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Strukturberichterstattung
Nr. 60/2

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Schwerpunktthema:
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Concentrate animal feed as an input good in Swiss agricultural production

The upstream and downstream stages of Swiss agricultural value chains: The effects of border protection and other support measures

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This study was conducted by Wageningen Economic Research in cooperation with Agroscope, the Swiss Confederation's centre for agricultural research, and was commissioned and financed by the Swiss State Secretariat for Economic Affairs.

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Summary

Die Studie hat das Ziel, die Mehrkosten für Futtermittel in der Schweiz im Vergleich mit dem benachbarten Ausland zu erklären. Mittels Preisanalysen und Expertengesprächen entlang der Wertschöpfungskette wird gezeigt, dass neben den Einfuhrzöllen auch die höheren Kostenstrukturen und fehlende Skaleneffekte in den Verarbeitungsbetrieben einen Einfluss auf die Kosten haben. Eine Simulation einer Aufhebung der Einfuhrzölle mittels des CAPRI-Modells zeigt schliesslich, dass auch bei zum Teil spürbar verminderten Futtermittelpreisen die Effekte auf die Produktion begrenzt sind.

1 Introduction

1.1 Background of the study

The State Secretariat for Economic Affairs (SECO) has commissioned a number of external studies examining value chains in Swiss agriculture. The main research question asks why the prices of certain products in Switzerland are significantly higher than in neighbouring countries as well as examining the extent to which single input factors, such as feed, contribute to an agricultural sector characterized by elevated production costs. The present study has been jointly prepared by Agroscope, the Swiss centre of excellence in agricultural research, and value chain experts from the Wageningen Economic Research Institute in the Netherlands.

1.2 Goal

The issue of cost differences in relation to animal feed as an input in Swiss agricultural production has been chosen for further investigation due to its importance as both an agricultural product (from crop production) and an agricultural production factor (for animal production).

This study examines whether industry protection might contribute to the identified price differences and whether abandoning import tariffs for feed would weaken Swiss crop production by depressing domestic prices at the same time as strengthening animal production. More specifically, this study aims to answer the following questions:

a) What are the reasons for the differences in the price of concentrate animal feed seen between Switzerland and other countries?
b) Who are the actors involved in the different stages of the value chain?
c) What impact would a reduction in trade or other barriers have on the relatively high current prices, the import quantities and prices, and domestic production?
d) What impact could we expect the hypothetical abolition of border protection to have on Swiss producers of concentrate animal feed?

1.3 Methods of analysis

In order to answer the questions above, three fundamental methodological approaches were followed:

a) **Data analysis**: A comparison of the prices and costs along the chain between Switzerland and Germany for feed barley, feed wheat and soybean meal. An additional analysis of the prices and costs along the chain between Switzerland and Germany was conducted for concentrate animal feed.
b) **Scenario modelling**: An analysis using the CAPRI (Common Agricultural Policy Regional Impact) model to investigate the possible impacts of reducing the border protection for animal feed.
c) **In-depth interviews**: Interviews conducted with experts provided additional information regarding the feed sector. Based on the interviews, it was possible to arrive at a better understanding of the Swiss feed value chain and its challenges and particularities when compared to other countries. Furthermore, the interviews increased awareness of both market relations and the possible impacts of reducing or abolishing border protection (tariffs) for feed importers and feed mills. Experts from one large and one small feed mill were interviewed, as was an expert from one feed importer.

The data sources used in the study and further explanations are presented in Table 1. For Switzerland,

the information was based on data obtained from the Department of Market Analysis of the FOAG, the Swiss-Impex database of foreign trade and the Swiss working tariffs database (Tares). For Germany, the information was based on data obtained from the German Ministry for Food and Agriculture (BLE), cereal stock market prices published by the media agency Proplanta GmbH & Co. KG and data derived from the AMI (*Agrarmarkt Informations-Gesellschaft mbH*) agricultural market analysis.

Table 1 – *Price data sources and definitions*

Data	Definition	Explanation	Source
Producer price for feed materials	Price of domestic production for the first market stage (e.g. price that farmers receive for oilseeds and cereals produced, excluding VAT)	CH - It corresponds to the indicative prices (*Richtpreise*), as defined yearly and with stable values over the years. DE - For Germany, the arithmetic mean for 2017 was considered, using a € exchange rate of 1.169 (December, 2017)	FOAG; Swiss Granum; BMEL
Import price	Price of imported feed raw material (e.g. feed barley, soybean meal), excluding customs duties and VAT	The arithmetic mean of all the imported materials analysed for the year 2017	EZV, Swiss-Impex
Import tariff	Border protection measure for feed oilseeds and cereals	Adjusted monthly. The tariffs published in September 2018 are considered in this study.	FOAG; Tares
Purchase price of feed materials	Price that farmers pay to acquire individual feedstuffs from feed mills, excluding tariffs and VAT.	The wholesale price for feed materials (e.g. feed barley, feed wheat, soybean meal)	FOAG; BMEL
Purchase price of concentrate feed	Price that farmers pay to acquire concentrate feed, excluding VAT	CH - The average price of concentrate animal feed in the year 2017. It considers the price for the contracted production of laying hen feed and chicken fattening feed, as well as the average price paid by pork producers for pig fattening feed. DE – The average price of different concentrate feeds in December 2017. It considers the wholesale prices from the Mannheim Grain Exchange Market with converted additional costs of 3.5 CHF/100 kg for the GMO-free soybean meal.	FOAG; Proplanta GmbH & Co. KG: price on stock exchange market; Interviews with feed mill representatives and animal producers association members

1.4 Terminology

English	German	Definition
Animal feed	*Futtermittel*	*Stoffe oder Erzeugnisse, einschliesslich Futtermittelzusatzstoffe, verarbeitet, teilweise verarbeitet oder unverarbeitet, die zur oralen Tierfütterung bestimmt sind.* FMV 916.307 (Stand am 1. Mai 2017)
Feed material*	*Einzelfuttermittel (Futtermittel-Ausgangsprodukte)*	*Erzeugnisse pflanzlichen oder tierischen Ursprungs, die vorrangig zur Deckung des Ernährungsbedarfs*

		von Tieren dienen (…) und für die Herstellung von Mischfuttermitteln oder als Trägerstoff für Vormischungen FMV 916.307 (Stand am 1. Mai 2017)
Concentrate feed	*Mischfuttermittel*	*Mischung aus mindestens zwei Einzelfuttermitteln, mit oder ohne Futtermittelzusatzstoffe, die zur oralen Fütterung in Form eines Alleinfuttermittels oder Ergänzungsfuttermittels bestimmt ist* FMV 916.307 (Stand am 1. Mai 2017)
franco	*Franko*	*Ohne Zollgebühren*
Custom charges = *import tariffs + guarantee fund contributions*	*Zollgebühren*	*Grenzbelastung= Zollansatz + Garantiefondsbeitrag*

*Definition follows the translation of the European Commission, Regulation No 68/2013 of 16 January 2013 on the Catalogue of feed materials

1.5 Abbreviations

English		**German**	
Agroscope	Swiss centre of excellence for agricultural research		*Kompetenzzentrum des Bundes für landwirtschaftliche Forschung*
		AMI	*Agrarmarkt Informations-Gesellschaft, Bonn*
BMEL	German Ministry of Food and Agriculture		*Deutsches Bundesministerium für Ernährung und Landwirtschaft*
BSO	Federal Statistical Office	BFS	*Bundesamt für Statistik*
CAPRI	Common Agricultural Policy Regional Impact		
EAER	The Federal Department of Economic Affairs, Education and Research	WBF	*Eidgenössische Departement für Wirtschaft, Bildung und Forschung*
FCA	Federal Customs Administration	EZV	*Eidgenössische Zollverwaltung*
PUE	Price monitoring	PUE	*Preisüberwachung*
FOAG	Federal Office for Agriculture	BLW	*Bundesamt für Landwirtschaft*
FONES	Federal Office for National Economic Supply	BWL	*Bundesamt für wirtschaftliche Landesversorgung*
GFC	Guarantee fund contribution	GFB	*Garantiefondsbeitrag*
GMO	Genetically modified organism	GVO	*Gentechnisch veränderte Organismen*
SFPS	Swiss Feed Production Standard		
VGS	Association of Cereals Collection Points	VGS	*Verband der Getreidesammelstellen der Schweiz*
VSF	Association of Swiss Feed Manufacturers	VSF	*Vereinigung schweizerischer Futtermittelfabrikanten*
VKGF	Association of Swiss Cereals and Feed Trade	VKGS	*Verband des schweizerischen Getreide- und Futtermittelhandels*
VKGS	Swiss collective association collection points		*Verband kollektiver Getreidesammelstellen der Schweiz*
IT	Import tariff	ZA	*Zollansatz*

1.6 Report outline

Section 1 of this report introduces the background of the study, its goals and the chosen methods of analysis. A literature review is presented in Section 2 concerning previous studies of the reasons behind the higher prices of animal feed seen in Switzerland. Section 3 introduces the concept of the animal feed chain. Further information about government support measures, such as tariffs and non-tariff measures, is presented in Section 4, while Section 5 discusses the other external factors that influence prices. This is followed in Section 6 by three case studies concerning the value chains of feed barley, feed wheat and soybean meal in comparison to Germany, which are intended to help illustrate the prices and costs along the feed chain. Moreover, a case study concerning concentrate feed is presented in Section 7 in order to demonstrate the prices and costs along the chain in addition to individual feed materials. The simulations using the CAPRI model that are discussed in Section 8 provide a hypothetical scenario involving reduced border protection for animal feed. Finally, Section 9 presents the overall results of the study, which are briefly discussed.

2 Literature review

The principal question that this brief literature review seeks to answer is 'which factors are driving up the price of concentrate animal feed as an in-put good in Swiss agricultural production?' Given the available time, the literature search was restricted to previously published studies on the subject of animal feed in Switzerland. Prior studies focusing on the analysis of feed prices were found to be firstly driven by the notion of a lack of transparency in the feed industry in Switzerland. The Price Monitoring (PUE) Department of the Federal Department of Economic Affairs, Education and Research (WBF) investigated this issue in 2005 by measuring the gross margins of concentrate feed producer mills in both Switzerland and abroad.[1] An average gross margin of 19.70 CHF per 100 kg of concentrate feed was identified for Swiss feed mills, whereas for Germany and the European Union (EU), an average gross margin of 11.50 CHF was identified. According to the study, 95% of concentrate feed is sold as loose product, and the prices for loose concentrate feed were found as being much lower than those for packaged feed in Switzerland. Observations regarding the study affirmed that the gross margin of feed mills in Germany reached a value of 15.00 CHF per 100 kg and, further, that the proportion of loose concentrate feed ranged between 50% and 70% of the total sold, which was very different from the Swiss 95%. This factor is important, since the average tonnage sold in Switzerland is less than that sold in neighbouring countries, which means that increasing the share of packaged concentrate feed would thus increase the purchase price. The conclusions of the analysis suggested that the current border protection for agricultural products indirectly induces industry protection in favour of Swiss feed mills and, additionally, that a reduction in import tariffs could represent a solution, albeit not without affecting agricultural value chains.

A study conducted by ETH Zürich[2] on behalf of the Swiss grain sector organization *Swiss Granum* measured the effects of a possible free trade agreement between Switzerland and the EU on the agricultural feed and food sector. The study was based on model calculations, as well as on written and oral interviews with representatives of collecting points, mills, traders, bakeries and animal producers. According to the collected data, an important measure with regards to the reduction of industry protection in the feed sector was the 2006 regulation,[3] that is, the regulation on preferential tariff treatment for feed and oilseeds, which helped to expose Swiss feed mills to foreign competition. The authors explained the political reasoning for introducing a standard formula as an attempt to offset the feed material prices for concentrate feed vis-à-vis foreign countries. Moreover, the results of the model calculations concerning a hypothetical scenario without import tariffs indicated increasing imports of animal feed. Based on the interviews, the study concluded that increasing imports of animal feed would not affect the production of concentrate feed, but would instead negatively affect domestic producers of cereals and oilseeds, who would not be able to compete with international prices without border protection. Border protection measures are applied for individual feedstuffs and a reduction in import tariffs directly affects domestic production, since variable import tariffs for individual feedstuffs allow for a relatively stable domestic market price for feed grains and oilseeds. Finally, the study also outlined the feed industry in Switzerland and the market structure in individual stages. Figure 1 delineates this analysis based on the market structure of the feed industry in 2009.

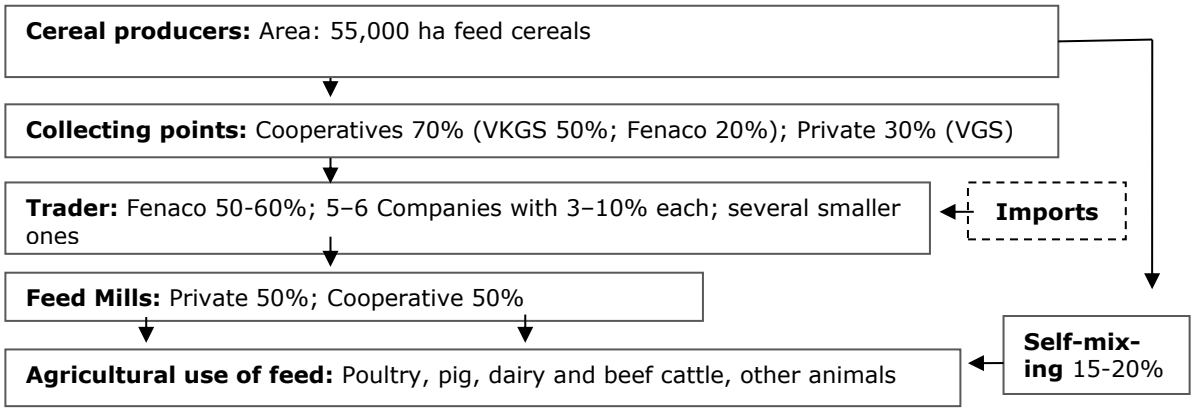


Figure 1 – *Market structure of the feed grain industry in 2009*
Source: Peter et al. (2009)[1]

Further, a study conducted on behalf of the FOAG was published by the research institute BAK Basel in 2014.[4] The input costs involved in Swiss agricultural production were presented. The results demonstrated that animal feed represented the largest share of the total expenditure of Swiss farmers (39%) in 2012 according to the Federal Statistical Office (BFS) and considering the total number of farms and agricultural accounts. This share was found to be lower when observing the period from 1985 to 2012. In 1985, animal feed accounted for 61% and in 2000 for 47% of the factor costs in Swiss agriculture, as compared to the 39% contribution identified in 2012. When considering the share of the total farm expenditure in neighbouring countries, this is not so different. Indeed, the share of expenditure for animal feed among the total number of farm accounts in 2012 was 47% in Germany, 35% in France, 37% in Italy and 40% in Austria. The difference is that the Swiss purchase prices for feed materials (without accounting for concentrate feed) were, on average, 41% higher than in the above-mentioned reference countries. The study hence concluded that the price difference could be attributed to import tariff measures (import tariffs + guarantee fund contribution) as the primary cause of the higher feed prices seen in Switzerland. Second, the high cost structure (e.g. labour costs, land prices and rent, transport and logistics costs) was found to impact on higher feed prices, along with the different qualities of raw materials (e.g. feed for organic farming and genetically modified organism [GMO] free). Moreover, the share of farmer expenses for services was found to have increased over the years. Finally, the study concluded that the market structure could not be excluded as a possible cause of the higher concentrate feed prices, since the Fenaco-Landi Group (UFA, Melior, etc.) holds approximately 50% of the Swiss market share of feed imports and production. However, this potential cause of higher costs was not examined by the study.

The PUE also investigated the 'high price island Switzerland' in 2014.[5] The main reasons for the price differences seen in comparison to other countries were explained by higher wages, advertising and marketing expenses, logistics costs, real estate and rental prices, as well as the relatively small size of the Swiss market preventing the realisation of potential economies of scale. The study did not make any direct reference to feed prices. However, it included a market analysis focusing specifically on concentrate feed in the following year,[6] which highlighted the need for greater transparency. In terms of the large differences in the gross margins of feed mills identified in the 2005 study, the PUE assumed that one reason for the difference could be the lack of competition in the Swiss concentrate feed sector. Accordingly, the gross margins of concentrate feed producer mills in Switzerland were re-examined and four main concentrate feed were analysed, namely pig fattening, dairy cattle, poultry and laying hens. The results indicated that the gross margins of feed mills ranged between 13.75 CHF/100 kg (pig fattening feed) and 16.5 CHF/100 kg (laying hen feed), with an average gross margin of 14.60 CHF per 100 kg for all four types of concentrate feed examined. The conclusions suggested that the cost of concentrate feed is essentially dependent on the purchase prices of feed raw materials and, further, that reducing or eliminating existing import barriers affecting raw materials would achieve cost savings for domestic meat and dairy producers.

The Market Analysis Department of the FOAG also published a report in 2014,[7] which affirmed that more competitive prices for feed had been reached in Switzerland in the referred year. Increasing imports of

GMO-free soybean meal were highlighted, in contrast to the still insignificant quantity of concentrate feed imports. The report emphasised that the comparability of feed between different countries has its limits, particularly due to possible differences in both the consultancy services provided and the quality of the feed (e.g. protein content). Additionally, a study published by the Swiss Farmers' Association[8] focused on the importance of strengthening the Swiss supply of concentrate feed. The analysis did not analyse price differences, although it did discuss the development of relevant factors that contributed to the reduction of feed cereals production, and it highlighted the deliberately higher prices paid for GMO-free protein feed.

