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Beef and Sheep Network

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Cost of production and competitiveness of beef production in Canada, the US and the EU

Working Paper 2013/5

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Prepared by

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Working paper: Benchmarking Australian and US feedlots
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http://www.agribenchmark.org/agri-benchmark/did-you-know/einzelansicht/artikel//puzzling-glo-1.html

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1 Introduction

1.1 Background

The USA and Canada are major beef producers and exporters. Given the beef price differential to the EU, both countries have an interest to export beef to the EU. Tariff trade barriers as well as Sanitary and Phyto-sanitary (SPS) trade restrictions create limitations of beef imports from North America to the EU. The SPS mainly refer to the use of growth hormones and beta-agonists (e.g., ractopamine) in the US and Canadian beef production. Against the background of the negotiations about a free trade agreement between the US, Canada and the EU, the project analyses the status quo, drivers and development of beef production and trade. In a second step, it looks at the potential of production and trade based on expert-assessments.

1.2 Objectives

Against the background of the negotiations about a free trade agreement between the US, Canada and the EU, the project has two main objectives:

1. Analyse the status quo, drivers and development of beef production and trade.
2. Identify the potential of production and trade.

1.3 Working steps

The study is divided into two parts:

Part 1: Present situation, developments, drivers and conclusions for competitiveness (due April 2013)

Part 2: Perspectives and likely developments under a free trade agreement (due July 2013)

1.4 Method and data

Farm Data

Data sets of typical cow-calf and beef finishing farms were taken from the *agri benchmark* Result Data Base 2013. The year of analysis is the calendar year 2012. To reflect differences between single years, differences between the years 2012 and 2011 are addressed in Chapter I.3 and II.I.7.

A complete set of **physical** and **economic/financial data** was recorded and analysed with the tools available from *agri benchmark* (TIPI-CAL model). For data collection, a standard questionnaire was used, explained and discussed with the producers. The definition of typical farms is following the Standard Operating Procedure (SOP) applied by *agri benchmark* (Deblitz, 2010).

Farms selected for this study were cow-calf farms and feedlots in main production areas in Canada and the US. The EU-farms are from the countries participating in the *agri benchmark* Network and reflect the prevailing production systems. Figures 1 and 2 show the main characteristics of the farms.

A recent study for the OECD (Deblitz, 2012a) showed that representation of the US feedlot industry with the two data sets is rather high. It can be assumed that the same applies to the Canadian farms. The example for Germany showed that a) it would need more data points to reflect the different farm sizes and mixed farm situations, but b) the production system is well depicted with the data available. In principle, this conclusion can be drawn for the other EU-countries as well.

Due to the fact that data in Canada are only in the first year of their analysis, time series data could not be shown. However, the similarity of most price developments between both countries (especially beef and livestock) would allow the conclusion that price impacts on farms were similar as in the US.

Fig. 1. Overview of cow-calf farms analysed

Farm name Cow-calf (1)	Farm name Finishing (2)	Size Mgmt Origin (3)	No. of cows	Region	No. & category of animals sold p.a. (4)	Breeds	Other activities	Total live weight sold per cow and year (kg) (4)	Replace-ment rate (%)	Age at first calving (months)	Calf losses (%) (5)	Weaned calves per 100 cows and year	Weaning weight (kg)	Weaning age (days)
AT-25C	–	A / A / I	24	Carinthia	11 female weaners, 11 male weaners, 4 cull cows	Fleckvieh	Wife 50% nurse	365	17 %	29	3 %	92	270 - 290	244
AT-30	AT-25F	A / A / I	27	Carinthia	12 female weaners, 12 male weaners to finishing, 4 cull cows	Charolais * Fleckvieh	Beef finishing, Cash Crops, Mach. Service	443	15 %	29	3 %	89	380 - 400	275
DE-100	–	A / A / F	100	Westerwald	1 bull, 46 male weaners, 30 female weaners, 15 cull cows	Limousin	Cash Crops	336	16 %	30	4 %	92	290 - 300	225 - 270
DE-300	–	L / A / I	300	Brandenburg	2 bulls, 125 male weaners, 74 female weaners, 43 cull cows	Various	–	278	16 %	30	3 %	83	250 - 280	180 - 240
DE-1100	–	L / A / I	1100	Mecklenburg-Western Pomerania	10 bulls, 161 female slaughter calves, 526 male weaners, 82 cull heifers, 242 cull cows	Charolais + Fleckvieh crosses	–	391	24 %	28	4 %	96	315 - 350	225
FR-80B	FR-60	L / A / P	78	Pays de la Loire	1 bull, 2 female weaners, 34 male weaners to finishing, 8 heifers to finishing, 11 cows to finishing	Charolais	Beef finishing, Cash Crops	415	28 - 31 %	30	5 %	90	310 - 345	262
FR-80	FR-70	L / A / P	79	Limousin	1 bull, 20 female weaners, 36 male weaners to finishing, 15 cows to finishing	Limousin	Beef finishing	322	18 - 23 %	33	5 %	90	239 - 303	223
FR-85	–	L / A / P	84	Limousin	1 bull, 22 female weaners, 38 male weaners, 15 cows to finishing	Limousin	Beef finishing	345	20 %	33	5 %	90	300 - 315	259 - 305
ES-80	–	A / A / I	83	Santa Eufemia, Córdoba	27 female weaners, 35 male weaners, 7 cull cows	Limousin * Retinta	Iberian pork	222	10 %	36	2 %	84	235 - 245	150
ES-150	ES-520	L / A / I	155	Guijuelo, Salamanca	2 bulls, 43 female weaners to finishing, 66 male weaners to finishing, 6 cull cows, 14 cows to finishing	Crosses	Beef finishing	220	15 %	27	4 %	70	225 - 240	195
UK-100	UK-80	A / A / P	100	Yorkshire	1 bull, 43 female weaners to finishing, 43 male weaners to finishing, 18 cull cows	Continental crosses	Beef finishing	333	19 %	36	3 %	86	265 - 285	210
UK-105	–	A / A / I	106	South Yorkshire	1 bull, 34 female weaners, 47 male weaners, 13 cull cows	Limousin crosses	Sheep	346	19 %	24	3 %	87	280 - 305	244
SE-95	SE-100	L / A / P	95	Sävsjö, Smaland	2 bulls, 28 female weaners to finishing, 43 male weaners to finishing, 15 cull cows	Angus/Lim/Cha * Cha X	Beef finishing	370	16 %	24	1 %	91	265 - 310	220
CZ-420	CZ-100	A / A / I	420	South Bohemia	138 male weaners, 48 female weaners to finishing, 1 cull heifer, 85 breeding heifers, 50 cull cows	Angus	Beef finishing	324	13 %	24	2 %	90	218 - 266	191 - 216
CA-200A	–	A / A / F	200	Alberta	2 bulls, 83 male weaners, 47 female weaners, 2 cull heifers, 30 breeding heifers, 3 cull cows	Angus crosses	–	285	15 %	25	9 %	83	246 - 292	210
CA-200B	–	A / A / F	200	Saskatchewan - North West	1 bull, 86 male weaners, 56 female weaners, 6 cull heifers, 22 cull cows	British crosses	–	271	12 %	24	3 %	86	238 - 281	225
CA-800B	–	L / A / F	800	Saskatchewan North West	8 bulls, 369 male weaners, 203 female weaners, 8 cull heifers, 65 breeding heifers, 80 cull cows	British crosses	–	228	11 %	24	3 %	92	206 - 220	190
CA-800A	–	L / A / F	800	Alberta	8 bulls, 349 male weaners, 230 female weaners, 23 cull heifers, 80 cull cows	British crosses	–	261	12 %	24	3 %	87	227 - 249	180
US-160A	–	L / A / F	159	Kansas	1 bull, 54 female weaners, 73 male weaners, 17 cull cows	Crosses	Cash crops	298	12 %	24	5 %	92	295	210
US-160B	–	L / A / F	160	New Mexico	3 bulls, 14 female weaners sold, 74 male weaners to finishing, 24 cull heifers, 32 cull cows	British * Continental	Backgrounding, Lease hunting	323	23 %	24	2 %	93	236 - 245	210
US-500	–	L / A / F	500	Montana	6 bulls, 78 female weaners, 227 male weaners, 19 cull heifers, 49 breeding heifers, 70 cull cows	British * Continental	Lease hunting	277	15 %	24	1 %	90	232 - 250	210

(1) Number refers to average suckler-cow inventory per year.
(2) Number refers to total finished cattle sold per year.
(3) Size (**A**verage, **L**arge) / Management (**A**verage, **T**op) / Origin (**I**ndividual, **P**re-Panel, **F**ull Panel) (see Chapter xx for details)
(4) Includes all animal sales of the cow-calf enterprise: slaughter cattle, weaner calves, breeding cattle. Transfers to the own beef finishing enterprise included.

Fig 2. Overview of finishing farms analysed

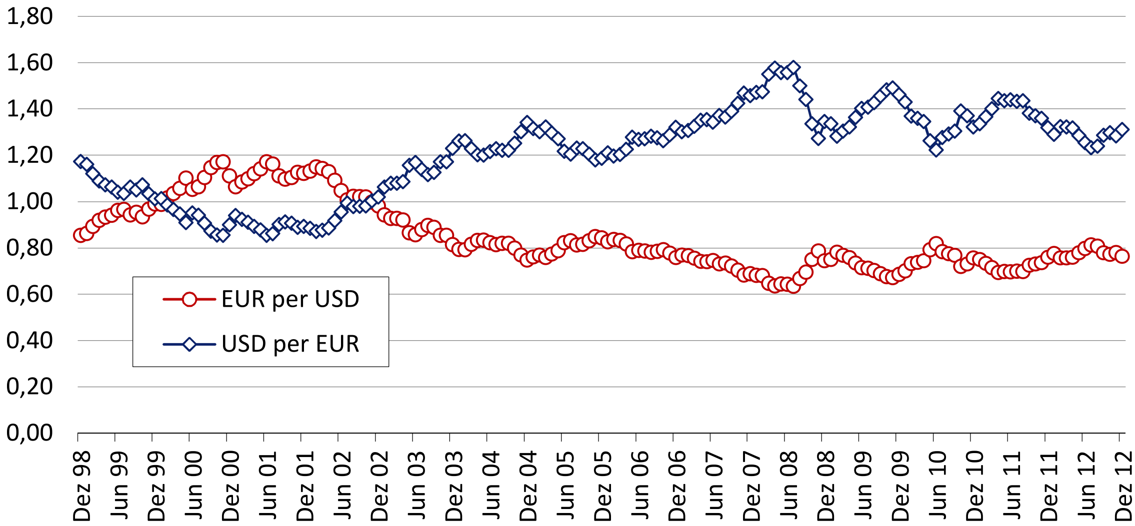
Farm name (1)	Size / Mgmt / Origin (2)	No. & type of beef cattle sold per year	Region	Breeds	Origin finishing cattle: Dairy or Cow calf (3)	Origin finishing cattle: Own or Purchase (4)	Category of animals: Input	Other activities	Production system	Main feed sources	Age at start (days)	Finishing period (days)	Age at end (days)	Weight at start (kg LW)	Daily weight gain (g / day)	Final weight (kg LW)	Dressing percentage (%)
AT-35	A / A / I	35 bulls	Upper Austria	Fleckvieh	d	p	Calves	–	Silage	Maize & grass silage + grains, soybean, hay	50	467	517	99	1296	704	57 %
AT-120	L / A / I	120 bulls	Upper Austria	Fleckvieh	d	p	Calves	Cash Crops, Mach. Service	Silage	Maize & grass silage + grains, soybean, hay	40	435	475	89	1366	683	58 %
DE-280	L / A / P	283 bulls	North Rhine-Westphalia	Fleckvieh	d	p	Calves	Cash Crops	Silage	Maize silage + concentrates	45	525	570	85	1210	720	60 %
DE-285	L / A / I	286 bulls	Schleswig Holstein	Holstein	d	p	Calves	Cash Crops	Silage	Maize & grass silage + concentrates	14	593	607	48	1034	661	54 %
FR-60	L / A / P	32 bulls, 11 cows, 14 heifers	Pays de la Loire	Charolais	cc	o	Weaners	Cow-calf, Cash Crops	Silage	Maize & grass silage + grains, soybean, hay	262	243	505	345	1540	720	59 %
FR-70	L / A / P	35 bulls, 20 heifers, 14 cows	Limousin	Limousin	cc	o	Weaners	Cow-calf	Silage	Maize silage + grains for bulls, pasture, silage and grains for females	223	241	464	303	1232	600	62 %
FR-200	L / A / P	200 bulls	Pays de la Loire	Charolais	cc	p	Weaners	Cash Crops	Silage	Maize silage, hay + concentrates	240	300	540	312	1410	735	59 %
ES-490	L / A / I	438 bulls	Segovia	Crosses	d/cc	p	Calves, Weaners	–	Feedlot	Straw + concentrates + grains	30 - 200	260 - 335	365 - 460	50 - 175	1164 - 1450	440 - 552	52-58%
ES-5500	L / A / P	5,500 bulls	Aragon	Simmental, Montbellard, Crosses	d	p	Calves	–	Feedlot	Straw + concentrates + grains	20	303 - 306	323 - 326	68 - 86	1422 - 1472	514 - 521	54-56%
IT-910	L / A / I	910 bulls	Veneto	Charolais	cc	p	Weaners	Cash Crops	Silage	Maize silage + grains + concentrates, straw	330	208	538	412	1466	717	61 %
UK-80	L / A / P	42 steers, 42 heifers	Yorkshire	Continental crosses	cc	o	Weaners	Cow-calf	Pasture	Pasture, grass silage + concentrates	210	550	760	285	627	630	55 %
UK-90	L / A / P	47 bulls, 46 heifers	Somerset	Holstein * Hereford, Simmental	d	o	Calves	Dairy, Cash Crops	Silage	Maize silage + grass silage + concentrates	42	558	600	100	871	586	54 %
SE-150	L / A / I	152 bulls	Skåne	Beef cross	d	p	Bulls	–	Silage	Grass silage, maize silage + grains	231	225	456	308	1653	680	54 %
SE-230	L / T / I	229 bulls, 47 calves for finshing	Västergötland	Dairy	d	p	Calves	Forestry	Silage	Maize and grass silage and grains	18	456	474	50	1138	569	52 %
PL-30	L / A / I	21 bulls, 9 heifers	Podlaskie	Black and White	d	o	Calves	Dairy, Cash Crops	Silage	Maize & grass silage + grains, concentrates	15	535	550	60	879	530	49-54%
CZ-500	L / A / I	496 bulls	Central Bohemia	Fleckvieh * Holstein, Limousin * Fleckvieh	d/cc	p	Calves, Weaners	Dairy, Cash Crops	Silage	Maize silage + concentrates	90 - 183	467 - 560	650	104 - 197	923 - 936	628	55 %
CA-28K	L / A / I	27,500 steers	Alberta	Angus	cc	p	Weaners, Backgrounders	–	Feedlot	Feed barley grain + barley and corn silage	200 - 450	136 - 215	405 - 586	272 - 386	1477 - 1549	590 - 612	59-62%
US-7200	L / A / I	7,195 steers	Kansas	British + Continental	cc	p	Weaners	–	Feedlot	Grains + soybean meal + alfalfa hay	265	191	456	303	1444	578	61 %
US-75K	L / A / I	41,882 steers, 33,111 heifers	Kansas	Mainly beef breeds + some dairy breeds	d/cc	p	Backgrounders	–	Feedlot	Corn + distiller grain + alfalfa hay	330	142 - 170	472 - 500	343 - 364	1601 - 1711	608 - 615	62 - 64%

(1) Number refers to total finished cattle sold per year
(2) Size (Average, Large) / Management (Average, Top) / Origin (Individual, Pre-Panel, Full Panel)
(3) d= dairy; cc= cow-calf
(4) p= purchase; o= own

Exchange rates

The standard currency of the *agri benchmark* Result Data Base is USD, which was calculated based on annual exchange rates from national currencies. USD-figures were converted into EUR using exchange rates for the calendar years 1997 to 2012. Figure 3 shows a monthly time series of the USD-EUR exchange rate from January 1999 through December 2012. On average, the EUR appreciated significantly against the USD over this period until the third quarter of 2008 when it depreciated and since oscillated around 1.20-1.40 USD per EUR. As all figures in this report are expressed in EUR-terms, it should be taken into account that the changes in exchange rates can over- or under-compensate national price changes. This is particularly true for the time series data in Chapter I.2 and Figure I. 9 (Chapter I.3). A constant price in EUR would appear rising in USD-terms with an appreciation of the EUR against the USD. This means that at least part of the price developments observed between the EU and the US may derive from changes in the exchange rates.

Fig 3. *Exchange rate USD vs. EUR 1997-2012 (monthly rates)*



Source: www.oanda.com

1.5 Scope of the study

It should be noted that the focus of this study is on farm level. As a consequence, trade flows and trade analysis is not covered here in a systematic way but Chapter I.2 provides a short overview of how production and trade have developed in the last 10 years. Further, Chapter II.3 contains some qualitative assessment of specific trade-related issues.

Part I: The status quo and recent developments

I.1 Production systems in North America and the EU

There is a wide variety of beef production systems with implications for the type of beef produced, the prices received and the cost structure. There are two main identification points when it comes to beef production systems.

1. The organisation of the on-farm beef production chain (fattening stages)
2. The feeding and housing systems in each of these parts of the chain

The organisation of the on-farm beef production chain

Figure I.1 shows the different types and flows of animals as they apply to most of the North American and the European production.

