GENERAL INTRODUCTION

Beef cattle production in Germany

Beef cattle production in Germany became more important since the setting of quotas for milk production in 1984. Along with a continuous increase in milk yield per cow, this led to a decrease of the number of dairy cows. In consequence, grassland was available for alternative utilization like beef cattle production (Mathiak, 2002). Additionally, beef cattle farming represents an extensive production system with low requirements to barns, productivity of grassland and last but not least to labor input (Hampel, 2005), making it an interesting branch of agricultural production, especially for spare-time farmers.

In a worldwide comparison beef cattle farming is of inferior importance in Germany with only every 8th cow being a suckler cow. The share of suckler cows of total cows is higher in other European countries like Ireland, France or Spain with about fifty percent. In the USA, Brazil, Canada, Australia and Argentina the situation is completely different with about eighty percent being suckler cows (Deblitz, 2006). Within the last few years, the number of suckler cows in Germany ranges about 650,000 animals (Table 1). At last 669,500 suckler cows were counted in 2007. In relation to the number of farms, average herd sizes are low with only fourteen cows per farm in 2002, slightly increasing to fifteen cows per farm in 2007, respectively (Table 1).

Table 1. Number of farms and suckler cows, cows per farm and annual change in number of suckler cows for consecutive years, kept in Germany between 2002 and 2007[1]

Year	Farms (1000)	Suckler cows (1000)	Cows per farm	Change (%)
2002	48.5	679.0	14.0	n.a.
2003	45.6	651.4	14.3	-4.1
2004	n. a.[2]	n. a.	n. a.	n.a.
2005	45.8	648.4	14.2	n.a.
2006	45.4	654.7	14.5	+1.0
2007	44.7	669.5	15.0	+2.3

[1]Data adopted from the annual reports of the German Beef Cattle Breeders Association (2002 – 2007); [2]n.a. = not available.

Within Germany the structure of beef cattle production is extremely diverse, with rather small farms in western Germany and large farms with hundreds of cows in eastern Germany, especially in Brandenburg and Mecklenburg-Western Pomerania (Deblitz et al., 2004). Furthermore, there is a great variety of beef cattle breeds in Germany, but only a few are important for agricultural production. The actual distribution of breeds registered in herd books is presented in figure 1. It is quite evident that German Simmentals, Limousin, Charolais and German Angus are the most popular breeds, followed by Herefords which are far less common. These five breeds unite about 70% of all registered breeding animals in Germany, emphasizing the particular status of these breeds for German beef cattle production and justifying their integration in this research project. Galloway and Highland Cattle, with approximately eight and six percent of all registered animals respectively, are of particular importance in landscape management or hobby farming (Golze, 1997).

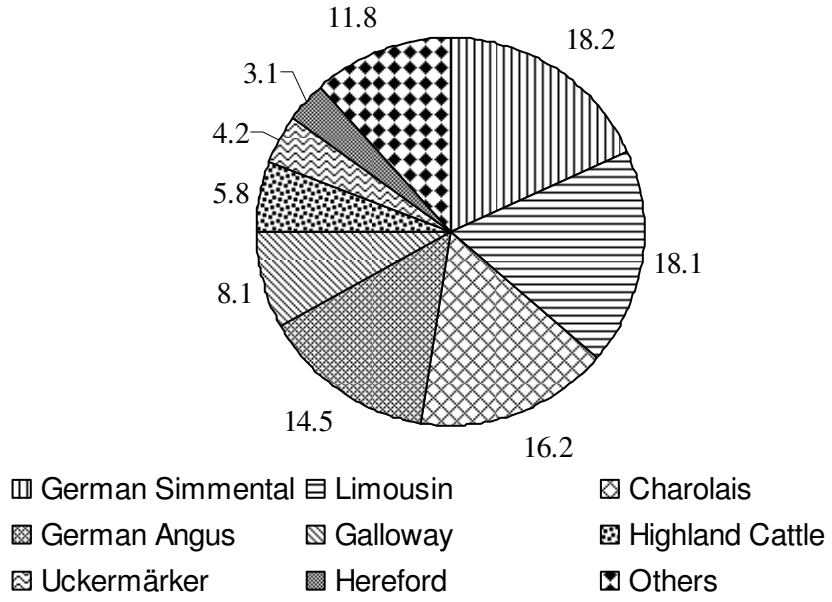

Figure 1. Relative distribution of registered breeding animals by breed (German Beef Cattle Breeders Association, 2007)

German Angus, Charolais, Hereford, Limousin and German Simmental are breeds characterized by differences in constitution, performance and functional traits like fertility, maternal care and temperament. For this reason the main breeding goals of each breed, constituted by the German Beef Cattle Breeders Association (2008) are presented below:

- German Angus cattle were developed in Germany in the 1950s by breeding Aberdeen Angus bulls to German dual-purpose breeds. The moderate framed beef cattle are characterized by a long and slight constitution and early maturity associated with good maternal traits such as milk production or persistency. Thus leading to moderate growth rates. German Angus cows are productive with an average age of two years at first calving and few calving difficulties. In order to temperament, calm and docile animals are preferred.
- Charolais are intensive, large framed beef cattle with heavy muscling of shoulder, back and haunch, resulting in high growth rates but also in higher birth weights than in other beef breeds. Charolais cows should have good maternal traits with sufficient milk production. German Charolais breeders want their cattle to be calm and docile.
- Herefords are moderate framed beef cattle with acceptable muscling and growth rates. Breeders emphasize good fundaments and feed conversion to suit extensive pasture systems. Hereford cattle are described as very docile and fertile with calving difficulties being unusual. Females should have pronounced maternal care traits and an average age of 24 month at first calving.
- Limousin cattle distinguish themselves from most other beef breeds through a very slender constitution with extraordinary muscling, especially of the haunch. A favorable gradient of the pelvis, associated with moderate birth weights, results in easy calving cows. According to temperament no specifications are defined by the Limousin breeders.
- German Simmental should be well muscled with an adequate constitution. They are large framed beef cattle with high growth rates, due to an outstanding milk production of the cows. Females are fertile with an average age at first calving of approximately 28 month. German Simmental should be docile and adaptable to different rearing conditions.