The factors considered to drive up prices in the feed chain, as addressed in the literature, are listed in Table 2. It is possible to gain an overview based on previous studies concerning feed prices in Switzerland, which have been conducted according to different methodologies and approaches. Border protection measures, such as import tariffs, were usually cited as the primary cause of higher feed prices. Another important factor was the generally higher cost structure seen in Switzerland, which was considered to account for higher wages, land prices and rent, transport costs, marketing, etc. Often, prior studies highlighted how the Swiss market structure, due to the country being a small market that lacks economies of scale and competitiveness, may also favour market share concentrations, a point that will be expanded on below. Furthermore, the advice services provided by feed mills to farmers are typically included in concentrate feed prices and indicated to be the source of additional costs influencing concentrate feed prices. These are some of the reasons suggested by the reviewed studies, along with feed quality and a preference for GMO-free and higher protein content for feed, which are thought to cause higher feed prices.

Table 2 – *Summary of the potential causes of the higher purchase price of feed according to previous studies*

Study	Tariff trade barriers	Non-tariff trade barriers	Cost structure	Market structure
PUE – WBF 2005	+		+	+
Peter/Swiss Granum 2009	+	+	+	+
BAK Basel 2014	+		+	+
BLW 2014		+	+	
PUE – WBF 2015	+		+(*)	+(*)
SBV 2016		+		

(*) The study is not focused on feed, but rather on the reasons for the higher prices seen in Switzerland (PUE [2014], *Preise und Kosten*)

Based on the discussed studies, it is already possible to identify several reasons for the price differences in animal feed seen in Switzerland. However, the general studies focussed on analysing feed materials, whereas the studies concerning concentrate feed typically focussed on analysing the gross margins associated with the final product. Hence, the present study seeks to enhance understanding of the many factors that contribute to the higher price of concentrate feed in Switzerland, taking into account the complexity of the subject and considering several features in addition to tariff measures.

3 Animal feed in Switzerland

'Feed' refers to the food given to farm animals and pets. More specifically, it is defined as substances or products that are processed, partially processed or unprocessed and used for animal feeding. Roughage, such as grass, silage or hay, is an example of animal feed, which is usually produced and consumed on the farm itself and, therefore, does not enter formal markets. Other types of animal feed include cereals, such as barley and wheat, and corn, peas, soybean meal, etc. They are all feed material components used by feed mills to produce concentrate feed. The production of concentrate feed is closely related to the market and supply of the individual components, and it is the mixing of at least two feed materials that defines a concentrate feed.[a]

The feed materials used for concentrate feed production can be basically divided into two important groups, namely energy and protein carriers (e.g. cereals and oilseeds). The energy carriers include cereals, such as barley, while the protein carriers are, for example, peas or oilseed by-products, such as press cake and extraction meal, which are usually made from soybean and rapeseed. They are known as by-products because the cake and the extraction meal are both residues left behind by the process of oil extraction that is used in the food industry or for biodiesel, etc. This is important because several protein sources stem from by-products, meaning that no extra land was needed for the cultivation of oilseeds. The waste materials from the food industry are used as feed material to produce the feed concentrate.

About 90% of all animal feed used in Switzerland is domestically produced. In Figure 2, it is possible to see the total feed use according to the origin as well as by feed group. The largest share is roughage (71%), whereas concentrate feed accounts for about 18.3% of the total feed use in the country. The 'other' 5.6% accounts for feeds like beetroot, milk and dairy products, which are not included in the quota for concentrate feed. Since approximately half the total feed material used to produce concentrate feed is imported, part of the value chain for concentrate feed is allocated outside of Switzerland. The total amount of feed consumed in the country has remained stable over the years (Figure 2), although the imports of feed material have increased, as has the domestic production of roughage.[9]

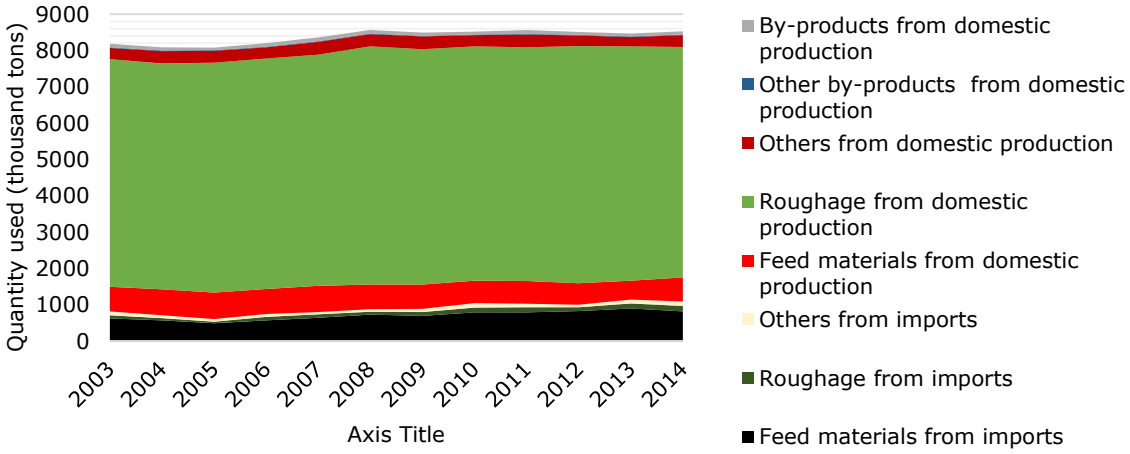


Figure 2 – *Balance of the total feed use in Switzerland*
Data source: Agristat (2015)

One of the main reasons for the increasing level of imports of feed materials has been the general reduction in the domestic production of grain feed over the years[10] (Figure 3). This has happened due to the expansion of grass cultivation on arable land, which resulted from the lack of economic attractiveness of the cultivation of feed cereals, as well as from import tariff concessions for feed.[1,8] Furthermore, the growing of feed cereals is considered to be relatively economically unappealing in

[a] Futtermittel-Verordnung, FMV 916.307 - Verordnung vom 26. Oktober 2011 über die Produktion und das Inverkehrbringen von Futtermitteln (Stand am 1. Mai 2017).

Switzerland because the prices of cereals for human consumption are higher. For example, a cereal such as bread wheat has a higher quality and a producer price of about 50 CHF/100 kg, whereas feed wheat has reached a maximum value of only 36 CHF/100 kg.[11]

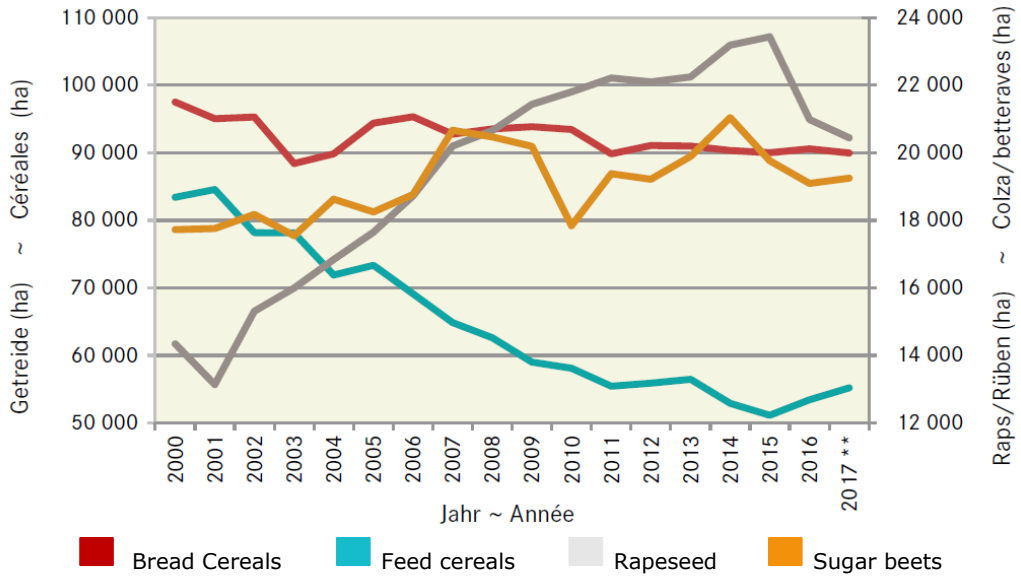


Figure 3 – *Cultivated areas of cereals, sugar beet and rapeseed (in hectares)*
Source: Agristat (2018)

The share of imported feed materials is mostly comprised of feed materials used to produce concentrate feed. In Figure 4, it is possible to see the origin of the feed material used to produce concentrate feed in Switzerland. The level of self-sufficiency in terms of feed materials in 2015 (the last available feed data balance) was 42%, which accounted for about 659,666 tons of domestically produced feed materials. Approximately 82,159 tons (5%) came from by-products of the food industry, such as rapeseed meal, and 817,429 tons (53%) needed to be imported, because the domestic production could not satisfy the demand.[12]

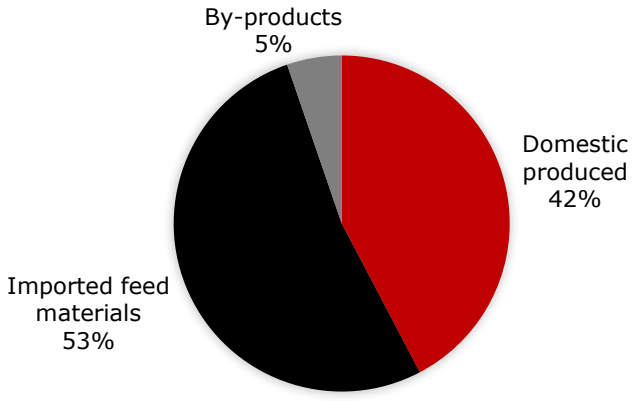


Figure 4 – *Concentrate feed use in Switzerland according to feed material origin*
Data source: Agristat (2015)

Ready-made concentrate animal feeds are usually not imported in large quantities, partly due to the tariff structure and partly because foreign feed mills have not yet established as smooth retailing structures as those seen in Switzerland. However, the amount of imported ready-made concentrate feed has increased over the years. Figure 5 illustrates this issue for the two most important kinds of imported concentrate feed, one enriched with vitamins and minerals (2309.9082) and the other one enriched with protein (2309.9089).

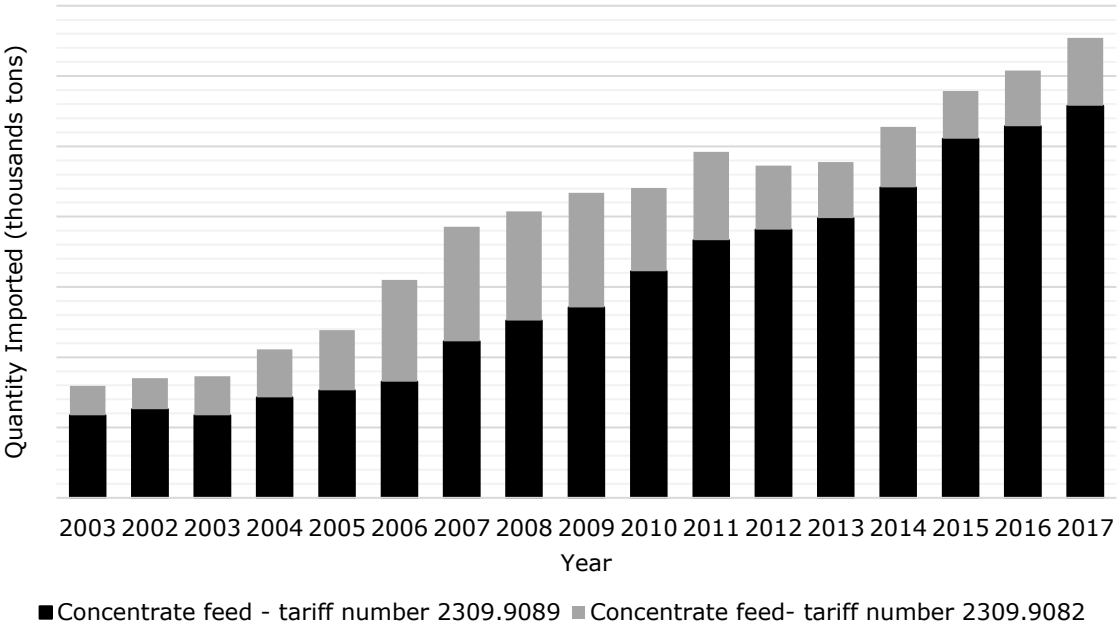


Figure 5 – *Imports of ready-made concentrate feed in Switzerland (tons/year)*
Data source: EZV, Swiss-Impex

The average price of imported concentrate feed is very high when compared to the cost of domestically produced concentrate feed, even without customs charges. The average price of the concentrate feed enriched with vitamins and minerals (2309.9082) was 160.00 CHF/100 kg in 2017, while the average price of the protein-enriched feed (2309.9089) was 113.00 CHF/100 kg (cif). This might also help to explain why there is no direct importation of concentrate feed. The average price paid for imports of concentrate feed (2309.9089) was 122 CHF/100 kg from Germany, 96 CHF/100 kg from France and 50 CHF/100 kg from Austria. This is probably an indication of the high quality of products intended for use in specific sectors, such as horse feed.[13] However, this is difficult to confirm, since there is no individual data available concerning concentrate feed imports. The three reference countries are also the main trade partners that export concentrate feed to Switzerland (Figure 6), although the amount is relatively low in relation to the total amount of feed materials used to produce concentrate feed in 2014 (1,559,254 tons).[12]

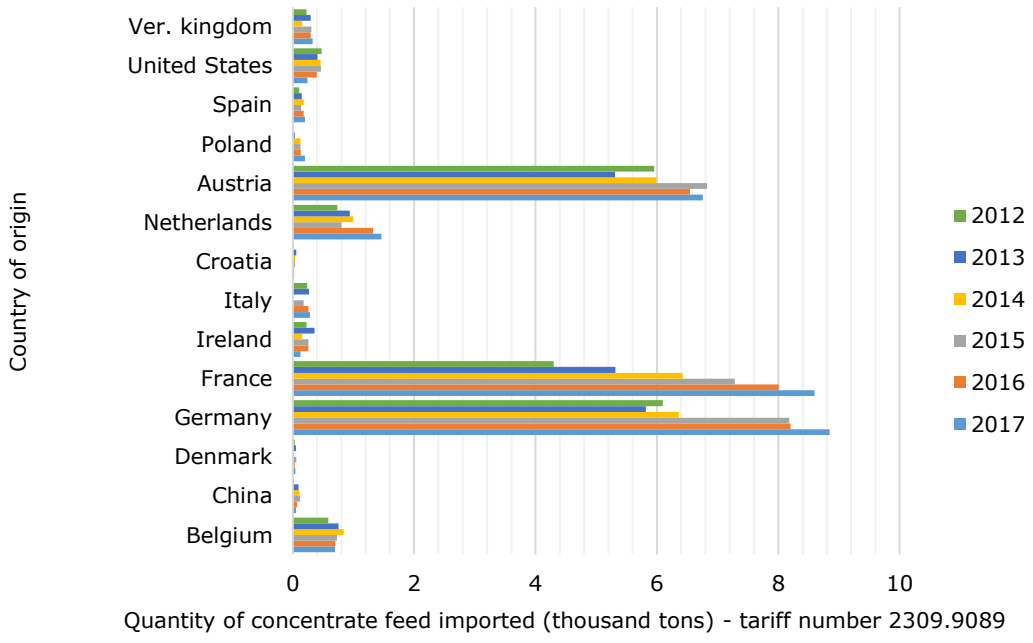


Figure 6 – *Relevant import quantities of concentrate feed per country of origin*
Data source: EZV, Swiss-Impex

The production of concentrate feed in Switzerland has remained relatively stable over the years. This is illustrated in Figure 7, which outlines the estimated development of concentrate feed production in the country according to the Swiss feed mills.

