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# Decoupled Payments to EU Farmers, Production, and Trade: An Economic Analysis for Germany

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# Decoupled Payments to EU Farmers, Production, and Trade: An Economic Analysis for Germany*

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## Abstract

After an extended process of reform the European Union has introduced direct payments to farmers which are decoupled from production decisions as a central element of its Common Agricultural Policy. They are also referred to as Single Farm Payments. In this paper we analyze the production and trade effects of this policy and its compatibility with WTO international trade rules. A survey of the literature suggests that the system of direct payments in its present form has effects which are analogous to a subsidization of agricultural land. Thus, they act to increase production and trade.

Furthermore we quantify the total economic cost of production of selected commodities in the European Union and compare them to the price at which EU production is sold in foreign markets. Our analysis suggests that the costs of production in the European Union for key agricultural commodities are below international prices. It can be established that commodities for which the European Union is a net exporter are sold below cost, for extended periods of time and in substantial quantities. The EU system of decoupled payments to farmers, thus, acts to inflict economic injury to third countries.

Under WTO rules, dumping can only occur when a country is an exporter. In this paper we demonstrate that on the markets included in the analysis dumping occurs on the market for wheat. The extent of injury is exemplified for Australia.

**Keywords:** European Union; Common Agricultural Policy; WTO rules; decoupled payments

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## Zusammenfassung

Im Zuge des Reformprozesses der Gemeinsamen Agrarpolitik der Europäischen Union wurden als zentrales Instrument schließlich Direktzahlungen an die Landwirtschaft eingeführt, die von den tatsächlichen Produktionsentscheidungen entkoppelt sind. In diesem Beitrag wird analysiert, welche Produktions- und Handelseffekte durch diese Direktzahlungen an die Landwirtschaft verursacht werden und wie diese im Licht der WTO Handelsregeln zu beurteilen sind.

Eine Auswertung der Literatur zeigt, dass die Direktzahlungen wie eine Subvention auf den Bodeneinsatz wirken und diese daher Produktionseffekte aufweisen. Darüber hinaus werden in diesem Beitrag die Produktionskosten in Deutschland für ausgewählte Agrargüter quantifiziert und mit den Weltmarktpreisen verglichen. Dabei zeigt sich, dass selbst unter sehr konservativen Annahmen die Produktionskosten oberhalb der Weltmarktpreise liegen. Bei Weizen ist die EU Nettoexporteur und erfüllt daher die WTO Kriterien für Dumping. Der Umfang der ökonomischen Kosten dieser Politik bei Weizen wird am Beispiel Australiens quantifiziert.

**Schlüsselwörter:** Europäische Union; Gemeinsame Agrarpolitik; WTO Regeln; entkoppelte Direktzahlungen

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# 1. Introduction: The CAP Reform Process and Decoupled Payments

The Common Agricultural Policy (CAP) of the European Union became fully effective in 1967/68. Traditionally, the CAP provided income support to farmers through a complex system of government market regulations. They included, inter alia, minimum import prices (threshold prices), domestic minimum producer prices (intervention prices), export subsidies (export refunds), and domestic production quotas. The traditional CAP was frequently subject to harsh criticism by economists, due to its adverse economic effects such as international trade distortions and related social welfare losses, erosion of incentives in developing countries, burdensome EU budgetary expenditures, or adverse distributive effects. In both the European Union (e. g. Koester and Tangermann, 1976; von Witzke and Schmitt, 1981) and in the United States (e. g. Cochrane and Runge, 1992) economists had developed systems of direct payments which are decoupled from actual production decisions as alternative means to provide income support to farmers.

For a long time, agricultural policy makers in the European Union were largely immune to criticism voiced by economists and were not agreeable to replacing the traditional CAP by direct payments. However, a reform process was started in the European Union amid rapidly growing budgetary expenditures caused by the CAP. The reform process began in 1992 and has continued since that time. The present CAP is scheduled to expire in 2013. Additional reforms may be expected then.

In the course of reform, support prices have been reduced significantly on many markets. The reduction in price support was paralleled by direct payments which are now to a significant degree, but certainly not completely, decoupled from actual production decisions. These decoupled payments are also referred to as Single Farm Payments. In dairy, the reform process has just begun in that support prices have been reduced and in dairy the quotas have been increased.

The political justification of direct payments to farmers under the CAP has changed over time. Initially, they were made as compensation for the reduction in support prices. With the 2003 agricultural reform, the rationale for the direct payments has changed. Now it is argued that the direct payments are made as compensation for public goods provided by farmers, such as clean air or a landscape perceived to be pleasurable, and as compensation for competitive disadvantages due to tighter domestic quality and environmental regulations than in other countries.

Proponents of decoupled payments claim that they are production neutral, i. e., that they represent pure lump sum transfers and, thus, have no effect on production. Therefore, they are perceived as an agricultural policy instrument which does not distort production, consumption, and international trade flows. For this reason, the proponents of decoupled payments also claim that they are consistent with the requirements for domestic support of the WTO's Green Box.

To the extent that the traditional support prices are still binding and are actually applied they obviously cause production and trade effects which have been analyzed in great detail. However, not much research has been done on the production and, thus, trade effects of the decoupled payments.

In this paper we will, first, provide a survey of the literature with regard to production effects of direct payments in general and specifically to the Single Farm Payments under the CAP. We will argue that the direct payments which are decoupled from production decisions actually do have a positive effect on production. Thus, they affect international prices and impact on EU trade flows. Both effects, therefore, may inflict economic injury upon third countries.

We will present the theoretical foundations of the standard textbook model of neoclassical economics as it relates to decoupled payments. In addition, we will analyze the shortcomings of this model. Furthermore, we will demonstrate that the direct payments under the CAP continue to stimulate production.

In addition, we will analyze costs and returns for selected agricultural commodities in Germany. As the result will be that the EU sells agricultural commodities in foreign markets below cost, for extended time periods, as well as in substantial quantities, we will, then, quantify the extent of economic injury for selected third countries. We will conclude with a discussion of the findings in this paper for the compatibility with WTO rules of the decoupled payments to European Union’s farmers.

# 2. The Production Effects of Decoupled Payments under the CAP

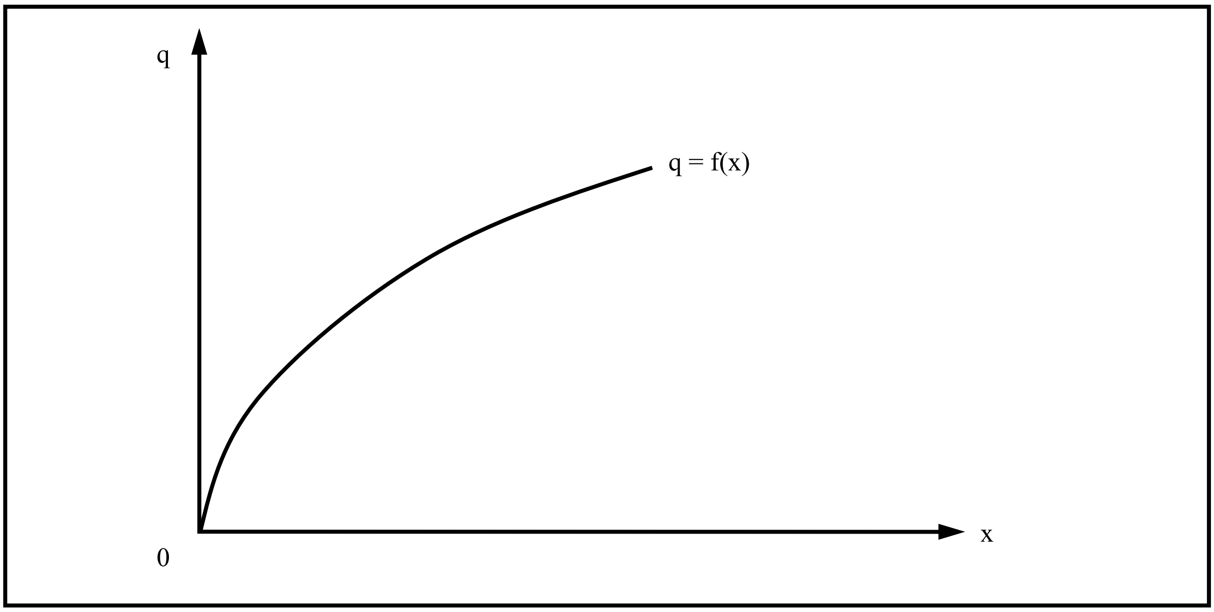
## 2.1 The Economics of Decoupled Payments: The Standard Textbook Model of Neoclassical Economics

The standard textbook model of direct payments is based on a simple neoclassical model of perfect competition. It is based on a number of simplifying assumptions. Some of them are relevant for the purpose of this analysis. They include the following:

– Liquidity, i. e. cash flow, does not matter.
– There is perfect foresight on the side of all market participants. This implies that there is no risk and, thus, there cannot be any risk aversion on the side of producers.
– There is no time dimension. Producers are assumed to expect no change in policies, or to adjust to changes in prices and policies instantaneously and with no cost.

The starting point of the simple textbook model of neoclassical economics is the production function which relates factor input (x) and quantity of production of a good (q). This is depicted in figure 1. The horizontal axis denotes the factor input while the vertical axis denotes the quantity produced. As can be seen, there is a positive functional relationship between both variables (q = f(x)). An increase in factor input results in an increase in production. However, the marginal increase in production declines with increasing factor input, i. e. the slope of the production function becomes flatter with increasing factor input.

**Figure 1: A production function**




When the diagram in figure 1 is rotated along the 45° line, one obtains the factor input function. This is depicted in the top panel of figure 2. It expresses the factor input as a function of the quantity produced (x = g(q)).

The first derivative of the factor input function is displayed in the central panel of figure 2. The bottom panel of figure 2 depicts the marginal cost (MC) curve. It represents the marginal factor input function multiplied by the factor price (r). When r is equal to one, the factor input function and the cost function are identical. When r is larger than one, the cost function is steeper than the factor input function. When r is smaller than one, it is flatter.

A time-proven behavioral assumption about producers' objective is that they aim at maximizing profit. This implies that the optimum quantity of production is where the marginal cost function equals the market price. For this reason the marginal cost function of a firm represents its supply function (S).

As the marginal cost curve has a positive slope, it follows that the quantity produced and supplied to the market is a positive function of price. The change in the quantity supplied in response to a change in the market price, therefore, is represented by a movement along the supply function, i. e. the marginal cost function. In figure 3, a price increase from $p_0$ to $p_1$ results in an increase in the quantity supplied from $q_0$ to $q_1$.

