2011-01-10

Johannes Thomsen
Head of Cattle production, Landwirtschaftskammer Schleswig-Holstein
Personal meeting 2011-06-14

Jørgen Korning
Chief Specialist, Rural Development, Ph.D, Knowledge Centre for Agriculture
Personal meeting 2011-06-17

Martin Hagemann
PhD student, Christian-Albrechts-Universität, Kiel
Personal meeting 2011-06-13

Appendix 1

Exchange rates

When recalculating currencies the following exchange rates have been used. The currencies are the annual average for each currency except from 2011 which is the average between January-April.

2006	1 EUR = 7,459 DKK	1 EUR = 9,254 SEK
2007	1 EUR = 7,450 DKK	1 EUR = 9,253 SEK
2008	1 EUR = 7,456 DKK	1 EUR = 9,614 SEK
2009	1 EUR = 7,446 DKK	1 EUR = 10,620 SEK
2010	1 EUR = 7,447 DKK	1 EUR = 9,543 SEK
2011	1 EUR = 7,455 DKK	1 EUR = 8,892 SEK

(www, ECB, 2011)

Appendix 2

The feed consumption of the dairy cow and heifer at the case farm is calculated with Agriwise.

Feed Consumption for dairy cows and heifers

Dairy cows (220)	**Per head**	**Total**
Grass silage	1996	439 120
Corn silage	1673	368 060
Barley silage	0	0
Pasturage	0	0
Grain	561	123 420
Concentrate purchased 1	636	139 920
Concentrate purchased 2	1070	235 400
Minerals	40	8800
Salt	0	0
Bedding	185	40 700
Straw	155	34 100
Heifers (81,4)		
Grass silage	1602	130 403
Corn silage	0	0
Barley silage	1602	130 403
Grain	0	0
Pasturage	1690	137 566
Minerals	0	0
Straw	200	16 280

Appendix 3

Income statement for the case farm when the Danish system is applied without fertilizer tax.

Income Statement

Income		
3081	Environmental subsidies	6 579,69 €
3110	Milk Production	738 086,14 €
3121	Calfs	17 407,73 €
3133	Dairy cows slaughter	50 940,99 €
3981	Single Payment Scheme	112 162,00 €
		- €
Total income		925 176,56 €
		- €
Costs		- €
4010	Seeds	6 348,57 €
4011	Seeds cereals	1 483,01 €
4012	Ley Seeds	1 943,86 €
4021	N	25 599,70 €
4024	P	2 463,06 €
4025	K	1 294,04 €
4041	Herbicides	2 746,31 €
4042	Fungicides	431,31 €
4043	Pesticides	160,79 €
4062	Sowing	1 929,46 €
4067	Grassland harvest	5 624,86 €
4069	Hired labor	20 251,49 €
4071	Torkning	1 885,44 €
4075	Analysis fees	41,62 €
4082	Feed preservatives	19 679,55 €
4083	Baler twine, nets and plastics	653,43 €
4130	Kraftfoder mjölkproduktion	- 8,28 €
4132	High yielding feed	77 701,98 €
4133	Coarse grains purchased	18 545,98 €
4134	Calf feed	9 305,41 €
4138	Mineral feed	9 779,26 €
4157	Bedding	1 407,42 €
4170	Overheads dairy production	32 374,56 €
4173	Vet and medicine	21 123,97 €
4174	Production consulting	1 729,02 €
4180	Other costs bovine	19 779,94 €
5110	Arrende/tomträttsavgäld	20 224,25 €
5170	Repair/maintainence of property	15 718,33 €

5191	Land Tax	11 097,14 €
5310	Electricity for operation	17 861,05 €
5360	Fuel & oils	12 864,30 €
5520	Repair/maintenance of inventory	20 957,77 €
5570	Repair/maintenance land	2 116,73 €
6100	Office supplies and printing	10 478,89 €
6210	Communication	3 171,96 €
6310	Company insurance	6 343,92 €
6312	Animal insurance	3 020,01 €
6900	Other external costs	3 667,61 €
7010	Salaries	111 039,23 €
Total costs		522 836,93 €
		- €
Profit before depreciation		402 339,63 €
		- €
Depreciation		- €
7821	Depreciation Buildings	64 424,19 €
7832	Depreciation machines/inventory	23 132,14 €
		- €
Total depreciation		87 556,32 €
		- €
Profit after depreciation		314 783,30 €
		- €
Financial income and expenses		- €
8410	Interest expences	41 913,76 €
		- €
Total financial income and expenses		- 41 913,76 €
		- €
Net farm income		272 869,54 €

