The ethical price for dairy

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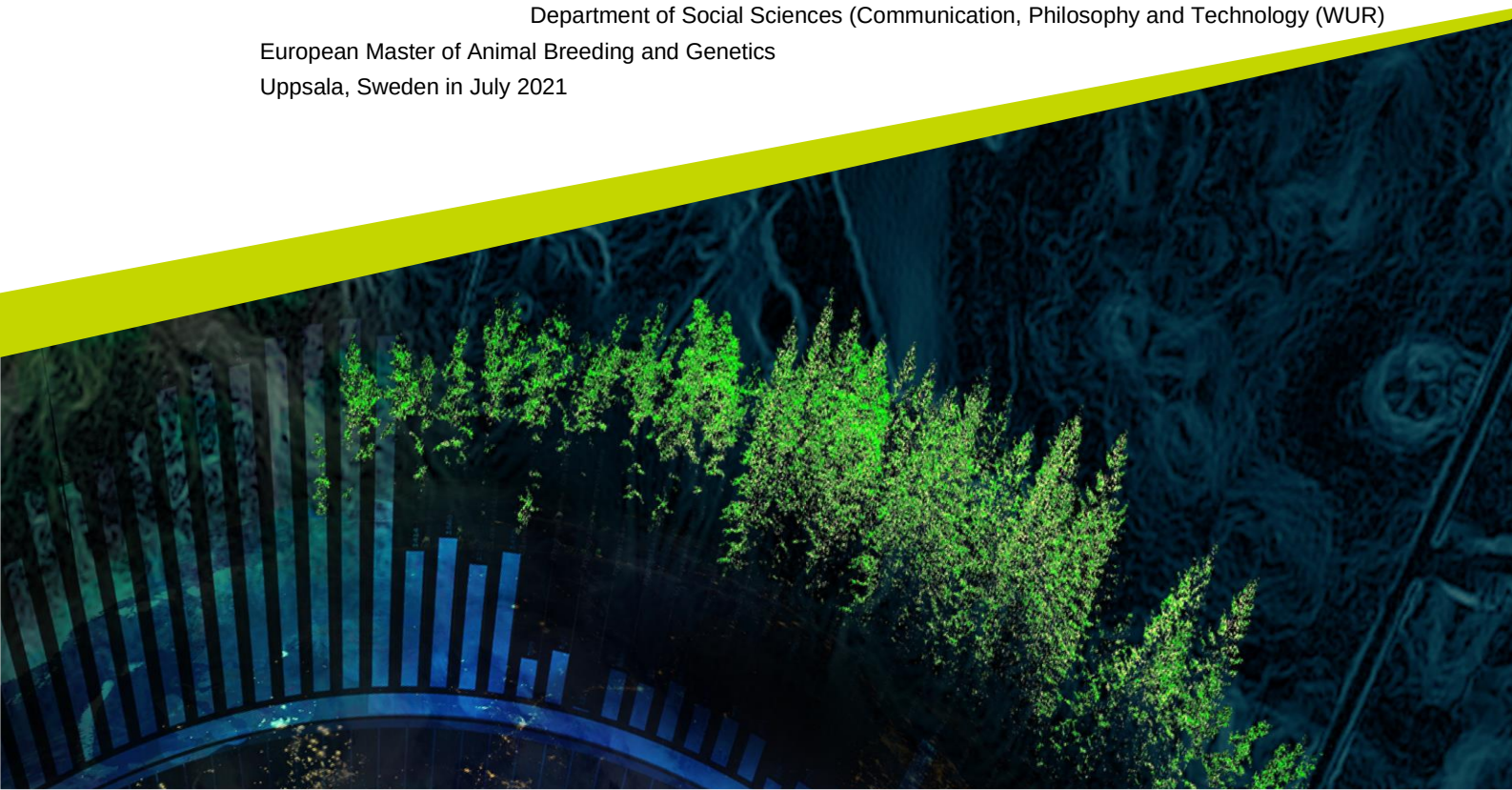

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Abstract

In the 21st century people in modern society within Europe are used to go to a supermarket to buy groceries of daily need. Everything is easily available and affordable and barely anyone is aware of the production of their consumed goods, their origin and unpleasant side effects.