Fig I.1. Fattening stages of animals

	Dairy origin		Cow-calf origin
Animal type ***Young animals*** *(calves, weaners)*	• Calves • 7 days Holstein	• 'Starter' • 2 months Simmental	• Weaners 6-9 months • Beef breeds and crosses
Animal type ***Pre-finished*** *backgrounders/ stockers/stores*	• Backgrounders • 6-7 months • 190 kg	• Backgrounders • 5-6 months • 190-200 kg	• Backgrounders • 11-12 months • 320-360 kg
Animal type ***Finished*** *slaughter cattle*	• Bulls • 18-19 months • 600-690 kg	• Bulls • 17-18 months • 650-720 kg	• Steers and heifers • 15-16 months • 550-610 kg

Source: Own illustration. For further explanation on calves, weaners and backgrounders see the last page of the report.

The vast majority of beef cattle in **North America** originate from cow-calf herds. Their output is male and female weaner calves (young animals)[1]. After weaning, the animals undergo a pre-finishing phase (backgrounding) before they are moved into a feedlot for finishing until slaughter. Weaner production and backgrounding is typically done on pasture with more or less supplemental feeding – either as a standard during winter time (for example hay and/or silage) or as an emergency feeding in case of weather extremes. With the increased grain (corn) prices there has been an incentive to put more weight on in the backgrounding phase as well as increasing efficiency in the high energy feeding in the finishing phase. The extent of backgrounding depends mainly on a) grass and feed availability and b) price relations between weaners, backgrounders and finished cattle (beef price). Good availability of grass as well as relatively high weaner and/or low beef prices increases the proportion of (low cost) backgrounding in the production stages. The three production stages usually take place on different farms.

In the **EU**, origin from dairy is much more important than in North America where the proportion of beef cows in total cow number is approximately 75 to 80 percent. In the EU, it ranges from 3 percent in countries like Poland via 13 percent in Germany to 50 to 63 percent in France, Ireland and Spain (*agri benchmark*, national statistics). As a consequence, backgrounding and finishing of young dairy calves of different

[1] The US also has dairy (Holstein) calves that feed into the beef production system, however, they would not be finished as bulls as is more common in Europe, but rather would be steers.

breeds (mainly Holstein and Simmental) are much more important. Furthermore and in contrast to the North American situation, the different production stages are more frequently combined in one particular farm. On one hand, backgrounding of dairy calves takes place on the dairy farms where the calves are born and then sold as backgrounders to specialised finishers. On the other hand, the raising and backgrounding of dairy calves is often combined with the finishing on one particular farm.

Production systems

The European cow-calf production systems are similar to those in North America in the sense that pastures form the feed basis. In the EU (except Ireland) winter housing of the cows and their progeny is more common than in North America. When it comes to beef finishing systems, there are distinct differences between the countries considered and other important beef producers. Figure I.2 shows details of the beef finishing production systems prevailing globally.

Fig I.2. Production systems in beef finishing

		Feed % in dry matter	Management/housing	Extent of purchase feed
	Pasture	> 30% pasture	Outdoor year round or part of year	Low
	Silage	> 30% silage and other forages	Closed or semi-open barns with slatted floors and/or straw bedding	Medium
	Feedlot	> 50% grains and other energy feed	Confined, large, open pens, partially with sun-covers	High
	Cut & Carry	> 30% freshly cut grass and other vegetation	Mix of pens and grazing of paths and paddies	Low

Source: Own illustration

Taking the dry matter composition, the housing system and the extent of purchase feed as indicators, four production systems can be identified: pasture, silage, feedlot and cut & carry.

- **Pasture** finishing systems are widespread in South America, Australia and parts of Africa. They are basically irrelevant in North America. Ireland, to some extent England and to a lesser extent France, are the most important EU-countries featuring pasture finishing. In the latter two countries it is often combined with (grass) silage and hay feeding.
- **Silage** systems are the prevailing production system in all other EU-countries.
- **Feedlots** are based on purchased grain feeding and form the standard finishing system in Canada, the US, Mexico and South Africa. They also have an important role in China and in Australia where the proportion of feedlot finished cattle oscillates between 25 and 40 percent of the total slaughter. Due to the expansion of grain production on beef land and resulting land scarcity, Argentina saw an enormous substitution of pasture systems by feedlot finishing which now represents approximately 50 percent of all beef finished in the country. Feedlots are also under expansion in Brazil, but to a lesser extent of below 10 percent. Here, they are mainly used as seasonal tools to deal with drought periods in summer time. Feedlots are not relevant in the EU. The only exception is Spain where cattle are fed on a straw / grain ration in feedlot-type of instalments and slaughtered as yearlings.

- **Cut & carry** systems are characterised by freshly cut grass and other feed which is then carried to the cattle standing in small pens or barn-like confinements. They are common in Asia and Africa but are not considered further in this study.

The prevalence of different production systems is driven – among other factors – by natural conditions, type of land available, land prices and the market preferences in the countries. For example, in a region with high land prices, a pasture system would not be profitable. As a consequence, animals are kept in confined systems and fed with high energy feed. Then, male animals which will not be grazing do not have to be castrated as they can be well managed in a barn. An example of market preferences is the weight of the animals

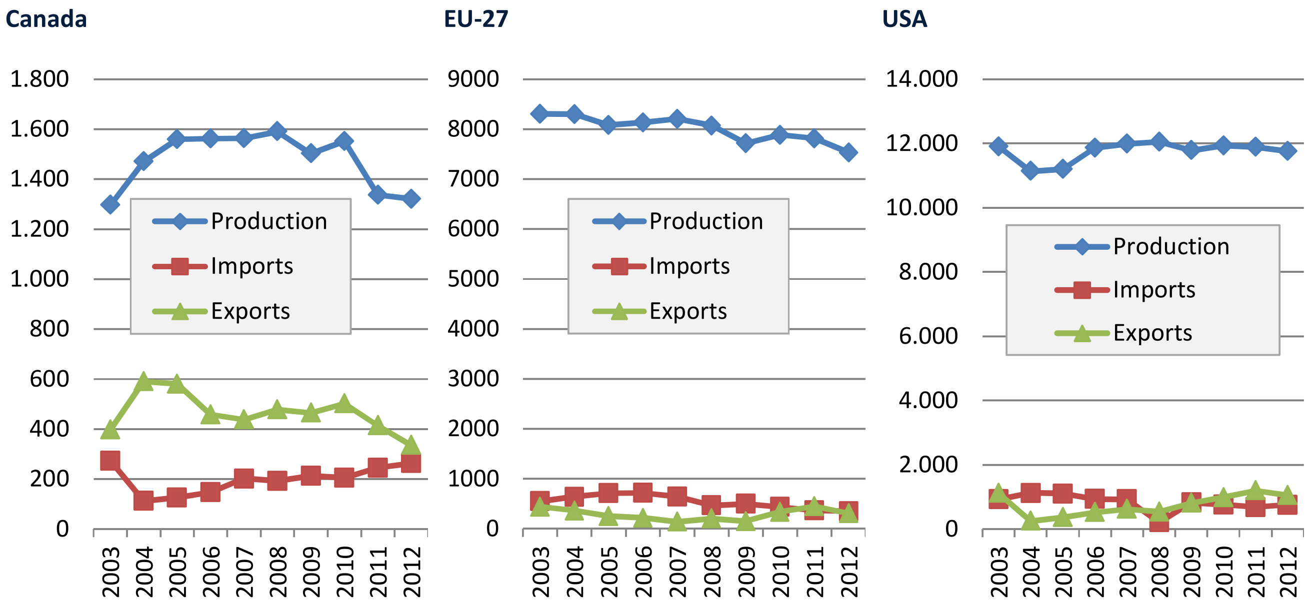
Further consequences are the type of beef resulting from the different feeding systems. Pasture-fed beef typically is leaner and has limited intramuscular fat whereas grain-fed (high energy) beef has a higher proportion of intramuscular fat (marbling). The final weight of the animals has an impact on the size of the primary cuts. All these issues are in principle rather breed-unspecific.

I.2 Production, trade and price developments for beef and livestock

Figure I.3 depicts aggregated production and trade figures for the regions analysed from 2003 to 2011.

Production in Canada went up first, was then stable and declined again at the end (and further beyond) the period considered. Reasons were the decline of the dairy herd (quota system), the BSE crisis in Canada and the US, the productivity increase in the cow-calf herd and the proportion of live cattle (weaners and backgrounders) exported to the US. Production in the EU-27 is on a permanent decline and now below 8 million tons p.a., mainly due to the milk quota system and decreasing calf supplies. Production in the US dropped significantly in 2003/2004 (BSE) and then recovered to the previous level of around 12 million tons. One reason was the decline in the cattle herd due to lack of profitability and the droughts, resulting in more cattle sent to slaughter than retained for replacement. In the coming years, the cattle herd which has still not come out of the dip of the present cattle cycle has to be rebuilt if production levels are going to be maintained.

Fig I.3. *Development of production and trade in Canada, USA and the EU-27 2003-2012 ('000 t)*



Source: USDA FAS-PSD online 2013 http://www.fas.usda.gov/psdonline/psdquery.aspx, National statistics

Exports in Canada went up first and then declined steadily. Reasons are similar as those mentioned for production. Canada has the highest export share of the regions considered here and relies heavily on the US and to a lesser extent on the Mexican market.

The EU-27 became a net **importer** of beef in 2003 and remained in this position until 2010 and is now basically balanced. The US-exports received a severe blow with the occurrence of BSE in 2003 and the subsequent ban from their high value export markets in Japan and South Korea. However, this incident occurred at the same time as high protein diets became popular and the US-market managed to absorb the additional beef quantities which were previously exported. In the recent years, exports have begun to recover and total imports decreased.

As Figure 1.4 shows, prices for beef pointed upwards in all European countries considered. Price developments for livestock (dairy calves, weaners, backgrounders) were less pronounced and consistent in development than for beef, showing more and higher amplitudes.

Price developments in Canada and the US were similar during the years due to the close linkage of both markets. In the US, it can be seen that beef prices expressed in EUR-terms decreased over the period from 2001 to 2009 which was mainly exchange rate driven and owed to the depreciation of the USD against the EUR. From 2009 to 2012, prices recovered to reach historic high levels in the following years as a result of the USD gaining against the EUR and – more important – the scarcity of livestock and beef globally and in the US. Prices developments in Canada were similar and following the specific CAD fluctuation.

Fig I.4a. Beef and livestock prices in the US and Canada 1998-2012

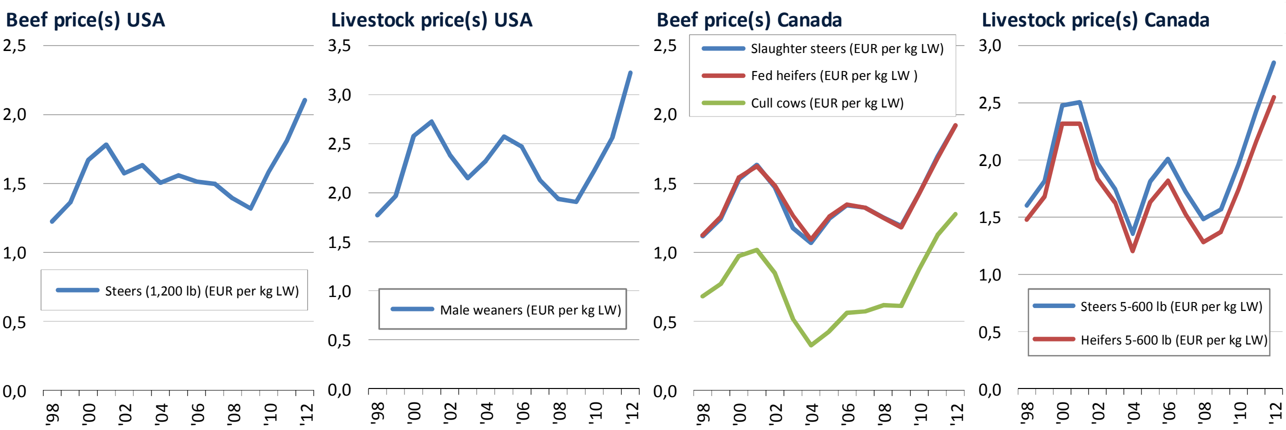
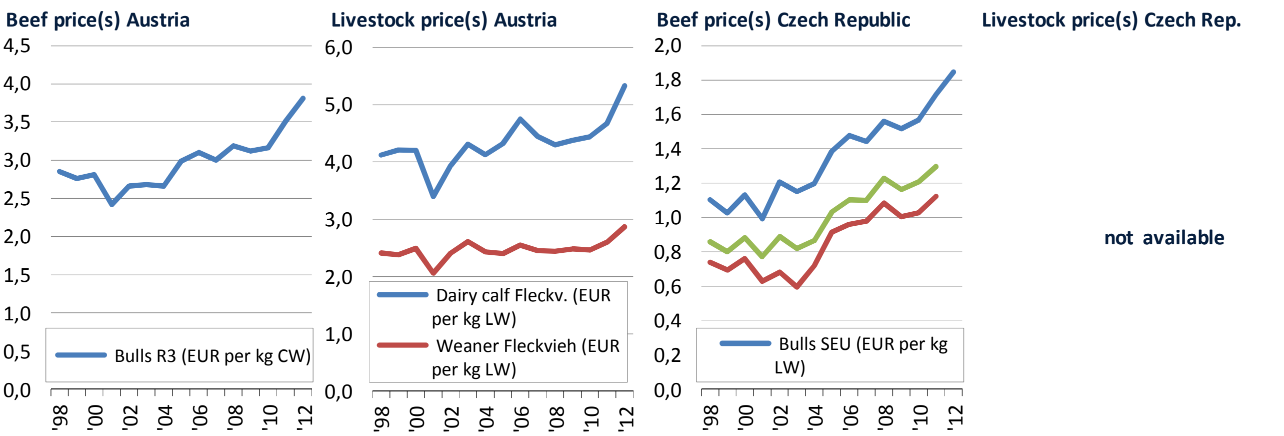
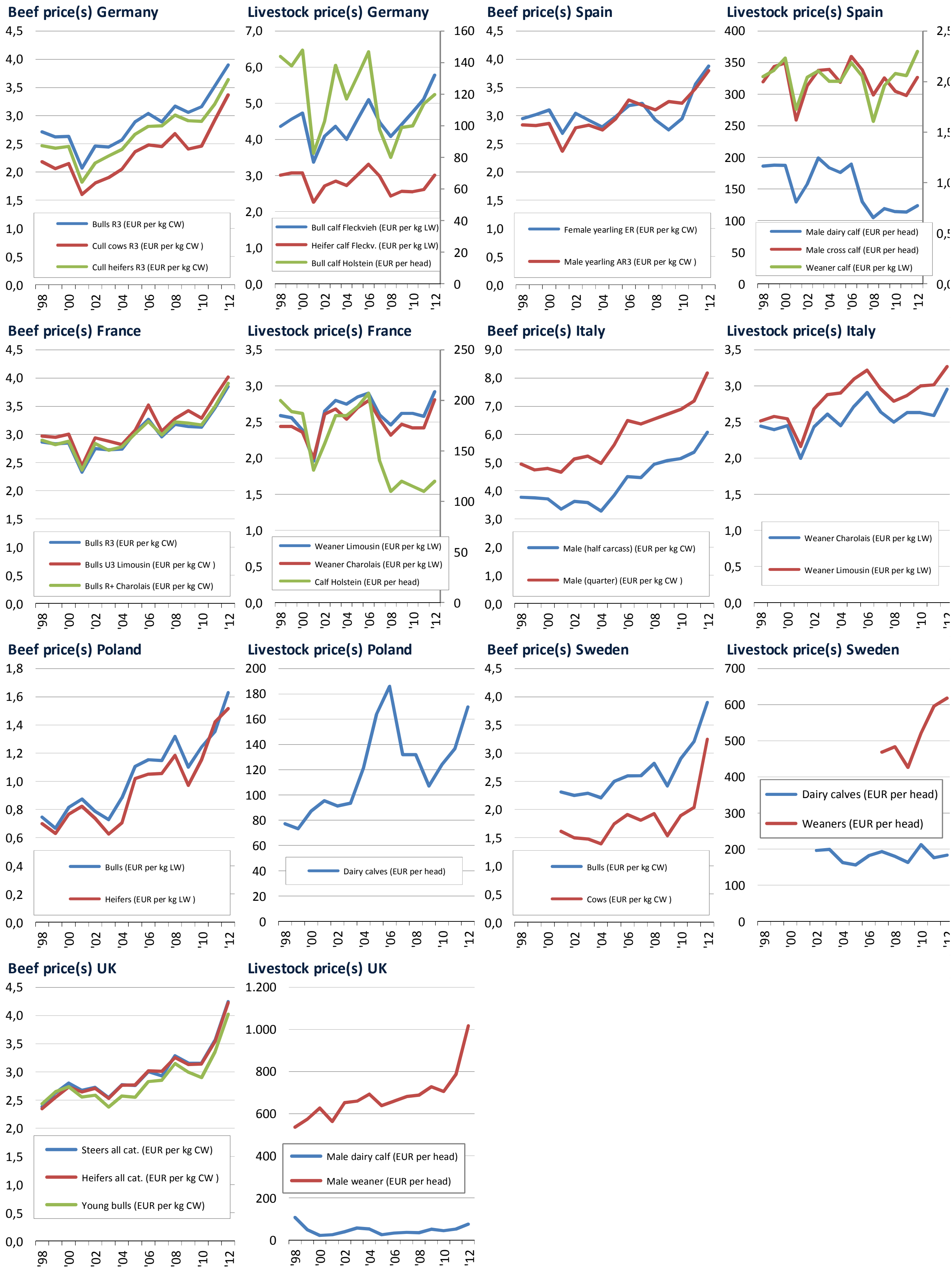


Fig I.4b. Beef and livestock prices in the Austria and Czech Republic 1998-2012



Source: *agri benchmark* Beef and Sheep Report 2013

Fig I.4b. Beef and livestock prices in selected EU-countries 1998-2012



Source: *agri benchmark* Beef and Sheep Report 2013

I.3 Cost of production and profitability

Unless otherwise indicated, sources of the charts and data shown in this chapter are sourced from the *agri benchmark* Beef and Sheep Report 2013 and, more specifically, from the underlying Result Data Base with data from the year 2012. It should be noted that per 100 kg output figures are referring to the cow-calf and beef finishing **enterprises** of the typical farms, respectively. Thus, they do not reflect whole-farm figures which in many cases contain data from other enterprises as well as whole farm direct payments. This becomes particularly relevant in the time series of profitability (margin over cash cost) where an unprofitable enterprise does not necessarily mean an unprofitable (whole) farm.