**Figure 2: Production of a single firm in the standard textbook model of neoclassical economics**

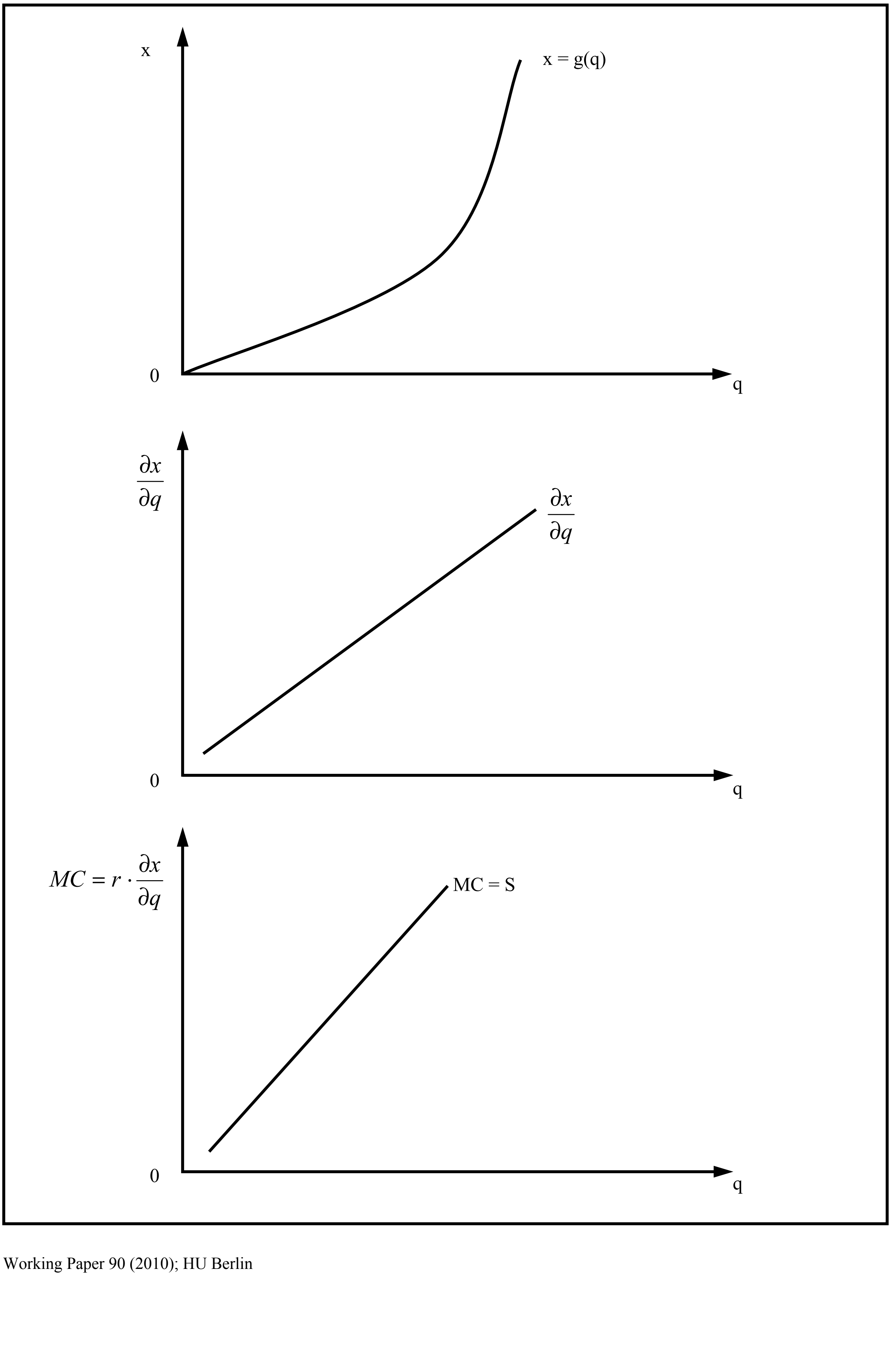
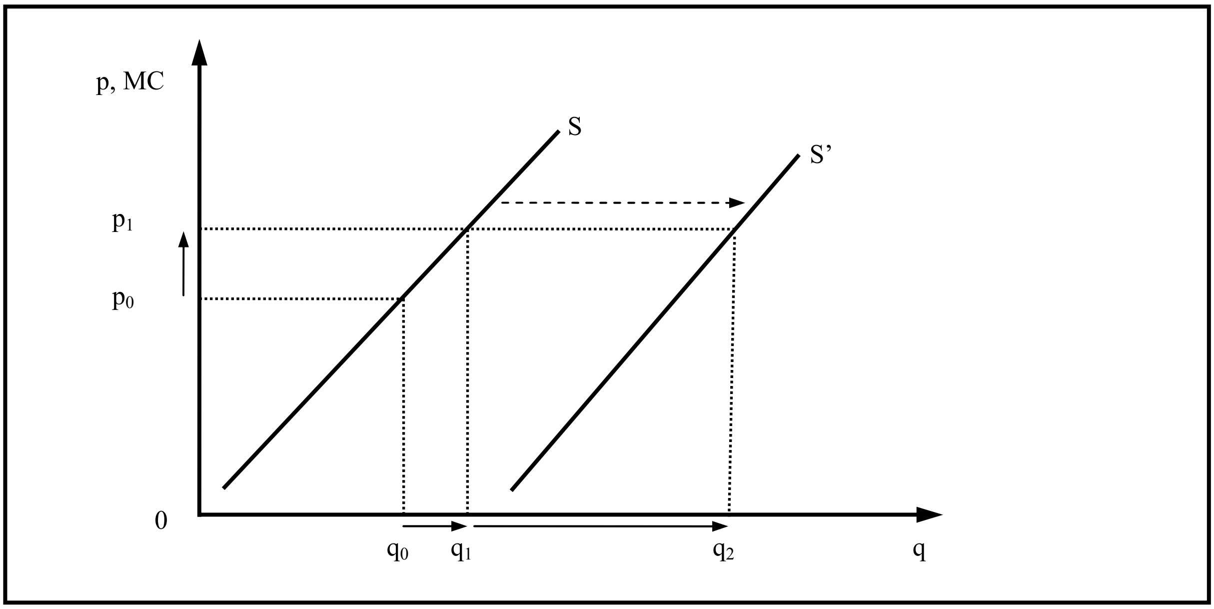


**Figure 3: Properties of the supply curve**




Of course, the price is not the only determinant of supply. When a supply determining variable other than the market price changes (such as the price of the factor input or the technology) this acts to shift the supply curve. For instance, a new technology which results in an increased factor productivity would shift the supply curve to the right. This is also depicted in figure 3. The supply function shifts to the right from S to S'. At a price of $p_1$ this would result in an increase of supply from $q_1$ to $q_2$.

The market supply of a group of producers or an entire industry can be obtained by a horizontal addition of the individual supply functions. The interpretation of the market supply function is analogous to the individual supply functions.

Figure 4 depicts the welfare position of producers. At $p_0$, producers supply the quantity $q_0$. The revenue of producers is $p_0 * q_0$. This is equal to the rectangle formed by the distances between 0 and $p_0$, and 0 and $q_0$. As the supply function represents the marginal cost curve, the variable cost of production is represented by the triangle under the supply curve between 0 and $q_0$. The difference between revenue and cost is the area between the price $p_0$ and the supply function. It is referred to as producer surplus (PS) which represents a money metric of aggregate economic welfare realized by producers at price $p_0$. The concept of producer surplus permits the quantification of producers' economic welfare under alternative prices. From figure 4 it is obvious that producer surplus increases with increasing prices and vice versa.

**Figure 4: The measurement of producer welfare**

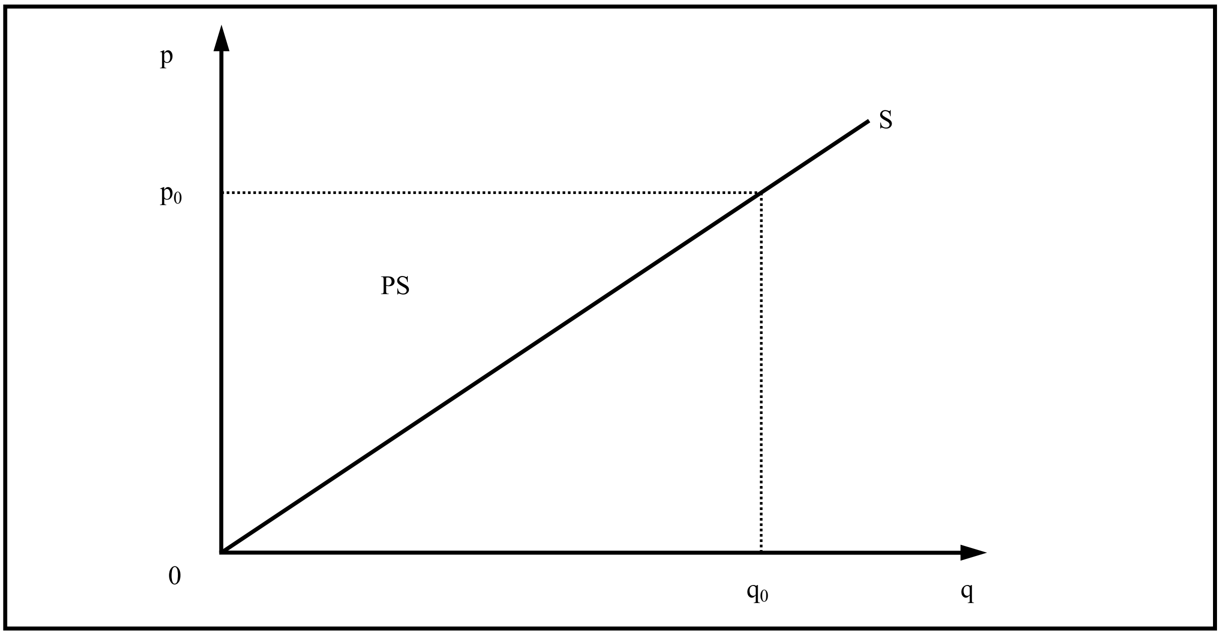
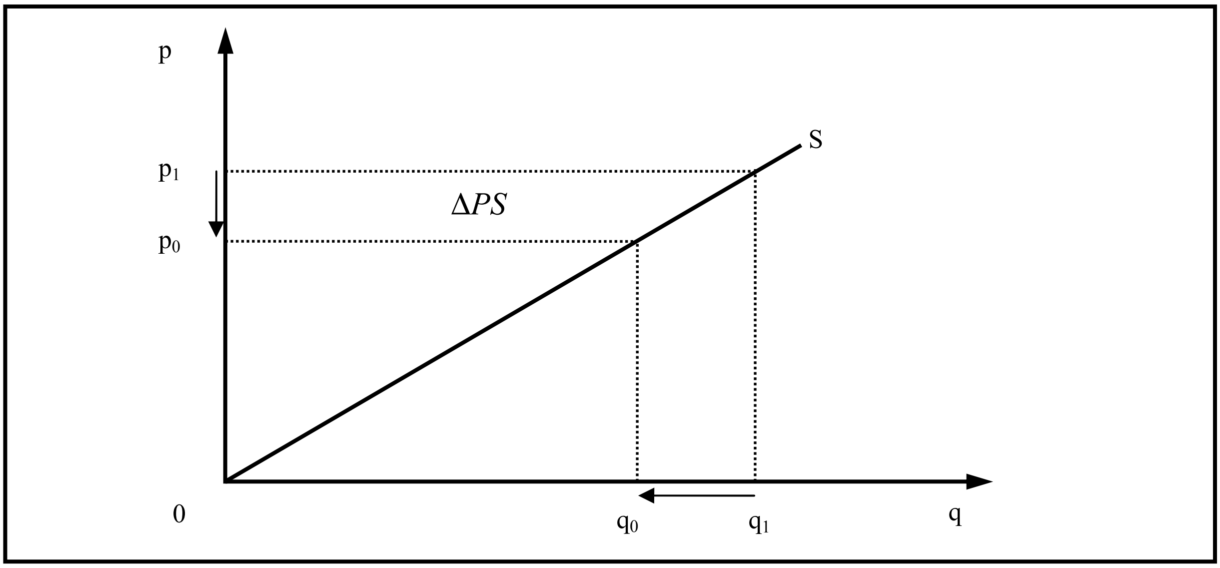



Figure 5 depicts the economics of decoupled payments in the standard textbook model. Let $p_1$ be the government regulated minimum producer price, then $q_1$ is the quantity supplied at the minimum price. Let $p_0$ represent the market price, then it is obvious that ΔPS is the gain in producer surplus which results solely from the producer price support. Removing the minimum price would bring the producer price down to $p_0$. This would result in the reduction of production from $q_1$ to $q_0$ and the loss in producer surplus ΔPS.

**Figure 5: The economics of decoupled payments in the standard textbook model**



The basic idea of decoupled direct payments is to discontinue price support and to provide income support to producers in the amount of ΔPS. As producers receive ΔPS regardless of the quantity produced, they would only produce $q_0$ and still have the same income as before under price support.

## 2.2 Decoupling under the CAP

If the real world were as simple as in the standard textbook model of decoupled payments this would be the end of the story. However, the reality of the CAP is different from the situation depicted above. There are three main reasons for this. The first is that not all farm subsidies have been decoupled. On some markets substantial traditional subsidies which are linked to production continue to exist. In sugar and dairy, the traditional subsidies have been reduced and the production effects of remaining supports have been limited by production quotas.

The second reason is that a sizable portion of direct payments continues to be coupled to production. For 2008, the EU Commission (EC, 2008) reports payments in the amount of € 4.485 billion to still be coupled to production. This is about 14 per cent of the total Single Farm Payment in 2008. However, the decoupling rates vary widely between the member countries of the European Union. More than 80 per cent of coupled payments are accounted for by just three large agricultural producer countries namely France, Portugal and Spain. France alone accounts for € 2.2 billion in coupled payments.

Portugal is the country with the highest portion of coupled payments (28 per cent). It is followed by France with a coupling rate of 26 per cent. In Spain 25 per cent of direct payments are still coupled, while the coupling rates in Belgium, Austria and the Netherlands are at between 12 and 17 per cent. Germany, Ireland, Luxemburg, and Malta, also Denmark, the United Kingdom and all new EU member states (with the exception of Slovenia) make no or only minimally coupled payments.