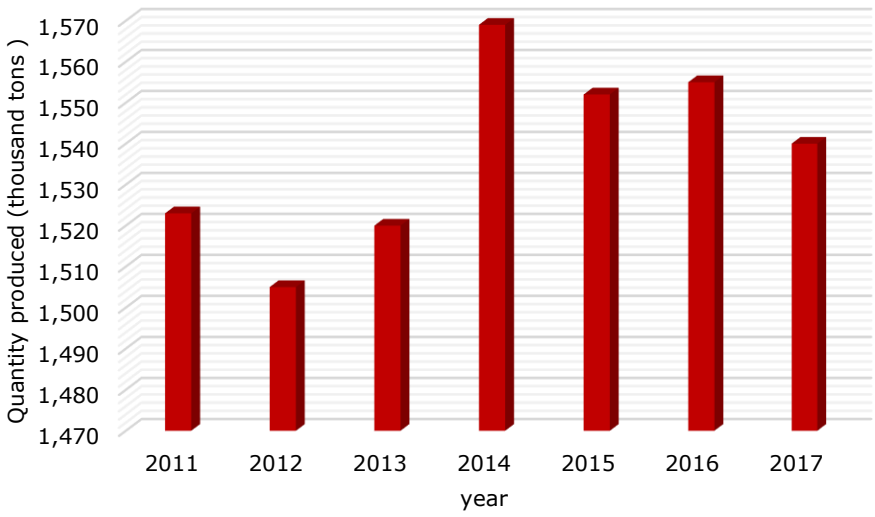


Figure 7 – *Production of concentrate feed in Switzerland (tons per year)*
Data source: Association of Swiss Feed Manufacturers (VSF, 2017)

3.1 The feed value chain

Figure 8 displays the value chain for concentrate feed. The feed materials produced by Swiss farmers (e.g. feed barley, feed wheat, triticale, corn, peas, etc.) enter the market after being sold and transported to collection points. A trader and/or importer usually liaises between the collecting points and the feed mills, purchasing additional amounts of feedstuff from abroad and collecting the necessary quantity (sometimes from different collecting points) to deliver to the feed mill. The feed mill then produces the concentrate feed according to its own formula and in accordance with customers' requests. After the process of grinding, mixing and sometimes pelleting, the concentrate feed is delivered to animal producers in a loose form via a container truck or in packages of about 25 kg each. Alternatively, the concentrate feed is transported to the retail market (e.g. Landi), where farmers can purchase it.

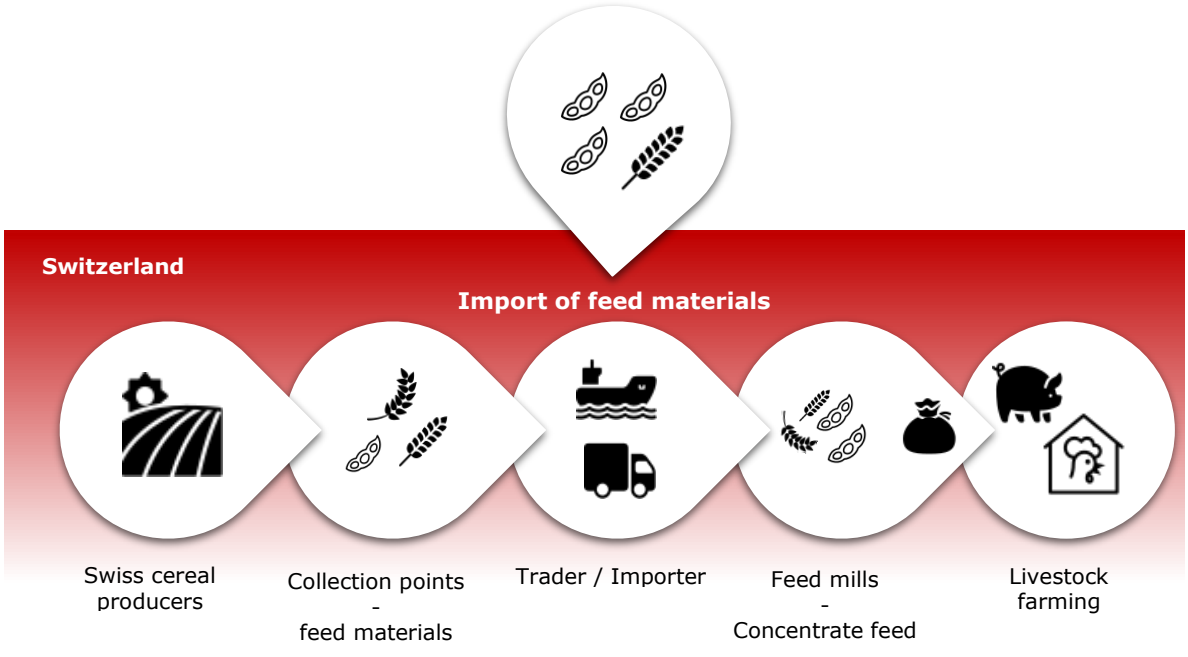


Figure 8 – *The concentrate feed supply chain map in Switzerland*

Images: Icons8 Free

3.1.1 Swiss cereal producers

Bread and feed grains cover approximately 144,000 hectares in Switzerland, which makes them the country's most important crops. The most important feed cereals produced are barley, wheat, corn and triticale (Figure 9), which covered an area of 61,588 hectares in 2016.[14] There are around 20,000 cereal producers in Switzerland and, in 2017, these farms achieved a production of 500,000 tons of cereals for feeding animals. The total demand has been calculated to be 950,000 tons.[15]

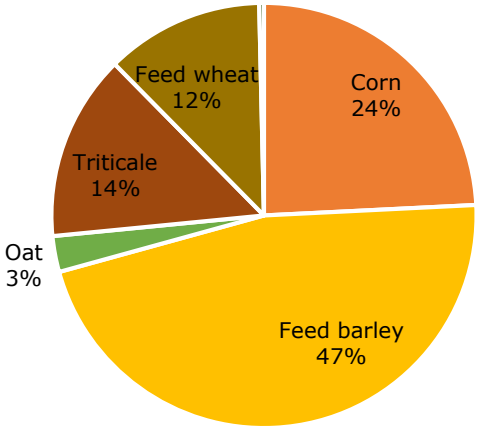


Figure 9 – *Production areas for feed cereals in Switzerland in 2016 (percentage)*
Data source: Agristat (2016)

At this stage, the producer price is attributed to the indicative prices (*Richtpreise*) that are calculated and communicated every year by the Swiss industry association for cereals, oilseeds and protein crops (*Swiss Granum*). The indicative prices have remained stable over the past ten years (Figure 10). This stability in terms of prices is dependent on the measures of border protection. Without border protection, Swiss cereal producers would not enjoy market prices of this level, since in the international market the prices for feed materials are much lower.

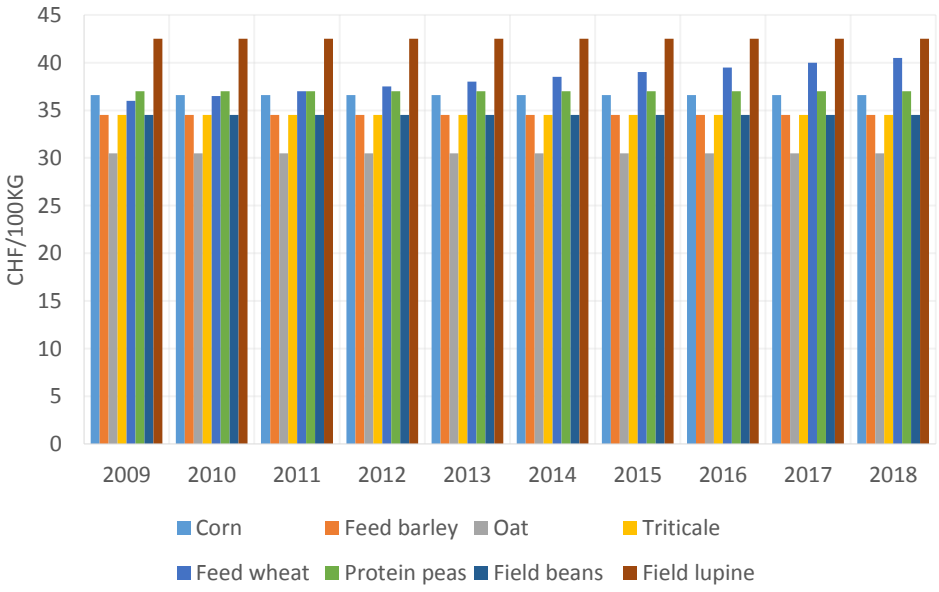


Figure 10 – *Indicative prices for producer prices (in CHF/100 kg)*
Data source: Swiss Granum (2018)

3.1.2 Collection points

The cereal producer chooses which collection point to deliver to, taking into account habits, prices and transportation costs. The prices at the collection point are usually very close to the indicative prices for producers. There are around 160 collection points distributed regionally in Switzerland. At the collection point, the grains are cleaned of the last impurities and stored. In terms of storage, an amount of 2 CHF/100 kg is charged to the feed cereal producers in order to cover the costs for energy, equipment, wages and services.[16] The actors at the collection stage are organised in three groups: the Swiss Association of Cereals Collection Points (VGS), with 35 private companies affiliated; the Swiss Collective Association of Collection Points (VKGS), with around 85 collection points; and 40 collection points without any affiliation.

3.1.3 Traders and importers

The feed cereals are either imported directly to feed mills or imported through a trader. A few companies specialise in this aspect of the supply chain. As a rule of thumb, such specialised importers mainly deliver to small feed mills, while their larger competitors handling imports by themselves.

3.1.4 Feed mills

The feed materials are purchased by the feed mills in order to produce concentrate feed. These feed materials are, for example, feed barley, feed wheat, protein peas, corn, fat, molasses, bran, soybean meal, rapeseed meal and starch. A particular formula is used depending on the concentrate feed being produced. The feed materials go through an industrial process of grinding, mixing and pelleting, as well as through packaging operations. This process involves costs associated with the operation of the mill, labour, transport, energy, marketing, advice services to farmers and the profit from the mill. The pig market is a very important segment for Swiss feed mills, accounting for 40% of the total production, while cattle covers 31% and poultry about 25%. The additional amounts are comprised of several types of animals, such as horse, sheep, goat etc.[17] The market share of feed mills is dominated by the Fenaco Group (UFA AG) with 53%. Another 51 companies affiliated with the Association of Swiss Feed Manufacturers account for the additional share of 41% of the market. Other feed mills are not part of any organisation and they cover 5% of the feed market, while the direct importation of concentrate feed accounts for the remaining 1%.[17]

3.1.5 Animal producers

The purchase price of concentrate feed represents the price that animal producers pay for this kind of feed. Animal producers are the most important buyers of concentrate feed. The production of concentrate feed follows formulas in order to cover all the nutrient requirements necessary to ensure the health and performance of the animals involved in the production of eggs, milk, meat, etc. Of the 55,200 agricultural businesses in Switzerland, approximately 47,000 keep farm animals.[18] Figure 11 displays the number of these farms per animal type. Beef cattle and milk cows clearly play a central role in livestock farming in Switzerland. For cattle, cows and sheep, the production of roughage is of major importance, while for pig and poultry production, concentrate feed is the principal feed source.

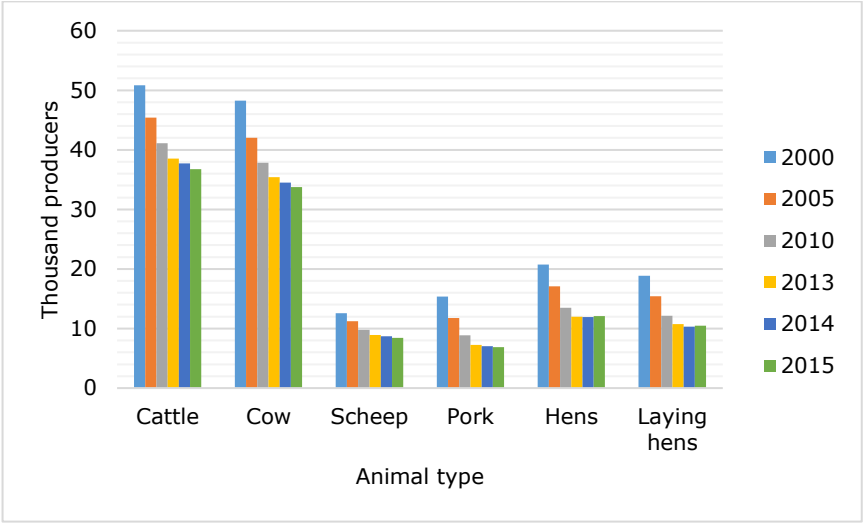


Figure 11 – *Number of animal producers per animal type and year*
Data source: Agristat (2015)

With regards to the quantity of animals, the numbers have remained relatively stable for almost all categories, except for a substantial increase seen in the case of poultry (hens and laying hens) (Figure 12). This increase is related to a continuous change in the dietary habits of the population, which has led to an increasing consumption of chicken.[19] The feeding of chickens mainly involves feed cereals, indicating an increasing trend for the consumption of products that are derived from animals whose diet is primarily reliant on concentrate feed.[20] Furthermore, when analysing the animal type and the feed material according to its origin, it can be seen that more than 90% of the feed used for cattle and cows comes from domestic production (mostly roughage), while for pork that figure is about 52% and for poultry it is only 30%.[21]

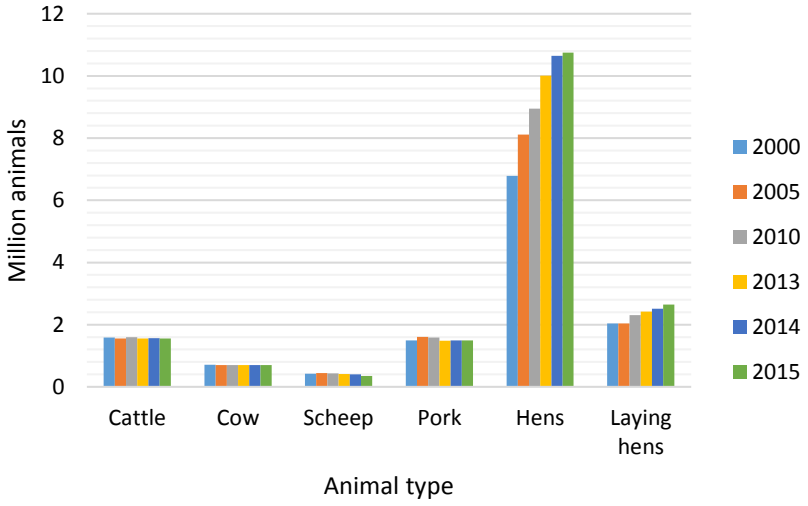


Figure 12 – *Number of farm animals per animal type and year*
Data source: Agristat (2015)

Based on Figures 11 and 12, it is possible to infer that the number of animal producers has been decreasing, whereas the number of farm animals is increasing. This suggests that fewer farms are producing more animals. For the feed industry, this trend indicates that feed mills can deliver larger quantities, which means that animal producers receive price advantages stemming from quantity-related discounts. Usually, a discount of about 9 CHF/100 kg off the list price is offered for the purchase of concentrate feed in its loose form (container truck).

4 Government support measures concerning animal feed

4.1 Tariff measures

While the agricultural policy in Switzerland shifted, around the year 2000, from domestic market support towards direct payments, the extent of the market protection remains considerable today and guarantees far higher prices for farmers than in adjacent countries. Technically, the producer price of domestically produced feed materials (or the indicative price) is dependent on the border protection within the threshold price system:[22]

The border protection sets the import tariffs, which are adjusted on a monthly basis according to the threshold price (plus/minus CHF 3 CHF/100 kg). If the world market price rises, the import tariff will be reduced, while if the world market price drops, then the import tariff will be increased. As there is no limit to the quantity of feed grain that can be imported (tariff quota), the prices are adapted according to the supply and demand of the Swiss market.

This threshold system aims to support Swiss producers and hence ensures the high price level in Switzerland and therefore provides stability to domestic prices. The **threshold prices** determine how much feed grain will cost at the Swiss border, as well as how much the customs charges should be in order to cover the difference between the domestic producer price and the world market price. Thus, the **threshold price corresponds to the target import price**. The import price comprises the price for feed materials at the Swiss border, plus the customs charges. The customs charges consist of the import tariffs and the guarantee fund contributions for both storage and price risks in CHF per 100 kg (which are explained in section 4.2.5).[23]

In an interactive process that occurs between institutions, three fundamental steps are set:

1. The Federal Council regulates the threshold price. The threshold price is established by comparing domestic and international prices plus the costs for transport and assurance up to the Swiss border. This corresponds to the target import price.
2. The EAER decides the extent to which it is possible to deviate from the threshold price without the need to adjust the customs charges for feed materials using a standard formula for concentrate feed as a reference. It may also set lower import tariffs as long as similar domestic products do not come under threat (AS 1998 3033;[24] AS 2011 5325[25]).
3. The FOAG set the import tariffs. The import tariffs are checked monthly on the basis of price reports and taking into account stock market quotations. The FOAG publishes the monthly applied tariffs and the guarantee fund contributions on its website.

In Table 3, the standard formula is presented and the calculations allow for the inference of the total customs charges for each feed material, as well as for the total customs charge for 100 kg of concentrate feed. Considering the total quantity of feed materials imported to produce concentrate feed in 2017, this represents an annual amount of about 21 million CHF with import tariffs from feed materials.