Weaner (cow-calf) production

As shown in Chapter I.1, cow-calf businesses are an important part of the beef supply chain. Figure I.5 shows the total cost of cow-calf production on a per kg live weight basis. The reference unit is the total live weight sold per cow and year and comprises cull animals (cows, breeding bulls and heifers), weaners and – if relevant – breeding heifers. Thus, producing a weaner calf is the main objective but not the only product of the cow-calf enterprise.

The cost differences between the North American and the EU-farms are significant and in some cases more than twice as high in the EU than in the North American farms. The differences in total returns are also existing, but less pronounced.

Figure I.6 provides detail on the weaner prices which are expressed as average of male and female weaners. Surprisingly, weaner prices per head and per 100 kg live weight are similar between the two world regions and in some cases even lower in the EU-farms. Taking the transport cost of weaners to the EU into account, live cattle export becomes even less profitable. Thus, differences in weaner prices in the year 2012 did not constitute an incentive for North American producers to export weaners to the EU. A crosscheck with the 2011 results revealed that the conclusions would be identical.

This assessment is confirmed by the price developments which were shown in Chapter 1.3 which allows the conclusion that the described weaner price relations are not entirely new. And even in case of improving price relations it is highly unlikely that animals (weaners, backgrounders) will ever be shipped from North America to Europe in greater quantities and for non-breeding purposes due to animal welfare issues and expectable public pressure. As a consequence, cow-calf production is not considered further in this study.

***Fig I.5.** Total costs and returns of cow-calf production 2012 (EUR per 100 kg live weight)*

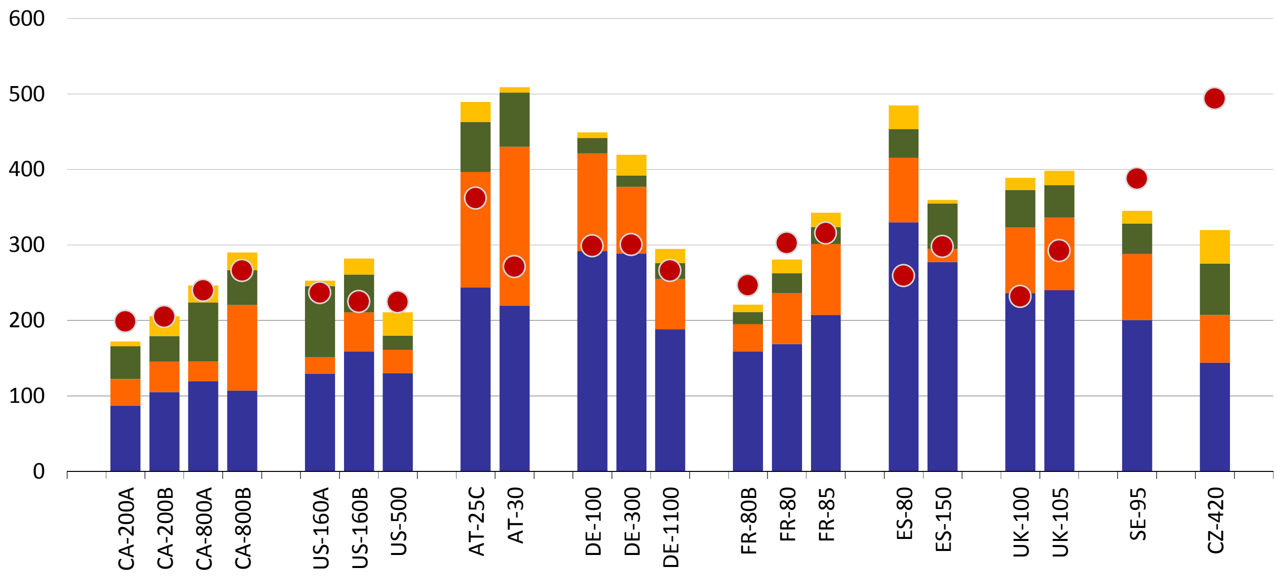
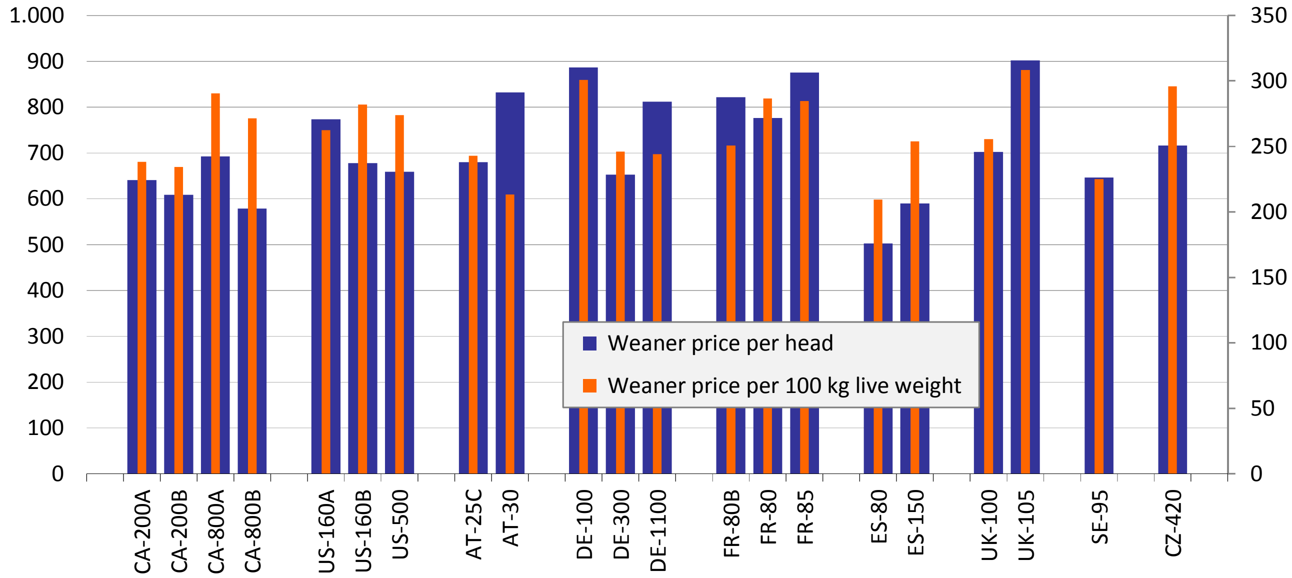


Fig I.6. Weaner prices per head (left axis) and per 100 kg live weight 2012 (right axis) (EUR)



Beef finishing

Figure I.7 illustrates the beef prices and – where relevant – the coupled government payments which can be assigned to the beef finishing enterprise. Beef prices in the US and Canada are between EUR 300 (CA) and EUR 302-311 (US) 100 kg carcass weight (CW). Farm producing Holstein cattle in Europe (DE-285, PL-30) are in the same price range or even lower but it can be assumed that North American beef will not have to compete with this type of beef. The other farms producing either double-purpose breeds (Fleckvieh in Austria and Germany) or beef breeds have a higher price level which typically oscillates between EUR 350 and 450 per 100 kg CW. It can be seen that coupled payments play a negligible role. This means that price-wise and looking at farm level only, there should be an incentive for North American producers to export beef to Europe with the absence of tariffs. However, transport costs and the issue of growth promoters have to be reflected to come to a final conclusion (see Chapter II.I.6 for details).

Fig I.7. Beef returns and coupled government payments of beef production 2012 (EUR per 100 kg CW)

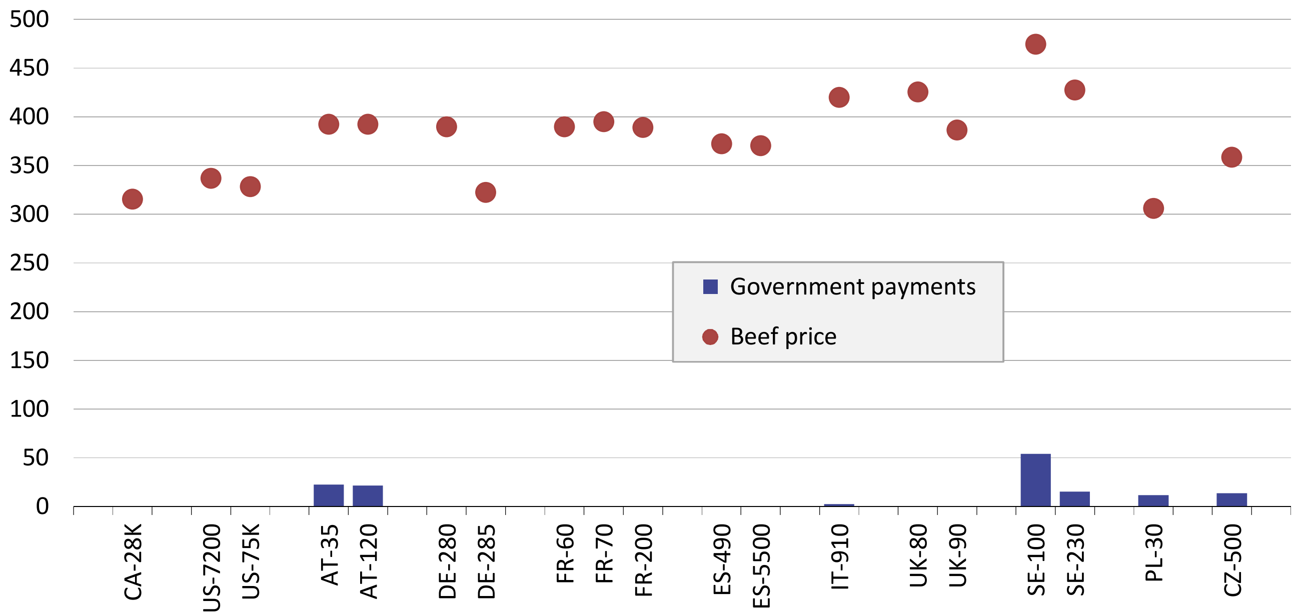


Figure I.8 shows the total cost of beef finishing between the North American and the EU-farms. The North American farms are feedlots and the EU-farms are silage farms with the exception of the Spanish farms according to the definitions made in Chapter I.2. The large US-feedlot US-75K has the lowest costs with approximately EUR 340 per 100 kg carcass weight (CW). The low cost in one of the German farms is due to the use of Holstein cattle from dairy and associated lower calf purchase costs (but also a lower beef price), which is common practice in the North of Germany but cannot be compared with the US-origin in terms of beef type and quality.

***Fig I.8.** Total costs of beef production 2012 (EUR per 100 kg carcass weight)*

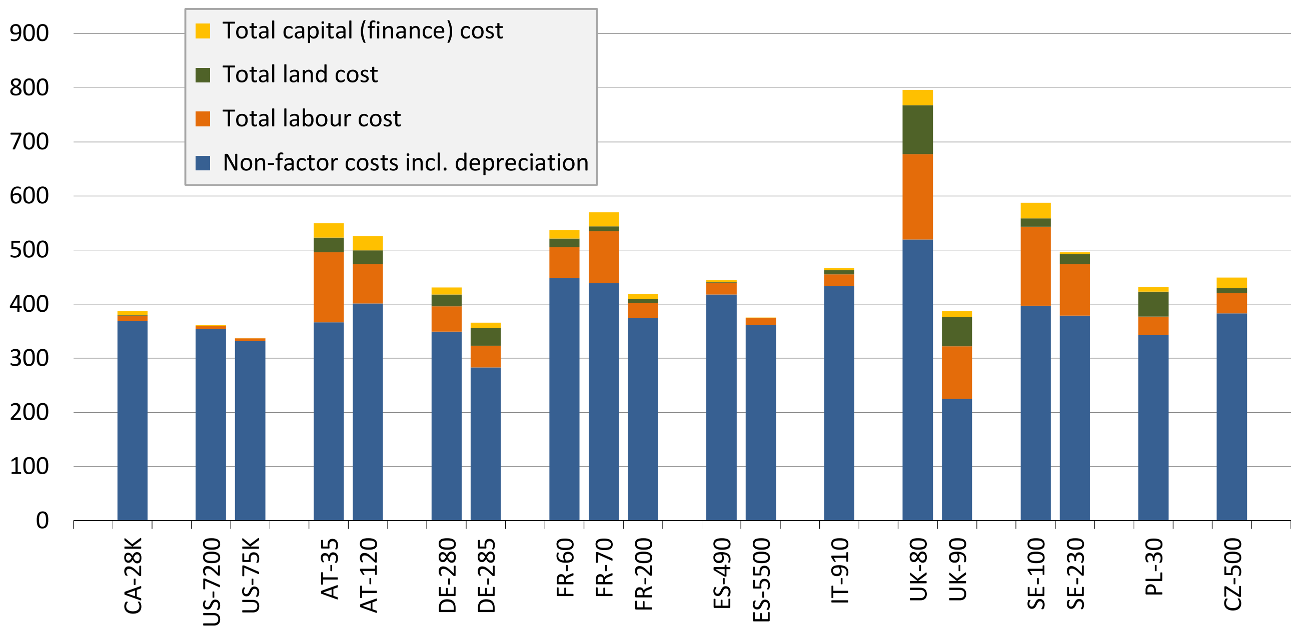
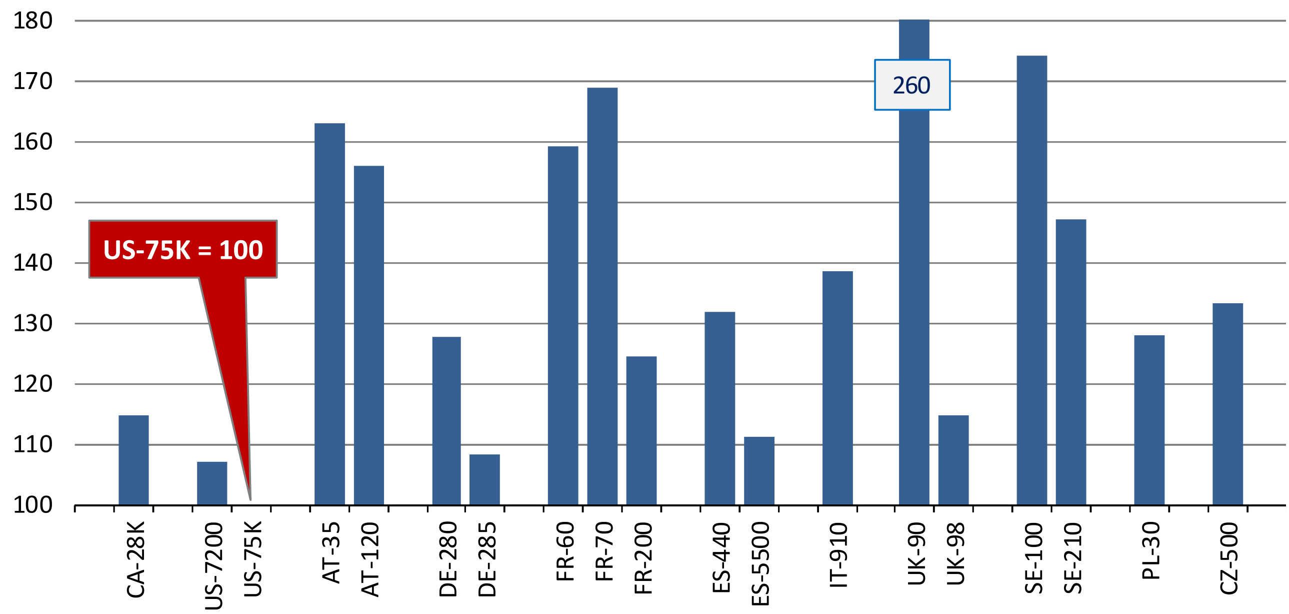


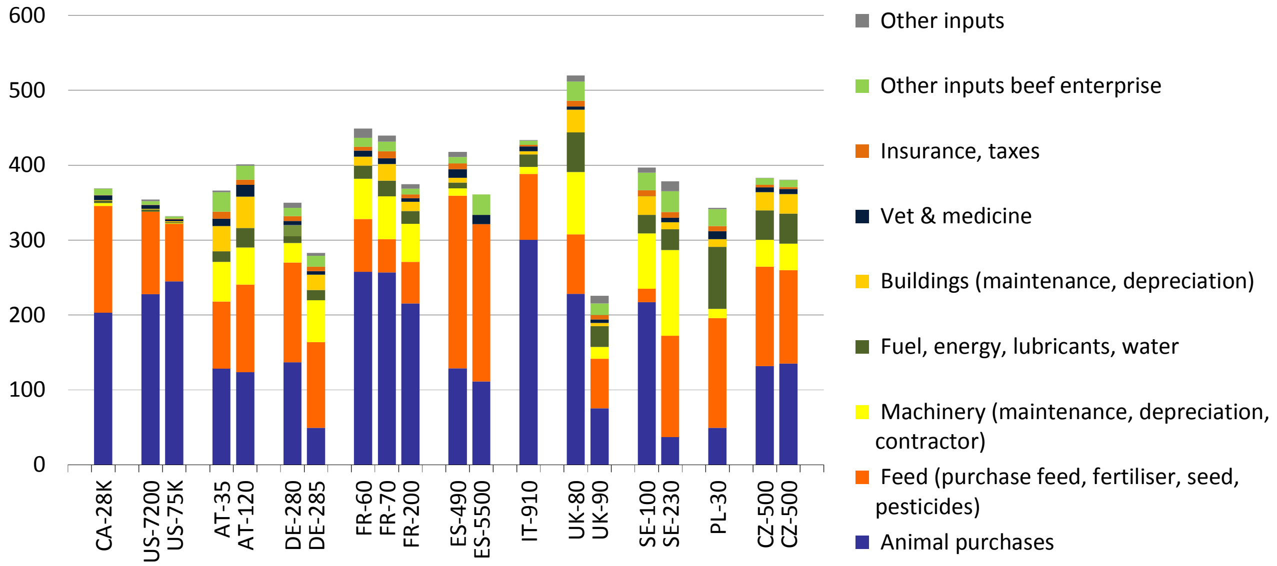
Figure I.9 shows the costs of the other farms relative to US-75K. The costs of the smaller US-feedlot are slightly higher. The costs of the other farms are between 20 and 70 percent higher and more than twice as high in one of the UK farms.