The third reason is that for a variety of reasons which are neglected in the standard textbook model of neoclassical economics, decoupled payments actually do stimulate production.

## 2.3 The Economics of Decoupled Payments: The Shortcomings of the Standard Textbook Model

The standard model leaves out several variables which are of relevance with regard to decoupled payments. For a realistic assessment of the production effect, the standard textbook model has to be enriched to also include risk and risk aversion, wealth, liquidity, and expectation about future changes in policy (e. g. Westcott and Young, 2004; Ahmadov et al., 2006).

*Economic risk and risk-averse economic agents*

Every human action involves some kind of risk. Sometimes it is more pronounced and sometime less. Humans tend to have an aversion to risk. For producers this implies that there is a negative relationship between risk on the one hand and production and investment decisions on the other. This is, production and investment decline with increasing risk, all other things being equal.

In contrast to traditional agricultural subsidies under the CAP which change with production and price, direct payments provide farmers with a steady stream of income. Therefore, direct payments reduce risk for producers and stimulate production and investment.

Risk perceived by economic agents may also be the result of imperfect information (e. g. Akerlof, 1970) or bounded rationality (e. g. Elster, 1983). Imperfect information implies that economic agents do not have full information about the consequences of a decision be it that the information is not available at all, or that it is too costly to acquire. Related to that is the concept of bounded rationality. This involves complex interactions between the decision maker and the economic environment in which the decisions are made. However, the decision maker may not fully understand these interactions – much like no chess player has ever fully understood the game and is able to win every game he or she plays.

Farmers usually are fairly skilled in making on-farm production and investment decisions. If that were not the case competition would have driven them out of business. However, they commonly lack detailed knowledge of the risks and returns of investing outside of agriculture. Direct payments increase their wealth and, thus, their ability to invest. As payments are not linked to production, farmers may use the money however they wish. Yet, given imperfect information about investment opportunities outside of agriculture or bounded rationality they will tend to invest in agriculture rather than outside it. The 2008 crisis on the international financial markets will certainly act to make agricultural investments appear even more lucrative to farmers (e. g. BVVG, 2009).

Hennessy (1998) develops a theoretical foundation for the analysis of the risk effects of income support policies in agriculture. The results suggest that income support acts to reduce risk. Thus, there is a significant positive effect of income support on production because the government support results in an insurance effect. Analyses by Schkokai and Moro (2002) and Anderson (2004) arrive at the same result.

Makki et al. (2004) survey empirical analyses on risk aversion in US agriculture. They found that risk aversion exists although the attitude of farmers towards risk appears to vary widely. Their results also suggest that the production effect of direct payments increase with increasing magnitude of direct payments relative to farmers' net worth.

*Wealth*

Likewise, in a world which is characterized by risk and risk aversion the ability to cope with risk is a positive function of wealth. That is, the wealthier an economic agent is, the more risk he or she tends to be willing to take, all other things being equal. The relationship between wealth and risk aversion is well established both theoretically and empirically (e. g. Just and Zilberman, 1986; Chavas, 2004).

Chavas and Holt (1990) report that this is the case for farmers as well. They analyzed production decisions for corn and soybeans in US agriculture and found absolute risk aversion to decline with increasing wealth.

Direct payments from the government directly increase the wealth of the recipients. They also may have an indirect effect on the wealth of the recipients through changes in the value of the assets owned by the recipients. In agriculture, any type of government support, including decoupled payments, tends to get capitalized to a large extent into the value of the land (von Witzke et al., 2007; Roe et al., 2004; Roberts, 2004). To the extent that operators own the land they farm, operators also increase their economic wealth through increasing value of agricultural land.

While Hennessy (1998) finds that the impact of income support policies on wealth and reduction in risk aversion are significant, Burfisher and Hopkins (2003) argue that this effect does exist but is not likely to be large. Their findings are consistent with analyses done by Goodwin and Mishra (2005; 2006) and Serra et al. (2005) who analyze the relationship between wealth and planting decisions in US agriculture.

*Liquidity*

For more than a century world agriculture has been subject to the Agricultural Treadmill; that is, farmers have produced ever more food for ever more humans at ever declining prices (Cochrane, 1958; von Witzke et al., 2008). As a consequence, there was a sustained economic pressure on the farm sector to adjust which led to a large reduction in the agricultural labor force. Therefore, farmers were often cash strapped and liquidity was constraining both production and investment. Direct payments from the government obviously increase farmers' liquidity and, therefore, expand a constraint to production and investment (Young and Westcott, 2000; OECD, 2001; 2005).

Collender and Morehart (2004) do not find liquidity to be a major issue for most US farmers. However, they identify some groups of farmers who are cash strapped and constrained in their production decisions by liquidity.

Ahmadov et al. (2006) pose the hypothetical question to a sample of about 3,600 US farmers of what they would do with an additional $ 10,000. The response suggests that farmers generally appear to have preferences for on-farm activities. The authors also found farmers with smaller operations who are expected to face liquidity constraints, to be more likely to allocate these funds for farm uses.

*Expectations about future policy changes*

In the real world, time matters as do economic agents' expectations about the future. Typically the expectations are formed based on past experience of economic agents. These expectations do affect production and investment decisions. This was first demonstrated in the 1920s by Hanau (1928), as well as Haas and Ezekiel (1926) who each did a quantitative econometric analysis of what has become known as the hog cycle. In a world in which government actions matter, rationally behaving economic agents also hold expectations about future policies and adapt to expected changes in these policies. This is the theoretical foundation of what has become known as the Lucas Critique (Lucas, 1976) and the principle of time consistency in economic policy (Prescott and Kydland, 1977).

In both the United States and the European Union the decoupled payments have been based on past production decisions. In the United States the base acreage for agricultural subsidies had been adjusted several times based on past production decisions. This has led to the expectation by farmers both in the United States and in the European Union that this will be the case in the future as well (OECD, 2001; 2005; Goodwin and Mishra, 2005; 2006; Revell and Oglethorpe, 2003). Westcott and Young (2004) argue that the US emergency assistance package was enacted six times in the 1998 to 2001 period and that farmers now expect this to happen any time production or producer prices are low.

*Farm labor input*

The effect of income support on production is also a function of labor input for farm and off-farm production as well as leisure (e. g Burfisher and Hopkins, 2003). Ahearn et al. (2004) analyze the impact of direct payments on farm operators' decision to work off the farm. They report that direct payments reduce the probability of working off the farm significantly. However, the effect is considered to be fairly small.

## 2.4 Production Effects of Decoupled Payments under the CAP

In the European Union, a system of decoupled payments to farmers was decided upon in 2003. Some EU member states started almost immediately to introduce the system; others implemented the policy change with some delay or continue to make significant amounts of coupled payments. Therefore, the time span for econometric time series' analyses of the production effects of the European Union's Single Farm Payments has been too short.

The analyses of the production effects of decoupled payments in the European Union which have been published so far rely on theoretical analyses, on simulation analyses, on surveys of farmers' production and investment intentions, or on other evidence. The results of our review of the literature on the production effects of decoupled payments to farmers in the European Union are presented below. The key finding is that decoupled payments are not production neutral, as suggested by the simple standard textbook model of neoclassical economics. Rather they act to stimulate production and investment in agriculture compared to a situation with no subsidies. However, given the limited data base for empirical analyses it is not all too surprising that the results with regard to the magnitude of the production effects vary considerably.

*Balkhausen and Balkhausen et al.*

Balkhausen (2007) and Balkhausen et al. (2007) survey how decoupled payments are implemented in simulation models of the EU's Single Farm Payments. Their study suggests that the simulation models do not explicitly account for the production effects of direct payments discussed in section 4 of this paper. Rather the models heuristically introduce what the authors refer to as a 'decoupling factor'. This coefficient may assume values between zero and one. A decoupling factor of one implies that the direct payments have the same production effect as traditional price supports of equal magnitude while a factor of zero implies no production effects of decoupled payments.

The results of the production effects of the Single Farm Payments in the simulation studies vary according to the magnitude of the decoupling factor (Balkhausen et al., 2007). A model implemented at the Pennsylvania State University applies a decoupling factor of 0.5. The FAPRI model which is used by Iowa State and Missouri State Universities uses a decoupling factor of 0.15 while the widely used GTAP model implements the direct payments as a subsidy to agricultural land which implies a positive production effect.

*Rude*

Rude (2007) also performs a comparative analysis of a variety of models which aim at quantifying the production effects of the Single Farm Payments. He compares the production under the old CAP regime with the production under the system of decoupled payments. The results of this comparison are listed in table 1.

**Table 1: Changes in EU production resulting from the introduction of decoupled payments (percent)**

| Model | Grains | Oilseeds | Beef | Dairy |
|---|---|---|---|---|
| OECD PEM | -0.7 to -0.3 | -0.7 | – | – |
| OECD Aglink | -0.5 to -0.1 | -0.4 | -0.6 | -6.2 to 1.2 |
| Gohin and Latruffe | -9.1 to -8.7 | -6.4 | -4.2 | -10.0 to 4.4 |
| ESIM | -2.7 | -2.9 | -2.7 | -6.6 to 1.7 |
| FAPRI | -0.6 to -0.4 | -0.6 to -0.2 | -2.6 to -0.2 | – |

Source: Based on Rude (2007).

As becomes obvious, production declines only by a small percentage as a consequence of switching from traditional agricultural subsidies to decoupled payments. In dairy, production may actually even increase. Only the 'Gohin and Latruffe' model shows some more pronounced reductions in production.

*Acs et al.*

Acs et al. (2008) analyze the effect of a variety of policy scenarios in marginal agricultural regions of the United Kingdom. One of them is the decoupling of farm payments. Their study is based on a linear programming model. The results suggest that even in marginal areas there is only limited idling of agricultural land after a switch of the policy scheme indicating a persistence of the production effect of the CAP.

*Gelan and Schwarz*

Gelan and Schwarz (2008) do a simulation analysis of the impact of the Single Farm Payment on Less Favoured Areas in Scotland. The study is based on a computable general equilibrium model with the assumptions of the simple textbook model of neoclassical economics; i.e. they assume away the production effect of the direct payments. This study may be considered as a benchmark for the maximum production decline of the decoupled payments. Based on this analysis, grain production should decline by 21 percent as a consequence of the introduction of decoupled payments to farmers. For beef the decline is estimated to be almost 39 percent and in sheep about 47 percent.

*Breen et al.; Hennessy and Thorne*

Breen et al. (2005) and Hennessey and Thorne (2005; 2006) provide a quantitative analysis of the decoupled payments on production decisions in Irish agriculture. This is of particular interest also because Ireland had essentially decoupled the direct payments from the beginning. The analysis is based on the Ireland section of FAPRI's EU model. This model is characterized by a set of market models which are interlinked and which have been estimated econometrically (Binfield and Hennessy, 2001).

The response of farmers is modeled using a linear programming model and data from the Irish Farm Accountancy Data Network. The prices for this modeling effort are taken from the FAPRI model. The results suggest that in grains "… decoupling is not expected to result in a significant change in aggregate production …" (Breen et al, 2005). Moreover, the results suggest that about 10 percent of cattle farmers and 3-6 percent of grain producers will quit production on the land they farm.

The study by Breen et al. (2005) is supplemented by the results of a survey of a sample of 1,030 Irish farmers which was conducted in late 2003. More than two thirds of farmers in the sample considered themselves to be 'very familiar' or 'familiar' with the concept of decoupling. About half the cattle farmers did not intend to change production as a result of decoupling while 10 percent intended to increase and 33 percent to reduce production. 70 percent of crop farmers intended to leave production unchanged while 10 percent were planning to increase and 20 percent to reduce grain acreage.

Breen et al. (2005) conclude that "… the possible benefits of decoupled payments for tillage farms may not occur as projected previously, using farm level models based solely on the axiom of profit maximization, due to their unwillingness to switch farming systems."

*Roche and McQuinn*

Roche and McQuinn (2003; 2004) do an ex ante analysis of the allocation of agricultural land in Irish and in British grain farms under alternative policy scenarios. One of them is the present CAP with decoupled payments. Their study is based on a portfolio theory approach. This permits them to explicitly address the production effect of risk reduction resulting from the decoupled payments. The result is that farmers are likely to engage in production activities which are riskier than those in which they engaged in the absence of the direct payments. Roche and Quinn (2004) "… also show that under the new CAP it will be optimal for British and Irish grain producers to allocate more of their non-idle land to riskier wheat production than has historically been the case."