Table 3 – *The standard formula for tariff calculations concerning feed materials for concentrate feed preparation (tariff numbers: 2309.9011/9082/9089)*

Feed material	Tariff number	Proportion of each feed material in 100 kg of concentrate feed (%)	Import tariff - Sep. 2018 (CHF/ 100 kg)	Guarantee fund contribution (CHF/ 100 kg)	Total customs charges for each feed material (CHF/100 kg)	Total customs charges for 100 kg of concentrate feed (CHF)
Protein peas	0713.1011	2	8	5	**13**	0.26
Wheat	1001.9939	24	7	5	**12**	2.88

Barley	1003.9059	21	8	5	**13**	2.73
Oat	1004.9039	1	0	2	**2**	0.02
Corn	1005.9039	22.5	8	5	**13**	2.93
Paddy rice	1006.4029	2	0	1	**1**	0.02
Other feed	1107.1013	1.5	1,7	5	**6.7**	0.10
Fat	1502.1011	0.5	0	0	**0**	0.00
Molasses	1703.9091	2.5	9	5	**14**	0.35
Bran	2302.3020	1.5	11	5	**16**	0.24
Corn gluten	2303.1018	2.5	0	0	**0**	0.00
Soybean meal	2304.0010	13.5	0	0	**0**	0.00
Rapeseed meal	2306.4110	3	0	2	**2**	0.06
Premixture	2309.9082	2	4.8	5	**9.8**	0.20
Starch	3505.1010	0.5	0	0	**0**	0.00
Concentrate feed		100				**9.78**

Source: WBF - Eidgenössische Departement für Wirtschaft, Bildung und Forschung, Verordnung des WBF über Zollbegünstigungen, Ausbeuteziffern und Standardrezepturen vom 7. Dezember 1998 (Stand am 1. Januar 2013); BLW - Bundesamt für Landwirtschaft (2018): Zollansätze Brotgetreide und Mehle, Futtermittel sowie Zucker. Grenzbelastung für Futtermittel, Ölsaaten und Getreide (Version, 28.08.2018).

The standard formula is used to calculate the border protection for individual feed materials, although the import of ready-made concentrate feed is also regulated according to the standard recipe determined by the EAER. For instance, the import charge for ready-made concentrate feed is 9.8 CHF/100 kg (September 2018), which would be the same amount if we calculated the customs charges for individual feedstuff materials by applying the standard formula. However, this is not a concrete rule, since the FOAG adapts the import tariffs on a monthly basis according to the quantity of feed imported. This permits a general understanding of border protection measures, although there are also other provisions to be considered.

4.2 Non-tariff measures

In addition to the tariff measures mentioned above, a series of non-tariff measures can also be identified as having an impact on the prices of animal feed. The production, processing, import and placing on the market of animal feed are all regulated by regulations FMV 916.307[26] and FMV 916.307.1.[27] The commercialisation and import of animal feed are only allowed in Switzerland if they are, as defined in FMV 916.307, Art. 7, p. 1:

I. safe;
II. do not have direct harmful effects on the environment or to animal welfare;
III. do not affect the health of humans or animals;
IV. are not unsafe for human consumption;
V. *are unspoiled, genuine, unaltered, suitable for its purpose and with sellable quality*.

4.2.1 General rules and authorisations

Anyone who manufactures and commercialises animal feed in the Swiss market must be registered with Agroscope, which involves providing a list of all the feed materials and the used quantities.[28] This is important in terms of recording relevant information related to the traceability of the feed. Agroscope publishes a list of all registered facilities and all permitted feed materials, as well as stating whether there is any mandatory information to be provided for each kind of feed.[29] Feed materials that are only intended to meet the nutritional needs of animal do not require any authorisation (e.g. feed barley, feed wheat etc.). However, if additives, such as vitamins or antioxidants, are added to the formula, additional authorisation from the FOAG is needed. This applies to all facilities in Switzerland, and all the regulatory guidelines are provided by regulation FMV 916.307.[30]

Agroscope performs the official feed 'check controls' on behalf of the FOAG and in accordance with the feed regulation FMV 916.307.[31] The official feed inspection generally occurs once a year for each feed mill and also involves the analysis of the presence of GMOs in the feed. These on-site inspections and feed analyses are conducted in order to check whether feed producers and distributors are complying with the legal requirements.[32] The costs involved within this regulation are not possible to be estimated.

In the case of imports, the Swiss legislation concerning feed is consistently aligned with EU law and the technical provisions are also in line with European regulations.[33] However, feed imported from countries outside the EU is subject to veterinary inspection. Veterinary inspection for the purposes of importation is available at the Zurich and Geneva airports and, since the Swiss regulation is aligned with the regulations of EU and EFTA countries (Norway, Iceland and Liechtenstein), the inspection takes place upon initial entry and can, therefore, also be carried out at EU border inspection offices, without the need to be repeated at the Swiss border.[34]

4.2.2 Genetically modified organisms

GMOs are defined as living organisms (plants, animals, bacteria, etc.) in which the genetic material has been altered in a way that does not occur under natural conditions.[35] Their cultivation and circulation for agricultural purposes is not permitted in Switzerland (AS 2003 4803); therefore, no GMOs are authorised for seeds, pesticides and fertilisers.[36] However, some GMOs are authorised for feeding purposes (FMV 916.307, Art. 62)[37] and the list of authorised GMOs published by the FOAG includes some GMOs for soy, corn, rapeseed and cotton.[38] There are special license and labelling requirements for companies dealing with GMOs, which involves extra costs. It is not possible to estimate the costs of such regulation, but currently, no Swiss feed mill is handling GMO feed. If it was the case, the facilities that handle GMOs must ensure that no mixing with conventional organisms occurs.[39] The monitoring of GMO traces in animal feed is also carried out by Agroscope during the official 'check controls' on behalf of the FOAG, and it is based on the feed regulation FMV SR 916.307. It should be mentioned that the import of GMO feed, including legal material, has been close to zero since 2007 as market partners have decided to give in to pressure from non-governmental organisations (NGOs) in this regard.[40] Nevertheless, the 'check controls' still need to be performed once a year also to monitored any traces of GMOs.[41]

4.2.3 Import permits

The importation of all agricultural products, including animal feed, requires a 'general import permit' (GIPs). The application for such a permit takes around one week to be processed, and quantities of up to 20 kg may be imported without the need for a GIP. GIPs can be issued to natural residents or juridical persons (e.g. companies) with head offices in Switzerland.[42] The cooperative *réservesuisse* is responsible for managing the procedures involved in the granting of GIPs for grains and feed on behalf of the EAER. If the annual average exceeds 4,000 tons of feed material per GIP holder, an agreement with the Federal Office for National Economic Supply (FONES) is necessary. Regarding participation in the compulsory stockpiling schemes [43] GIPs are issued without charge and they are valid indefinitely. Therefore it is a cost for once and therefore probably negligible, in contrast to the other costs involved with regulations.

4.2.4 Compulsory stock agreements

The guarantee fund contributions cover the costs of compulsory stock. The *réservesuisse* is also responsible for the management and funding of the compulsory stockpiling of certain foods and cereals on behalf of the EAER.[44] According to requirements of the Federal Council, certain essential goods, including animal feed, are to be stocked. The FONES concludes compulsory stock agreements with the companies undertaking the storage of the goods.[45] The compulsory stock of energy-rich and protein-rich feed materials must cover the average Swiss requirements for a period of two months, that is, the equivalent of 147,700 tons and 67,900 tons, respectively. Companies holding compulsory stock agreements (about 250 in 2017) are responsible for physically managing the stock and the costs of its maintenance. The value covering the guarantee fund for each feed material is listed in Table 3 (standard

formula for tariff calculations concerning feed materials), and the values are published monthly by the FOAG together with the import tariffs (*Grenzbelastung für Futtermittel, Ölsaaten und Getreide*). Currently, the regulation governing the compulsory stocking of essential goods is being revised by the FONES.

4.2.5 Environmental externalities

In accordance with the Direct Payment Ordinance of 23 October 2013, as of 1 January 2018, all Swiss farms need to provide proof of the 'nitrogen or phosphorus balance' for the fulfilment of the ecological proof of performance (ÖLN) (DZV-SR 910.13).[46] Nutrient cycles, such as Phosphorus (P) and nitrogen (N), are directly related to animal (manure) and cereal feed (fertilisers) production. Besides, P and N are important plant nutrients, although using them to excess can endanger the environment, polluting lakes and groundwater, as well as our drinking water sources. The N-P nutrient surplus has declined over the years in Switzerland, especially due to measures such as the reduction in manure accumulation stemming from the reduction in livestock numbers and lower inputs of mineral fertilisers. Moreover, by optimising animal feed, the input of phosphorus and nitrogen can be reduced.[9] On the basis of achieving a nutrient balance, Swiss farmers' need to show the usage of nutrient-reduced feed. The requirements for the nutrient balance are defined by regulations (e.g. Grundaf 2009). The amounts of phosphorus and nitrogen are determined through calculations, with their intake depending on both the plant requirements and the management practices.[47]

5 Other external factors

5.1 Production guidelines

The production of concentrate feed must comply with the provisions of the Swiss feed regulation FMV 916.307, including the requirements concerning hygiene, hazard analysis and critical control points (HACCP). Some non-compulsory compliance guidelines[48] have been approved by the FOAG and Agroscope as being in line with the feed regulation. These guidelines and/or standards can help feed mills and collection points alike to comply with the legislation and validate the quality of their product through certification.

The current guidelines approved by the FOAG are:

- GSP[49] - Collecting point good practices, version from 17.03.2015: developed by the Fenaco Group (GOF) and IP-SUISSE in collaboration with ProCert;
- SFPS[50] - Swiss Feed Production Standard© for the production of feed, version 3 from 27.01.2015: developed by the VSF and the UFA AG;
- Guideline Swiss Farmers' Association – SBV, version 4 from 28.05.2015;
- QSGF[51] - Quality Assurance for Cereals and Feed and QST - Quality Assurance Drying: developed by MABESA GmbH; and
- Guidelines for Good Manufacturing Practice for Safe Pet Food[52], version 2014: developed by the Pet Food Association VHN and European Pet Food Association FEDIAF.

The acceptance of a body of standards such as those listed above involves charges for feed mills. The most frequently used guideline is the certification offered by the Swiss Feed Production Standard (SFPS), which is based on the EU-approved European Feed Manufacturers' Guide (FEFAC) and is internationally recognised.[53] The guidelines must be followed by all Swiss mills to be aligned with the legislation and there is no data of feed mills not complying with the standards. The most used one is the SFPS. The implementation of the SFPS involves compliance with a set of principles and criteria, along with financial expenses. The feed mill that is applying for the label needs to sign a user agreement, agreeing to pay the necessary charges and to follow the SFPS rules, as well as potential agreements with retailer programmes (e.g. from COOP Naturafarm, TerraSuisse, IP-Suisse, Suisse Garantie, etc.).[54] For instance, the retail market usually requires that feed suppliers declare their production system to be certified by a 'Good Production Guideline' approved by the FOAG (e.g. "SFPS).[55] Accordingly, feed mills need to adjust to such a market demand in order to keep their customers. The Association of Swiss Feed Manufacturers (VSF) and the UFA AG separately publish on their website a list of all the feed mills that have signed the user agreement with the SFPS guidelines. The SFPS list is periodically sent to ALP, COOP and Migros.[47] Currently, 51 companies affiliated with the VSF are SFPS-listed, as are all the UFA AG feed mills. It is not possible to measure the costs for attending such criteria. But it must be considered that the certification is a clear validation that the production process is aligned with the legislation and following quality guidelines. Hence, if a feed mill decides not to follow such standard would hardly have a space on the market.

5.2 Quality management system

In addition to following the production guidelines, feed mills often use a quality management system (QMS), such as the ISO 9001: 2008.[56] In general, the costs involved in obtaining a certification can vary greatly, and they are dependent on the conditions established by international rules. To some extent, the costs of such a certification are dependent on the size of the company and the number of employees. For example, for a company with ten employees, the price for the first certification will be between 3,500 and 5,000 CHF, while the yearly maintenance audits will cost between 1,200 and 1,600 CHF.[57]

5.3 GMO free, certification and high-protein content

Although certain GMO material feeds are authorised by the legislation, Swiss farm animals are fed exclusively with GMO-free feed. Along with Norway, Switzerland is the only country in Europe that uses 100% GMO-free animal feed (VSF, 2018). Based on the precautionary principle, as well as on the request of the retail market, this is done on a voluntary basis. The Swiss market usually exhibits a negative public attitude towards genetic engineering in food and agriculture, although some studies have indicated that Swiss consumers are not negative against GMO food 'as long as they have freedom of choice and are properly informed'.[58] Swiss consumers are usually not aware of GMO-free feed when they buy meat, eggs or milk in the supermarkets, since farmers are only allowed to declare such a thing if genetic engineering was not applied at all. Nevertheless, the foreign meat sold in Swiss supermarkets often comes from animals that have eaten GMO feed.[59] The preference for non-GMO feed entails a supplementary cost of CHF 15–50 million per year for the Swiss economy, considering that soybean meal accounts for 10–20% of the feed materials used in the concentrate feed.[60]

Argentina, Brazil and the USA are the biggest soybean producers, accounting for 60% of all production worldwide. The vast majority of globally cultivated soy involves GMO (about 82%) and the supply of GMO-free soy on the world market is limited. Of the three largest soy producers worldwide, only Brazil grows a significant amount of GMO-free soy, and the main imports to Switzerland originate from Europe and Brazil.[61] Nevertheless, the supply of GMO-free soybeans is highly dependent on the willingness of market participants to pay additional costs.[62] The price difference between GMO and non-GMO soybeans is particularly high. Indeed, a premium is paid to GMO-free soybean meal producers of around 60–110 euros per ton of soybean meal (around 7 to 18.5 CHF/100 kg). The surcharges differ according to the certification applied. For the 'ProTerra' standard, for example, the highest charges are to be paid, which ensures consistent traceability along the soybean supply chain.[58]

The 'Soy Network Switzerland' was founded in 2011 as a group committed to increasing imports of 'responsibly produced' soybeans that are socially and environmentally sound. According to this Network, the imports of soybean products into Switzerland should follow the principles of 'responsible production' according to the certification standards, such as the ProTerra Certification Standard. This aims to prevent such production causing harm to the environment (e.g. deforestation) or to people (e.g. workers' rights). The group has been an association since 2016 and it includes important stakeholders from agriculture and the food industry, such the farmers' associations, feed manufacturers and major food retailers, as well as WWF Switzerland. Several certifications are accredited by the network. For instance, the Basler Criteria, RTRS Standard, Danube Soya Standard, ProTerra Certification Standard and others are among the accredited certifications focusing on responsible soy production in relation to the environmental and social aspects of sustainability. The biggest importers and traders in Switzerland are included in the network, as are more than 90 feed mills.[63]

Alongside the GMO-free and certification standards, the quality of feed is also of high importance. This refers to the protein content of feed materials. More specifically, the higher the protein content, the better. Feed materials with a higher protein content cost more. Collection points have even started to offer a bonus for a higher protein content.[64,16] The quality criteria for protein content is based on several elements agreed among the Swiss cereal sector, including the current bonus of 0.15 CHF per 1% protein content per 100 kg.[65] This reward or loss regarding protein-content affects domestic cereal producers, whereas for soybean meal the variations in prices related to protein-content follows the trends and variations from the international market prices.

5.4 Market Structure

The market structure relates to the interactions and the number of firms sharing a market sector. By looking at the market share, it is possible to measure market concentration. In some cases, market concentration might lead to higher prices, given that few actors increase their market power with the decreasing competition.[66]

In order to address this concern, Figure 13 indicates a clear overview of market relations of the supply chain of concentrate feed in Switzerland. The value chain of animal feed involves approximately 20,000 cereal producers, who deliver their harvests to one or other from among the 140 regionally distributed collection points. A few companies specialise in the import and trading of additional feed materials, mainly delivering to small feed mills, while larger competitors handle their imports themselves. The 51 companies affiliated with the SVF account for the market share of 41% in terms of production (tons sold per year). The market share of feed mills owned by the Fenaco – UFA AG Group accounts for the largest share with 53% of feed production. Other feed mills that are not part of any organisation cover an additional 5% of the feed market, while direct imports of concentrate feed account for the remaining 1%.[17] At the end point, concentrate feed is purchased by around 47,000 farms involved in animal production, especially pigs, poultry and cattle.

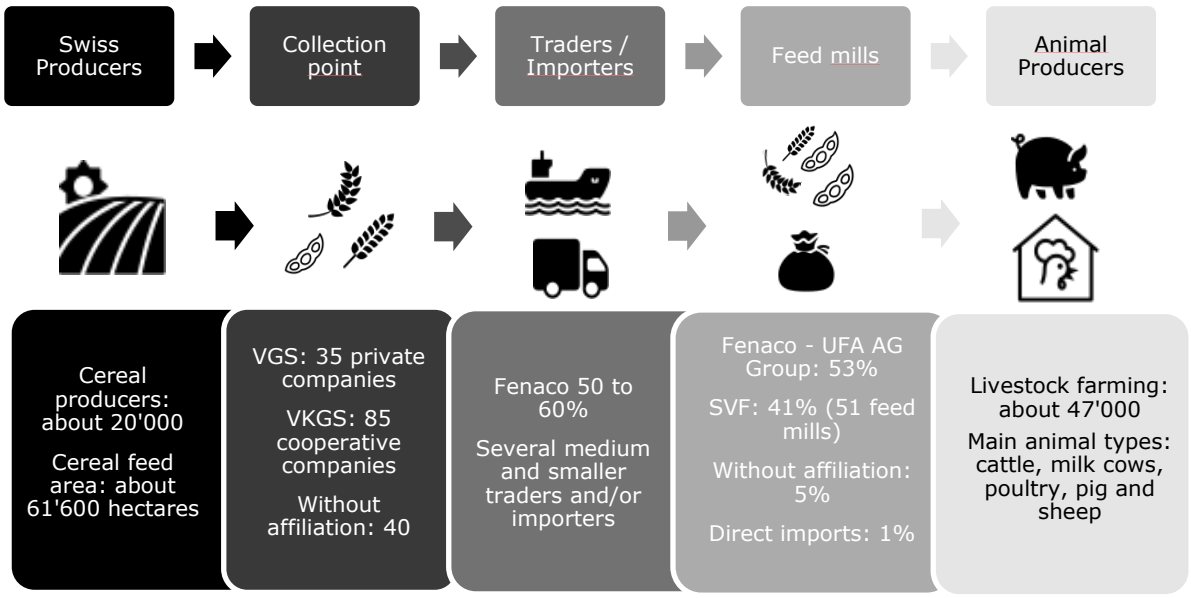


Figure 13 - *Main actors and market shares in the Swiss feed value chain*

Data sources: SGPV (2017); VSF (2017); Agridea (2015)

Based on the literature review, reports from the feed sector, price data analysis and interviews with experts, there was no evidence found on market concentration leading to higher prices for concentrate feed in Switzerland, even if the third and fourth parts of the feed chain can perhaps not be regarded as being fully fragmented. In spite of that, there are indications that the vertical integration with the retail market results in several requirements for feed materials which might lead to higher costs, such as poultry processors prescribing particular feed materials for the farmers they contract. Actually, all animal producers usually follow programme requirements from the retail market that request for feed material specificities such as non-GMO feed and certifications for sustainability and production standards.[67] Feed mills are the suppliers of concentrate feed to animal producers. Hence, they need to declare that their product follows such specificities, attending the requirements of their clients and animal producers, which in turn attend to the conditions of the retail market and consumers.