***Fig I.9.** Index of cost of production 2012 compared with US-75K = 100 (based on data expressed in EUR)*



Non-factor costs (NFC) are the most important cost components in all farms. Details on NFC are provided in Figure I.10. Animal purchase and feed purchase costs are the most important cost items in the feedlots on both sides of the Atlantic. In the other farms, costs for producing own feed are another important cost factor. The proportion of feed costs is particularly high in farms which buy young (dairy) calves at a relatively low age and price and keep them for a relatively long period. In this way, the animal purchase costs 'dilute' to some extent in the equation and result in a relatively low proportion of animal purchase costs and a higher proportion of feed costs.

Fig I.10. *Non-factor costs of beef production 2012 (USD per 100 kg carcass weight)*



I.4 Strengths and weaknesses of the farms

To display strength and weaknesses of the farms, performance indicators and cost items were analysed. The following calculations were made: The data of the US-75K feedlot (the farm with the lowest cost) were set to 1 and all other farm data were expressed relative to the US-75K data and expressed as a factor. A factor of 1.2 means that the figure of the farm considered is 1.2 times higher than in the US-75K. Further, an average of the economic factors from non-factor costs to beef price (13 items) was calculated throughout all farms and then each farm was compared with this average by colouring their data. The colours indicate:

green the enterprise's factor is 10 or more percent better than the average factor
yellow the enterprise's factor is in the range of +/− 10 percent difference to the average factor
red the enterprise's factor is 10 or more percent worse than the average factor

Figure I.11 shows the results for both the economic results and the physical performance of the farms. The US-75K is ranked first and the other farms are ordered by the number of green, yellow and red fields in descending order, using the economic indicators from non-factor costs to the beef price for the ranking. White areas on the animal performance were not ranked as they do not necessarily indicate strengths or weaknesses of the production system.

Fig I.11. ***Strengths and weaknesses of beef finishing farms 2012 (relative factors versus US-75K)***

	US-75K	IT-910	US-7200	CA-28K	ES-5500	DE-280	DE-285	FR-200	UK-90	ES-490
Non-factor costs	1,0	1,3	1,1	1,1	1,1	1,1	0,9	1,1	0,7	1,3
Animal purchases	1,0	1,2	0,9	0,8	0,5	0,6	0,2	0,9	0,3	0,5
Feed (purchase feed, fertiliser, seed, pesticides)	1,0	1,1	1,4	1,8	2,7	1,7	1,5	0,7	0,9	3,0
Machinery (maintenance, depreciation, contractor)	1,0	21,9	0,6	9,8	0,0	61,1	130,7	119,2	37,3	23,2
Fuel, energy, lubricants, water	1,0	11,8	1,9	2,1	0,0	6,9	9,9	12,2	19,7	5,3
Buildings (maintenance, depreciation)	1,0	3,4	0,7	0,7	0,0	11,7	17,0	10,1	3,7	5,3
Vet & medicine	1,0	2,4	1,9	2,3	4,8	2,0	1,7	1,7	1,8	4,4
Insurance, taxes	1,0	2,9	0,9	0,6	0,0	8,2	7,6	7,1	7,7	9,4
Other inputs beef enterprise	1,0	2,1	1,6	3,2	9,9	4,2	5,3	2,7	5,5	3,0
Other inputs	1,0	1,6	3,7	0,6	0,0	9,7	6,7	9,1	15,7	10,7
Total labour cost	1,0	4,1	1,0	1,9	2,6	8,7	7,6	5,3	18,3	4,2
Total land cost										
Total capital cost	1,0	17,1	3,6	25,0	1,4	48,0	35,8	35,7	40,0	13,9
Beef price	1,0	1,3	1,0	1,0	1,1	1,2	1,0	1,2	1,2	1,1
Physical performance										
Daily weight gain	1,0	0,9	0,8	0,9	0,9	0,7	0,6	0,8	0,5	0,8
Net gain	1,0	1,0	0,9	0,9	1,1	0,9	0,7	1,0	0,6	0,9
Age at end (days)	1,0	1,1	1,0	1,0	0,7	1,2	1,3	1,1	1,3	0,8
Finishing period (days)	1,0	1,4	1,3	1,3	2,1	3,6	4,1	2,1	3,9	2,1
Final weight (LW)	1,0	1,2	1,0	1,0	0,8	1,2	1,1	1,2	1,0	0,8
Final weight (CW)	1,0	1,1	0,9	0,9	0,7	1,1	0,9	1,1	0,8	0,7
Carcass yield	1,0	1,0	1,0	1,0	0,9	0,9	0,8	0,9	0,8	0,9
Labour productivity										
Physical labour productivity	1,0	0,2	0,7	0,8	0,2	0,1	0,1	0,2	0,1	0,1
Economic labour productivity	1,0	0,3	1,0	0,5	0,4	0,1	0,1	0,2	0,1	0,3

	PL-30	CZ-500	SE-230	AT-35	FR-60	SE-100	UK-80	FR-70	AT-120
Non-factor costs	1,0	1,2	1,1	1,1	1,4	1,2	1,6	1,3	1,2
Animal purchases	0,2	0,5	0,1	0,5	1,1	0,9	0,9	1,0	0,5
Feed (purchase feed, fertiliser, seed, pesticides)	1,9	1,7	1,8	1,2	0,9	0,2	1,0	0,6	1,5
Machinery (maintenance, depreciation, contractor)	29,5	84,0	269,3	124,6	126,1	173,6	196,0	134,2	115,7
Fuel, energy, lubricants, water	59,1	27,8	19,9	10,3	12,5	18,1	37,9	15,0	18,7
Buildings (maintenance, depreciation)	8,0	20,0	7,6	27,7	10,1	20,4	24,7	18,3	34,3
Vet & medicine	4,1	2,6	2,4	3,7	2,8	0,0	1,6	2,8	6,0
Insurance, taxes	8,9	4,2	9,6	11,9	6,8	9,7	9,8	12,1	9,0
Other inputs beef enterprise	8,1	3,2	10,1	9,5	4,4	8,6	9,3	4,7	6,9
Other inputs	2,6	0,3	20,1	3,4	18,4	10,6	12,3	11,7	2,5
Total labour cost	6,5	7,0	17,9	24,5	10,7	27,6	29,8	18,1	13,8
Total land cost									
Total capital cost	32,5	73,9	12,7	97,2	57,6	107,0	106,5	97,2	99,1
Beef price	0,9	1,1	1,3	1,2	1,2	1,4	1,3	1,2	1,2
Physical performance									
Daily weight gain	0,5	0,5	0,7	0,8	0,9	0,8	0,4	0,7	0,8
Net gain	0,6	0,7	0,8	1,0	1,0	0,9	0,5	1,0	1,0
Age at end (days)	1,2	1,4	1,0	1,1	1,1	1,0	1,6	1,0	1,0
Finishing period (days)	3,7	3,5	3,1	3,2	1,7	1,7	3,8	1,7	3,0
Final weight (LW)	0,9	1,0	0,9	1,2	1,2	1,1	1,0	1,0	1,1
Final weight (CW)	0,7	0,9	0,8	1,0	1,1	0,9	0,9	1,0	1,0
Carcass yield	0,8	0,9	0,8	0,9	0,9	0,8	0,8	1,0	0,9
Labour productivity									
Physical labour productivity	0,0	0,1	0,1	0,0	0,1	0,1	0,0	0,1	0,1
Economic labour productivity	0,1	0,2	0,1	0,1	0,1	0,1	0,0	0,1	0,1

Explanations see text

- The North American feedlots are particularly strong on the non-feed and non-animal purchase side of costs including depreciation, labour productivity and costs. Most of that is due to the sheer size of the operations and associated economies of scale. In the US at least, the low labour costs is also a result of employing Mexican and other Latin origin workers at relatively low wage rates. The Canadian farms do not have this advantage due to the high opportunity cost originating from the mining and oil industry.
- It should be mentioned, however, that the feedlot period is only approximately 150 days long and only represents part of the animal's life. The pre-feedlot life is partially captured by the cow-calf data presented above and showed a) similar levels of weaner prices when compared with the EU and b) lower costs and returns per 100 kg live weight produced, the latter of which including the production of cull and breeding animals where relevant. With similar productivity levels it means that price levels for beef (cull) animals are lower than in the EU.
- The backgrounder life is not captured by the analysis yet as the production of backgrounders does not necessarily happen and depends on the availability of grass and price relations between beef, backgrounder and weaner prices.

- The only – but important – weaknesses of the North American feedlots are:
  - the beef prices (lowest in the US). This can be interpreted as a competitive advantage when considered isolated. In the national context, it is of course a disadvantage because it reduces profitability.
  - the animal purchase costs (in the US and CA). High animal purchase costs in the US have been analysed in a recent study (Deblitz et al. 2012b). The authors came to the conclusion that these higher costs were offset by lower feed and other costs.
  - the feed costs (in CA, they feed barley silage and barley grain instead of corn and distillers grain in the US), and
  - the net gain[2] (in the small US-feedlot). The latter reflects not just the finishing period but the whole life of the animal and gives a better indication on the overall productivity than daily weight gain. The net gain reflects lower weight gains pre-feedlot which lowers the overall performance of the combined weaner-backgrounder-feedlot system and lets the silage and pasture systems' performance look better.
- In economic terms, however, the pre-feedlot life of the animals is reflected in the purchase price of weaners and backgrounders, respectively, and thus the data cover the whole picture.
- The Italian farm is another top-performer in this analysis, mainly because of its high beef price. Its main weakness is the high animal purchase costs based on heavy weaners of more than 350 kg LW imported from France (which again is linked to the high beef price).
- Going further to the right of the table, more and more cost positions become red. These can be less related to feed purchase and inputs for producing feed (seed, fertiliser, plant protection) but rather to machinery, fuel and labour. All of these play an important role for the production and feeding of forages and in some cases feed grains. In addition, building-related costs become more important. It can be assumed that some of the farms are overstocked with machinery and buildings for keeping and feeding animals.

From the data shown, we can conclude that from the cost and price side there is an incentive for North American producers to export beef to the EU. At the moment, exports can only take place within defined quotas. For quantities beyond the quotas, the tariff rate constitutes a prohibitively high limit for exporting profitably.

I.5 Developments over time and their drivers

Figures I.12a, b and c give an impression of margin over cash costs of the enterprises analysed for the period 2005 to 2012 (where data are available, otherwise for a shorter period). The margin over cash costs compares the total returns of the enterprises (beef returns plus coupled direct payments, if existent) with the cash costs (expenses) of the enterprises. Cash costs do not comprise depreciation and opportunity costs for production factors provided by the farm family / operator (labour, land, capital). Thus, the margin indicates the short-term profitability of the enterprises.

The following conclusions can be drawn:

- In a number of farms, profitability has been negative for quite some years but beef production is continued anyway. On the other hand and with the exception of the Canadian and the small US-feedlot, profitability on whole-farm level was positive in all farms analysed here. This means that the losses in the beef finishing enterprise were compensated by profits in other enterprises (for example, dairy, cash crops) and/or direct (decoupled) payments on whole-farm level which cannot be associated with the enterprise due to their decoupled character. It must be said, however, that this situation is not sustainable and that this type of producers should drop out of beef finishing sooner or later.

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[2] Net gain= Carcass weight divided by age of the animal; Daily weight gain= (Weight at end – weight at start) divided by finishing period.

Fig I.12a. *Margins over cash costs for selected EU beef finishing enterprises 2005-2012 (EUR per 100 kg CW)*

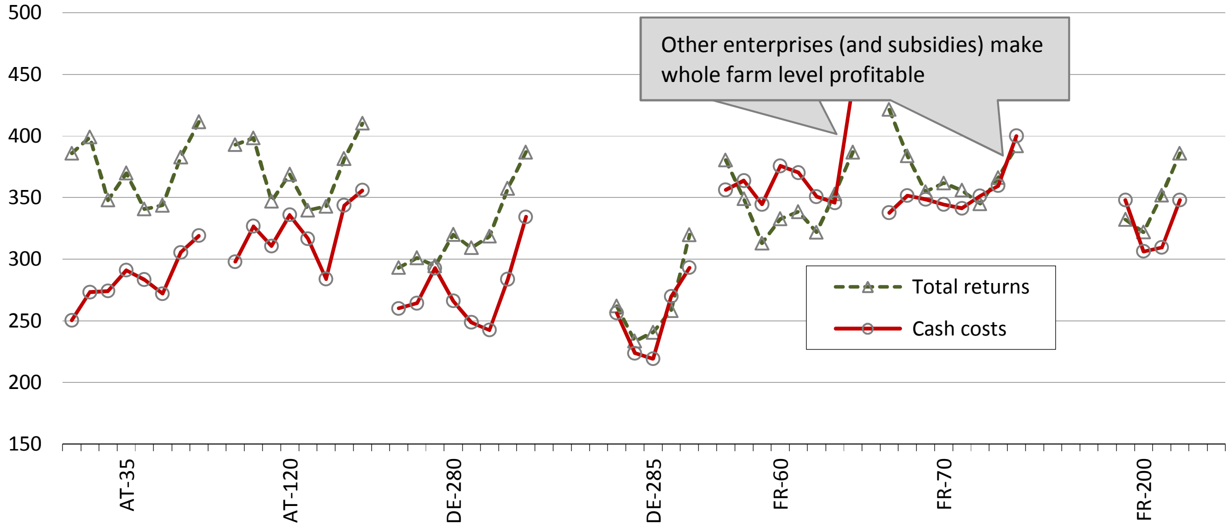


Fig I.12b. *Margins over cash costs for selected EU beef finishing enterprises 2005-2012 (EUR per 100 kgCW)*