*Brümmer and Koester*

More than 30 years ago, two German economists published a study (Koester and Tangermann, 1976) which was commissioned by the German government. In this study, they developed a proposal for a fundamental reform of the CAP. Essentially, they proposed a system of decoupled payments in line with what the EU member states eventually agreed upon in 2003. Their proposal was based on the simple textbook model of neoclassical economics discussed in section 2 of this paper.

In a recent paper by Brümmer and Koester (2006), the authors stress the production effect of decoupled payments. They argue that the entitlements for direct payments are related to the acreage and have been capitalized in the price of agricultural land. In essence, they are seen to have the same economic effects as a subsidy on land input. A key reason for this is that the number of entitlements for decoupled payments tends to exceed the eligible agricultural acreage and, therefore, that there is no acreage without the entitlement for the direct payments.

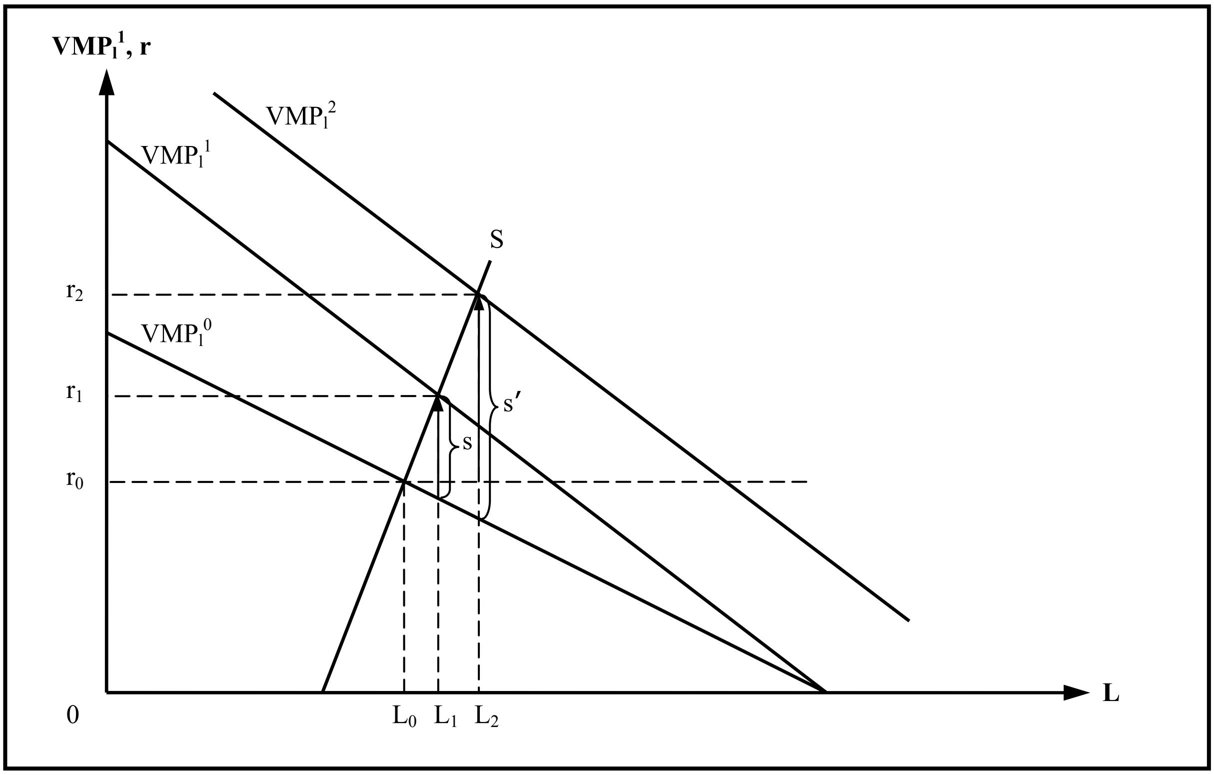
*Ciaian et al.*

Ciaian et al. (2008) analyze the static and the dynamic distributive effects of the decoupled payments in the European Union. Their analysis is theoretical in character. They argue that in the simple neoclassical model described and analyzed in section 2 of this paper, there cannot be production effects of decoupled payments. However, as the entitlements for direct payments tend to exceed the eligible acreage, their effect is analogous to a subsidy on agricultural land. Thus, the direct payments are capitalized into the price of agricultural land and have a positive effect on production.

*Von Witzke et al.*

Von Witzke et al. (2007) make use of an approach which is complementary to the approach used by Ciaian et al. (2008) in that the authors show theoretically and empirically how decoupled payments may get capitalized into the price of agricultural land in Germany and the United States. The results of their empirical analysis suggest that the decoupled direct payments under the CAP actually do get capitalized into the price of rental land in Germany because the Single Farm Payments represent subsidies to agricultural land and, thus, they stimulate production. This is depicted in figure 6 (von Witzke et al., 2007).

**Figure 6: The land rental price effect of agricultural producer price support plus direct payments.**




Source: Adopted from Lippert (2001).

VMP$_1^0$ represents the value marginal product of agricultural land in the absence of subsidies. It represents the demand function for agricultural land. The supply function of land is denoted by S. The equilibrium market price is at $r_0$.

Traditional price supports, which are still provided in sugar and dairy, shift the value marginal cost curve to VMP$_1^1$. As a result, the price of land increases to $r_1$. The decoupled payments are a subsidy to agricultural land and cause the value marginal product function to shift to VMP$_1^2$. This acts to increase the price of land further to $r_2$. The horizontal difference between the intersection of S and VMP$_1^2$ (which is at $L_2$) and VMP$_1^0$ represents the total subsidy. In many parts of Germany the rental price of land would be close to zero in the absence of agricultural subsidies ($r_0$).

## 2.5 Conclusion

In this section of the paper we have reviewed the literature on the production effects of the system of decoupled direct payments to EU farmers which was agreed upon under the CAP reform of 2003 and introduced in EU member states beginning in 2004. These subsidies are also referred to as Single Farm Payments. The payments are made regardless of the extent of agricultural production.

Proponents of these subsidies argue that only market prices of agricultural commodities and cost of production, however, not the direct payments, have an impact on production. That is, the production under this system of direct payments is identical to production without these subsidies. This view is supported by a rather simplistic model of neoclassical economics.

The findings in this section suggest that the Single Farm Payments under the new CAP actually do have significant production effects. Thus, they do qualify for the WTO Amber Box of domestic support. The production stimulating effect of the direct payments is the result of a variety of sources. The key arguments can be summarized as follows:

(i) Not all direct payments are decoupled from production. A significant portion of payments actually remains linked to production.

(ii) The direct payments provide a steady stream of cash to producers. Thus they reduce risk and stimulate production in the presence of risk aversion.

(iii) The direct payments increase the wealth of the recipients. Therefore, they can engage in riskier production activities which result in increased production.

(iv) The direct payments are based on past production. This acts to generate the expectation on the side of the recipients that future changes in agricultural policies may also be based on past production. Therefore, farmers maintain production at a higher level than without these subsidies.

In the literature there is consensus on the theoretical foundation of the positive production effects of decoupled payments to agricultural producers as listed under (i) to (iv). The assessments of the magnitude of the production effect vary, as there have not been time series data available which would permit an econometric analysis. However, what is much more important is that the EU's Single Farm Payment system is generally considered to be a subsidy paid to agricultural land. The production effects of such a subsidy could be but have not yet been analyzed quantitatively.

Clearly, a subsidy paid to agricultural land generates an incentive for increased input of land and other production factors. Increasing factor input, in turn, acts to increase production. This acts to reduce world prices, has an impact on international trade flows and may inflict economic injury on third countries. The system of Single Farm Payments under the European Union's Common Agricultural Policy, therefore, represents a measure of domestic support which qualifies for the WTO's Amber Box. In essence, the decoupled payments have replaced a system of subsidies on production by subsidies paid on agricultural land.

# 3. Dumping under WTO Rules of the CAP's System of Decoupled Payments

In economics, selling below cost is usually considered dumping. Under WTO rules, dumping occurs when a good is sold in an export market at a lower price than in the home market, or when a good is sold in a foreign market below cost.

According to WTO rules (WTO, 2009), dumping may be determined by comparing the appropriate price in the exporting country (also referred to as the "normal value") and the appropriate price in the importing country (also referred to as the "export price") in an ordinary course of trade. "One of the bases on which countries may determine that sales are not made in the ordinary course of trade is if sales in the domestic market of the exporter are made below cost" (WTO, 2009). Those sales must be made for an extended period of time which usually is at least a year. In addition, the sales must occur in substantial quantities which are at least 20 per cent of the volume of sales in foreign markets.

In this section we will calculate what is referred to as the "constructed normal value", based on the cost of production, plus selling, general and administrative expenses and profits. This implies the calculation of total cost, including opportunity cost where appropriate.

We will then compare the cost of production with the price at which the EU sells selected agricultural commodities in foreign markets, i. e. the world market prices. This permits one to assess the extent of dumping. We will show that dumping by the European Union under the Common Agricultural Policy has occurred, that the time period of dumping has been long and that dumping continues to occur in substantial quantities.

## 3.1 Methodology and Data

The approach used to calculate the costs and returns of agricultural production in this paper is consistent with the WTO concept of the "constructed normal value" and the "export price". The methodology of our analysis was developed by Eidman et al. (2000). It permits the crop specific calculation of total variable and fixed costs of production, including the opportunity costs which often also are referred to as indirect costs. This methodology is also used by USDA in its calculations of costs and returns of US agricultural production (e. g. McBride and Green, 2007; USDA, 2009c). It is consistent with AAEA standards (USDA, 2009). Commodities considered in this analysis include wheat, corn, rapeseed, sugar beets and dairy. The main data sources are the Federal Ministry of Food, Agriculture and Consumer Protection (BMELV, 2009a) and the German Kuratorium für Technik und Bauwesen in der Landwirtschaft (KTBL, 2009). Details on the data sources and calculations of the cost components are provided in Appendices A.1 and A.2. The clustering of the cost components is exhibited in Table 2.

**Table 2: Clustering of costs and returns for standardized calculations**

| Plant production activities (wheat, corn, rapeseed, sugar beet) | Animal production (dairy) |
|---|---|
| Operating (variable) costs | Operating (variable) costs |
| Seed | Breeding material |
| Certified seed | Heifers |
| Non-certified seed | Insemination |
| Fertilizers | Veterinary and medicine |
| Lime | Veterinarian and medicine |
| N-fertilizer | Other veterinary |
| PK-fertilizer | --- |
| Chemicals | Feed |
| Fungicides | Feed from arable land/grand culture |
| Herbicides | Feed from grassland |
| Pesticides | Other feed |
| Other chemicals | Water |
| Other operational (variable) costs | Other operational (variable) costs |
| Fuel, lube and electricity | Bedding and litter |
| Other variable machinery costs | Variable machinery costs |
| Purchased services | Purchased services |
| Interest on operating inputs | Interest on operating inputs |
| Allocated overhead and fixed costs | Allocated overhead and fixed costs |
| Hired labor and opportunity costs of family labor | Hired labor and opportunity costs of family labor |
| Capital recovery machinery/equipment | Capital recovery machinery/equipment |
| Land rental/opportunity costs of land | Land rental/opportunity costs of land |
| Insurances | Insurances |
| Other (general) farm overheads | Other (general) farm overheads |
| Returns (gross value of production) | Returns (gross value of production) |
| Primary product | Primary product |
| Secondary product | Secondary product |

Source: Adopted from USDA (2009c).

## 3.2 The Extent of Dumping

Tables 3 and 4 exhibit the revenues per hectare in per cent of costs per hectare for a “small” and for a “large” German farm. Details on the cost and return calculations including the world market prices are listed in Appendix A.3. For historic reasons farms in the East of Germany tend to be large while the West of the country is characterized by smaller family farms. The results for the small German farm, therefore, should be characteristic for farms in West Germany while the results for the large farm represent the East of the country. The calculations have been done for 2008 – a year with historically high commodity prices – and for the 2004-2008 average commodity prices.

As discussed above, the price of agricultural land is a function of the direct payments. Von Witzke et al. (2007) have shown that the rental value of agricultural land would be close to zero in the absence of the direct payments. Therefore, the costs of production were calculated with and without the price of land.