6 Feed materials

The peculiarity of the production of concentrate feed concerns the great flexibility in terms of the selection of raw materials that can be used. The reason for this is the interchangeability of the feed components. For example, all the common grains are interchangeable, which means that their use in concentrate feed is based on the price of each component. This results in the great advantage that the supply of concentrate feed does not collapse immediately if the availability of a particular feed material is limited. This applies to the energy-content feed materials (e.g. grains, such as feed wheat and feed barley). With regards to the protein-content feed materials, the interchangeability is much more limited. The most critical bottleneck concerning feed supplies is the supply of protein feed. The protein content is an essential parameter of the feed's value, and it is calculated on the basis of the nitrogen content (BLE, 2017), which means that the selection of appropriate ingredients is most frequently carried out on the basis of the content of different amino acids in the feed. Figure 14 presents the shares of the feed material components in the concentrate feed according to the standard formula (EAER, 2013):

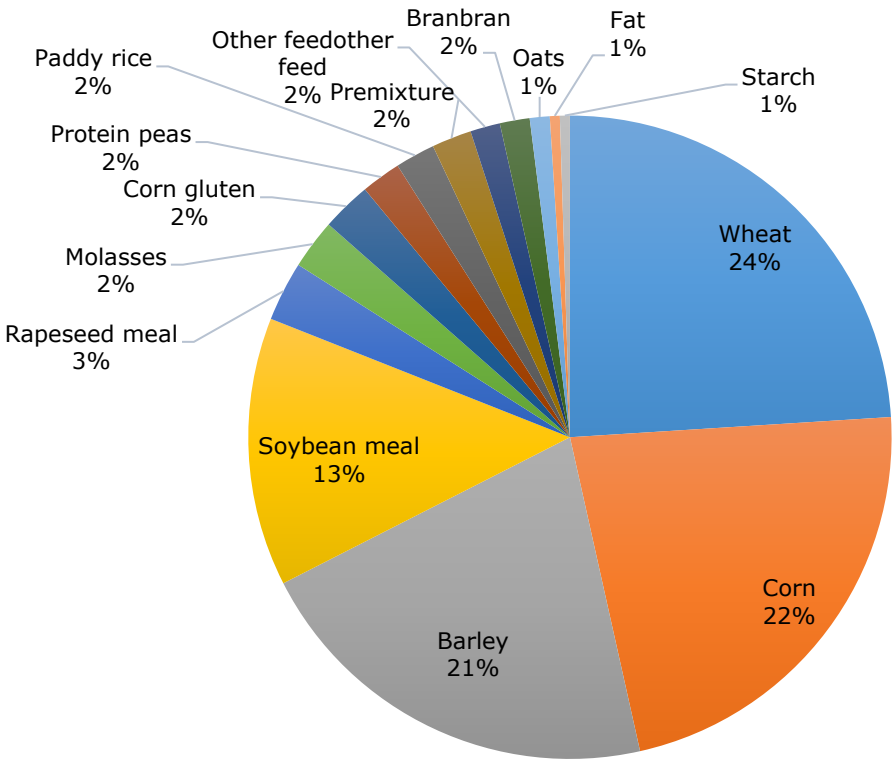


Figure 14 – *Proportions of raw materials according to the standard formula for customs charges*

Source: WBF, Verordnung des WBF über Zollbegünstigungen, Ausbeuteziffern und Standardrezepturen vom 7. Dezember 1998.

Based on three representative feed materials used for concentrate animal feed, three case studies will now be presented. The case studies aim to illustrate the price transmission as well as the costs along the value chain for the feed materials used to produce concentrate feed and, further, to explain the reasons for the higher prices. The country used as a comparison is Germany, a country neighbouring Switzerland that happens to be the biggest feed producer in the EU.

6.1 Feed barley

Barley is the most important feed cereal in Switzerland, occupying 28,641 hectares and 47% of the total production area used for feed cereals in 2016.[14] Winter barley is usually used as feed, since it is more protein rich than summer barley, which is mainly used for malting. The producer price of feed barley was defined by the indicative price of 34.5 CHF/100 kg in 2017. The purchasing price was 37 CHF/100 kg. This is the price at which it is sold by feed importers and traders, resulting in a gross margin of roughly 2.5 CHF/100 kg. This gross margin includes costs related to domestic storage and transport.

In Germany, the average producer price of feed barley in 2017 was 14 CHF/100 kg and the purchase price reached an average of 17 CHF/100 kg on the wholesale market. A gross margin of 3 CHF/100 kg can also to be seen in this case. It is worth mentioning that, in Germany, large-scale production allows farmers to deliver the product directly to the mills and hence the costs of storage between the stages (collection point) are decreased, as are the transport costs associated with moving the imported materials to the feed mill.

What causes the difference between the purchase price of 17 CHF/100 kg in Germany and the purchase price of 37 CHF/100 kg in Switzerland? In Figure 15, it is possible to find some answers to this question. The average import price of feed barley was 19 CHF/100 kg in 2017. The difference between the wholesale price of 17 CHF/100 kg in Germany and the import price of 19 CHF/100 kg can be attributed to the transport and administrative costs due to regulations up to the Swiss border. Additionally, the customs charges (IT plus GFC), as the border protection measure that protects Swiss producers of feed barley, are added at an amount of 13 CHF/100 kg (IT = 8 CHF/100 kg and GFC = 5 CHF/100 kg).[b*] This measure ensures that Swiss production of feed barley is supported, since 19 CHF (import price at the Swiss border) plus 13 CHF in customs charges results in 32 CHF/100 kg, which is close to the domestic producer price. The threshold system ensures that the import charges can be adapted each month. Hence, the threshold can vary upwards or downwards from between 0 to 3 CHF of the indicative price according to the quantity being imported in order to guarantee the supply of barley as well as to ensure the purchasing of domestically produced feed barley. Without such a measure, the producer price would not be competitive in relation to the international market and concentrate feed producers would prefer to buy barley for the wholesale value of 17 CHF/100 kg from abroad.

The large difference between the domestic and the EU price for barley is the result of protective measures. Both the cause and the effect of this policy is (at least technically) a much less efficient agriculture sector in Switzerland when compared to adjacent countries. Indeed, German farms are three times as big as Swiss farms, less densely equipped with machinery and more active in terms of using off-farm income sources.

[b*] As from September 2018.

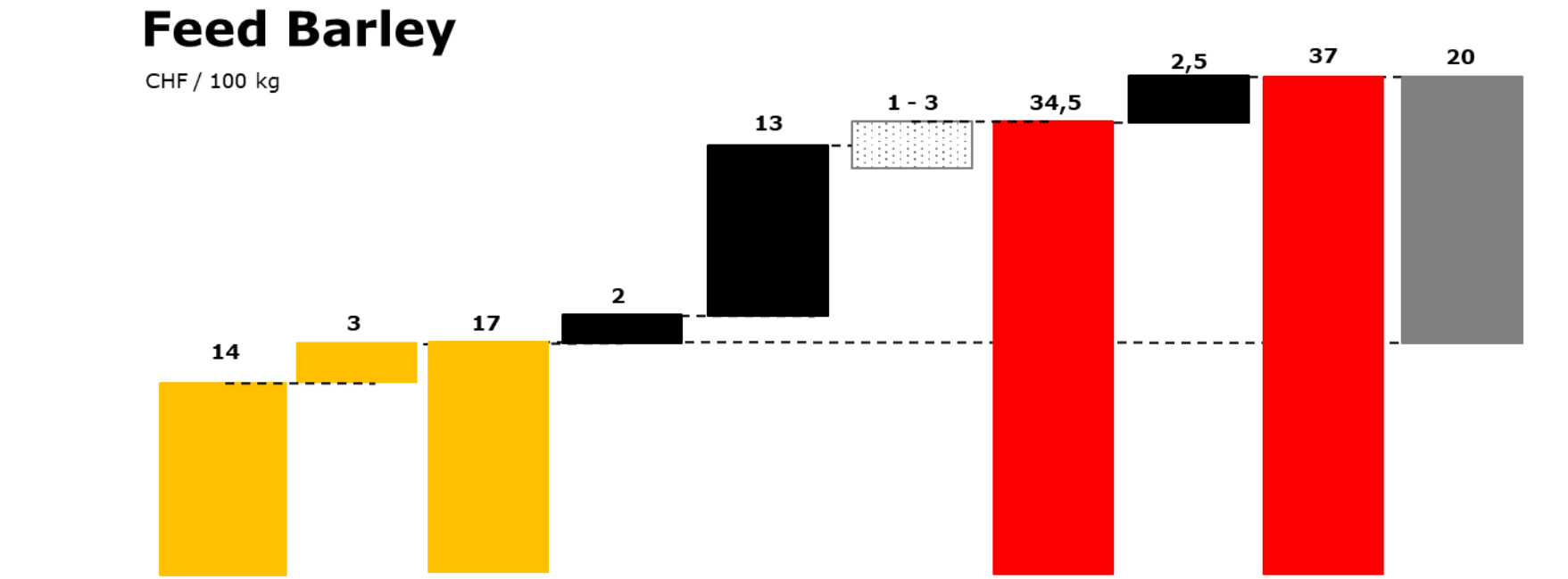


Figure 15 – *Factors explaining the high price of feed barley in Switzerland*

6.2 Feed wheat

Wheat is another very important feed cereal in Switzerland, occupying 7,408 hectares and 12% of the total production area for feed cereals in 2016.[14] The producer price of feed wheat, as noted by the indicative price, was 36.5 CHF/100 kg in 2017, while the purchase price was 39.0 CHF/100 kg. This is the price at which it is sold for by feed importers and traders, which results in a gross margin of 2.5 CHF/100 kg. This gross margin includes costs related to domestic storage and transport.

In Germany, the average producer price of feed wheat was 13 CHF/100 kg in 2017, while the purchase price reached an average of 19 CHF/100 kg in the wholesale market. A gross margin of 6.0 CHF/100 kg can be seen in this case, which is a bigger share than the one seen in Switzerland. It is worth mentioning again that, in Germany, large-scale production allows farmers to deliver the product directly to the mills, which means that the costs of storage between the stages (collection point) are decreased, as are the transport costs of moving the imported materials to the feed mill.

What causes the difference between the purchase price of 19 CHF/100 kg in Germany and the purchase price of 39 CHF/100 kg in Switzerland? While the previous section offered some explanations for price differences in the case of barley, which are equally valid for wheat, Figure 16 provides some more technical answers. The average import price of feed wheat was 20 CHF/100 kg in 2017. The difference between the wholesale price of 19 CHF/100 kg in Germany and the import price of 20 CHF/100 kg can be attributed to transport and administrative costs up to the Swiss border. Additionally, the customs charges (IT plus GFC), as the border protection measure intended to protect Swiss producers of feed Barley, are added, resulting in an amount of 12 CHF/100 kg (IT = 7 CHF/100 kg and GFC = 5 CHF/100 kg).[c*] This measure ensures that Swiss production of feed barley is supported, since 20 CHF (import price at the Swiss border) plus 12 CHF of customs charges leads to a value of 32 CHF/100 kg, which is close to the domestic producer price (36.5 CHF/100kg).

The difference between the 32 CHF/100kg and the 36.5 CHF/100kg is explained by the threshold system, which ensures that the import charges are adapted each month as necessary. Hence, the threshold can vary upwards or downwards from between 0 to 3 CHF of the indicative price (domestic producer price) according to the quantity being imported in order to guarantee the supply of feed wheat and to ensure the purchasing of domestically produced feed wheat. Without such a measure, the producer price would not be competitive in relation to the international market and, therefore, concentrate feed producers would prefer to buy it for the wholesale value of 19 CHF/100 kg from abroad. However, even with a monthly adaptation of the import tariff from 0 to 3 CHF/100 kg, the level of the domestic prices is not fully explained by the border protection measures. An amount value of 1.5 CHF/100 kg is still to be added in order to reach the 36.5 CHF/100 kg. One possible explanation could be that the profit margins from traders or importers are larger when importing feed wheat, even after accounting for customs charges.

Here again, the large difference between the domestic and the EU price of wheat results from the applied protective measures. Both the cause and the effect of this policy is (at least technically) a much less efficient agriculture sector in Switzerland when compared to adjacent countries. German farms are three times as big as Swiss farms, less densely equipped with machinery and more active in terms of using off-farm income sources.

[c*] As from September 2018.

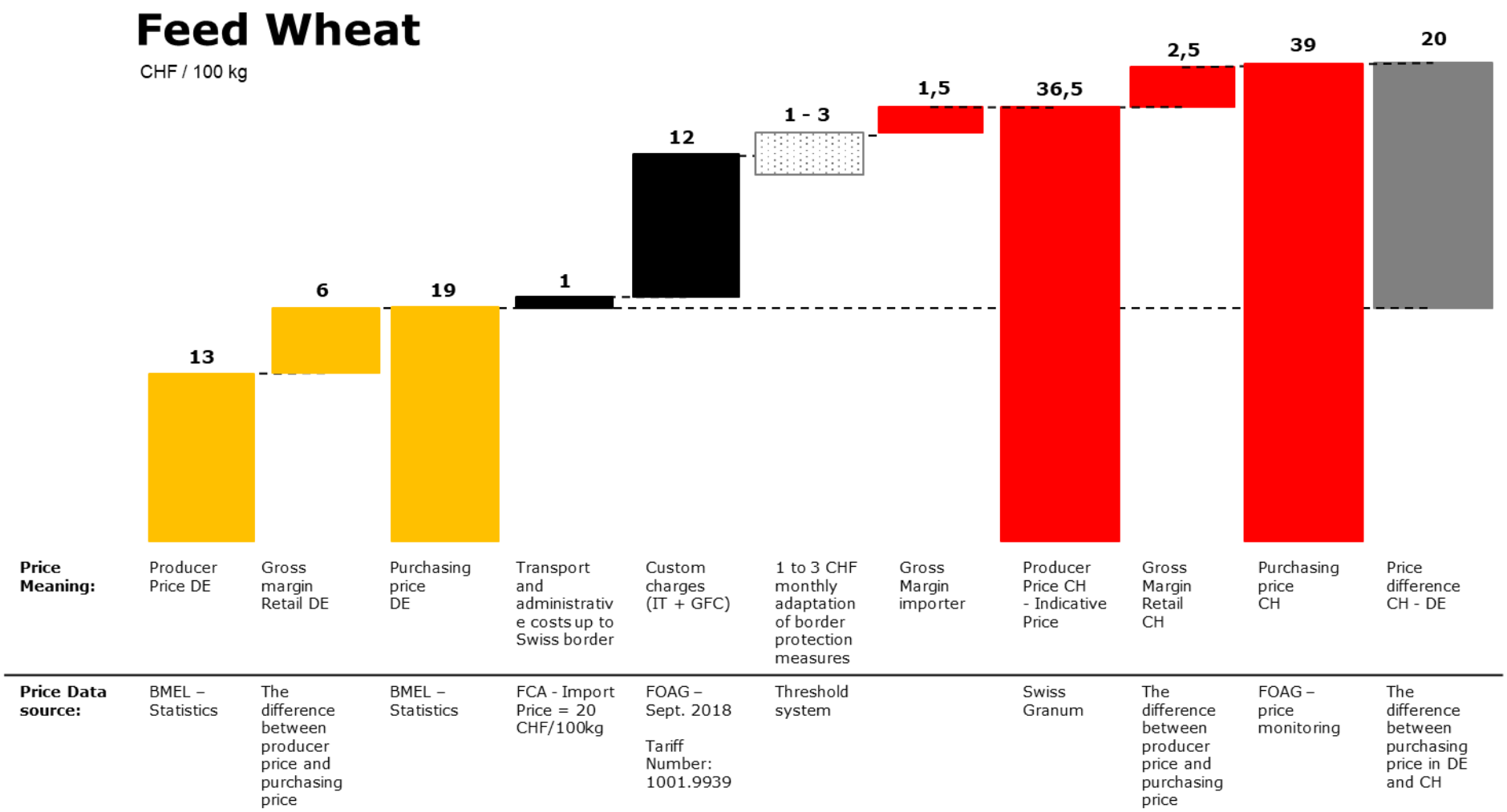


Figure 16 – *Factors explaining the high price of feed wheat in Switzerland*

6.3 Soybean meal

Soybean meal is an important protein-rich feed material that is used in the production of concentrate feed. The market prices are extremely different depending on the quality (protein content) and the certification with regards to ecological and social standards. In general, the most conventional soybean meal on the market has a protein content of 44%, which results in a lower price than soybean meal with a protein content of 48%. Soybean meal with a protein content of 48% is considered to be better quality and, generally, it is made from soybeans grown overseas. Due to weather constraints, soybeans grown in Europe have an average protein content of 44%.[62] These factors are directly related to the higher cost of soybean meal in Switzerland, since the average quality used is higher (at least a 48% protein content) and 96% of imports hold a certification of responsible production.