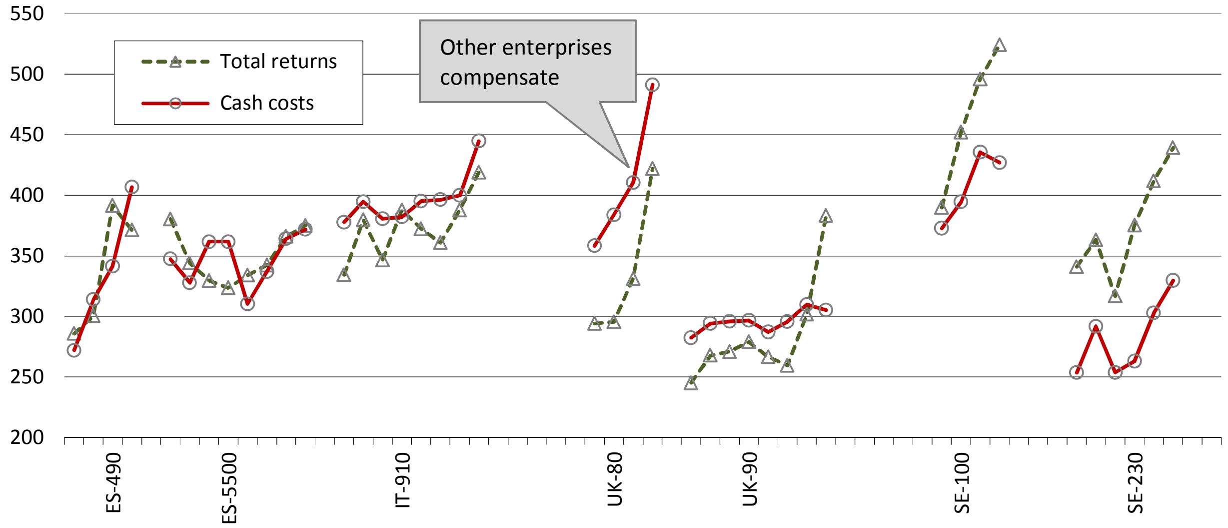
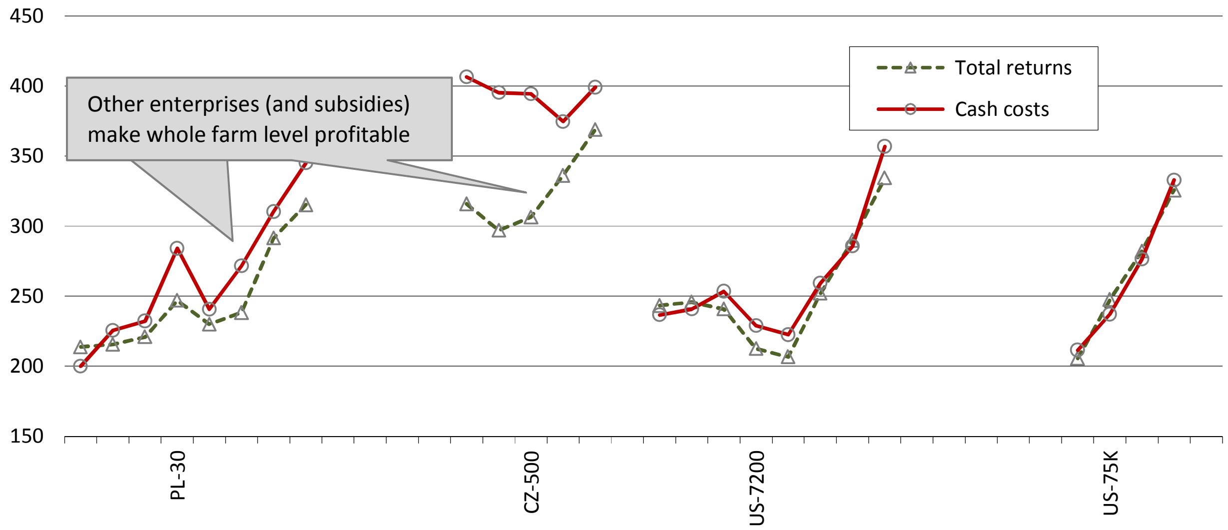


Fig I.12c. *Margins over cash costs selected EU and US beef finishing enterprises 2005-2012 (EUR/100 kg CW)*



- The feedlots are a specific case. Other than family farms, they have to pay for all production factors and opportunity costs are extremely low which means that the cash costs shown here are basically equivalent to total costs. With everything else being equal, a cash deficit with these farms is more likely than for family farms.
- The US-7200 which represents a medium-sized feedlot in the US reflects the crisis which the US-feedlot industry has undergone in the last years with most years being negative in profits. Reasons are provided in Chapter I.5.
- Some of the enterprises within the family farms (like the Austrian and the German) are relatively profitable in the short-term which is mainly due to the relatively high proportion of opportunity costs (mainly labour). From a longer-term perspective and putting a value to the factors, these enterprises are not profitable, either.

The main **drivers** of the development were:

Beef prices
Global demand, fuelled by economic growth in Asia, Middle East and Russia and resulting increases in beef prices were the main drivers on the return side of beef enterprises.

Livestock prices
Livestock prices usually follow beef prices but supply shortage of livestock can also impact on beef prices via high livestock prices. The price time series in Chapter I.2 indicate a certain but not in all cases significant correlation between both prices. Apart from the beef price levels, livestock prices are also driven by calf supply which is influenced by the milk quota regulation in the EU and more recently by climatic conditions and grass availability in the US and Canada. The recent drought years in the US were a major reason for a further decline of the cow-calf herd, the calf crop, the lowest cattle inventory in 40 years, and the historically high domestic livestock prices. The sharp increase in livestock prices in the US is one of the reasons why the cost between the US and the EU narrowed in 2012 when compared with 2011.

Energy prices
Oil and energy prices peaked in 2008, contracted in 2009 and increased / remained since then on high level. High energy prices are particularly reflected in fertiliser costs, fuel and transport costs. It can be assumed that they are transmitted into higher grain and feed prices sooner or later.

Feed prices
Wheat, corn and oilseed prices showed a similar pattern as energy prices. Fuel prices have probably been one driver of high grain and feed prices. The growing global demand for grains and feed – for both human but particular animal production – and the increasing use of grains for biofuels were other important drivers of feed prices. It must be said, however, that the residual of the US-ethanol production DDGS (dried distillers grains with solubles) has proven a useful replacement of corn in the US-feedlot industry. In contrast, the German biogas policy has led to strong competition for land and corn silage, resulting in increasing prices for these items and in a relative reduction of livestock's competitiveness vs. the subsidised biogas production. Similarly, the US bio-fuels policy that effectively mandates the use ethanol has reduced livestock’s competiveness even with the ability to feed DDGS. The increase of feed prices in the US is another reason why the cost between the US and the EU narrowed in 2012 when compared with 2011.

Land scarcity
Driven by high grain prices and the global demand for more food, land which was previously used as grassland but was technically suitable for crop production, has been converted into cropland because the higher grain prices allowed a positive margin. At the same time, grassland areas and thus total land area did not grow. This pushed beef finishing out of grassland locations. As a result – and paradoxically given the high grain prices – the proportion of cattle finished on grain increased. Changes in some countries like Argentina were dramatic and grain-fed cattle have a proportion of an estimated 50 percent of total slaughter these days.

Over-capacity of US feedlots.
The time series analysis indicated a lack of profitability in parts of the industry and over some years. High feed prices were accompanied by historically high feeder/stocker cattle prices, resulting in years of loss and over the last years pointing at a combination of high competition and overcapacity in the feedlot industry given current cattle inventories.

Exchange rate
In the last decade, exchange rate developments between the USD and the EUR played in favour of the USD from a competitiveness point of view. The devaluation of the USD against the EUR meant that the increasing domestic USD prices in the period 2002 to 2008 were offset by the exchange rate development, resulting in decreasing beef prices in EUR-terms. From 2009 to 2011, the strong domestic price increases due to the shortage of cattle combined with a slight recovery of the USD against the EUR resulted in significant price increases of both beef and livestock to historic levels. The valuation of the USD against the EUR in 2012 reinforced the negative effect on the US competitiveness determined by domestic price increases for livestock and feed.

Policy intervention
Policy measures directed to beef (and other agricultural products) production and markets are manifold and usually have direct, indirect and sometimes unintended impacts. The most important trade-relevant intervention is the border protection of the EU with an applied weighted ad valorem tariff rate of approximately 90 percent. Other direct interventions are the SPS measures on beef produced with hormones and beta-agonists (see below). The most important indirect intervention is probably the milk quota regulation in the EU which has led to a constant decline of domestic supply of dairy calves which is one reason for the decline of beef production in the EU.

Referring to the production and trade data in Chapter I.2, it can be concluded that the movements in production and trade can be more associated to animal disease issues and related trade policy measures, policy intervention and extreme weather conditions than to changes in price relations.

Part II: Likely developments and perspectives

II.1 The role of hormones and beta-agonists in US beef production

The following sections are mainly dedicated to the analysis of the US versus the EU. Data and information on Canada were too limited during the period of the study to do a similarly detailed analysis as in the US.

II.1.1 The substances in question

Growth hormones are typically applied as ear implants in both cow-calf and finishing operations. Research trials have typically found that these management practices significantly improve key production measures such as average daily gain, feed intake and feed conversion.

Beta-agonists are not hormones. They are used to increase leanness of the animals in finishing operations and thus dressing percentages. There are two main beta-agonists in use: OptaFlexx® (ractopamine hydrochloride, by Elanco) and Zilmax® (zilpaterol hydrochloride, by Merck). Their impact obviously will vary considerably, but values from numerous research trials would suggest dressing percentage will likely increase from 0.5-1.5 percent (Optaflexx on the lower end and Zilmax on the higher end).

In Canada and the US, the use of growth hormones and beta-agonists in beef production is common practice. The use of these substances is banned in the EU. Recent import concessions comprise of 11,500 tons quota for North America and an additional non-country-specific quota of 20,000 tons under similar conditions (CAP-Monitor 2011). These quantities come in under preferential access in terms of a reduced tariff rate of 20 percent ad valorem customs duty but allow only beef which was not produced with the help of these substances. Australia and particularly the US have taken most of these quantities.

II.1.2 Cow-calf operations using growth hormones

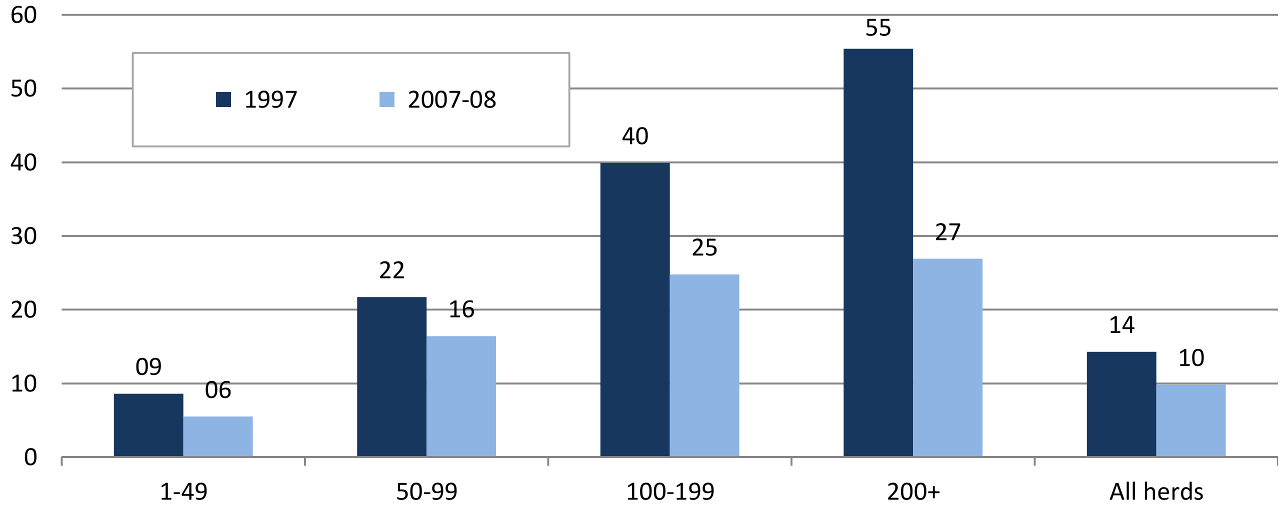
The United States Department of Agriculture (USDA) surveys different segments of the beef industry from time to time to discern typical management practices. These surveys are a cooperative effort of the National Agricultural Statistics Service (NASS) and the Animal and Plant Health Inspection Service (APHIS). The survey sampling method is done in a manner that the responses are representative of the broader population of producers and thus should be representative of the industry as a whole. Where possible the data from the USDA surveys are supplemented with other information.

Figure II.1 shows the percentage of beef cow-calf operations that implanted any calves **prior to weaning** in 2007-08 and 1997. Several points are quite revealing from this figure, first the percent of total operations that are implanting calves is relatively low (9.8 percent of all herds in 2007-08 and 14.3 percent in 1997) and the percentage has decreased for all herd sizes between the two time periods. That is, there are considerably fewer beef cow-calf operations implanting their calves prior to weaning in the most recent survey compared to the survey approximately 10 years earlier.

The other point is that larger operations tend to use the management practice of implanting their calves prior to weaning more so than smaller operations. However, the reduction from 1997 to 2007-08 was much larger for larger operations, those with 100 cows or more, compared to smaller operations. Approximately one-fourth of operations with more than 100 cows in 2007 indicated they were implanting their calves prior to weaning compared to about 6 percent of operations with fewer than 50 cows. Ten years earlier 40 percent of operations with herds of 100-199 cows and 55 percent of operations with herds over 200 cows were implanting their calves at weaning compared to about 9 percent of operations with fewer than 50 cows.

Figure II.2 shows comparable information as was displayed in Figure II.1 only it reflects those beef cow-calf operations that implanted any calves **at weaning**. As would be expected, the percentage implanting calves prior to weaning is higher than the percentage of operations implanting at weaning. The reason for this is that the majority of cow-calf operations do not retain their calves – it would only be beneficial to implant calves at weaning if they were being retained such that the benefits could be captured during a backgrounding/stocker phase (explanation see Chapter I.1).

Fig II.1. Beef cow-calf operations implanting any calves ***prior to weaning***



Source: USDA (1997, 2008)

Fig II.2. Beef cow-calf operations implanting any calves ***at weaning***

Source: USDA (1997, 2008)

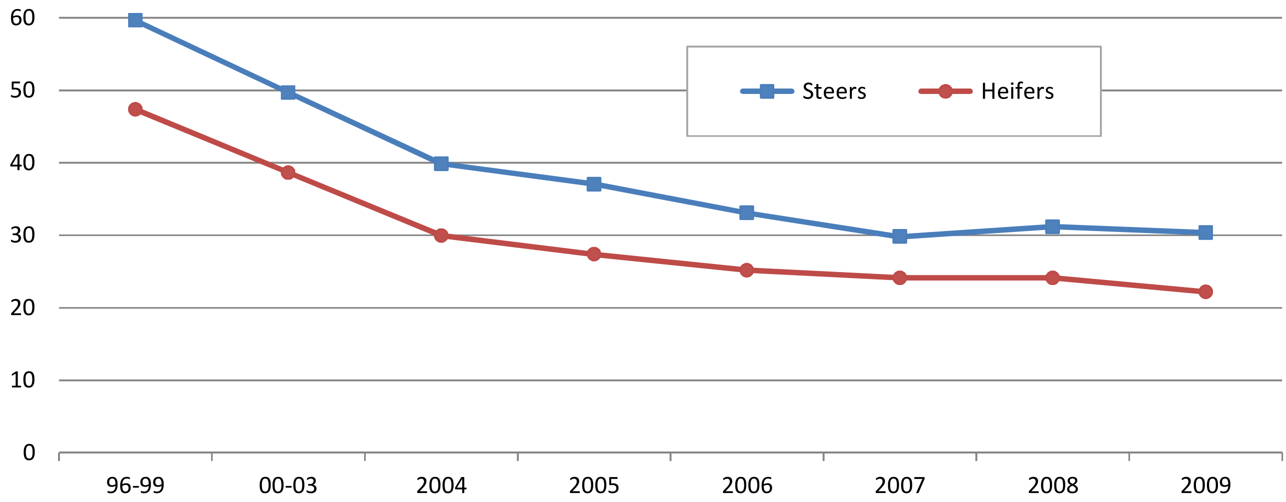
Similar to Figure II.1, it can be seen that the percentage of beef cow-calf operations implanting any calves at weaning has decreased significantly from 1997 to 2007-08. Also, as was the case with implanting prior to weaning, there is a tendency for larger operations to use the management practice of implanting more often than smaller operations.

II.1.3 Feedlot operations using growth hormones

Figure II.3 shows the percentage of sale lots of feeder calves/cattle from the largest video auction in the U.S. (Superior Livestock Auction – SLA) that were either known to have been implanted or where the implant status was unknown from 1996-2009. Beef cow-calf operations that sell their calves through a video auction tend to be larger than average (average lot size of data in Figure II.3 was typically around 120 head) and thus these data are likely most aligned with the 200+ head herd size category in Figures II.1 and II.2.

The trend shown in Figure II.3 is consistent with that presented in Figures II.1 and II.2 suggesting that the number of beef cow-calf operations (and number of calves) that are implanted with growth promoting hormones has been declining over time in the U.S. However, it also appears that the decline has possibly stabilized and thus the values from the most recent USDA survey (2007-08) are probably reasonable estimates for current practices (at least for larger operations).

Fig II.3. *Feeder cattle sale lots implanted or of unknown status (percentage)*



Source: Zimmermann (2010)

Figure II.4 shows the percent of feedlot operations having more than 1,000 head capacity that implanted cattle/calves at initial processing in 2011 and 1999.[3] It can be seen that the use of implanting calves in the feedlot is done by the majority of feedlots in these size categories. Similar to what was seen with beef cow-calf operations, there is a tendency for larger feedlots to use the management practice of implanting with growth hormones slightly more than smaller feedlots. Also as was the case with beef cow-calf operations, it appears that the practice of using implants has been declining over time, but at a slower rate for feedlots compared to cow-calf operations. For example, in 1999 92.4 percent of feedlot operations reported that they implanted cattle at the initial processing, but that declined to 78.7 percent in 2011.

Figure II.5 shows similar information as was displayed in Figure II.4 only it reflects the percent of cattle and calves that received implants (as opposed to the percent of feedlots implanting cattle). The fact that the values are similar in both figures suggests that those feedlots that are implanting cattle basically implant most of the cattle and not just a portion of them.

Figure II.6 shows 2011 information similar to what was presented in Figures II.4 and II.5 for feedlot operations having less than 1,000 head capacity (data are not available for 1999). The percent of feedlots implanting cattle/calves at initial processing is considerably lower for these smaller feedlots compared to those having capacities greater than 1,000 head. The percent of cattle and calves implanted is higher than the percent of operations implanting reinforcing that the larger feedlots (within these smaller categories) tend to implant their cattle more frequently than the smaller feedlots.

3 Feedlots with 1,000 head capacity and greater account for less than 3 percent of the total feedlots, but they accounted for 85.4 percent of fed cattle marketings from 2003-2012 (88.1 percent in 2011-12).