As can be seen, revenues for all commodities and all years considered are below the full costs of production for small farms and large farms alike and whether the present land rental value was included as cost component or not. The only exception is rapeseed production in large farms in 2008 when prices were very high by historic standards, and only when the rental value of land is assumed to be zero. That implies that the Common Agricultural Policy has enabled and continues to enable farmers to sell below cost. This is most pronounced in sugar, dairy and corn.

According to WTO rules, dumping can only occur when a good is exported. Therefore, dumping can be established for the EU on the markets of wheat, rapeseed, sugar and dairy. In sugar and dairy the reform process is underway but not complete and some of the traditional price support measures remain in place. This is particularly true in the dairy market. In wheat and rapeseed the central instrument is decoupled payments.

The extent of exports of selected commodities is listed in table 5. As can be seen, the EU has been a major exporter of wheat, rapeseed, sugar and dairy. In sugar, the net export quantity was negative for the first time in 2008. This is a consequence of the reform of the sugar policy and the increasing use of sugar beets in bio-energy production. Although not in technical violation of WTO rules in corn and in 2008 in sugar, the EU subsidies do cause economic injury to exporting countries on these markets also, as the production increase resulting from these subsidies acts to reduce both EU imports and world market prices. Please note that the European Union is a significant exporter of rape seed. However, rape is an oilseed and in oilseeds the EU is a large importer.

**Table 3: Commodity returns in per cent of costs for a small German farm and selected commodities**

| Wheat | | At prices of years | |
|---|---|---|---|
| | | 2008 | Average 2004-2008 |
| Total costs | With land rental costs | 77 | 74 |
| | Without land rental costs | 87 | 84 |

| Corn | | At prices of years | |
|---|---|---|---|
| | | 2008 | Average 2004-2008 |
| Total costs | With land rental costs | 62 | 52 |
| | Without land rental costs | 68 | 58 |

| Rapeseed | | At prices of years | |
|---|---|---|---|
| | | 2008 | Average 2004-2008 |
| Total costs | With land rental costs | 80 | 69 |
| | Without land rental costs | 94 | 81 |

| Sugar beets | | At prices of years | |
|---|---|---|---|
| | | 2008 | Average 2004-2008 |
| Total costs | With land rental costs | 40 | 35 |
| | Without land rental costs | 48 | 42 |

| Dairy | | At prices of years | |
|---|---|---|---|
| | | 2008 | Average 2004-2008 |
| Total costs | With land rental costs | 48 | 49 |
| | Without land rental costs | 51 | 52 |

Source: Own calculations.

**Table 4: Commodity returns in per cent of costs in a large German farm**

| Wheat | | At prices of years | |
|---|---|---|---|
| | | **2008** | **Average 2004-2008** |
| Total costs | With land rental costs | 84 | 81 |
| | Without land rental costs | 94 | 90 |

| Corn | | At prices of years | |
|---|---|---|---|
| | | **2008** | **Average 2004-2008** |
| Total costs | With land rental costs | 67 | 57 |
| | Without land rental costs | 73 | 62 |

| Rapeseed | | At prices of years | |
|---|---|---|---|
| | | **2008** | **Average 2004-2008** |
| Total costs | With land rental costs | 97 | 84 |
| | Without land rental costs | 109 | 94 |

| Sugar beets | | At prices of years | |
|---|---|---|---|
| | | **2008** | **Average 2004-2008** |
| Total costs | With land rental costs | 53 | 47 |
| | Without land rental costs | 59 | 52 |

| Dairy | | At prices of years | |
|---|---|---|---|
| | | **2008** | **Average 2004-2008** |
| Total costs | With land rental costs | 54 | 56 |
| | Without land rental costs | 57 | 59 |

Source: Own computations.

**Table 5: EU Exports by selected agricultural commodities (million mt and (in dairy) 1000 mt)**

| Commodity | 2004/05 | 2005/06 | 2006/07 | 2007/08 | 2008/09 |
|---|---|---|---|---|---|
| **Wheat** | | | | | |
| World | 110.4 | 115.4 | 108.0 | 114.8 | 123.2 |
| EU | 14.7 | 15.7 | 13.5 | 12.2 | 18.0 |
| EU in p.c. of ttl. | 13.3 | 13.6 | 12.5 | 10.6 | 14.6 |
| **Rapeseed** | | | | | |
| World | 4.9 | 7.0 | 6.8 | 8.4 | 9.8 |
| EU | 0.2 | 0.3 | 0.1 | 0.4 | 0.4 |
| EU in p.c. of ttl. | 4.1 | 4.2 | 1.5 | 4.8 | 4.1 |
| **Corn** | | | | | |
| World | 77.6 | 80.9 | 90.1 | 97.3 | 88.8 |
| EU | -1.8 | -2.2 | -5.1 | -4.0 | -13.0 |
| EU in p.c. of ttl. | -2.3 | -2.7 | -5.7 | -4.1 | -14.6 |
| **Sugar** | | | | | |
| World | 46.9 | 46.7 | 49.2 | 47.3 | 50.2 |
| EU | 5.5 | 6.7 | 1.5 | -3.7 | -4.9 |
| EU in p.c. of ttl. | 11.7 | 14.3 | 3.0 | – | – |
| **Dairy:** Butter | | | | | |
| World | 866 | 866 | 820 | 790 | 707 |
| EU | 352 | 302 | 242 | 185 | 147 |
| EU in p.c. of ttl. | 40.6 | 34.8 | 29.5 | 23.4 | 20.8 |
| **Dairy**: Skimmed milk powder | | | | | |
| World | 1 074 | 1 175 | 1 145 | 1 181 | 1 072 |
| EU | 239 | 142 | 149 | 191 | 172 |
| EU in p.c. of ttl. | 22.2 | 12.0 | 13.0 | 16.2 | 16.0 |
| **Dairy**: Whole milk powder | | | | | |
| World | 1 821 | 1 822 | 1 748 | 1 781 | 1 862 |
| EU | 505 | 465 | 402 | 425 | 475 |
| EU in p.c. of ttl. | 27.8 | 25.5 | 23.0 | 23.9 | 25.5 |

Source: Toepfer International (2008a, b), FO Licht (2008), International Sugar Organization (2008), European Commission (2008).WTO, OECD FAOSTAT, USDA/FAS.

# 4. Economic Injury to Third Countries under the CAP's System of Decoupled Payments

## 4.1 The Model and Simulation Scenarios

The subsequent chapters provide a quantitative analysis of the economic implications of CAP subsidies in the EU in third countries, using the Australian wheat market, and the corn and oilseed markets in Brazil as case studies. The economic analysis focuses on changes in world market prices, producer surplus and the balance of trade on those markets. A partial equilibrium model has been used for this quantitative analysis.

Partial equilibrium models are widely used in the analysis of agricultural markets. They are particularly suitable for the simulation of alternative scenarios (Sadoulet and de Janvry, 1995; Saunders and Wreford, 2005). The comparative advantage of the multi-market partial equilibrium model used in this analysis is that it can quantify in a rather detailed way changes in supply, demand and prices as well as in trade flows between the model regions (Francois and Reinert, 1997).

The model is an agricultural multi-region, multi-market trade model developed to quantify the price, supply, demand and net trade effects of various policy and non-policy induced shocks. It is based upon the principles of the VORSIM modelling framework and its predecessor the Static World Policy Simulation Modelling Framework (Roningen 19986; Roningen et al. 1991) developed by Jechlitschka et al. (2007).

The model explicitly considers wheat, corn, other grains, oilseeds and sugar markets in the EU, Brazil, Australia and a residual rest of the world region. In this model each market in each region is characterized by a Cobb-Douglas supply and demand functions. On the demand side, food and feed demand are represented by separate demand functions. Bioenergy is exogenous to the model. Each market is linked with other markets through a set of cross-price elasticities. The model is comparative static in character and assumes that domestically produced and foreign goods are perfect substitutes in consumption. International trade is the difference between domestic supply and demand in each region. The model is closed by the assumption of market equilibrium; i. e., trade flows are such that world supply equals world demand and that total global exports equal total global imports.

The model is calibrated for the period 2004 – 2008, as are the calculations of the cost of production in section 3. Costs of production are calculated for different scenarios based on data from Germany. The production price and trade effects for the European Union are quantified by using the lowest and the highest cost of production scenarios to reflect the European Union at large. The selection of an average across five years as a base period avoids that extreme events in one year (e.g. extreme price peaks) affect the results of the analysis.

The impacts of the discontinuation of the direct payments on the EU cost of production are accounted for by a multiplicative shift factors in the supply functions, an approach commonly used in partial equilibrium models (see, e.g., Kazlauskiene and Meyers 1993, 2003; Cagatay et al. 2003). A subsidy acts to shift the supply function downward, as it acts to reduce the marginal cost of production. By analogy, the discontinuation of a subsidy results in an upward shift of the supply function. Supply shift factors are implemented in the supply function as follows:

(1) $$qs_{l,g}(p_{l,g}) = a_{l,g} * ps_{l,g} \wedge \eta_{lg} * \prod_{m=1}^{w} ps_{m,g} \wedge \eta_{lmg} * e_{l,g}$$

where

| | |
|---|---|
| l | = commodity l |
| m, …, w | = competing goods (cross commodities) |
| g | = model region g |
| $qs_{l,g}$ | = supply quantity of commodity l in region g |
| $a_{l,g}$ | = constant parameter (calibration factor) |
| $ps_{l,g}$ | = supply price for commodity l in region g |
| $\eta_{lg}$ | = own price elasticity of commodity l in region g |
| $\prod_{m=1}^{w} ps_{m,g}$ | = cross prices for commodities m, …, w in region g |
| $\eta_{lmg}$ | = cross price elasticity for commodities m, …, w in region g |
| $e_{l,g}$ | = supply shift factor. |

A more detailed description of an earlier version of the model and its specifications can be found in von Witzke et al. (2008).

Two scenarios are analysed for each of the three case study markets, namely wheat (Australia), corn and oilseeds (Brazil). In order to capture a realistic range of the production cost increases for each commodity in the European Union, the scenario with the highest and lowest cost increase respectively have been selected for the quantitative analysis of economic injuries on the case study markets in Australia and Brazil. The scenarios with the highest increase in production costs represent small farms including land rental costs (scenarios 1a – 1c) and the smallest increase in production costs represents the situation of large farms in the EU without land rental costs (scenarios 2a – 2c).

The supply shift factors represent the altered ratio of world market prices and production cost. A shift factor smaller than 1 implies that the production cost have increased in comparison to the base scenario leading to a reduction in the quantity supplied for any given world market price. For example, scenario 1 assumes a 10% increase in production costs for large farms on the EU wheat market without land rental cost. Hence, a shift factor of 0.9 is used. Table 6 summarises the shift factors for the EU wheat, corn and oilseeds market.

**Table 6: Shift factors for the case study markets**

| Region and market | | Scenarios | |
|---|---|---|---|
| | | **Scenario 1: Small farm structure – with land rental cost** | **Scenario 2: Large farm structure – without land rental cost** |
| | | Scenario 1a | Scenario 2a |
| EU | Wheat | 0.74 | 0.90 |
| | | Scenario 1b | Scenario 2b |
| EU | Corn | 0.52 | 0.62 |
| | | Scenario 1c | Scenario 2c |
| EU | Oilseeds | 0.69 | 0.94 |

Source: Own calculations

## 4.2 The Extent of Injury in Selected Third Countries

*Australian wheat market*

In scenarios 1a and 2a, only the increases in production cost on the EU wheat market are analyzed. Tables 7 and 8 summarize the impacts of a discontinuation of direct payments under the CAP on world market prices (WMP), producer surplus (PS) and net trade (NT) of Australia.

**Table 7: Impacts of a discontinuation of decoupled CAP payments on producers and trade balance in Australia – scenario 1a**

| Variable | Unit | Base scenario | Scenario 1a: Small farm structure - with land rental cost | Scenario 1: Change in percent |
|---|---|---|---|---|
| WMP | USD/t | 158 | 174 | 10.15 |
| PS | million USD | 1 822 | 2 122 | 16.49 |
| NT (volume) | kt | 11 930 | 13 119 | 9.97 |
| NT (value) | million USD | 1 885 | 2283 | 21.12 |

Source: Own calculations

The reduction in wheat exports from the EU caused by a discontinuation of decoupled CAP subsidies results in an increase in the world market price by about 10 percent. This together with the increased demand for Australian wheat exports results in significant gains for wheat producers there. The producer surplus gain exceeds 16 percent. The trade balance improves by 21 percent or 398 million USD.