Relatedly, GMO-free soybean meal also has a higher price, 18.5 CHF/100 kg instead of 7. Besides its use rarely being required in Germany, there is an increasing trend towards GMO-free feed, mainly due to the demands of the food retail market.[68] Nevertheless, the largest amount of soybean meal consumed in Germany still stems from GMO varieties, whereas in Switzerland only GMO-free feed is used. When considering the same product (GMO-free), the price is equal to that of the soybean meal available in Germany at an average price of 52 CHF/100 kg.

A possible substitute for soybean meal as a protein-rich feed material is rapeseed meal. Rapeseed meal is the second most commonly produced oilseed behind soybeans, and the EU is one of the major producers worldwide.[68] It should be noted, however, that rapeseed meal has a lower protein content (34%) and, in order to achieve the necessary protein content in the concentrate feed, a greater quantity of rapeseed meal would have to be used. Even with the cultivation of 9,225 thousand tons of rapeseed meal in Europe in 2016, the feed demand for protein-rich feed material in Europe was not reached. The dependence on imports of protein-rich raw material in Switzerland is not much different to the situation in other European countries. Hence, soybean meal/cake continues to represent the main supplier of crude protein for feed in Europe.[69]

The largest share of soybean meal purchased in Switzerland in 2017 came from Brazil (Figure 17), and the average price was 52 CHF/100 kg. In Figure 18, it is possible to see that the price of soybean meal in Switzerland is basically the same as in Germany if the GMO-free variety is accounted for. Soybeans are traded on international markets and the average price on the Chicago exchange market in 2017 was 35 CHF/100 kg. It costs about 2.5 CHF/100 kg to ship soybeans to a European port and there are no border protection measures related to soybean meal in Switzerland. There are also additional costs for transport and storage, which are included in the gross margin of the retail market. It is worth mentioning that the value of 54 CHF/100 kg accounts for GMO-free soybean meal with a protein content of at least 48%, while the value of 52 CHF/100 kg accounts for a protein content of only 44%. Hence, the higher prices for soybean meal are due to higher quality parameters (higher protein-content and non-GMO varieties). This is an important factor to be consider, since soybean meal accounts for between 10 and 20 % of the total used feed materials to produce concentrate feed in Switzerland.

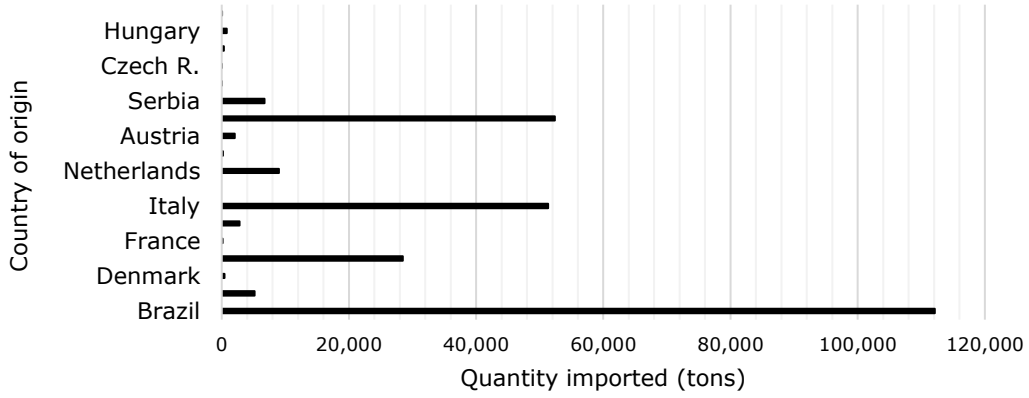


Figure 17 – *Quantity of soybean meal imported into Switzerland in 2017 according to the country of origin*
Data source: EZV, Swiss-Impex

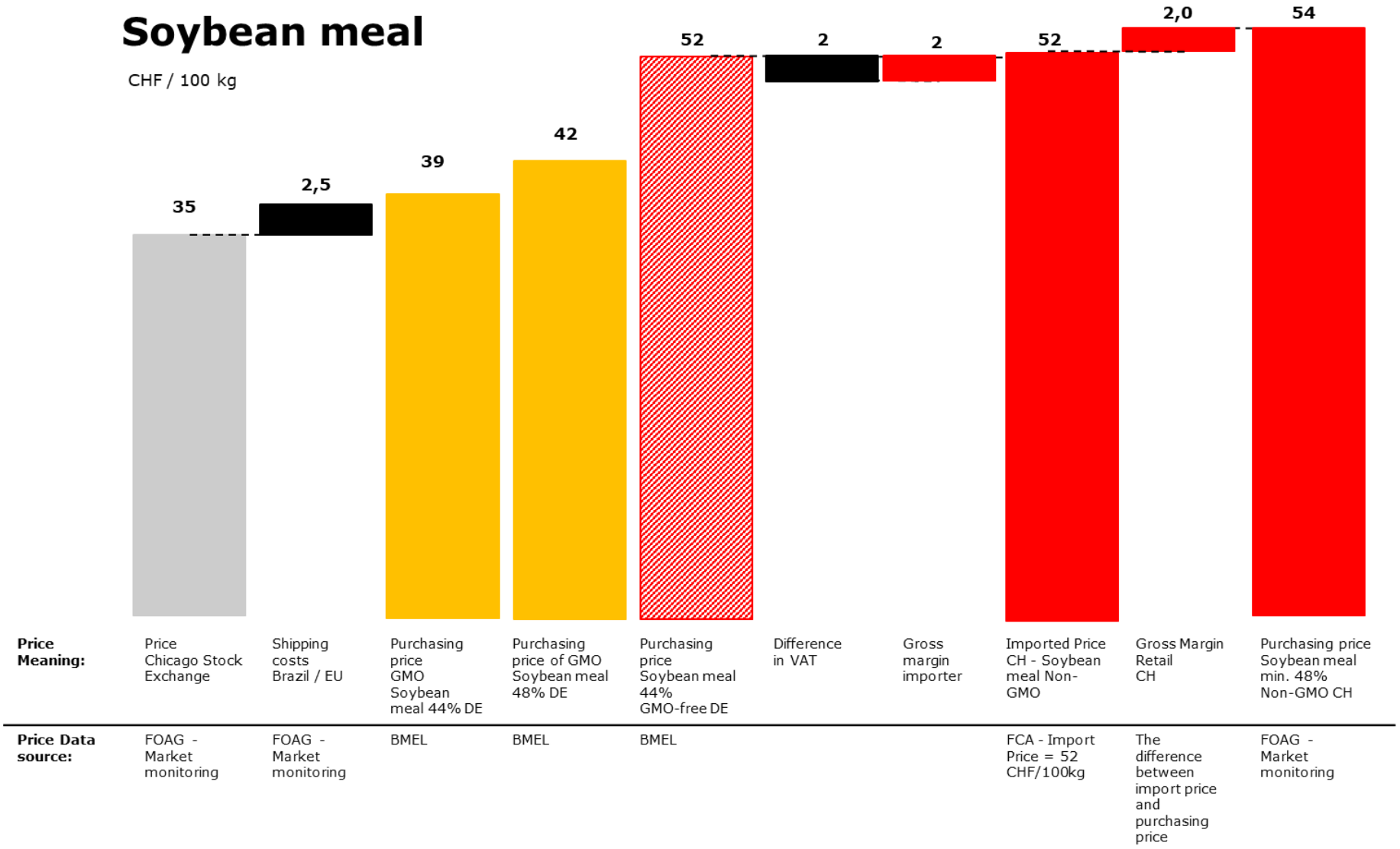


Figure 18 – *Factors explaining the high price of soybean meal in Switzerland*

7 Concentrate feed

Based on the previous three case studies, it should be clear that the higher prices paid for feed materials are related to the higher producer prices for feed barley and feed wheat in Switzerland, to border protection measures intended to support the domestic production of feed materials and to an industry struggling with high domestic costs and absent economies of scale. In the case of soybean meal, the higher prices are not related to any border protection measures, but instead to higher costs stemming from the quality requirements associated with a higher protein content, GMO-free varieties and certifications concerning ecologically and socially responsible production.

Concentrate feed, however, is a combination of approximately 15 feed materials. Each component has different costs, such as those previously discussed in relation to the three case studies. Considering this background, there are many challenges involved when analysing the prices and costs along the value chain for concentrate feed:

1. There is the potential for the interchangeability of the feed materials. For this reason, the formula might change according to the feed materials combined in order to produce concentrate feed.
2. The formula also changes according to the target animal, as well as according to the different stages of animal production. For example, piglet concentrate feed is usually purchased on the market at a price of 90 CHF/100 kg, whereas the concentrate feed for pig fattening is purchased for about 59 CHF/100 kg.
3. There can be adaptations made to the formula and, therefore, the feed material content according to the desires of the animal producer (e.g. if some minerals are to be added, if organically produced cereals are preferred etc.).
4. Each feed mill has its own formula, which is treated as a trade secret that cannot be published or communicated to the public.

In the face of these difficulties, the standard formula from the AEAR is used as a reference for attaining as precise as possible measurements. Using the standard formula, it was possible to calculate the costs of feed materials by considering the domestic producer prices and the average import prices from 2017. A value of 40 CHF represents the feed material cost necessary to produce 100 kg of concentrate feed according to this standard formula. In other words, this is what feed mills pay for all the feed materials required to produce 100 kg of concentrate feed. Table 4 presents the exact calculation when considering the use of several feed cereals produced in Switzerland. Import charges, such as import tariffs, for some products are still considered, since no other price is available. The fact that not all the feed materials can be sourced domestically increased the final price of concentrate feed by 1.5 CHF.

Table 4 – *Costs of the feed materials necessary to produce concentrate feed using Swiss-produced materials*
Data source: FOAG (2017), FCA (2017)

Feed	Quantity %	Domestic producer prices (*) and import prices CHF	Domestic producer prices (*) and import prices CHF in 100 kg - CHF	Import charge - CHF/100kg (Sep. 2018)	Import charge in 100 kg CF (CHF - Sep. 2018)	Final Price with customs - CHF
protein peas - *Eiweisserbsen**	2	36,00	0,72	-	-	0,72
wheat - *Weizen**	24	36,00	8,64	-	-	8,64
barley - *Gerste**	21	33,80	7,10	-	-	7,10
oat - *Hafer**	1	29,00	0,29	-	-	0,29
corn - *Mais**	22,5	37,00	8,33	-	-	8,33
paddy rice - *Bruchreis*	2	35,10	0,70	1	0,02	0,72
other feed - *Übrige Futtermittel*	1,5	43,50	0,65	6,7	0,10	0,75
fat - *Fett*	0,5	84,80	0,42	0	0,00	0,42
Molasses - *Melasse*	2,5	22,12	0,55	14	0,35	0,90
bran - *Kleie*	1,5	17,70	0,27	16	0,24	0,51
corn gluten - *Maisgluten*	2,5	65,30	1,63	0	0,00	1,63
soybean meal - *Sojaschrot*	13,5	52,00	7,02	0	0,00	7,02
rapeseed meal - *Rapsschrot*	3	25,12	0,75	2	0,06	0,81
premixture - *Vormischungen*	2	160,00	3,20	9,8	0,20	3,40
starch - *Stärke*	0,5	54,10	0,27	0	0,00	0,27
Concentrate feed (CF)	100kg		**40,5**		1,0	**41,5**

*from Swiss production

In order to determine the impact of border protection on the production of concentrate feed, the standard formula was again used when considering the import prices of all the raw materials. A value of 30 CHF represents the cost of the feed materials necessary to produce 100 kg of concentrate feed without customs charges (IT + GFC). Table 5 presents this calculation. If the customs charges for the feed materials are included where tariff measures are applied, there is a total increase of 10 CHF, resulting in a final cost of 40 CHF per 100 kg of concentrate feed (the same value as when using domestically produced feed materials). Hence, it is possible to confirm the effectiveness of the applied border protection, since the Swiss agricultural policy aims at compensating the price difference between the imported feed materials and the domestically produced ones. Therefore, one fourth of the price of imported concentrate feed is due to import tariffs.

Table 5 – *Costs of the feed materials required to produce concentrate feed using only imported materials*
Data source: FOAG (2017), FCA (2017)

Feed	Quantity %	Import price CHF	Import price in 100 kg - CHF	Import charge - CHF/100kg (Sep. 2018)	Import charge in 100 kg concentrate feed CHF (Sep. 2018)	Final Price with customs - CHF
protein peas - *Eiweisserbsen*	2	29,48	0,59	13	0,26	0,85
wheat - *Weizen*	24	20,60	4,94	12	2,88	7,82
barley - *Gerste*	21	20,16	4,23	13	2,73	6,96
oat - *Hafer*	1	24,34	0,24	2	0,02	0,26
corn - *Mais*	22,5	22,63	5,09	13	2,93	8,02
paddy rice - *Bruchreis*	2	35,10	0,70	1	0,02	0,72
other feed - *Übrige Futtermittel*	1,5	43,50	0,65	6,7	0,10	0,75
fat - *Fett*	0,5	84,80	0,42	0	0,00	0,42
Molasses - *Melasse*	2,5	22,12	0,55	14	0,35	0,90
bran - *Kleie*	1,5	17,70	0,27	16	0,24	0,51
corn gluten - *Maisgluten*	2,5	65,30	1,63	0	0,00	1,63
soybean meal - *Sojaschrot*	13,5	52,00	7,02	0	0,00	7,02
rapeseed meal - *Rapsschrot*	3	25,12	0,75	2	0,06	0,81
premixture - *Vormischungen*	2	160,00	3,20	9,8	0,20	3,40
starch - *Stärke*	0,5	54,10	0,27	0	0,00	0,27
Concentrate feed	100kg		**30,6**		**9,8**	**40**

In practice, neither solely domestically produced feed materials nor solely imported ones are used in the production of concentrate feed. A mixture of both is usually utilised, bearing in mind the Swiss self-sufficiency rate of about 42% in relation to feed materials. In Table 6, it is possible to see the average purchase prices of different concentrate feeds, as reported by six feed mills to the Department of Market Analysis of the FOAG. Again, in practice, the price associated with contracted production is the usual purchase price paid by farmers. Contracted production is related to quantity discounts stemming from the purchase of concentrate feed in large quantities. The values of 58 CHF/100 kg for laying hen feed and 62 CHF/100 kg for chicken fattening feed under conditions of contracted production are closer to reality. Moreover, according to interviews conducted with representatives of feed mills, the selling price of pig fattening feed ranges between 56 and 65 CHF/100 kg (considering the quantity-related discounts), while an average price of 59 CHF/100 kg has been confirmed by the Swiss Pig Producers' Association. Hence, a value of 60 CHF/100 kg is pondered in this study as the average purchase price for concentrate feed.

Table 6 – *Prices for different types of concentrate feed in Switzerland*

Type of concentrate feed	Price (CHF/100 kg)
Laying hen feed	87
Chicken fattening feed	104
Breeding sow feed	76
Pig fattening feed	74
Dairy cow mixture of cereals	69
Cattle fattening feed	83
Laying hen feed, contracted production	**58**
Chicken fattening feed, contracted production	**62**

Source: FOAG, Market Analysis – mean average 2011 to 2017

The purchase price of concentrate animal feed in Switzerland has decreased over the years. This is demonstrated by Figure 19, which displays the price index for animal feed in Switzerland from the early 1990s until 2017, indicating a reduction in feed costs.