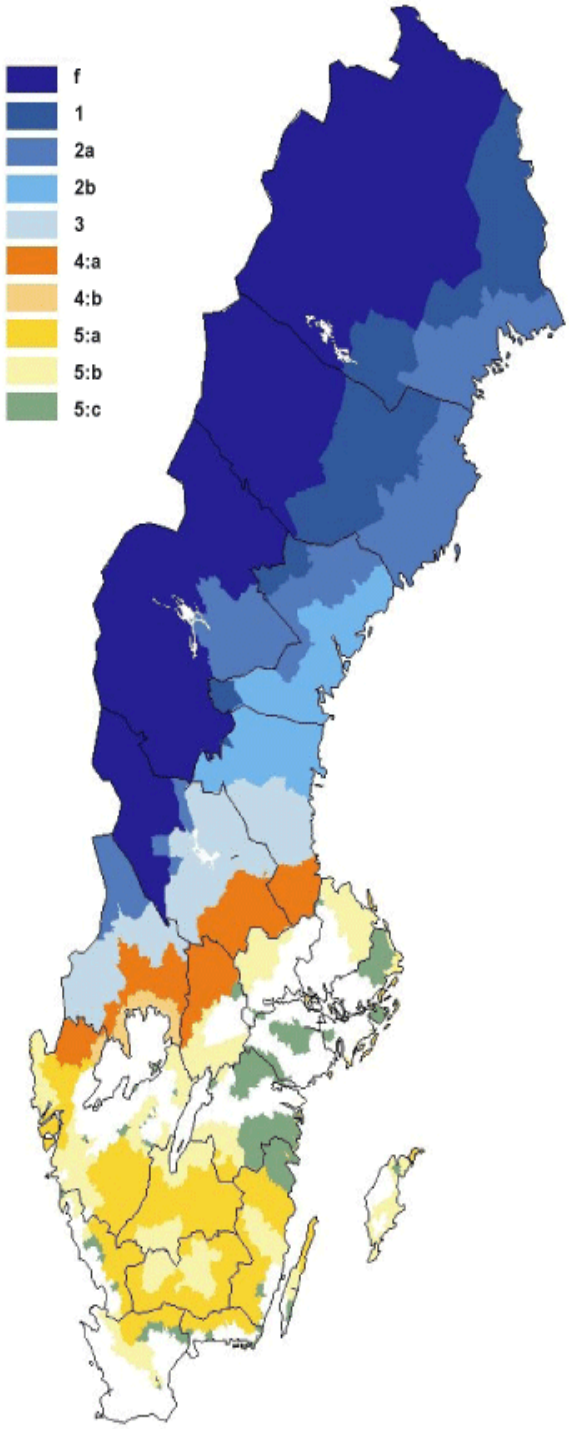
Appendix 4

Value of payments Contractual nature conservation in Germany.