Fig II.4. *Proportion of feedlot operations implanting calves / cattle at initial processing (feedlots with **> 1,000 head** capacity)*

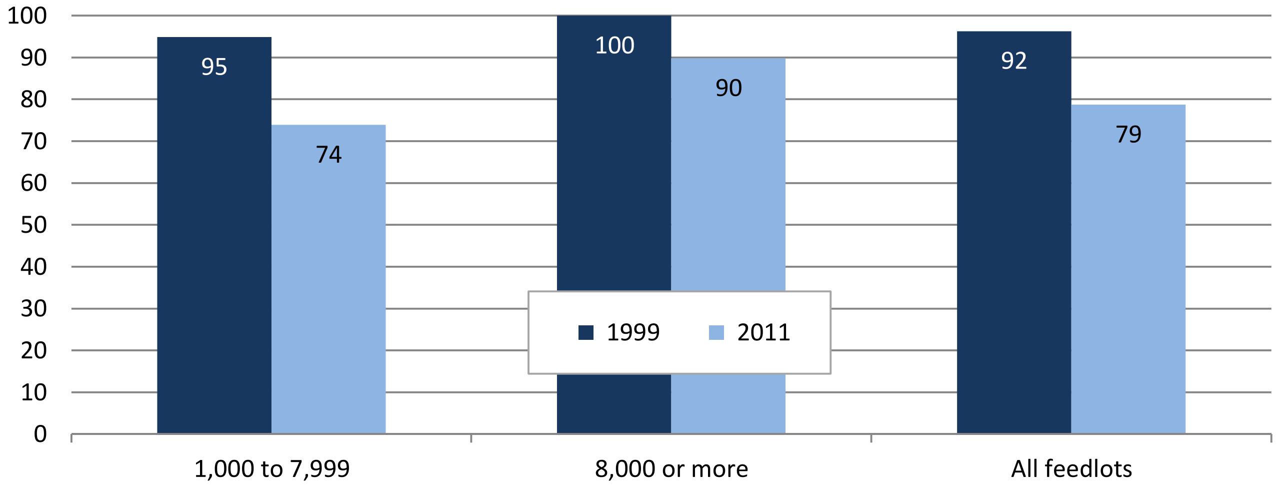


Fig II.5. *Proportion of implanted calves / cattle at initial processing (feedlots with **> 1,000 head** capacity)*

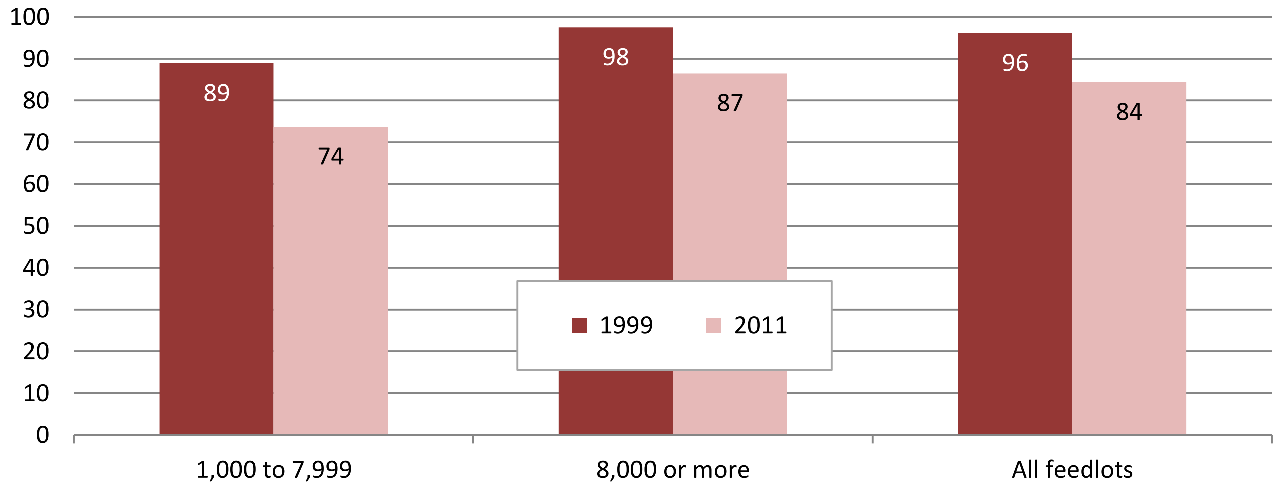
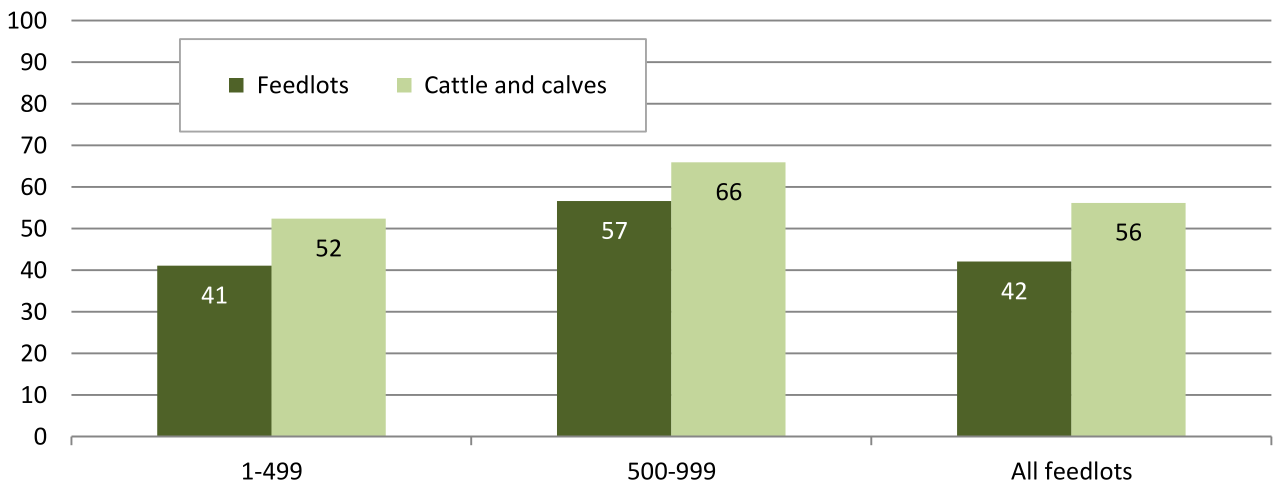


Fig II.6. *Proportion of implanted calves / cattle at initial processing (feedlots with **< 1,000 head** capacity)*



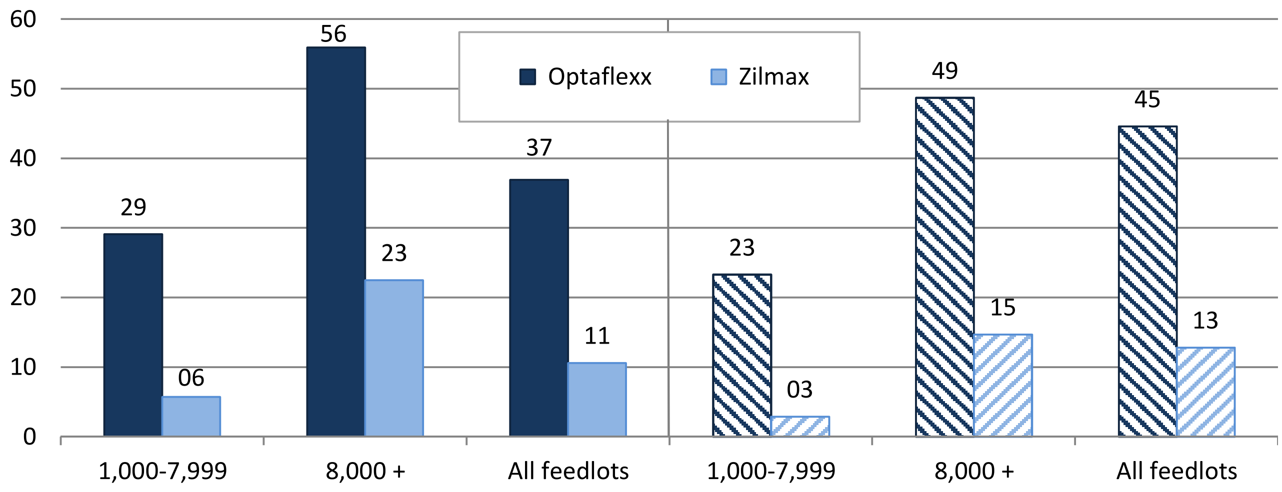
Sources: USDA (2000, 2013a, 2013b

II.1.4 Feedlot operations using beta-agonists

Beta-agonists are used as feed additives for a relatively short number of days at the end of the feeding period (Lawrence and Ibarburu, 2007) as a means of improving growth rate and increasing dressing percentage (i.e., promoting carcass leanness). In an analysis of the environmental and economic impact of growth-enhancing technologies in U.S. beef production, Capper and Hayes (2012) used an adoption rate of 38 percent for beta agonists based on industry estimates.

The USDA feedlot survey that asked about the use of implants also asked a question about the use of beta-agonists as part of their nutritional management, however, because this technology only became commercially available within the last 10 years it was not asked in the 1999 survey. Figure II.7 shows the percent of feedlots and the percent of cattle for feedlots with over 1,000 head capacity that reported feeding beta-agonists as part of their nutrition program in 2011. The survey asked for respondents to report on the use of Optaflexx (ractopamine hydrochloride) or Zilmax (zilpaterol hydrochloride) and it can be seen that Zilmax was used by considerably fewer feedlots (and on less cattle) than Optaflexx. Regardless of the type of beta-agonist, larger feedlots used this feed additive more frequently than the smaller category of feedlots.

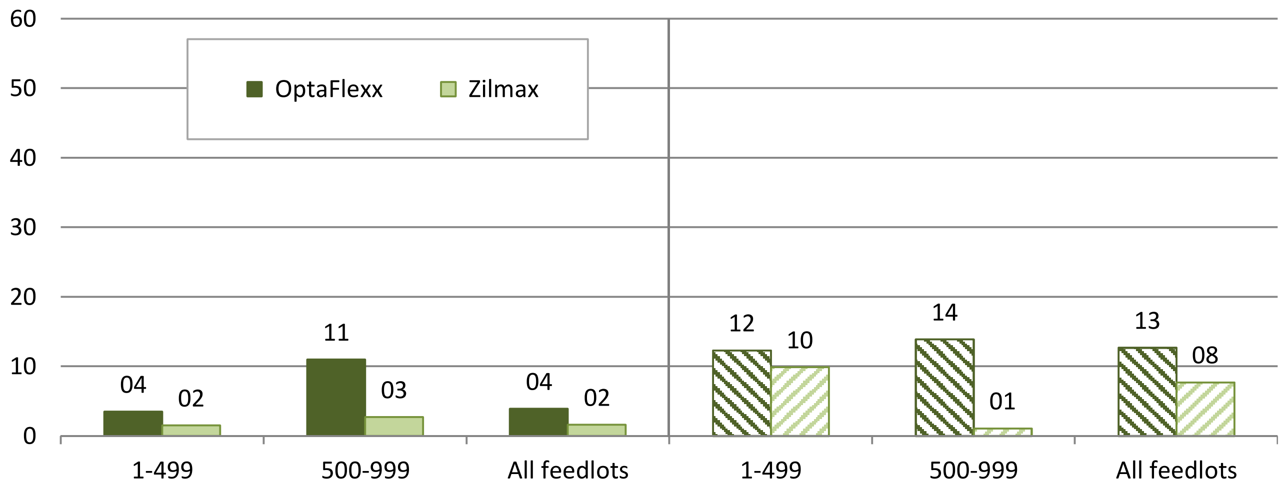
Fig II.7. *Proportion of beta-agonists used (feedlots with > **1,000 head** capacity)*



Source: USDA (2013a)

Figure II.8 shows similar information as displayed in Figure II.7 only for feedlots with less than 1,000 head capacity. The data for these smaller feedlots confirms what was shown in Figure II.7 in that the use of beta-agonists as a feed additive is used much less by small feedlots. Also, similar to the larger feedlots, Zilmax was reported to be used by considerably fewer feedlots than Optaflexx.

*Fig II.8. Proportion of beta-agonists used (feedlots with < **1,000 head** capacity)*



Source: USDA (2013b)

Assuming the values in Figures II.7 and II.8 are additive (i.e., total cattle receiving beta-agonist is the sum of those receiving Optaflexx and Zilmax) there are 57.4 percent of cattle from feedlots with greater than 1,000 head capacity being fed a beta-agonist and 20.4 percent of cattle from feedlots with less than 1,000 head capacity. Using these percentages, along with recent fed cattle marketings of the different sizes (88 percent for > 1,000 head and 12 percent for <1,000 head), would imply that slightly over half (53 percent) of the cattle fed in US feedlots are fed a beta-agonist for a short portion of their total feeding period. While this is a fairly large percentage, it also indicates that there are many cattle fed in the US that are not receiving a beta-agonist feed additive.

II.1.5 Reasons for the reduced use of hormones

Chapter II.1.2 and II.1.3 show a decline in hormones (growth implants) over time for both cow/calf (Figures II.1, II.2, and II.3) and feedlots (Figures II.4 and II.5).

This cannot be said about the use of beta-agonists. That is, the data on beta-agonists was only at a point in time (2011) so we were unable to comment on use over time. We suspect it has actually increased (at least until summer 2013) but we have no data to confirm or refute that at this point. Beef produced without the use of beta-agonists mostly goes into the commodity market and thus is sold at “normal” conditions.

The reasons for the decline of hormone use could be:

- Some cow/calf producers might have decided that the application of hormones wasn’t worth the extra management – we estimate this is only a small percent of the pullback.
- The main reason is likely to be an attempt of producers targeting markets to get a premium, i.e., hormone-free beef.
- Hormone-free markets are a combination of domestic and export. Anything that has a chance of making it to EU will needs to be hormone free, as under the present export quota. Producing lees beef with hormones might be based on the expectation that this market is going to grow in the future and that positioning themselves early enough would provide an easier entry at a later stage.
- There is a food chain that pitches that they only used hormone-free beef, but occasionally they point out that they have to deviate from that because of limited supply. It is, however, not clear if it is a “limited supply” issue or a “don’t want to pay what it will take to get it” issue. This would suggest though that there likely is not much verifiable hormone-free beef that is sold through “normal” conditions. However, it is likely that there is beef that has not been implanted that is sold under normal conditions because the producer cannot verify its hormone-free status.

Concluding, it appears that beef produced without hormones goes to all kind of market places. That is, if it can be verified as hormone free it likely does receive a price premium and that goes to both domestic and export market. If it cannot be verified it will go through normal marketing channels and not receive a premium.

II.1.6 The economics of the treatments

The economics of cattle implanted with growth hormones or fed a beta-agonist feed additive will depend upon many factors (e.g., price of product, cost of product delivery to animals, feed prices, and cattle prices). The economic advantage of the use of growth hormones and ractopamine/beta-agonists is twofold:

1. better feed conversion reduces feed costs, and

2. higher carcass yield and conformation.

The total economic benefit of the substances can be estimated at 7-10 percent of the feed costs, net of application costs (de Roest et al., 2012).

Lawrence and Ibarburu (L&I, 2007) conducted an economic analysis of the impact pharmaceutical technologies have on modern beef production in the US. Specifically, L&I used a meta analysis approach to combine results from many different individual research studies examining the various pharmaceutical technologies (parasite control, growth promotant implants, sub-therapeutic antibiotics, ionophores, and beta-agonists). The authors considered an average response to the various technologies along with a measure of variability in the response and then conducted a simulation of the impact each of these technologies have on the breakeven price for the respective sector in the industry (cow-calf, stocker, and feedlot) and also the amount costs would increase in the absence of the technology. L&I's initial study was based on prices in 2005, but they redid their analysis in 2007 to capture the impact of feed prices that had increased significantly due to the increased amount of corn going into the biofuels market (Lawrence and Ibarburu, 2009).

Figure II.9 shows the results from the initial 2005 analysis and the subsequent analysis with 2007 cattle and feed prices by L&I. Based on the various studies they examined in their meta analysis they used an impact of +3.07 percent on weaning weight (along with an impact on weaning rate) for implanting calves prior to weaning and concluded that eliminating this technology would increase breakeven price by 5.8 percent or USD 28 per head. At the higher feed price scenario (2007) the cost per head increased to USD 34. This value of using growth promoting implants in calves prior to weaning will be significantly higher than the cost of the product and or applying it (implant in ear of calf) for producers that have facilities and routinely process their calves.

Fig II.9. *Economic impact of growth promotants and beta-agonists on beef sectors in the US*

	Weaning rate	Weaning weight	ADG	F/G	2005 Breakeven price	2005 Cost per head	2007 Breakeven price	2007 Cost per head
Growth promoting implants								
Beef cow-calf	2,54%	3,07%	n/a	n/a	5,8%	$28,03	5,8%	$34
Stocker cattle	n/a	n/a	12,85%	n/a	2,3%	$18,19	2,9%	$21
Beef feedlots	n/a	n/a	14,13%	-8,79%	6,5%	$68,59	6,1%	$71
Beta-agonists feed additive								
Beef feedlots	n/a	n/a	14,04%	-12,59%	1,2%	$13,02	1,2%	$15

Source: Lawrence and Ibarburu (2007)

However, as was shown in Figure II.1, the percent of beef cow-calf operations implanting their calves prior to weaning is relatively low in spite of these favorable economic returns. This is likely attributed to the following factors:

- smaller operations do not have the labor or facilities to process calves prior to weaning (thus their costs would be significantly higher),
- producers are increasingly targeting "natural" or "hormone free" markets and they anticipate receiving a price premium large enough to offset the lower weaning weight without implanting their calves, and
- smaller cow-calf operations often view the enterprise as supplemental income and thus are less profit motivated.