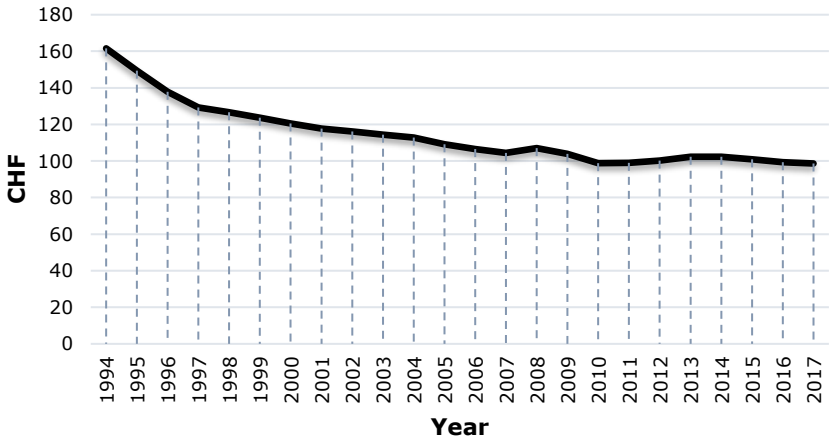


Figure 19 - *Purchaser price index of animal feed in Switzerland relative to the consumer price index (December 2015 – 100)*
Data source: BFS - Purchase price index of agricultural inputs

The comparison of Swiss concentrate feed prices with those of other countries can only be performed to a certain extent, since many product characteristics (e.g. GMO-free, high protein content, certifications, etc.) differ greatly between countries. Nevertheless, the same Swiss standard formula was used to simulate the feed material costs in Germany, using GMO-free soybean meal as the example. In order to determine the reasons behind the higher price of concentrate feed seen in Switzerland, a case study investigating the average price of concentrate feed as well as the costs along the chain is presented below.

7.1 Average values and costs of concentrate feed

The cost of the feed materials necessary to produce 100 kg of concentrate feed in Germany ranges between 20 and 24 CHF. This holds when considering the quantities used in the Swiss formula, the German producer prices and the use of GMO-free soybean meal. The gross margin of German feed mills, therefore, ranges from 11 to 15 CHF per 100 kg of concentrate feed, since the average purchase price of concentrate feed is 35 CHF/100 kg. The gross margin includes the costs associated with labour, energy, building, administration, transport, marketing, etc.

In Switzerland, the average purchase price of concentrate feed is 60 CHF/100 kg. As the cost of the raw materials ranges between 40 and 46 CHF, the gross margin of the feed mills ranges between 14 and 20 CHF.

What causes the difference between the purchase price of 35 CHF/100 kg for concentrate feed in Germany and the purchase price of approximately 60 CHF/100 kg in Switzerland? In Figure 19, it is possible to find some answers to this question. The first factor related to the price differences is the cost of the feed materials. In Germany, this means about 20 to 25 CHF, whereas in Switzerland, it is 40 to 45 CHF. This difference is larger than the actual import tariff because several middlemen also have to be paid when cereals are traded. The price difference is related to the factors analysed in the three case studies discussed above. Border protection measures, such as import tariffs, also play a role due their aim of protecting the domestic production of feed cereals, such as feed barley, feed wheat, triticale, etc. On the other side, the difference is due to external factors, such as the preference for high-quality feed materials, GMO-free products and sustainability/production certifications. In addition, feed mills also provide advisory services, for example, in terms of calculating the nutrient balance. These costs might be integrated into the purchase price of concentrate feed, but this factor could not be proven by the data analysed.

The difference between the purchase price of concentrate feed in Switzerland (60 CHF/100 kg) and the total cost of the required feed materials (40 to 46 CHF) results in a gross margin for feed mills ranging between 14 and 20 CHF/100 kg. The lighter areas of the columns in Figure 19 reflect the cost fluctuations that are dependent on the feed material costs. These fluctuations in concentrate feed costs are subject to feed material usage, as well as to the challenges that were discussed at the beginning of this chapter regarding the analysis of prices for concentrate feed.

Since there is a great interchangeability of the feed materials used to produce 100 kg of concentrate feed, the final price of concentrate feed will be highly dependent on the price of each component used (among the approximately 15 normally utilized). For instance, if comparing the prices for feed barley and feed wheat, it might happen that the share of the least expensive grain covers the share for the two components. Besides, the fluctuations on costs are related to the different concentrate feed produced and available on the market (see Table 6). Chicken fattening feed have a different process than pig fattening feed since the nutritional needs of chickens are very different from those required by pigs, for example. Hence, the feed materials and its costs will change, directly affecting the final price of concentrate feed. The price for concentrate feed is therefore signalised (~) by an average price for the common types of concentrate feeds supplied by Swiss feed mills.

The gross margin in Figure 20 includes, for example, costs related to transport, the running of the mill, wages, energy, marketing and advisory services, which means that the margin may vary greatly depending on the size of the mill. These results concerning the gross margins do not differ from those of previous studies that analysed the gross margins associated with concentrate feed. In 2005, the PUE found an average gross margin of 19.70 CHF/100 kg in relation to concentrate feed from Swiss feed mills and an average gross margin of 11.50 CHF/100 kg from German feed mills. The replication of that study conducted by the PUE in 2015 determined an average gross margin of 14.60 CHF per 100 kg for the four concentrate feed types examined in Switzerland.

Border protection measures achieve their purpose by ensuring that imported feed inputs are at least as expensive as Swiss-produced ingredients. Swiss feed materials have a slight advantage due to their lower transport costs when compared to the costs of feed materials from abroad. Further information regarding the effects of reduced border protection is provided in the subsequent chapter.

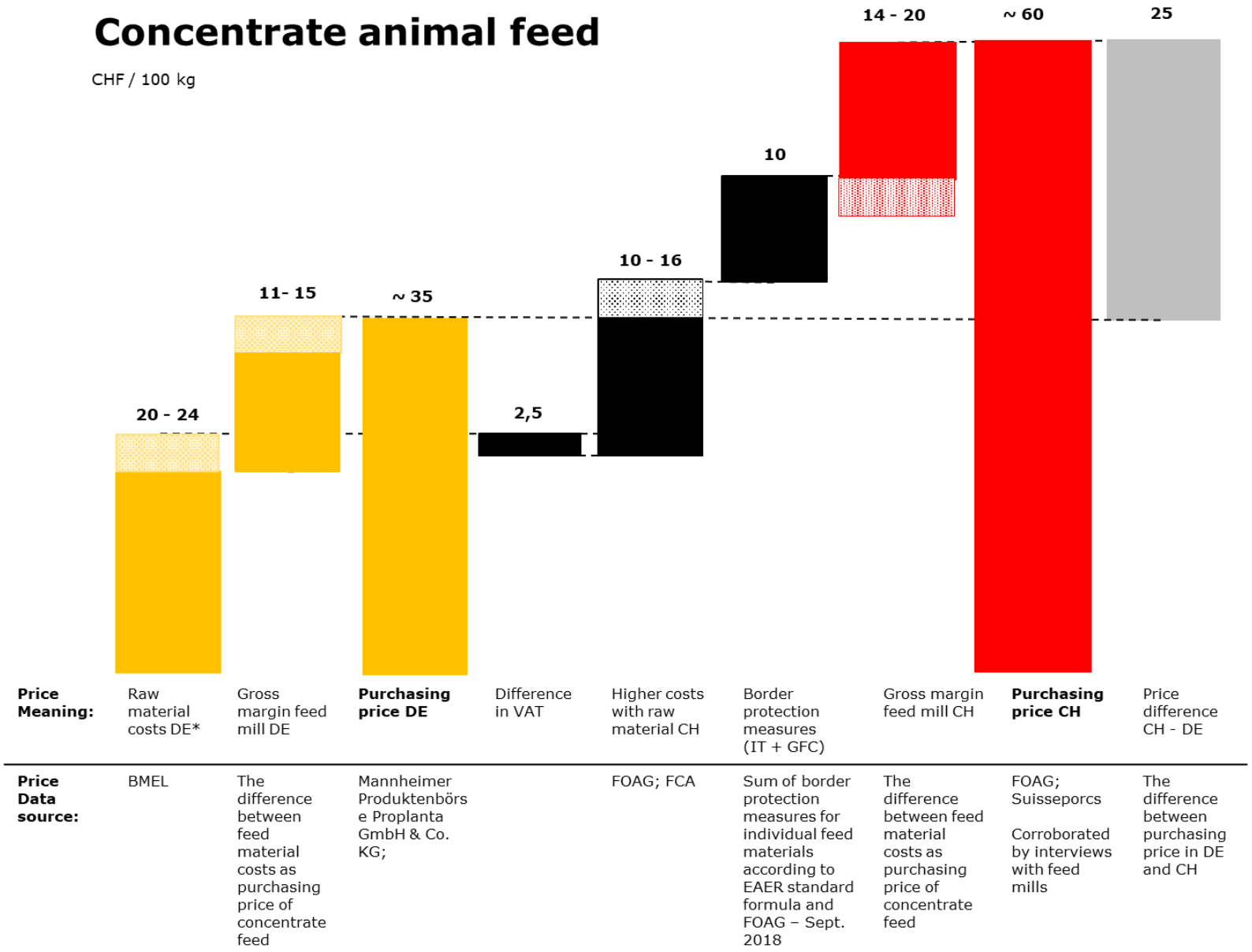


Figure 20 – *Factors explaining the high price of concentrate feed in Switzerland*

8 Modelling zero border protection for animal feed

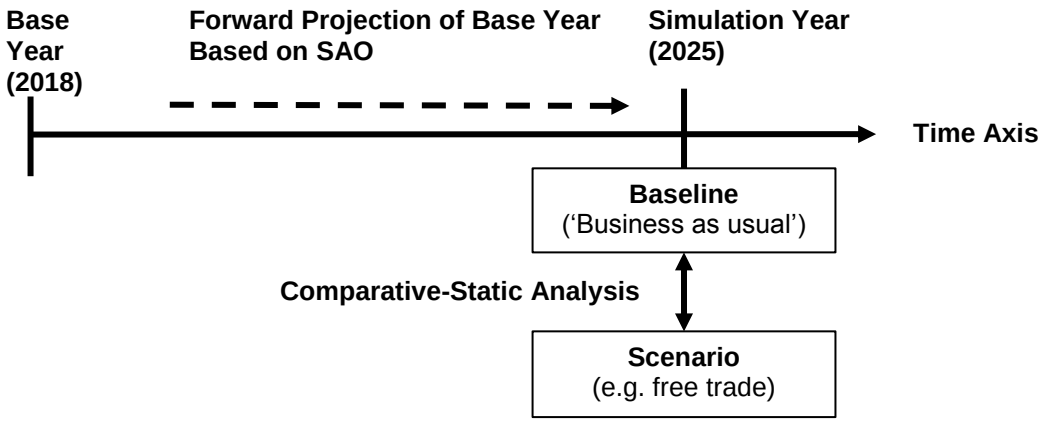
Below, the CAPRI equilibrium model is used as an example of a cost-reducing measure allowing us to more accurately assess the consequences of eliminating tariff on feed by means of model simulations. As part of the analysis, the effects on imports, prices, production quantities and feed consumption of a full tariff reduction on feed are discussed. CAPRI (Common Agricultural Policy Regionalised Impact Modelling System) ist a comparative-static equilibrium model illustrating the bilateral trade flows of 77 countries for the 47 most important agricultural products (for a detailed product list, see Annexe). Since 1997, the University of Bonn has continuously refined, updated and expanded the model in terms of content. For Switzerland, these additional developments are carried out by Agroscope. Here, supply and demand are linked via an iterative process, and follow economic principles: if prices fall, consumption increases and supply falls. Markets are cleared in equilibrium, i.e. prices are adjusted such that demand matches supply.

Bilateral trade between countries exists in the model on the basis of the Armington assumption, i.e. products differ according to country of origin, with the result that domestic and imported agricultural goods are not perfect substitutes for consumers. In CAPRI, agricultural markets are defined at an aggregate level, i.e. meat, for example, is classified as beef, poultry, pork, and goat and lamb/mutton; no further details are given. Accordingly, tariff reductions or eliminations can only be implemented and investigated on the same level. In CAPRI, the processing industry is modelled on the basis of cheese, dairy products, oil cakes and oils alone.

The model used in this analysis corresponds to the one that is freely available on the CAPRI Network website: no modifications were made to it.

The Swiss Agricultural Outlook (SAO) as well as information from the Swiss-Impex database serve as the underlying data for Switzerland. The former provides the necessary medium-term volume- and price- trend forecasts for the most important Swiss agricultural products in the simulation year; the latter furnishes information on Swiss import and export shares. Data from the FOAG's Agricultural Report are also included. Moreover, the knowledge of FOAG market experts is included in the model through the validation process for the baseline. They validate both the prices and quantities used in the model for the baseline. For this reason, and likewise owing to the incorporation of Swiss-specific measures (such as Switzerland's direct-payment system), the effects of trade-policy measures on the Swiss agricultural sector can be estimated ex-ante. In particular, effects on (1) expected prices, (2) domestic production, (3) imports and exports, and (4) overall social welfare are modelled.

The effects of trade-policy measures (e.g. tariff adjustment) are illustrated in relation to a reference situation (the situation in 2025; comparative static analysis). The reference situation refers to 'business as usual', i.e. the unchanged continuation of the trade and agricultural policy from the base year (see Figure 20).



N.B.: SAO = Swiss Agricultural Outlook.
Figure 20: Comparative Static Analysis in CAPRI

When interpreting the results, it should be borne in mind that model calculations with the CAPRI model are based on various assumptions, and that the findings are decisively influenced by different parameters in the model (such as assumptions regarding supply- or Armington elasticities). Armington elasticities are thus based e.g. on estimates from the literature. By contrast, supply elasticities are generated for Switzerland from the SWISSland model and incorporated in CAPRI. All in all, these elasticities are very low, with the result that the effects of trade-policy changes on domestic production tend to be fairly slight. Because of these different assumptions, which will be addressed below, the results of the CAPRI model can point to trends, but should not be interpreted as point estimators. In particular, very small changes are often scarcely interpretable.

When simulating tariff reductions, it is important to note that border protection differs according to the product in question.

In CAPRI, tariffs for Switzerland are illustrated as specific tariffs, i.e. CHF per tonne. In the model, tariffs raise import prices and reduce imports compared to a free-trade scenario. This supports domestic supply, but leads to welfare losses. Tariff quotas work in a similar manner. If there is a tariff quota for a product, it should be noted that imports within the quota are subject to a reduced rate of duty. By contrast, duty on imports outside the quota figure is charged at a (prohibitively) high rate. The rule for feedstuffs in CAPRI is that all quotas are fully exhausted.

8.1 Scenario Definition: Unilateral Tariff Reductions for Feedstuffs

Below, and in order to gauge the impact of the unilateral elimination of all tariffs (including guarantee-fund payments) on feedstuffs as a potentially important element for reducing domestic costs, we present the effect on imports, domestic production and producer prices, at both product level and aggregate level. Besides highlighting the direct impacts on the various feedstuffs, the effects are also placed in relation to the price differences with the EU, and changes on the domestic market for meat production and dairy products are discussed.

In CAPRI, the following products with their corresponding percentages are counted as feed (see Table 7), with the products 'husked rice' and 'flax and hemp' not being produced in Switzerland:

Table 7 – *Products in CAPRI with corresponding utilisation as feed in %*

Products of which more than 30% and less than 70% of production is used in feed production (remainder for human consumption)		Products of which more than 70% of production is used in feed production (remainder for human consumption)	
Product	Percentage used as feed	Product	Percentage used as feed
Skimmed-milk powder	30%	Barley	70%
Wheat	32%	Other types of grain	80%
Rye	40%	Oats	85%
Husked rice	50%	Soybean oil	85%
Pulses	50%	Flax and hemp	90%
		Maize	94%
		Whey powder	100%
		Rapeseed cake	100%
		Sunflower-seed cake	100%
		Soybean cake	100%

Based on the division into the '30–70% use as feed' and 'over 70% use as feed' categories, two different scenarios were described:

(i) Scenario_70: The *ad valorem* tariffs applied to all products of which more than 70% is allocated to feed production (right-hand side of table *Table 7 – Products in CAPRI with corresponding utilisation as feed in* % **Table 7** – Products in CAPRI with corresponding utilisation as feed in %), are completely eliminated.

(ii) Scenario_30: The *ad valorem* tariffs applied to all products listed in Table 8 – i.e. to products of which less than 70% but more than 30% is used as feed – are fully eliminated.

In CAPRI it is not possible to separately lower just the tariffs for the share of the products that are also used as feed, which explains the distinction between the two scenarios: whereas scenario (i) will lead to a slight underestimation of the tariff elimination, since several products that are also used as feed are not taken into consideration, scenario (ii) actually overestimates the results. Here, the tariffs for products with a comparatively high consumption by humans are also eliminated. There is an unintentional effect on supply and on food prices, and a switch to the production of foods for human consumption is not being encouraged (because prices for food for human consumption are also falling). Both of these effects lead to an overestimation of the effects on supply prices and domestic-product prices in scenario (ii). All in all, we may conclude that a realistic estimate of tariff elimination will lie within the range of the two calculated scenarios.

Products used as feed tend to be subject to lower tariffs that foodstuffs. Since, however, it is not possible to separate the products into feed and the percentage used for human nutrition, the applied *ad valorem* tariffs are thus eliminated equally for both categories, and not, for example, by a weighted average that takes different *ad valorem* tariff approaches and the proportion of (animal) feed and (human) food into consideration. This would have been an alternative approach particularly in the case of products of which only a low proportion is used as feed (wheat, rye, rice, pulses, skimmed-milk powder). Looking at the *ad valorem* tariffs of these products for feed and human consumption, however, it is obvious that the tariffs (average for 2000-2007) differ only slightly, which is why this approach is not pursued any further, and the tariffs are eliminated as a whole.