Umsetzungsinstrument	Bewirtschaftungsauflagen	Ausgleichszahlung	Bemerkungen
Vertragsnaturschutz (VNS)	(i. d. R.) Verzicht auf Düngung u. Pflanzenschutz; verringerte Besatzdichte; spätere Mahd; freiwillige oder obligatorische Biotopgestaltungsmaßnahmen (BGM)	(60,– bis 650,– €/ha u. Jahr) (nur bei freiwilligen BGM: 25,– € je 1% pro ha Vertragsfläche)	Verträge mit 5-jähriger Laufzeit; Beantragung und Vertragsabschluss über Landgesellschaft (LGSH)
a) Vertragsmuster für Geest und Hügelland			
Weide-Wirtschaft	Standweide (max. 3 Tiere/ha); Mahd ab 16.06. o. 16.07.	280,– €/ha u. Jahr; 255,– / 300,– €/ha	freiwillige BGM
Weide-Landschaft	ganzjährige Beweidung mit 0,3 bis max. 1,0 Tieren/ha	360,– €/ha u. Jahr	Mindestfläche: 10 ha; freiwillige BGM
b) Vertragsmuster für (tonige) Marschen			
Weide-Wirtschaft Marsch	Standweide (max. 4 Tiere/ha); Mahd ab 21.06.; [wahlweise organ. Düngung zulässig]	365,– € / [295,– €]; 355,– € / [290,– €]	obligat. BGM (Vernässungsmaßnahmen)
Weide-Landschaft Marsch	Grüne Flächen: ohne Vorgabe von Tierzahl o. Mahdtermin, [wahlweise kein Schleppen etc. 01.04.-15.05]; Gelbe Flächen: Standweide (max. 4 Tiere/ha) o. Mahd ab 21.06., organ. Düngung zulässig; Rote Flächen: Standweide (max. 4 Tiere/ha)	90,– € / [125,– €] 390,– €/ha u. Jahr 450,– €/ha u. Jahr	Einbeziehung des gesamten einzelbetriebl. Grünlandes; mindest. 10 % Rote Flächen; obligat. BGM (Grabenanstau; auf Roten Flächen Vernässungsmaßnahmen auf der Fläche)
c) Vertragsmuster für Niedermoorgebiete			
Weide-Wirtschaft Moor	Standweide (max. 4 Tiere/ha); Mahd ab 21.06.; [wahlweise organ. Düngung zulässig]	320,– € / [250,– €]; 305,– € / [245,– €]	freiwillige BGM
d) besondere Vertragsmuster für Rastvögel			
Dauerweide	Keine Bodenbearbeitungssperrfrist: keine Einschränkungen beim Schleppen u./o. Walzen der Flächen. Mit Bodenbearbeitungssperrfrist: kein Schleppen u./o. Walzen der Flächen ab 01.04.	60,–€/ha und Jahr 80,–€/ha und Jahr	keine Mahd; Pflegeschnitt ab 21. Juni zulässig; Weidegang i. d. R. vom 01.05 bis 30. 09. (Stand-, Umtriebs-, Portions- oder Hütetagsweide), davor u. danach fakultativ; Beweidung mit Rindern; Mischbeweidung mit Pferden und Schafen möglich; freiwillige BGM.
Nahrungsgebiete für Gänse und Schwäne (Grünland in traditionellen Rastgebieten)	ohne Vorgabe von Tierzahl o. Mahdtermin; Standweide (max. 4 Tiere/ha); Mahd ab 16.06.; [Düngung generell zulässig]	85,– €/ha u. Jahr; 120,–€/ ha u. Jahr; 125,– €/ha u. Jahr	Mindestfläche: 2 ha; obligat. BGM (Vernässungsmaßnahmen); Duldung von Gänsen etc.
Rastplätze für wandernde Vogelarten (Acker in traditionellen Rastgebieten)	Einsaat von Winterraps bzw. Wintergetreide (bis 15.09./1.10.); nach Aussaat bis 31.3. keine Ausbringung von Totalherbiziden. In diesem Zeitraum sind der Einsatz anderer Pflanzenschutzmittel sowie die Ausbringung org. und mineral. Düngemittel jedoch zulässig; ab 01.04. Weiterbewirtschaftung zulässig	205,– €/ha u. Jahr (bei Flächenrotation: 170,– €/ha)	keine BGM; Mindestfläche: 5 ha; Duldung von Gänsen etc. im Winterhalbjahr

Appendix 5

Map over Sweden illustrating the Less Favored Area regions. The case farm is located in region 5:a.



Appendix 6

The classification system by OECD

Producer Support Estimate (PSE)

A. Support based on commodity outputs
A1. Market price support (MPS)
A2. Payments based on output

B. Payments based on input use
B1. Variable input use
B2. Fixed capital formation
B3. On-farm services

C. Payments based on current Area/ Animal numbers/ Receipts/ Income, production required
C1. Based on current receipts/income
C2. Based on current area/animal numbers

D. Payments based on non-current Area/Animal numbers/ Receipts/Income, production required

E. Payments based on non-current Area/Animal numbers/Receipts/Income, production not required
E1. Variable rates
E2. Fixed rates

F. Payments based on non-commodity criteria
F1. Long-term resource retirement
F2. Specific non-commodity output
F3. Other non-commodity criteria

G. Miscellaneous payments

General Services Support Estimate (GSSE)

H. Research and development
I. Agricultural schools
J. Inspection services
K. Infrastructure
L. Marketing and promotion
M. Public stockholding
N. Miscellaneous

Consumer Support Estimate (CSE)

Price transfers, the inverse value of Market price support, see A. strives to be adjusted to apply to quantities consumed.

Budgetary transfers