Based on their meta analysis, L&I used improvements in average daily gain (ADG) for stocker cattle and feedlot cattle of 12.85 percent and 14.13 percent, respectively. Likewise, they used an improvement in feed-to-gain (F/G)[4] of 8.79 percent due to growth promoting implants. This technology is worth approximately USD 20 per head for backgrounder/stocker operations and about USD 70 per head for feedlots. The much larger gain in the feedlot makes sense as this generally reflects a longer time period and one where higher priced feed ingredients are used. This is also consistent with why there has historically been a higher adoption rate of this technology in the feedlot sector as was shown in Figures II.4 and II.5.

Why the smaller feedlots are less likely to use this technology is somewhat unclear (i.e., data in Figure II.6). Unlike cow-calf operations, it would not be due to a lack of processing facilities so it may be that they are targeting more specialty markets or this simply reflects a lower level of management in these operations, which could be the case as they often are more farmer-feeders that also are involved with crop production.

L&I used an impact of +14.04 percent for ADG and -12.59 percent for F/G for cattle receiving a beta-agonist in the feedlot (during period receiving product). Eliminating this technology would increase breakeven price by 1.2 percent or about USD 13-USD 15 per head. The authors indicated that one of the reasons the gain to beta-agonists was lower than other technologies (i.e., implants) is that they are only used for a relatively short time period at the end of the feed period (typically 20-28 days).

Capper and Hayes (2012, C&H) also conducted an analysis examining what the economic and environmental impact would be of removing growth-enhancing technologies (GET) from US beef production. They did not consider the use of implants in the cow-calf sector prior to weaning as they felt the adoption rate was sufficiently low. C&H factored in adoption rates of the various technologies and examined what the impact would be on US beef production with the elimination of these technologies. The authors concluded that if these technologies were eliminated it would be the equivalent of imposing an 8.2 percent tax on US beef farmers and ranchers. This tax could lead to reduced domestic beef production and increased beef imports from Canada, Brazil, Argentina, and Australia and a significant increase in global carbon emissions.

Capper followed this previous study with one focusing on differences between conventional (CON) beef production (i.e., one using growth-enhancing technologies), natural (NAT), and grass-fed (GFD) production systems (Capper, 2012). For the most part the same production parameters were used for this study as the C&I study. The CON and NAT systems were assumed to be managed identically except that the CON production system used growth-enhancing technologies (i.e., implants, ionophores, MGA, and beta-agonists) and the NAT system did not use any of these technologies.

Unlike the L&I study, Capper did not explicitly indicate what impact each technology would have on most productivity measures, but a comparison of some of the values from the CON and NAT systems is still useful. In the stocker phase, the NAS system had a 22 percent lower growth rate (kg/d) compared to the CON system. Capper considered both calf-fed and yearling-fed feedlot classes. In the calf-fed beef feedlot class, the NAT system had a 25 percent lower growth rate (kg/d) and a 14 percent lighter ending weight at harvest compared to the CON system. In the yearling fed beef feedlot class, the NAT system had a 20 percent lower growth rate and a 7 percent lighter ending weight at harvest compared to the CON system. The author did point out that the impact of the beta-agonist technology used was an increase growth rate of 18.4

[4] Feed to gain describes the amount of feed required to produce one kilogram of meat. For example, if a cattle needs 5 kg of grain to grow by 1 kg of live weight, the feed to gain ratio is 5.

percent during the supplementation period and an increase in dressing percentage of 0.5 percent (63.8 percent versus 63.3 percent).

Own calculations for beef finishing (feedlot)

Data from the US-feedlot in Kansas (US-75K) producing 75,000 animals p.a. were used to perform own calculations. Data used here are from the recent analysis year 2012.

Using the standard analysis data, a reference scenario (S1) was defined which describes the situation without the use of hormones and beta-agonists. A second scenario represents the use of hormones (S2) and the third scenario the use of hormones and beta-agonists (S3).

Figure II.10 illustrates the changes in the absolute figures and Figures II.11 and II.12 show the relative changes as an index with the 'without' situation set to 100.

Results presented in Figure II.10 are differentiated in performance indicators and subsequent economic results.

- In the section of *performance indicators*, figures in the grey frame show where changes according to the use of the substances occur. Ages, finishing periods and weights at start were kept constant. As discussed previously, hormones and beta-agonists increase the growth rate, final weights and dressing percentages.
- As a consequence for the *economic section*, the basis for the cost analysis increases and costs which are not directly affected by the use of hormones are decreasing by the equivalent percentage of the weight increase.

However, there are also costs directly associated with the use of the substances:

- Feed costs

  Feed conversion and dry matter (DM) intake increase with the use of hormones / beta-agonists which means that less feed is required and feed costs decrease to a greater extent than the increase in weight.
- Material as well as application costs

  The cost of implanting a growth hormone basically is to inject the hormone into the ear of the animal. For operations that are already working/processing their cattle this simply is one more step and thus the marginal cost of implanting is very close to zero.

  However, for producers that are not already processing their cattle, if implanting requires a separate operation the costs could be considerably higher. Furthermore, for very small operations that currently have poor or no facilities for processing cattle, the cost of adding facilities is likely prohibitive.

  Because beta-agonists are a feed additive there are no “application costs” but there still may be costs incurred with delivering the product to the cattle. Depending on the product, the additive is included at inclusion rates of approximately 70-200 mg/hd/day, which may prohibit some feedlots from using this product with current equipment if they cannot mix and deliver ingredients with that level of precision. For large feedlots with sophisticated feed mixing and delivery systems this likely is not an issue and thus the marginal cost of including beta-agonists in their diets is basically the cost of the product itself.

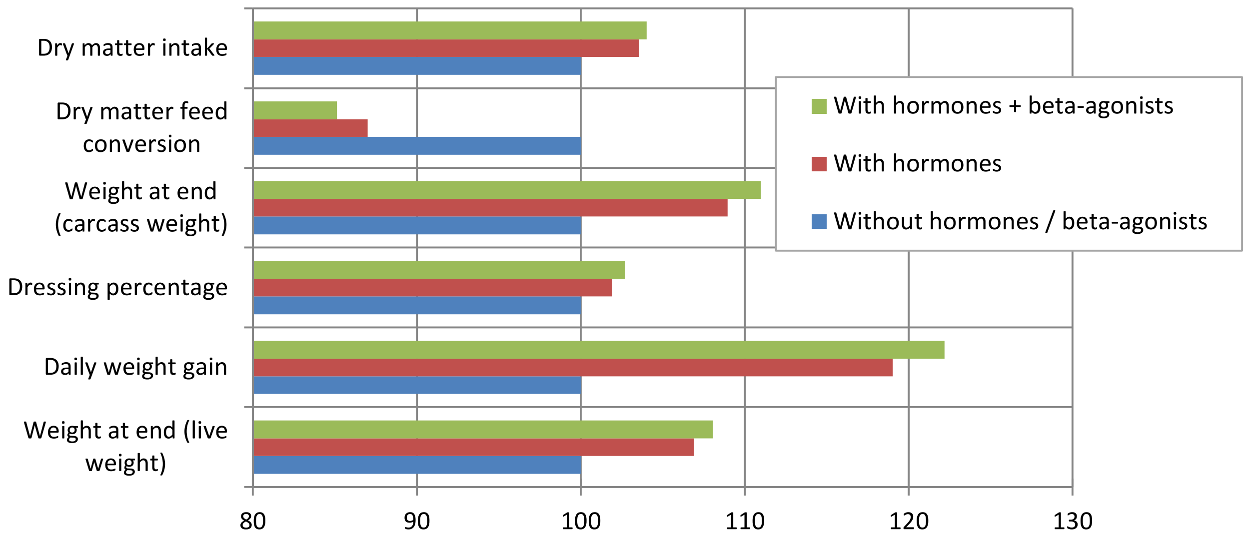
Beef prices varied slightly across the three scenarios reflecting carcass quality and composition. The beef price on a carcass basis was highest for S1 because of slightly lower quality grades for cattle implanted and receiving a beta-agonist (S2 and S3 scenarios). However, the benefit of the heavier carcass weights for S2 and S3 scenarios were greater than the impact on quality and thus gross revenue per head increased compared to the no implant/beta-agonist scenario (S1).

Fig II.10. Impact of growth promotants and beta-agonists on beef sectors in the US 2012

Scenario		Without hormones or beta-agonists	Hormones	Hormones + beta-agonists
Performance	No. sold p.a.	75.000	75.000	75.000
Age at start	days	331	331	331
Age at end	days	475	475	475
Finishing period	days	144	144	144
Weight at start (live weight)	kg per head	343	343	343
Weight at end (live weight)	kg per head	538	575	581
Daily weight gain	g per day	1.352	1.609	1.652
Dressing percentage	%	62,48%	63,67%	64,17%
Weight at end (carcass weight)	kg per head	336	366	373
Dry matter feed conversion	F/G	6,92	6,02	5,89
Dry matter intake	kg/hd/day	9,35	9,69	9,73
Economics			EUR per 100 kg CW	
Beef returns		**332,76**	**329,43**	**328,73**
Non-factor costs (NFC)		**360,82**	**335,14**	**331,04**
Animal purchase		264,66	242,94	238,48
Purchase concentrates / grains		85,39	81,16	80,03
Machinery maintenance/depreciation		0,46	0,43	0,42
Electricity		1,11	1,02	1,00
Gas, oil		0,50	0,46	0,45
Buildings maintenance/depreciation		1,32	1,21	1,19
Veterinary service		1,31	2,35	4,00
Medical products		1,14	1,05	1,03
Insurance Beef		0,18	0,16	0,16
Farm insurance		0,44	0,40	0,39
Farm taxes and duties		0,24	0,22	0,21
Maintenance and spare parts		2,21	2,03	1,99
Sales commission		0,25	0,23	0,23
Fees for Pedigree Records		0,17	0,15	0,15
Advisory Services Beef		0,21	0,20	0,19
Insurance Beef		0,18	0,16	0,16
Other / Miscellaneous		0,33	0,30	0,30
Other input		0,31	0,29	0,28
Other		0,41	0,38	0,37
Factor costs		**6,05**	**5,57**	**5,47**
Labour costs		5,77	5,30	5,20
Capital costs		0,27	0,27	0,27
Total costs		**366,87**	**340,71**	**336,52**
Net profit (long term profitability)		**-34,11**	**-11,29**	**-7,79**

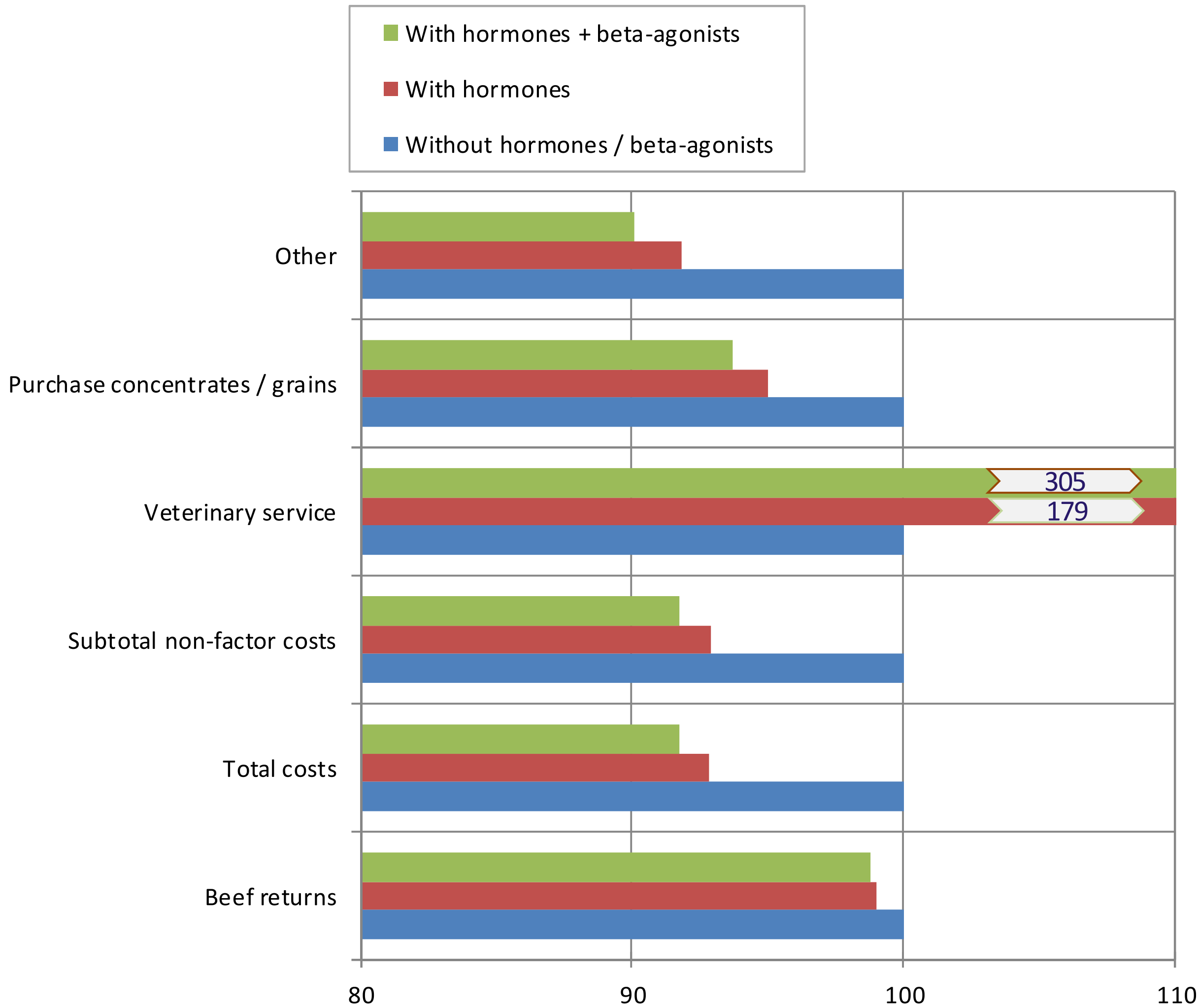
Source: Own calculations based on *agri benchmark* data 2012

Fig II.11. Performance indices (index of the without situation = 100)



Source: Own calculations based on *agri benchmark* data 2012

Fig II.12. Beef price and cost indices (index of the without situation = 100)



Source: Own calculations based on *agri benchmark* data 2012

Whether or not producers obtain price premiums/discounts on cattle that have been implanted or fed beta-agonists will depend on the specific way cattle are marketed. First simply having a heavier carcass is worth more, all else equal, even without a price premium. Second, a leaner carcass that results in more Yield Grade (YG) 1 and YG2 (and fewer YG4 and YG5) carcasses will result in a premium. However, the benefit of better YG carcasses could possibly be offset by lower quality grade (QG) carcasses. That is, there may be a lower percentage of carcasses that grade Prime of Choice (higher percentage Select) and thus the benefit of YG premiums could be offset by QG discounts. The relative premiums and discounts associated with leaness (YG) and marbling (QG) vary seasonally and over time based on market conditions.

Compared with the without-situation, the beef returns decrease by EUR 3,34 per 100 kg CW (1 percent) in the S2 scenario and EUR 4,04 (1.2 percent) in the S3 scenario. Total costs decrease by EUR 26 per 100 kg CW (7 percent) in the S2 scenario and EUR 30 (8 percent) in the S3 scenario. Profitability increases by EUR 23 in the S2 scenario and EUR 26 in the S3 scenario.

II.1.7 Summary of the economic implications

Taking the results from the calculations in Chapter I.3 and Chapter II.I.5 into account, the following conclusions can be drawn.

Weaner and beef prices

It could be shown that low or non-existent **weaner** prices differentials do not constitute an incentive for North American producers to sell weaners to the EU. Exports of individual breeding cattle from beef breeds are exceptions. Further and even in the case of a free trade agreement it is highly unlikely that animals (weaners, backgrounders) will ever be shipped from North America to Europe in greater quantities and for non-breeding purposes due to animal welfare issues and expectable public pressure. This conclusion is the same when comparing 2011 figures.

Comparing the preliminary data from 2012, beef prices in the US were around EUR 330 per 100 kg CW and between EUR 370 and 420 per 100 kg CW in the EU. Thus, there is an incentive for US producers to export beef to the EU without the existence of a tariff.

Beef finishing on farm costs and prices

For an overview of the results see Figure II.13. Beef prices in 2012 were at around EUR 330 per 100 kg CW in the US-75K and EUR 390 to EUR 440 in the comparable EU-farms. The results also showed a significant cost differential between particularly the US and the EU. The costs in the US-75K was 340 per 100 kg CW and the gap to the EU-farms narrowed compared with 2011 and is now between EUR 35 and EUR 200 per 100 kg CW[5] (see also Figure II.13).

The corresponding figures for 2011 were for the US-75K a beef price of EUR 296 and total costs of EUR 292 per 100 kg CW and the difference in both beef prices and total costs was higher than in the year 2012 (reasons see Chapter I.3). This means that a higher incentive of exporting beef from the US to the EU existed in 2011. Whether the last years trend of narrowing prices and costs between the US and the EU continues depends on a large number of conditions, among them the development of exchange rates and feed costs.