8.2 Import Changes

Except for a few substitution effects, imports of products used for feed production are increasing on the whole (see Table 8). In the first scenario, Scenario_70 (S_70 below), the products 'wheat', 'rye', 'pulses', 'skimmed-mild powder' and 'rice' are not affected by tariff eliminations. By contrast, scenario_30 (S_30

below) includes all the listed products. Consequently, the products not subject to tariff eliminations in S_70 are imported less, and are replaced by other products that are useful for feed production. Thus, whereas imports of wheat, rye, pulses and skimmed-milk powder fall in this scenario, imports of barley, oats, maize and other cereals rise sharply. This increase is somewhat smaller in S_30, since here too, imports of products not taken into consideration in S_70 are increasing (e.g. wheat imports remain practically the same in S_70, but rise by 43% in S_30, whilst barley still rises by 40% in S_30, but only by 11% in S_70. It is also striking that the usually-more-expensive oil cakes are replaced by cereals, and that import volumes for the cakes decrease as a whole (more on this later in the Chapter 'Impact on producer prices').

Table 8 – *Import volumes (in 1000 t) and relative changes compared to the reference for the S_30 and S_70 scenarios in 1000t and %, at product level*

	Reference	Scenario_70	Scenario_30
Wheat	*363.93*	*357.66*	*518.79*
		-1.72%	*42.55%*
Rye and meslin	*3.83*	*3.14*	*6.42*
		-17.99%	*67.36%*
Barley	64.88	90.66	72.32
		39.72%	11.46%
Oats	52.32	75.59	70.53
		44.45%	34.79%
Grain maize	121.94	185.25	153.43
		51.92%	25.83%
Other cereals	14.14	28.56	26.22
		102.05%	85.44%
Pulses	*15.47*	*13.88*	*15.77*
		-10.29%	*1.96%*
Flax and hemp	6.22	5.63	5.47
		-9.38%	-12.08%
Skimmed-milk powder	*1.64*	*1.53*	*1.51*
		-6.65%	*-8.24%*
Whey powder	3.81	4.81	4.69
		26.31%	23.05%
Soybean oil	2.85	10.56	9.18
		270.53%	222.05%
Rapeseed cake	26.87	22.68	22.08
		-15.57%	-17.81%
Sunflower-seed cake	1.87	1.44	1.36
		-22.98%	-27.17%
Soybean cake	256.78	255.57	255.03
		-0.47%	-0.68%
Rice, husked	96.69	91.93	94.83
		-4.92%	-1.93%

At aggregate level in Table 9, imports of cereals as a whole clearly increase the most, since they account for a large proportion of feed production. Moreover – as already mentioned – imports of oil cakes decrease slightly. Meat imports remain on a more-or-less constant level.

Table 9 – *Import levels (in 1000 t) and relative changes c the reference for the S_30 and S_70 scenarios in 1000t and %, at aggregate level*

	Reference	Scenario_70	Scenario_30
Cereals	621.04	740.86	847.7
		19.29%	36.50%
Oilseeds	51.57	48.61	47.49
		-5.73%	-7.91%
Meat	91.07	90.96	90.93
		-0.12%	-0.16%
Dairy products	65.28	66.03	65.82
		1.15%	0.82%
Oils	78.8	85.53	83.96
		8.54%	6.55%
Oil cakes	285.51	279.69	278.47

		-2.04%	-2.46%

8.3 Impact on Producer Prices

Table 10 illustrates the changes in producer prices in both scenarios. It also gives the reference prices of the initial situation both in Switzerland and in the EU. With regard to the reference – a continuation of previous framework conditions in the simulation year 2025 – Swiss prices usually amount to a figure twice as high as for the EU (see also Table 11), which is congruent with the above results. When tariffs are eliminated, producer prices in Switzerland fall, especially in the second calculated scenario. The sharpest decrease is recorded for wheat in the second scenario: here, prices fall by nearly 50%. This result must be treated with caution, however, since only 40% of wheat actually goes to feed production. In scenario S_70, however – the scenario in which the tariff on wheat is not eliminated, but remains at a constant level – prices still fall by 15%. As a whole, though, the price level in the S_30 scenario is still higher than the EU prices. For the aggregate level and the products not directly affected by the tariff eliminations, such as meat products, there is a minimal drop in prices that can be explained by, and results from, the lower prices for feed. Prices for oils and oilseeds remain at a more-or-less constant level (see Table 11).

Table 10 – *Producer prices for the EU reference and Swiss (CH) reference, with changes for the S_30 and S_70 scenarios in EUR per tonne, at product level*

	Reference_EU	Reference_CH	S_70	S_30
Wheat	156.29	375.53	318.71	204.13
			-15.13%	-45.64%
Rye and meslin	145.26	360.1	330.64	278.06
			-8.18%	-22.78%
Barley	160.94	292.31	228.1	207.52
			-21.97%	-29.01%
Oats	148.2	244.02	197.75	197.16
			-18.96%	-19.20%
Grain maize	166.69	302.12	224.43	207.99
			-25.72%	-31.16%
Other cereals	159.18	280.94	197.98	189.78
			-29.53%	-32.45%
Pulses	261.44	719.01	691.04	631.85
			-3.89%	-12.12%
Skimmed-milk powder	2664.54	2654.11	2605.87	2591.11
			-1.82%	-2.37%
Whey powder	675.6	1156.52	1151.4	1149.38
			-0.44%	-0.62%
Soybean oil	593.13	1121.5	979.87	980.79
			-12.63%	-12.55%
Rapeseed cake	266.91	357.93	327.23	323.22
			-8.58%	-9.70%
Sunflower-seed cake	258.31	599.44	529.83	517.75
			-11.61%	-13.63%
Soybean cake	215.55	559.66	465.59	466.86
			-16.81%	-16.58%

Table 11- *Price levels and relative changes in Swiss producer prices in EUR per tonne, compared to the reference for the S_30 and S_70 scenarios and to the EU reference prices, at aggregate level*

	Reference_EU	Reference_CH	S_70	S_30
Cereals	159.12	336.3	275.55	205.18
			-18.06%	-38.99%
Oilseeds	351.72	663.04	659.51	647.55
			-0.53%	-2.34%
Meat	2088.79	4585.2	4317.63	4221.01
			-5.84%	-7.94%
Dairy products	1607.82	4339.01	4313.5	4301.46
			-0.59%	-0.87%

Oils	948.81	1117.77	1094.2	1093.29
			-2.11%	-2.19%
Oil cakes	245.15	446.82	388.28	384.25
			-13.10%	-14.00%

8.4 Impact on Domestic Production and Yields

Domestic production of feed grains and oilseeds also changes due to tariff eliminations, and is accordingly slightly regressive. What is striking here is that maize production falls by around 25% in both scenarios. Decreases for barley and oats are also relatively constant in both scenarios. There are no changes in either model scenario for skimmed-milk powder or whey powder. Here too, the significant decreases for wheat in the second scenario, S_30, are once more to be interpreted bearing in mind the percentage of wheat used for feed of only 40%. Table **1**12 again corroborates the minor changes for dairy products, oils and oil cakes. In keeping with the low changes in producer prices, changes in domestic meat production are also low here. Table13 once again gives results for the meat products and selected dairy products represented in CAPRI at product level: changes are scarcely noticeable here.

Table 12 – *Production levels (in 1000 t) and relative changes in domestic production compared to the reference for scenarios S_30 and S_70 in 1000t and %, at product level*

	Reference	S_70	S_30
Wheat	541.28	517.31	445.25
		-4.43%	-17.74%
Rye and meslin	11.38	11.41	10.75
		0.32%	-5.46%
Barley	223.53	204.85	205.39
		-8.36%	-8.11%
Oats	10.53	9.82	10.1
		-6.73%	-4.03%
Grain maize	184.46	137.85	136.61
		-25.27%	-25.94%
Other cereals	79.4	69.87	71.38
		-12.00%	-10.11%
Pulses	19.54	19.35	18.18
		-0.96%	-6.99%
Skimmed-milk powder	27.65	27.83	27.97
		0.66%	1.16%
Whey powder	0.52	0.53	0.54
		2.49%	3.42%
Soybean oil	4.33	3.92	3.89
		-9.49%	-10.29%
Rapeseed cake	36.98	38.73	38.94
		4.72%	5.30%
Sunflower-seed cake	7.3	7.2	7.13
		-1.46%	-2.42%
Soybean cake	19.26	17.41	17.26
		-9.60%	-10.41%

Table 13 - *Production levels (in 1000 t) and relative changes in domestic production compared to the reference for scenarios S_30 and S_70 in 1000t and %, at aggregate level*

	Reference	S_70	S_30
Cereals	1050.58	951.12	879.49
		-9.47%	-16.29%
Oilseeds	91.46	94.78	97.45
		3.63%	6.54%
Meat	475.19	481.29	483.82
		1.28%	1.82%
Dairy products	1038.58	1041.3	1042.73

		0.26%	0.40%
Oils	34.96	35.68	35.74
		2.06%	2.24%
Oil cakes	63.54	63.33	63.32
		-0.33%	-0.35%

Table 14 - *Production levels (in 1000 t) and relative changes in domestic production for other products compared to the reference for scenarios S_30 and S_70 in 1000t and %*

	Reference	S_70	S_30
Beef	128.92	129.82	130.28
		0.69%	1.05%
Pork	265.81	269.68	271.16
		1.45%	2.01%
Lamb, mutton and goat	5.04	5.06	5.07
		0.34%	0.64%
Poultry	75.41	76.74	77.3
		1.76%	2.51%
Butter	41.73	42.07	42.25
		0.80%	1.23%
Cheese	189.88	191.41	192.14
		0.80%	1.19%
Fresh milk products	683.64	683.69	683.75
		0.01%	0.02%

Table 15 – *Price levels and relative changes in domestic consumer prices, other products compared to the reference for scenarios S_30 and S_70 in EUR per tonne and %*

	Reference	S_70	S_30
Beef	12747	12514	12422
		-1.82%	-2.55%
Pork	9658	9332	9217.68
		-3.38%	-4.56%
Lamb, mutton and goat	13910	13689	13599
		-1.59%	-2.24%
Poultry	6648	6466	6397
		-2.73%	-3.77%
Butter	11368	11214	11134
		-1.36%	-2.06%
Cheese	10416	10371	10351
		-0.43%	-0.63%
Fresh milk products	2334	2322	2317
		-0.51%	-0.74%

Yields for grain (wheat, rye, barley, oats and other cereals) as well as maize tend to fall, since imports increase and domestic production falls more sharply that the utilised area. By contrast, oilseed yields remain relatively constant (or even rise slightly) since production rises more sharply than the utilised area.

Table 16 – *Changes in domestic yields compared to the reference for scenarios S_30 and S_70 in T per ha and %, at product level*

	Reference	S_70	S_30
Wheat	5.84	5.74	5.41
		-1.65%	-7.42%
Rye and meslin	4.93	4.91	4.81
		-0.51%	-2.46%
Barley	6.81	6.63	6.56
		-2.66%	-3.73%

Oats	5.53	5.37	5.37
		-2.91%	2.81%
Grain maize	10.18	9.38	9.18
		-7.80%	-9.79%
Other cereals	6.31	6.03	6.00
		-4.40%	-4.85%
Pulses	8.43	8.40	8.25
		-0.35%	-2.17%
Rapeseed	2.67	2.69	2.67
		0.46%	-0.22%
Sunflower seed	3.12	3.13	3.11
		0.10%	-0.43%
Soybean seed	5.41	5.42	5.42
		0.16%	0.14%

8.5 Conclusions

Based on the hypothetical scenario and the identified potential consequences of reducing border protection for animal feed, we may conclude that there would be an overall increase in the importation and use of feed materials. Moreover, lower domestic producer prices could be expected for cereals (-30%) and oilseeds (-10%), while a very moderate increase is likely for animal production, mainly for pork and poultry (2% in both cases). Without border-protection measures ensuring that imported feed inputs are at least as expensive as Swiss-produced cereals, the market would be open to the purchase of cheaper imported feed materials. Lower prices are expected for concentrate feed, since production costs would decline by about 17% bearing in mind the customs charges currently applied for the feed materials required for the production of 100 kg of concentrate feed. However, the simulation also indicates the likely impacts on domestic production. Here, yields of wheat, rye, barley, oats, other cereals and maize tend to decline in line with the increase in imports of feed materials. This means that a reduction in border protection for feed materials would cause the price of concentrate feed to fall, while posing a threat to Swiss cereal producers, who would not have much economic incentive for cultivating crops of this type.

9 Overall conclusion and discussion

Table 17 summarises the main causes of the higher price of concentrate feed seen in the case of Switzerland. The most obvious reason for the price difference in relation to concentrate feed is the difference in the prices of the utilised feed materials. The feed materials used to produce concentrate feed have higher prices in Switzerland than in Germany, which results in a higher overall cost. This is clearly illustrated by the case studies concerning feed barley and feed wheat. The large difference between the domestic producer prices is related to the applied border protection measures, which guarantee that imported feed materials are at least as expensive as Swiss-produced feed materials. The producer prices in Switzerland are also higher due to structural factors, such as much smaller farms and higher labour costs.

For other feed materials, no border protection measures are applied. In such cases, other factors play an important role, with an example being provided by the soybean meal case study. Swiss feed mills uses only top-quality, GMO-free soybean meal, and almost all imports are certified with international labels, such as the ProTerra, with ensures traceability and guarantees environmental and social production standards. The demand for a higher protein content in feed materials, the consideration of sustainability implications, GMO-free varieties and the need to align with guidelines and standards concerning production and management all result in high-quality feed materials and higher production costs for concentrate feed.

Other non-tariff measures directly or indirectly influence the final price of concentrate feed. For example, the ecological performance of farms, as a precondition for direct payments, requires an even nutrient balance. The nutrient cycle is directly related to animal production as well as to the nitrogen content in concentrate feed.[70] Often, advisory services concerning the nutrient balance are provided by feed mills, which provide assistance to farmers with regards to calculations. The costs of such services are integrated into the purchase price of concentrate feed. Additionally, in Switzerland there is a more expensive overall cost structure related to the higher costs of labour, transport, marketing, etc., as well as clear disadvantages regarding economies of scale.[71,72] Such lower-level economies of scale are also reflected in the sizes of Swiss feed mill plants, which are much smaller than those in adjacent countries, so that size disadvantages occur.

Table 17 – *Summary of the reasons for the higher concentrate feed price in Switzerland*

Demand side	**Supply side**	**Policy**
Animal producers	Producers of concentrate animal feed	Measures
Preference for domestic products	Quality strategy	Import tariffs Guarantee fund contributions
Preference for high quality	Certifications for production	Agricultural policies
Preference for GMO-free qualities	Product differentiation	
Transaction costs	Higher cost structure	
	Provision of services to farmers	
	Higher costs of feed materials	

The importation of concentrate feed is not a common practice in Switzerland. Usually, only individual feed materials are imported in order to be processed by Swiss feed mills. This is partly because of the tariff structure and partly because foreign feed mills have not yet established as smooth retailing structures as those seen in Switzerland. Another possible explanation could be the preferences from animal producers for Swiss made concentrate feed, baring the higher costs with concentrate feed due to a closer and long-term relationship and better advice services from Swiss feed suppliers, as well as an improved safety for non-GMO feed. This factors could not be verified by this study but they are pointed by previous studies.[2]

Additionally, all the regulations and market structures applied to animal feed result in high transaction costs, both in relation to foreign feed mills establishing market relations in the country and to animal producers purchasing concentrate feed from abroad. Swiss feed suppliers have already adapted to meet the quality standards required by the Swiss retail market, as well as to provide the services relevant to ensuring the nutrient balance is sufficient for the ecological proof of performance of farms and for direct

payments. However, the increasing imports of concentrate feed over the years serve as an indication of the expanding competition offered by foreign suppliers of concentrate feed. In 2017, the VSF members reported a decline in sales of 11,000 tons of concentrate feed when compared to 2016. [73] The vertical integration with retailers is highlighted by the Swiss mills as the main cause for this decline and hindering a market expansion.

If compared to the results reached by Peter et. al (2009), the market shares and economic relations within the feed sector in Switzerland have not been changed much in ten years. Based on the literature review, reports from the sector and interviews with experts, we did not find any indication of the exploitation of monopolistic power that could be the reason for higher prices of concentrate feed. There are rather advantages regarding economies of scale benefiting bigger players in the purchasing and processing of more quantities of feed materials.

In the case of the possible abolition of the border protection for animal feed, the price of concentrate feed would be reduced to an average value of 50 CHF/100 kg (rather than the current average of 60 CHF/100 kg), when considering the current customs charges that are applied. Based on the hypothetical scenario and the identified potential consequences of reducing the border protection for animal feed, it is possible to conclude that there would be an overall increase in the importation of feed materials. Such a measure would also induce lower prices for concentrate animal feed, since the production costs would decline by about 17% in terms of the production of 100 kg of concentrate feed. However, the self-sufficiency rate of Switzerland with regards to feed cereals would be significantly affected, since Swiss cereal producers would not have any economic incentive for the cultivation of such crops. Hence, the domestic production of feed materials would be strongly affected and largely replaced by increasing imports.

Taken together, the high feed costs currently result in a system that means Switzerland must cope with high cost and price levels, which are mainly fostered by border protection measures and high quality requirements, engendering inefficient markets.

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