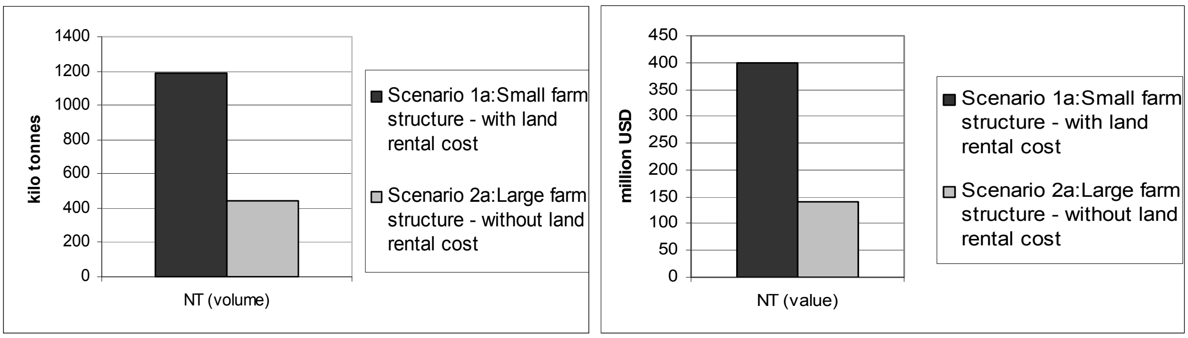
**Table 8: Impacts of the discontinuation of CAP direct payments on producers and trade balance on the Australian wheat market – scenario 2a**

| Variable | Unit | Base scenario | Scenario 2a: Large farm structure - without land rental cost | Change in percent |
|---|---|---|---|---|
| WMP | USD/t | 158 | 164 | 3.69 |
| PS | million USD | 1 822 | 1 929 | 5.89 |
| NT (volume) | kt | 11 930 | 12 369 | 3.68 |
| NT (value) | million USD | 1 885 | 2 026 | 7.51 |

Source: Own calculations

The supply shift in scenario 2a is smaller than in scenario 1a. Consequently the increases in world market price, producer and consumer surplus are less pronounced. However, even in this case, the relative smaller increase in production cost (assuming large farm structure and rental costs of land without subsidies close to zero), results in economic benefits for Australian wheat producers of 107 million USD (5.89 percent) and an increase in the trade balance of 141 million USD (7.51 percent). Figures 7a and 7b illustrate trade effects for Australia in wheat.

**Figures 7a and 7b: Changes in net trade volume and value (Australia, wheat, scenarios 1a and 2a)**




Source: Own calculations

*Brazilian corn market*

In scenarios 1b and 2b, only the effects of an increase in EU production cost are analyzed. Tables 9 and 10 summarize the impacts of a discontinuation of CAP subsidies on the EU market, world market prices (WMP), producer surplus (PS) and net trade (NT) of Brazil in corn.

**Table 9: Impacts of a discontinuation of CAP decoupled payments on producers and trade balance on the Brazilian corn market – scenario 1b**

| Variable | Unit | Base scenario | Scenario 1b: Small farm structure – with land rental cost | Change in percent |
|---|---|---|---|---|
| WMP | USD/t | 106 | 111 | 4.72 |
| PS | million USD | 3 361 | 3 591 | 6.84 |
| NT (volume) | kt | -697 | 963 | 138.16 |
| NT (value) | million USD | -74 | 107 | 144.59 |

Source: Own calculations

Not surprisingly, Brazilian corn producers also benefit from a higher world market price and increased demand abroad. The relatively small impact on the world market price of the rather large shift factor in EU corn supply can be explained by the small EU share in total world corn production and exports. Nevertheless, producer surplus of Brazilian corn farmers increases by nearly 7 percent and the net trade position changes from net imports to net exports. The trade balance improves by 181 million USD in scenario 1b.

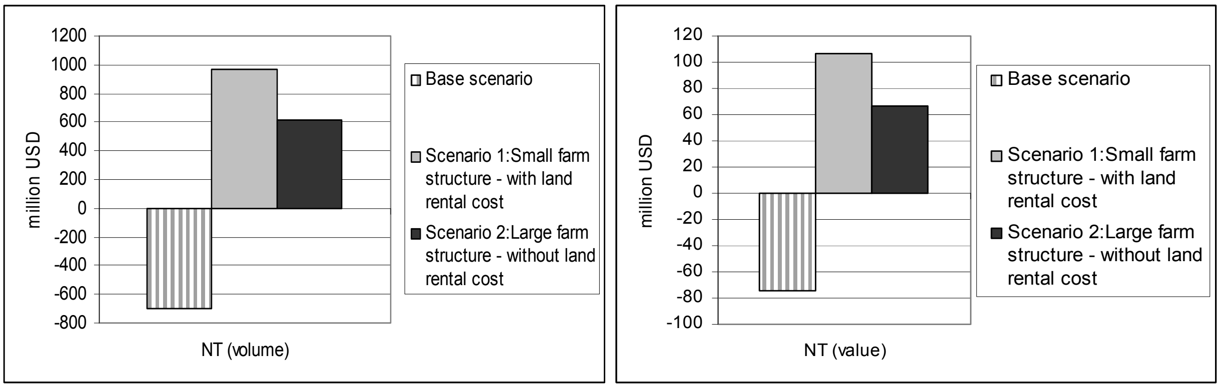
**Table 10: Impacts of a discontinuation of CAP direct payments on producers and trade balance on the Brazilian corn market – scenario 2b**

| Variable | Unit | Base scenario | Scenario 2b: Large farm structure – without land rental cost | Change in percent |
|---|---|---|---|---|
| WMP | USD/t | 106 | 110 | 3.77 |
| PS | million USD | 3 361 | 3 541 | 5.35 |
| NT (volume) | kt | -697 | 610 | 87.52 |
| NT (value) | million USD | -74 | 67 | 90.54 |

Source: Own calculations

Even under the most conservative assumptions a discontinuation of the EU's Single Farm Payment scheme leads to an increase in producer surplus by 180 million USD and a trade surplus of 141 million USD (table 9). However, the fairly small differences in the increase in the production cost of EU corn under the different scenarios result in a smaller range of changes on the Brazilian corn market. This is also illustrated in figures 8a and 8b, which highlight the impacts of scenarios 1b and 2b on the net trade situation and the trade balance.

**Figures 8a and 8b: Changes in net trade volume and value (Brazil, corn, scenarios 1b and 2b)**




Source: Own calculations

*Brazilian oilseed market*

In scenarios 1c and 2c the increase in production cost on the EU oilseeds market is analyzed. Tables 11 and 12 summarizes the impacts of the abolishment of CAP direct payments on the EU market on the world market prices (WMP), producers surplus (PS) and net trade (NT) of oilseeds in Brazil.

**Table 11: Impacts of a discontinuation of CAP decoupled payments on producers and trade balance on the Brazilian oilseeds market – scenario 1c**

| Variable | Unit | Base scenario | Scenario 1c: Small farm structure – with land rental cost | Change in percent |
|---|---|---|---|---|
| WMP | USD/t | 288 | 296 | 2.80 |
| PS | million USD | 10 308 | 10 747 | 4.26 |
| NT (volume) | kt | 22 656 | 23 713 | 4.67 |
| NT (value) | million USD | 6 525 | 7 020 | 7.59 |

Source: Own calculations

The impact of the reduction in EU oilseed supply on the world market price is fairly small due to the small EU share of world oilseeds production and exports. The small price change also leads to a small relative change of producer surplus on the Brazilian oilseed market. But since oilseeds are one of the key sectors in Brazilian agriculture, the increase in producer surplus in absolute terms is fairly large. A small increase in demand for Brazilian oilseed exports results in an increase in net exports of nearly 5 percent. The trade balance improves by 495 million USD.

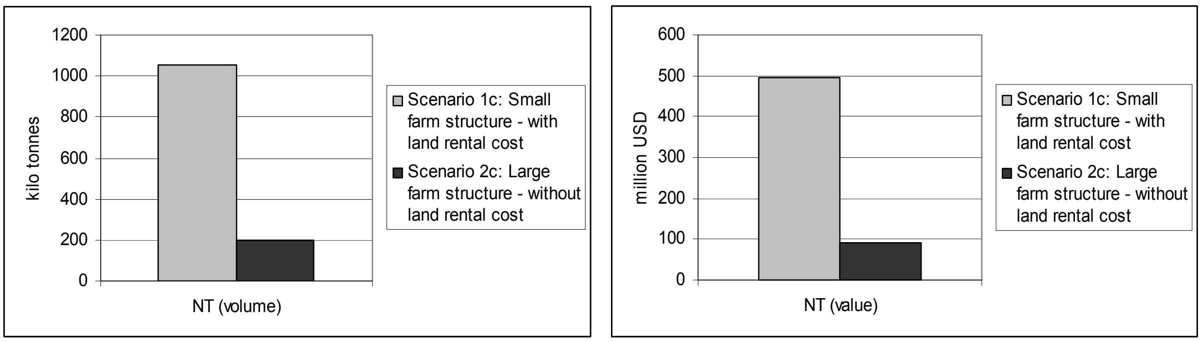
**Table 12: Impacts of a discontinuation of CAP subsidies on producers and trade balance on the Brazilian oilseeds market – scenario 2c**

| Variable | Unit | Base scenario | Scenario 2c: Large farm structure – without land rental cost | Change in percent |
|---|---|---|---|---|
| WMP | USD/t | 288 | 290 | 0.53 |
| PS | million USD | 10 308 | 10 390 | 0.79 |
| NT (volume) | kt | 22 656 | 22 857 | 0.89 |
| NT (value) | million USD | 6 525 | 6 617 | 1.42 |

Source: Own calculations

Since production cost for EU oilseeds in scenario 2c only increase by 6 percent, the positive impacts on the Brazilian oilseeds market are small. Producer surplus only rises by 82 million USD and the trade balance by 92 million USD. The absolute changes in net trade (both volume and value) in both scenarios are compared in figures 9a and 9b.

**Figures 9a and 9b: Changes in net trade volume and value (Brazil, oilseeds, scenarios 1c and 2c)**




Source: Own calculations

# 5. Conclusion

Overall, the three case studies confirm that an abolishment of the CAP subsidy system in the EU would have positive impacts on agricultural producer prices and trade in third countries. The results highlight the extent of the economic injury to selected markets in third countries caused by the CAP. The abolishment of the CAP subsidy system would improve producer surplus for Australian wheat producers between 300 and 107 million USD, for Brazilian corn producers between 230 and 180 million USD and for Brazilian oilseeds producers between 439 and 82 million USD. Similarly, without the CAP subsidy system substantial gains in the trade balance could be realized in the three case study markets. The trade balance for Australian wheat, Brazilian corn and oilseeds would rise between 398 and 141 million USD, 181 and 141 million USD and 495 and 92 million USD, respectively.

In sum, it can be concluded that the subsidies paid under the present system of the European Union's Common Agricultural Policy violates WTO trade regulations on markets in which the European Union is an exporter. The Single Farm Payments are a subsidy of agricultural land input and result in a production stimulating effect. The European Union on some markets is an exporter of substantial quantities and over extended periods of time. As the EU sells its production abroad below cost, these exports establish dumping. The economic injury to other exporting countries is significant as evidenced by three case studies. These include wheat in Australia, and corn and oilseeds in Brazil. However, the EU is a major exporter only in wheat. Hence, it can be established that the European Unions direct payments to farmers result in a violation of WTO trade rules in wheat.