Table 2. Main characteristics of the most important beef cattle breeds in Germany

Breed	Trait	Male	Female
German Angus	Hip height (cm)	cir. 145	cir. 136
	Body weight (kg)	950 – 1200	600 – 700
	Birth weight (kg)	35	32
Charolais	Hip height (cm)	cir. 154	cir. 144
	Body weight (kg)	1200 – 1300	800 – 900
	Birth weight (kg)	44	40
Hereford	Hip height (cm)	cir. 141	cir. 136
	Body weight (kg)	900 – 1300	600 – 700
	Birth weight (kg)	36	33
Limousin	Hip height (cm)	cir. 150	cir. 140
	Body weight (kg)	1100	700
	Birth weight (kg)	39	36
German Simmental	Hip height (cm)	150 – 165	140 – 150
	Body weight (kg)	1100 – 1300	700 – 850
	Birth weight (kg)	41	39

A survey of basic measures of birth weights of the calves or body size, and body weights of mature animals is shown in table 2. Based on these attributes, Charolais, Limousin and German Simmental cattle could be characterized as the large framed, intensive beef cattle breeds, whereas German Angus and Herefords are moderate framed and more extensive breeds (Golze, 1997). As average daily weight gain is one of the most important performance traits in beef cattle production (Hampel, 2005; Nkrumah et al., 2007), corresponding data were calculated for male and female calves at weaning and as yearlings, using information from the annual reports of the German Beef Cattle Breeders Association (2007). A summary of these figures is presented in tables 3 and 4, emphasizing differences in performance of growth rates of the beef cattle breeds used in these experiments.

Between 2005 and 2007 average daily weight gains at 200 and 365 days of life were at the same level in German Angus and Hereford cattle, ranging about 1100 g/d for males, and 1000 g/d (200-d) and 900 g/d (365-d) for females, respectively. On the other side, values were explicitly higher in Charolais and German Simmentals bulls, with values about 1300 g/d. Heifers of both breeds reached average daily weight gains of over 1100 g/d at weaning and 1000 g/d as yearlings. Limousin cattle ranked between the two groups mentioned before.

Table 3. Body weights (BW)[1] and average daily weight gains (ADG)[1] of male beef cattle at weaning (200-d) and as yearlings (365-d) recorded between 2005 and 2007

Breed	Year	200-d		365-d	
		BW (kg)	ADG (g/d)	BW (kg)	ADG (g/d)
German Angus	2005	215.7	1079	386.7	1059
	2006	217.1	1086	392.1	1074
	2007	218.0	1090	387.0	1060
Charolais	2005	253.3	1267	466.3	1278
	2006	258.3	1292	465.3	1275
	2007	254.9	1275	454.9	1246
Hereford	2005	206.3	1032	397.3	1088
	2006	222.3	1112	404.3	1108
	2007	226.2	1131	406.2	1113
Limousin	2005	233.9	1170	409.9	1123
	2006	235.4	1177	416.4	1141
	2007	232.0	1160	415.0	1137
German Simmental	2005	244.2	1221	482.2	1321
	2006	245.4	1227	484.4	1327
	2007	252.3	1262	489.3	1341

[1]Birth weight corrected values.

Table 4. Body weights (BW)[1] and average daily weight gains (ADG)[1] of female beef cattle at weaning (200-d) and as yearlings (365-d) recorded between 2005 and 2007

Breed	Year	200-d		365-d	
		BW (kg)	ADG (g/d)	BW (kg)	ADG (g/d)
German Angus	2005	197.1	986	322.1	882
	2006	199.6	998	324.6	889
	2007	200.1	1001	323.1	885
Charolais	2005	223.1	1116	361.1	989
	2006	231.5	1158	368.5	1010
	2007	231.4	1157	368.4	1009
Hereford	2005	190.8	954	311.8	854
	2006	196.6	983	322.6	884
	2007	206.2	1031	323.2	885
Limousin	2005	207.1	1036	332.1	910
	2006	211.7	1059	333.7	914
	2007	207.5	1038	335.5	919
German Simmental	2005	220.3	1102	357.3	979
	2006	226.6	1133	359.6	985
	2007	231.4	1157	367.4	1007

[1]Birth weight corrected values.

Another important aspect to consider is that the beef cattle breeds mentioned above differ in order to their breeding history. Most of the breeds were developed during the 19th century (Jarrige and Auriol, 1992). Herefords in England and Aberdeen Angus in Scotland were selected for early maturity to suit extensive pasture systems with relatively poor feeding conditions, resulting in smaller body size and lower growth rates. Out of Aberdeen Angus, German Angus cattle were developed in the 1950s by breeding Aberdeen Angus bulls to German dual-purpose breeds (Hampel, 2005). The repeated use of Aberdeen Angus bulls through artificial insemination and the purchase of purebred breeding animals have a large impact on German Angus cattle until today. In contrast to the British beef cattle breeds, European continental breeds like the French Charolais and Limousin or likewise the German Simmentals were retained for dual-purpose until the middle of the 20th century, e.g. for meat production and as draught animals or, in the case of German Simmentals, for meat- and milk production. These dual-purpose breeds were large framed and heavy muscled with late maturity (Jarrige and Auriol, 1992). The described differences in former breeding goals and rearing conditions between European continental and British or British-derived beef cattle breeds may have long lasting effects on these breeds.