Slaughter costs

There was no recent and comparable data on slaughter costs in the US and the EU available. As a consequence, it was assumed for the analysis that slaughter costs are identical. It can, however, be assumed that due to the size of the operations the average slaughter costs in the US are likely somewhat lower than the average costs in the EU. To the extent this is the case (i.e., US processing costs are lower than EU processing costs), the relative costs of US beef shipped to Europe would be less than reported here.

[5] Except the German Holstein farm with a difference of EUR 25, see Chapter I.3, Figure I.7.

Transport costs

Transport costs for beef from the US to the EU can be estimated at EUR 27 per 100 kg carcass weight.[6] There is no difference between frozen and chilled product. Added to the cost of production on farm level, total cost at arrival in Europe sums up to approximately EUR 370 per 100 kg CW ('S3 + transport' in the figure). Thus, US-costs would remain EUR 20-40 below most of the EU-beef prices and thus there would be an incentive to export. The cost differential to the EU-farms would still be between EUR 0 and more than EUR 100 per 100 kg CW. Further differences could occur if transport from farm to slaughter plant and slaughter costs and insurance between US and EU origin are different.

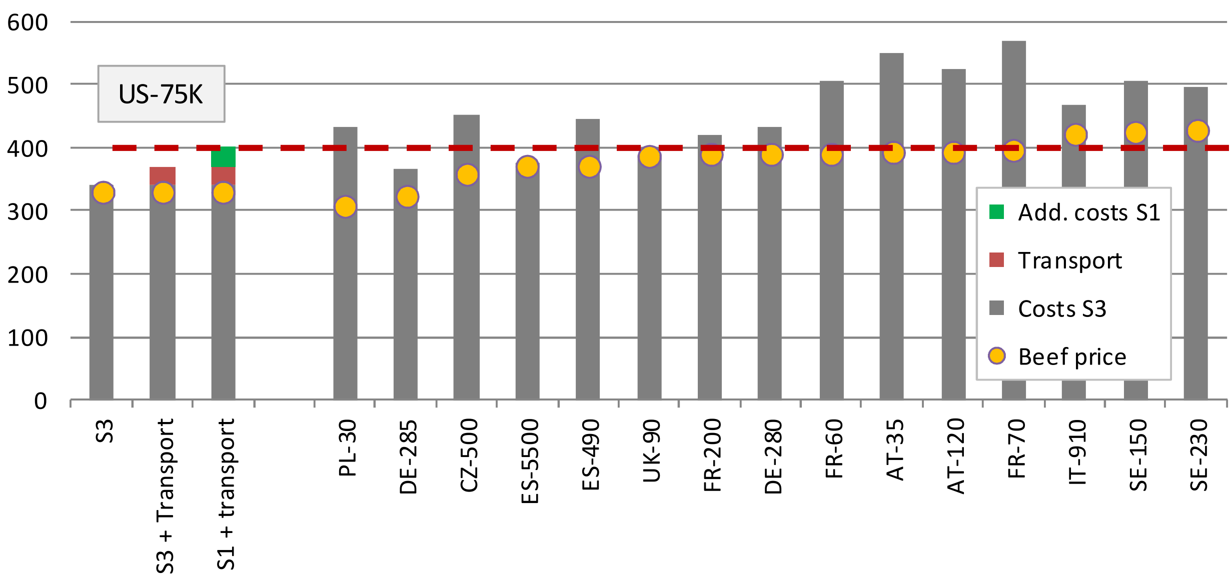
Cost and price differentials of hormone and beta-agonist free beef

The calculations in Chapter II.5 showed that the costs per head in the without scenario (S1) would be approximately between EUR 26 and EUR 30 per 100 kg CW higher than the current cost. Costs at arrival in Europe would rise to around EUR 400 per 100 kg CW. This would reduce the cost difference between US-75K and the EU farms further and US-costs would come close to the cost levels of the lowest cost farms in the comparison (ES-5500, UK-90). The costs would now be higher than the EU beef prices in 2012, with the exception of the Italian and the Swedish far prices (see red dashed line in Figure II.13).

Thus, total costs could not in all EU-countries be covered by the EU-price levels. However, this is even more the case in the US with the lower beef price and it is not known at the moment where the hormone-free price in the US would adjust. Thus, it can be assumed that even under the 2012 conditions and the assumption of equal slaughter costs, there is still a certain incentive to export beef to the EU.

It should be noted that calculations were only made for the beef finishing side of the supply chain. As Chapter II.1.2 has shown, there is also a proportion of almost 20 percent of all calves treated with growth hormones. Not using these hormones would most likely increase costs and thus prices for weaners. It can therefore be concluded that the additional cost for doing without hormones estimated in the feedlot are slightly underestimated.

Fig II.13. *Cost and price differentials for Scenario 1 and 3 (including transport costs)* ***2012***



Explanations: S1: without hormones / beta-agonists; S3: with hormones / beta-agonists; Transport: Nebraska-Rotterdam
Source: Own calculations based on *agri benchmark* data 2012

6 From Nebraska to Rotterdam port. Figure is based on personal communication with industry. It was agreed to keep the source confidential.

Exchange rate impact

The calculations were made by converting USD figures into EUR figures using an exchange rate of EUR 0.77 per USD. The exchange rate plays an important role for the competitiveness of the US beef in the EU (and vice versa). In case of parity between the USD and the EUR, the beef price of the US-feedlot would – ceteris paribus – rise to a level of EUR 430 per 100 kg CW which would be higher than in most of the EU-farms and thus provide an incentive for EU-producers to export to the US. The costs would rise to a level of EUR 480 per 100 kg CW which would be higher than in many of the EU farms analysed.

This, admittedly, is a rather theoretical assumption, as it is likely that a) costs for imported soybean in the EU and subsequently feed costs would increase and b) soybean prices would lower due to reduced demand from the EU and subsequent lower feed costs in the US. It can be concluded that the impact of a significant change in exchange rates between USD and EUR would a) be much more complex than the analysis in this study can provide and b) result in important changes of the competitive situation.

II.2 Likely development of production systems

As shown in Chapter II.1.3, there was a trend of declining use of growth hormones in the last 10 years which seems to have stabilised in recent years. This means that beef production without hormones (and most likely associated beta-agonists) already happens on a low scale.

The assumption for a FTA is that American beef entering Europe must be produced without hormones and beta-agonists as it already happens under existing quota regimes. Thus, producers in the US would have the following basic options:

1. Produce beef in feedlots without these substances

The US (and probably Canada) could produce beef without hormones and beta-agonists quite easily. As the figures above showed, there is quite a bit of beef produced in the US that is not receiving beta-agonists and a growing percentage that is hormone free. In the past, there has not been the economic signals/market to do this on a wider scale. The economic implications of this change were described in the previous chapters.

2. Switch to pasture / grass-finished beef production

Pasture beef would likely be a lot more difficult to produce as this is still very much a niche market in the US (and Canada). There are a number of aspects which resulted in the fact that non-grain finished beef has only an estimated market share of 3 percent in the US (Matthews and Johnson, 2013):

- Preference of US consumer and importers of US beef for grain-fed beef and associated marbling (intramuscular fat) and associated higher prices for grain-fed beef.
- Grain-fed beef achieves higher grades in the US-grading system.
- Relatively high land costs in the US compared with other pasture beef providing countries, requiring high land productivity in beef finishing.
- Higher costs per kg for producing grass-fed cattle.

The most conducive to grass-fed beef is the south eastern part of the country. However, that is also the part of the country that tends to be comprised of much more small, part-time producers and thus developing a “production system” that could certify and verify production practices and deliver sufficient quantities would be much more difficult than in the 'beef' regions of the country (i.e. Texas, Kansas, Nebraska). The problem with the other regions is obviously that grass-fed production is much more difficult given the natural conditions and/or land prices.

II.3 Some trade specific issues (questions and answers)

The following is a collection of questions. Answers are based on the authors' expert knowledge. As mentioned before, none of the authors runs trade or market models to quantify the answers. Thus, answers must be considered as approximation and interpreted with care.

In the light of the difference in beef production costs between US and Canada compared to EU Member States, what impacts on trade flows could we expect by a tariff liberalisation?

The US and Canada appear to be rather competitive in providing high quality beef to the EU which already takes place to a limited extent under specific quota arrangements. Recent import concessions comprise of 11,500 tons quota for North America and an additional non-country-specific quota of 20,000 tons under similar conditions (CAP-Monitor 2011). These quantities come in under preferential access in terms of a reduced tariff rate of 20 percent ad valorem customs duty but allow only beef which was **not** produced with the help of these substances. Australia and particularly the US have taken most of these quantities. This provides evidence that the US can provide product to EU competitively, at least for relatively small quantities.

As regards grass-fed beef, when taking the explanations made above into account, it cannot be expected that this kind of product will be very competitive compared to other countries of origin producing that type of beef (Argentina, Brazil, Uruguay). We therefore do not expect that grass-finished beef from the US will gain significant market share. Beef from Bison might be an exception but also only in a niche market.

Regarding the type of cuts and following the above argumentation, it would be logical for the US to supply Europe with high value cuts like those presently covered under the Hilton quota (beef suitable for making steaks). Other cuts and meat preparations like minced meat are unlikely to be accepted in Europe due to their degree of fat and the fact that the European dairy cow herd is a source of sufficiently low priced minced meat.

Do US and Canada have room on their supply side (in terms of availability of land, production factors, etc.) to increase beef production to supply the additional quantities to the EU market? Or is it more likely that the additional flows to the EU will derive from a diversion of trade currently directed to other countries or used on the domestic market?

The US currently has the lowest number of beef cow inventory of the last 40 years for a number of factors (weaning beef demand, increased productivity, drought, high grain prices, etc.). Further, production increase or maintenance in the past were mainly driven by productivity gains rather than increases in inventories: increased cow-calf productivity (higher calf crops) and increased slaughter weights. In general, there is still potential to increase production if market signals exist (such as high beef prices) and assuming drought conditions do not persist. Further, there might be other markets than the EU with more attractive prices (such as China, middle East, Indonesia, North Africa, Russia, South Korea, Japan).

On the EU side, will additional beef imports from US and Canada rather displace domestic beef production or imports from other countries (e.g. Brazil)

Based on the deliberations from above, it would be more likely that it might displace domestic beef production rather than imports of pasture-finished beef from Brazil and other South American countries. That is, the type of beef produced in the US and Canada would be similar, but likely less costly, to the domestically produced beef.

Which are the beef production systems in the EU that would be mainly affected by additional imports (extensive/intensive, grass fed vs. cereals fed, rearing vs. fattening sector, etc.) and in which Member States?

It can be assumed that the rearing (cow-calf) sector would not be affected directly as we do not expect weaner exports to take place. As mentioned before, animal welfare considerations are most likely preventing live (weaner) cattle exports from the US to the EU even if a significant price gap would open between the US and the EU. However, there is a chance of this sector being affected indirectly, at least temporarily. As shown in Chapter II.I.7, a tariff liberalisation would provide an incentive for US producers to export cattle meat to the EU (a significant export incentive based on 2011 data, a less significant one based on 2012 data). If the EU starts importing more beef from the US, we could expect that the increased availability of beef on the EU market would somewhat reduce the EU beef prices and/or US beef imports would partly displace (=reduce) the EU beef finishing activity to a certain extent as it can be expected that marginal producers would go out of business. The result would be a beef price lower than in the status quo and margins of the finishers put under pressure. It can be expected that the decline in the beef price would be transmitted into decreasing weaner prices and thus, the cow-calf sector would be affected, too. Changes in the dairy market and associated changes in calf supply from the dairy herd would also have an impact on overall livestock prices.

The type of production systems in the finishing sector affected would be those which produce similar type of beef – marbled, high quality beef. The production systems most suitable to produce this type of beef would be a) the Spanish feedlot systems and b) the silage systems finishing bulls on corn silage / concentrates / grains. The feedlot system is common in Spain but the cattle are very different from the US-type of cattle: the vast majority of the cattle are yearlings whereas US-cattle are typically slightly older (e.g., 14-16 months). It is not sure whether the US industry will be able to produce that type of cattle at competitive costs. The silage systems are common throughout Europe with main origins from Germany, France, UK, Belgium and Austria but also in most other, less important beef producing countries with the exception of Ireland where pasture finishing remains the main production system.

What would compliance with EU SPS regulatory framework imply for US beef production costs (e.g. would it be possible to simulate production costs and margins for US and Can beef farms constrained to produce beef without hormones or beta-agonists)? Under this modified scenario, what would be then the impact in terms of trade flows from US and Canada to the EU?

The additional cost associated with the production of beef free of hormones and beta-agonists were detailed in Chapter II.I.5. It could be shown that with the present price relations and exchange rates, there would still remain an incentive for US beef producers to export beef to the EU without the existence of a tariff. As regards the US-market, the producers do not have to produce 100 percent of the beef in the country that way. That is, the US consumer is not near as concerned with this technology and thus it is unlikely to quit using the technologies for the majority of the US production. In other words, some operations/production systems would respond well to these signals to produce hormone/beta-agonist -free beef and others would continue to produce “commodity” beef.

Part III: Conclusions and summary for Part I and Part II

The key findings of the report can be summarised as follows:

- **Weaner price** differentials between the US and the EU are minor. In many cases, weaner prices in the US and Canada are even higher than in the EU. Thus, there is no incentive to export weaners from a cost or price point of view. Even with the existence of a price differential, it is questionable whether live exports would ever be allowed for animal welfare restrictions.
- The present situation in the **beef finishing** illustrates that there are substantial price and costs differences between US (and CA) farms and EU farms. The differences narrowed from 2011 to 2012.
- Due to the lack of data and information, it was assumed that **slaughter costs** were equal in the US and the EU. It can, however, be assumed that average slaughter costs in the US are likely lower than in the EU due to the size of the operations. Thus, the costs of US beef arriving in Europe would be lower than the costs of slaughtered beef in the EU, providing a competitive advantage for US-beef.
- Reflecting **transport costs** as well as the costs for not applying **growth hormones** and **beta-agonists** would take the US-costs to a level which is around EUR 400 per 100 kg CW and thus slightly higher than the prices received by most typical EU farms in 2012. At the same time, US-prices (as well as costs in most of the cases) remain below EU-prices. With the present price relations, this would mean that with the EU-price the US feedlot could reduce the loss.
- It should be noted that calculations were only made for the beef finishing side of the supply chain. As there is also a proportion of almost 20 percent of all calves in **cow-calf** treated with growth hormones. Not using these hormones would most likely increase costs and thus prices for weaners. It can therefore be concluded that the additional cost for doing without hormones estimated in the feedlot are slightly underestimated. However, the effect of this is likely small and lower than the slaughter cost difference effect mentioned above.
- The above findings suggest that if there is any beef coming from the US it can be expected to be rather **high quality grain-fed**. It can also be assumed that the prices paid for this type of beef (by restaurants and high-end retailers) would be above the prices found in the typical farms analysed. This means that a beef price of more than EUR 400 per 100 kg CW for this kind of beef would constitute an incentive to export beef to the EU.
- **Increasing** imports from the US would rather replace domestic beef from the EU than pasture-finished beef coming from South America. **Silage** systems which are wide-spread in the EU would be most affected by possibly increasing imports from the US.
- **Non-EU** markets might be more attractive for American exports if beef prices are higher in these countries and market access is available for them (without or with low tariff protection and/or TBTs). Examples are China and Indonesia.
- **Parity** of the USD and the EUR would c.p. result in US-costs higher than in most EU-countries but cost and price changes induced by exchange rate were not reflected for this calculation.
- In some EU-countries like Germany with an intensive public and critical discussion about the so-called 'Massentierhaltung' (the keeping of animals like poultry and pigs in large units), there might be customer concern about the large-scale feedlot type of production should this be displayed in media. It must be said, however, that from an animal welfare point of view, feedlots cannot be ranked worse than the prevailing barn systems in Europe when measured by space provision for the animals, possibilities to move, stand and rest. Moreover, the 'life-cycle' animal welfare assessment of feedlot cattle is likely to rank even higher as the animals usually come from pasture when put into the feedlot. The environmental impact of such installations would mostly consist of ammonium emissions coming from the pens and open lagoons where manure and effluent are held.

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Definitions of calves (see also Figure I.1)

Calves are the progeny of cows.

Dairy calves are the progeny of dairy cows and usually weaned from the cow after a few days and after that fed with the cow's colostrum (usually not more than a week) and afterwards with milk substitute (usually no longer than 2 months). They are relatively light animals and do usually not weigh more than 80 kg when they enter the fattening / finishing stage.

Weaners or **weaner calves** are the progeny of suckler-cows and feed for a period of typically between 6-9 months on the milk of their mother which is gradually complemented by grass, hay, silage and in some cases grain. They enter the backgrounding and / or fattening / finishing stage at the day of weaning.

Backgrounders / stores / stockers / feeder cattle are animals which enter the finishing stage and which had an initial period of fattening after weaning. They can origin from dairy or suckler-cows. The backgrounding period can be an integral part of a fattening process if this is done in one farm. In this case, the backgrounding period is not addressed as a separate stage of fattening. There are, however, producers growing backgrounders for further sale to finishers and finishers buying them. Apart from some possible price advantages when trading them, one reason to buy backgrounders instead of calves is that the fact that they are old enough to be fed on a finishing ration and there is less labour involved compared with rearing them on milk.