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# Appendix

## Appendix A: Calculating commodity costs and returns in German agriculture: Methodology and data

### A.1 Data sources

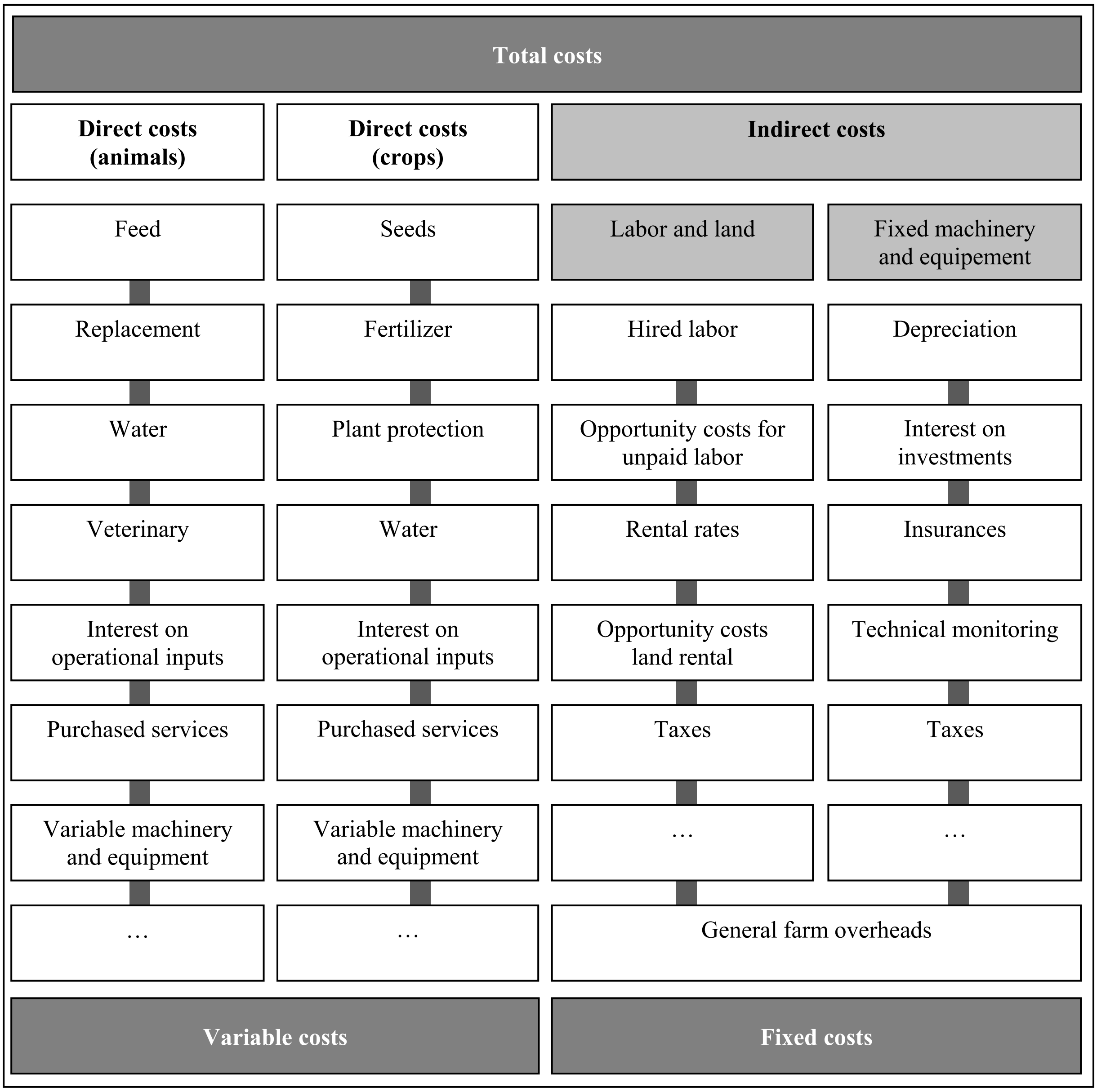
Main data sources are the Federal Ministry of Food Agriculture and Consumer Protection (BMELV, 2009a) and the German Kuratorium für Technik und Bauwesen in der Landwirtschaft (KTBL, 2009). The BMELV data set is part of the standardized EU Farm Accountancy Data Network (FADN). The FADN data set is based on annual surveys of agricultural holdings in the European Union (EC, 2009). It provides representative data by region, economic size and type of farming. The data set is considered to be a reliable source for cost and return calculations in European agriculture, including the German farm economy (EC, 2009).

When combined with KTBL data on inputs and related cost information on farming processes such as liming, plowing, mulching, harvesting, feeding, breeding, milking etc., the BMELV data permit a detailed calculation of crop specific cost components. The cost structure of the KTBL data set is summarized in Figure A.1.

In the calculations of the production costs the following principles have been applied:

- Calculations were done for Germany and 2008.
- Available cost data for specific production activities were obtained from KTBL (2009) whenever possible.
- Input prices in KTBL (2009) are as of January 1, 2008.
- BMELV (2009) information is used when KTBL data was not available or in case of methodological inconsistencies with the Eidman et al. (2000) approach.
- In particular, production costs which are not crop specific are taken from BMELV (2009). BMELV (2009) data are for the fiscal year July 2007 to June 2008.
- For some inputs, such as borrowed capital and fuel, the government provides subsidies. The costs of production in this analysis are calculated without these subsidies.
- For land, the actual cash rents were used, or the rents which would have prevailed in the absence of agricultural subsidies, including the direct payments.
- Data which are not contained in the data sets of the BMELV and KTBL are from FAPRI (2009) and ECB (2009).
- Yield data are from (BMELV, 2009b).
- Data are aggregated to the extent possible as in USDA (2009c); the principles applied in aggregating the data are as depicted in figure A.2.

**Figure A.1: KTBL cost structure of agricultural production**




Source: Based on KTBL (2009).

**Figure A.2: Aggregation of cost and return components**

| **Plant production activities (e.g., wheat, corn, rapeseed, sugar beet)** | **Animal production activities (e.g., milk)** |
|---|---|
| Operating (variable) costs | Operating (variable) costs |
| Seed | Breeding material |
| Certified seed | Heifers |
| Non-certified seed | Insemination |
| Fertilizers | Veterinary and medicine |
| Lime | Veterinarian and medicine |
| N-fertilizer | Other veterinary |
| PK-fertilizer | --- |
| Chemicals | Feed |
| Fungicides | Feed from arable land/grand culture |
| Herbicides | Feed from grassland |
| Pesticides | Other feed |
| Other chemicals | Water |
| Other operational (variable) costs | Other operational (variable) costs |
| Fuel, lube and electricity | Bedding and litter |
| Other variable machinery costs | Variable machinery costs |
| Purchased services | Purchased services |
| Interest on operating inputs | Interest on operating inputs |
| Allocated overhead and fixed costs | Allocated overhead and fixed costs |
| Hired and opportunity costs of labor | Hired and opportunity costs of labor |
| Capital recovery machinery/equipment | Capital recovery machinery/equipment |
| Land rental/opportunity costs of land | Land rental/opportunity costs of land |
| Insurances | Insurances |
| Other (general) farm overheads | Other (general) farm overheads |
| Returns (gross value of production) | Returns (gross value of production) |
| Primary product | Primary product |
| Secondary product | Secondary product |

Source: Adopted from USDA (2009c).

## A.2 Data aggregation and definitions

In order to cluster the data according to USDA (2009b) methodology the following procedures are applied:

- Cost and return calculations for **crops a**re made per ha under cultivation and for **dairy** per 1 000 liters of milk produced. Average crop yields are based on (BMELV, 2009b). In **dairy** average annual production has been assumed to be at 8 500 liters.
- Farms are assumed to farm land of **average productivity** and average other natural conditions such as rainfall etc.
- In order to account for the dual farm structure in Germany **two farm sizes** are considered (von Witzke et al., 2006).
- A **"small" farm** as is characteristic of many regions in **West Germany** is defined to operate with an average plot size of 2 hectares, and an average distance to the fields of 2 km. For these farms the use of a 67 kW tractor was assumed. In dairy, a herd size of 64 cows was assumed and annual milk yield per cow of 8 500 liters.
- A **"large" farm** which is characteristic for large parts of **East Germany** has an average plot size of 20 hectares, and the average distance to the field is longer than in the small farm (5 km). Moreover, tractors of 102 kW are assumed to be in operation. In dairy, the large farm is assumed to have a herd size of 492 cows and an average annual milk yield of 8 500 liters per cow.
- The **farm size definitions** are consistent with KTBL (2009) classifications. BMELV (2009a) data are converted to meet the KTBL classifications.
- **Operating costs** are practically identical with variable costs and include inputs such as seed, fertilizer, feed, chemicals, as well as interest on operating capital. However, hired labor is not included. Rather it is part of the farm overheads allocated to the different crops.
- Data on **seed** costs (certified seed as well as non-certified seed) are from KTBL (2009). The same applies to **fertilizer** and **chemicals. Other chemicals** include seed treatment, growth regulators etc. as well as water for application of chemicals.
- **Other operational (variable) costs** are taken from KTBL (2009) but had to be adjusted in a few cases: Subsidies on diesel are from **fuel, lube and electricity** statistics provided by KTBL (2009). **Purchased services** are not properly covered by KTBL (2009) and are calculated by using BMELV (2009) information. **Interest on operating inputs** is assumed to be at four percent.
- **Allocated overheads** include positions such as cost of hired labor, opportunity cost of unpaid labor, capital recovery of machinery and equipment, opportunity cost of land, general farm overheads as well as taxes and insurance cost.
- For **hired labor and opportunity cost of unpaid labor** a wage of 15 EUR per working hour is assumed KTBL (2009). Unpaid labor is labor provided by the farm operator and by partners and family members. Information on unpaid labor is included in KTBL (2009) commodity surveys.

- Cost of **capital recovery for machinery and other equipment** are the cost of replacing the capital good. It is the annualized capital depreciation in machinery and equipment priced at replacement cost. Data are from KTBL (2009) but are adjusted for the interest rate subsidies paid by the European Funds for Agricultural Rural Development and national co-financing. Subsidy data are from BMELV (2009).
- **Land rental** rates and **opportunity cost of land** are not included in KTBL (2009) and are based on BMELV (2009) data on cash rents by region. Actual cash rental rates are used according to methodology provided by Eidman et al. (2000).
- Production related **insurance costs** such as hail insurance are from KTBL (2009). Other insurance costs are from BMELV (2009).
- Information about **other (general) farm overheads** are from BMELV (2009) which provides data on "Other farm expenses excluding land rentals" and "Non time-related expenses". An additional 30 EUR per ha were added in order to account for administrative cost related to the "cradle to grave" documentation of production as required by German and EU authorities.
- **Returns** are based on the **gross value of production**. Data on yields are multiplied with the average (world market) price reported by FAPRI (2009). The raw sugar price in the EU was derived from the EU price of sugar beets (LEL and LfL, 2009).
- Revenues include those from the primary commodity and from by-products such as straw, sugar beet leaves and calves.

### A.3 Cost and return data in detail

Figures A.3 to A.7 exhibit the results of the calculations of production costs for wheat, corn, rapeseed, sugar beet and dairy, while figures A.8 to A.12 contain the corresponding returns.

Yields represent the year averages to account for random fluctuation in weather, animal and plant disease. The yield levels used are as follows (BMELV, 2009b):

- Wheat: 7.450 mt/ha,
- Corn: 8.993 mt/ha,
- Rapeseed: 3.660 mt/ha, and
- Sugar beets: 60.08 mt/ha.

- In 2008, agricultural prices were very high. Therefore, results are displayed for 2008 prices and for the average of 200x to 200y. The price levels used are as follows (see ECB, 2009 and FAPRI, 2009). For sugar a price conversion factor of 16.5 (LEL and LfL, 2009) is used to determine the sugar beet price relative to the raw sugar price:
  - Wheat: 170.8 EUR/mt (2008) and 164.8 EUR/mt (five year average),
  - Corn: 132.3 EUR/mt (2008) and 112.9 EUR/mt ( five year average),
  - Rapeseed: 351.3 EUR/mt (2008) and 303.6 EUR/mt (five year average),
  - Sugar beet: 12.6 EUR/mt (2008) and 10.8 EUR/mt (five year average),
  - Dairy: 0.19 EUR/l (2008) respectively 0.20 EUR/l (five year average).

– Customary actually observed land rental values are used in calculating production costs. However, land rental values are also a positive function of subsidies. Von Witzke et al. (2007) have shown that in the absence of agricultural subsidies, land rental values in typical German farms would be close to zero. In order to account for this, cost calculations have been done alternatively with the actual land rental price and with a land rental price of zero.

**Figure A.3: Costs of wheat production, 2008 (EUR/ha)**

| Costs and returns | Small farm | Large farm |
|---|---|---|
| Operating (variable) costs | 823.66 | 828.43 |
| Seed | 62.40 | 62.40 |
| Certified seed | 49.20 | 49.20 |
| Non-certified seed | 13.20 | 13.20 |
| Fertilizers | 404.30 | 404.30 |
| Lime | 67.50 | 67.50 |
| N-fertilizer | 204.80 | 204.80 |
| PK-fertilizer | 132.00 | 132.00 |
| Chemicals | 116.00 | 116.00 |
| Fungicides | 56.00 | 56.00 |
| Herbicides | 43.00 | 43.00 |
| Insecticides | 12.00 | 12.00 |
| Other chemicals | 5.00 | 5.00 |
| Other operational (variable) costs | 240.96 | 245.73 |
| Fuel, lube and electricity | 101.77 | 88.58 |
| Other variable machinery costs | 131.19 | 116.15.33 |
| Purchased services | 6.00 | 36.00 |
| Interest on operating inputs | 2.00 | 5.00 |
| Allocated overhead and fixed costs | 832.91 | 684.37 |
| Hired and opportunity costs of labor | 158.25 | 109.35 |
| Capital recovery machinery/equipment | 251.97 | 252.33 |
| Land rental/opportunity costs of land | 195.00 | 152.00 |
| Insurances | 64.69 | 52.69 |
| Other (general) farm overheads | 163.00 | 118.00 |
| **Total costs (including costs for land rental)** | **1 656.57** | **1 512.80** |
| **Total costs (excluding costs for land rental)** | **1 461.57** | **1 360.80** |

Source: Own calculations based on sources provided in Annex A.

**Figure A.4: Costs of corn production, 2008 (EUR/ha)**

| Costs and returns | Small farm | Large farm |
|---|---|---|
| Operating (variable) costs | 1 006.67 | 1 012.19 |
| Seed | 160.40 | 160.40 |
| Certified seed | 160.40 | 160.40 |
| Non-certified seed | 0.00 | 0.00 |
| Fertilizers | 193.90 | 193.90 |
| Lime | 67.50 | 67.50 |
| N-fertilizer | 76.80 | 76.80 |
| PK-fertilizer | 49.60 | 49.60 |
| Chemicals | 66.50 | 66.50 |
| Fungicides | 0.00 | 0.00 |
| Herbicides | 65.00 | 65.00 |
| Insecticides | 0.00 | 0.00 |
| Other chemicals | 1.50 | 1.50 |
| Other operational (variable) costs | 585.87 | 591.39 |
| Fuel, lube and electricity | 94.56 | 83.76 |
| Other variable machinery costs | 483.31 | 466.63 |
| Purchased services | 6.00 | 36.00 |
| Interest on operating inputs | 2.00 | 5.00 |
| Allocated overhead and fixed costs | 927.93 | 771.76 |
| Hired and opportunity costs of labor | 161.85 | 108.30 |
| Capital recovery machinery/equipment | 340.51 | 337.89 |
| Land rental/opportunity costs of land | 195.00 | 152.00 |
| Insurances | 67.57 | 55.57 |
| Other (general) farm overheads | 163.00 | 118.00 |
| **Total costs (including costs for land rental)** | **1 934.60** | **1 783.95** |
| **Total costs (excluding costs for land rental)** | **1 739.60** | **1 631.95** |

Source: Own calculations based on sources provided in Annex A.

**Figure A.5: Costs of rapeseed production, 2008 (EUR/ha)**

| Costs and returns | Small farm | Large farm |
|---|---|---|
| Operating (variable) costs | 721.97 | 718.09 |
| Seed | 40.59 | 40.59 |
| Certified seed | 40.59 | 40.59 |
| Non-certified seed | 0.00 | 0.00 |
| Fertilizers | 327.10 | 327.10 |
| Lime | 67.50 | 67.50 |
| N-fertilizer | 140.80 | 140.80 |
| PK-fertilizer | 118.80 | 118.80 |
| Chemicals | 99.25 | 99.25 |
| Fungicides | 19.00 | 19.00 |
| Herbicides | 63.00 | 63.00 |
| Insecticides | 15.00 | 15.00 |
| Other chemicals | 2.25 | 2.25 |
| Other operational (variable) costs | 255.03 | 251.15 |
| Fuel, lube and electricity | 101.82 | 86.22 |
| Other variable machinery costs | 138.21 | 123.93 |
| Purchased services | 12.00 | 36.00 |
| Interest on operating inputs | 3.00 | 5.00 |
| Allocated overhead and fixed costs | 892.37 | 611.67 |
| Hired and opportunity costs of labor | 137.55 | 90.90 |
| Capital recovery machinery/equipment | 199.51 | 201.46 |
| Land rental/opportunity costs of land | 243.00 | 152.00 |
| Insurances | 72.31 | 49.31 |
| Other (general) farm overheads | 240.00 | 118.00 |
| **Total costs (including costs for land rental)** | **1 614.34** | **1 329.76** |
| **Total costs (excluding costs for land rental)** | **1 371.34** | **1 177.76** |

Source: Own calculations based on sources provided in Annex A.

**Figure A.6: Costs of sugar beet production, 2008 (EUR/ha)**

| Costs and returns | Small farm | Large farm |
|---|---|---|
| Operating (variable) costs | 1 131.68 | 1 120.16 |
| Seed | 233.10 | 233.10 |
| Certified seed | 233.10 | 233.10 |
| Non-certified seed | 0.00 | 0.00 |
| Fertilizers | 399.50 | 399.50 |
| Lime | 67.50 | 67.50 |
| N-fertilizer | 128.00 | 128.00 |
| PK-fertilizer | 204.00 | 204.00 |
| Chemicals | 195.25 | 195.25 |
| Fungicides | 32.00 | 32.00 |
| Herbicides | 161.00 | 161.00 |
| Insecticides | 0.00 | 0.00 |
| Other chemicals | 2.25 | 2.25 |
| Other operational (variable) costs | 303.83 | 292.31 |
| Fuel, lube and electricity | 124.09 | 104.93 |
| Other variable machinery costs | 164.74 | 146.38 |
| Purchased services | 12.00 | 36.00 |
| Interest on operating inputs | 3.00 | 5.00 |
| Allocated overhead and fixed costs | 1 070.40 | 524.13 |
| Hired and opportunity costs of labor | 163.65 | 77.25 |
| Capital recovery machinery/equipment | 222.61 | 220.74 |
| Land rental/opportunity costs of land | 372.00 | 152.00 |
| Insurances | 86.28 | 58.28 |
| Other (general) farm overheads | 225.86 | 15.86 |
| **Total costs (including costs for land rental)** | **2 202.08** | **1 644.29** |
| **Total costs (excluding costs for land rental)** | **1 830.08** | **1 492.29** |

Source: Own calculations based on sources provided in Annex A.

**Figure A.7: Costs of milk production (including costs for land rental), 2008 (EUR/1 000 l)**

| Costs and returns | Small farm | Large farm |
|---|---|---|
| Operating (variable) costs | 231.77 | 239.60 |
| Breeding material | 62.59 | 62.59 |
| Heifers | 60.00 | 60.00 |
| Insemination | 2.59 | 2.59 |
| Veterinary and medicine | 7.56 | 7.56 |
| Veterinarian and medicine | 5.17 | 5.17 |
| Other veterinary | 2.39 | 2.39 |
| Feed | 139.94 | 139.94 |
| Feed from arable land/grand culture | 98.79 | 98.79 |
| Feed from grassland | 30.06 | 30.06 |
| Other feed | 5.49 | 5.49 |
| Water | 5.59 | 5.59 |
| Other operational (variable) costs | 21.68 | 29.52 |
| Bedding and litter | 1.25 | 1.25 |
| Variable machinery costs | 12.53 | 11.71 |
| Purchased services | 2.08 | 10.74 |
| Interest on operating inputs | 5.82 | 5.82 |
| Allocated overhead and fixed costs | 255.85 | 189.96 |
| Hired and opportunity costs of labor | 71.86 | 46.72 |
| Capital recovery machinery/equipment | 74.98 | 60.53 |
| Land rental/opportunity costs of land | 29.85 | 22.43 |
| Insurances | 15.92 | 12.67 |
| Other (general) farm overheads | 63.24 | 47.60 |
| **Total costs (including costs for land rental)** | **487.62** | **429.56** |
| **Total costs (excluding costs for land rental)** | **457.77** | **407.13** |

Source: Own calculations based on sources provided in Annex A.

**Figure A.8: Returns of wheat production, 2008 (EUR/ha)**

| Returns | Small and large farm |
|---|---|
| Primary product (Scenario: Price of 2008) | 1 272.80 |
| Primary product (Scenario: Price of past five years) | 1 227.76 |
| Secondary product (Both scenarios) | 0.00 |

Source: Own calculations based on sources provided within Annex A.

**Figure A.9: Returns of corn production, 2008 (in EUR/ha)**

| Returns | Small and large farm |
|---|---|
| Primary product (Scenario: Price of 2008) | 1 189.84 |
| Primary product (Scenario: Price of past five years) | 1 015.35 |
| Secondary product (Both scenarios) | 0.00 |

Source: Own calculations based on sources provided in Annex A.

**Figure A.10: Returns of rapeseed production, 2008 (EUR/ha)**

| Returns | Small and large farm |
|---|---|
| Primary product (Scenario: Price of 2008) | 1 285.76 |
| Primary product (Scenario: Price of past five years) | 1 111.18 |
| Secondary product (Both scenarios) | 0.00 |

Source: Own calculations based on sources provided in Annex A.

**Figure A.11: Returns of sugar beet production, 2008 (EUR/ha)**

| Returns | Small and large farm |
|---|---|
| Primary product (Scenario: Price of 2008) | 757.01 |
| Primary product (Scenario: Price of past five years) | 649.49 |
| Secondary product (Both scenarios) | 120.16 |

Source: Own calculations based on sources provided in Annex A.

**Figure A.12: Returns of milk production, 2008 (in EUR/1 000 l)**

| Returns | Small and large farm |
|---|---|
| Primary product (Scenario: Price of 2008) | 194.00 |
| Primary product (Scenario: Price of past five years) | 199.80 |
| Secondary product (Both scenarios) | 40.08 |

Source: Own calculations based on sources provided in Annex A.

**Figure A.13: Value of production minus total production costs for small German farms in EUR/ha (dairy: EUR/1 000 l milk)**

| Wheat production | | Value of production based on price from | |
|---|---|---|---|
| | | 2008 | Past five years |
| Total costs listed | With land rental costs | -384 | -429 |
| | Without land rental costs | -189 | -234 |

| Corn production | | Value of production based on price from | |
|---|---|---|---|
| | | 2008 | Past five years |
| Total costs listed | With land rental costs | -745 | -919 |
| | Without land rental costs | -550 | -724 |

| Rapeseed production | | Value of production based on price from | |
|---|---|---|---|
| | | 2008 | Past five years |
| Total costs listed | With land rental costs | -329 | -503 |
| | Without land rental costs | -86 | -260 |

| Sugar beet production | | Value of production based on price from | |
|---|---|---|---|
| | | 2008 | Past five years |
| Total costs listed | With land rental costs | -1 325 | -1 432 |
| | Without land rental costs | -953 | -1 060 |

| Milk production | | Value of production based on price from | |
|---|---|---|---|
| | | 2008 | Past five years |
| Total costs listed | With land rental costs | -254 | -248 |
| | Without land rental costs | -224 | -218 |

Source: Own calculations.

**Figure A.14: Value of production minus total costs for large German farms in EUR/ha (dairy: EUR/1 000 l milk)**

| Wheat production | | Value of production based on price from | |
|---|---|---|---|
| | | 2008 | Past five years |
| Total costs listed | With land rental costs | -240 | -234 |
| | Without land rental costs | -88 | -133 |

| Corn production | | Value of production based on price from | |
|---|---|---|---|
| | | 2008 | Past five years |
| Total costs listed | With land rental costs | -594 | -769 |
| | Without land rental costs | -442 | -617 |

| Rapeseed production | | Value of production based on price from | |
|---|---|---|---|
| | | 2008 | Past five years |
| Total costs listed | With land rental costs | -44 | -219 |
| | Without land rental costs | 108 | -67 |

| Sugar beet production | | Value of production based on price from | |
|---|---|---|---|
| | | 2008 | Past five years |
| Total costs listed | With land rental costs | -767 | -875 |
| | Without land rental costs | -615 | -723 |

| Milk production | | Value of production based on price from | |
|---|---|---|---|
| | | 2008 | Past five years |
| Total costs listed | With land rental costs | -195 | -190 |
| | Without land rental costs | -173 | -167 |

Source: Own calculations.

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