Due to the growing world population, the demand for food is steadily increasing. Among many countries, goods such as meat, fish and dairy have become more attractive and accessible due to low prices and decent income. Access to these products is easy through buying a packaged product at a supermarket. Due to ethical considerations, however, more people decide to omit meat, dairy or eggs and live on a vegetarian or vegan diet. Nevertheless, the majority is still including dairy and eggs in their diet. While it seems rational to live on a vegetarian diet to avoid harm to farm animals as well as their killing for meat, there is comparably little awareness among consumers about the issues arising with dairy industry.

In European countries, some specialized cattle breeds, performing well for dairy related traits such as milk yield, calving interval, calving ease and longevity are most commonly used. In order to produce milk, cows need to have a calf approximately once a year. While longevity is emphasized and cows can serve for several years, the consequence is a larger number of offspring than needed for replacement in the dairy industry. Additionally, half of them are bull calves, and therefore of no use for dairy industry. Aforementioned causes several issues concerning the handling of these calves. This starts with the early separation of cow and calf with possible effects on health and behaviour, in addition to the important management of colostrum, followed by the transportation of many calves for enormous routes or the immediate killing of new-born calves due to a lack of economic benefit of raising or selling them.

Utilitarianism and abolitionism, two of the most important ethical theories, propose a less cruel livestock industry and suggest to abandon animal-based products to the largest extent possible, recommending a vegetarian or vegan lifestyle. While such a way of taking action might be viable for part of the population, more extensive and adaptable implementations in order to ensure a morally more acceptable animal industry need to be considered.

Making use of sexed semen and crossbreeding with beef cattle breeds potentially provides better management practices for dairy farms as well as more profitable calves to enter veal and beef markets. In addition to that, the government and legislation could provide regulations, as for instance carried out in organic dairy industry (see Table 1, p 32.) for extended welfare in the handling of these calves. With respect to these implementations, awareness among consumers needs to be

emphasized to achieve the desired shift in dairy industry. Therefore, in this thesis, I aim to review literature on different aspects of dairy industry and will assess some options from a utilitarian and rights-based approach.

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Abbreviations

EC	European Commission
EP	European Parliament
EU-13	Group of 13 EU countries
EU-15	Group of 15 EU countries
CMO	Common Market Organization
CAP	Common Agricultural Policy
ADG	Average Daily Gain
FI	Feed Intake
BSE	Bovine Spongiform Encephalopathy
CoE	Council of Europe

1. Introduction

As of 2017 the world population was reported to have reached 7.6 billion people. With an increase of 0.3 billion only within two years (2015-2017) the expectation is to exceed this number with approximately 8.5 billion by 2030 and even 9.6 billon by 2050, which means a population 34% larger than today (McNabb, 2019). Most of this growth will be recorded in less developed countries (McNabb, 2019). This increase in population will be accompanied by higher demand for food, requiring agriculture to adapt and produce not only more, but also more efficient and sustainable products, since natural goods such as land and water are limited. According to Marie (2006), technical revolutions, industrialization and a connected world market have increased production tremendously within the past decades. Yet, meeting demand in the future will still be challenging (Marie, 2006). Cereal and livestock production can increase through adequate investment and development, yet food security can only be assured by complemented policies (Marie, 2006). As a matter of fact, "food security" – which is described as the accessibility to enough food to meet dietary requirements – is not even met at this point, as we can see when taking a closer look at several areas in Africa or Asia (Marie, 2006, Prosekov and Ivanova, 2018). The gap between poor and rich, obese and malnourished as well as urban and rural causes discrepancies in distribution of land and goods that need to be addressed.

The increase in population will be accompanied by an increase of the "middle class", which is referring to the amount of people with an average income and accessibility to animal products (Lagrange et al., 2015). One of the main animal-based products on the market are dairy products, mainly coming from cattle. Dairy products ranging from solid milk to cheese and highly processed foods, such as milk powders, are considered as desired food in industrialized countries for their taste and high nutritional value (Lagrange et al., 2015). The demand is increasing rapidly, and production is as well. Approximately 466 million metric tons of dairy were produced globally in 2013 and either sold as milk for consumption or processed to butter, yoghurt, cheese, ice cream or whey and traded on the international market (Lagrange et al., 2015).

With this increase in production and intensification of dairy farming, several issues arise. On the one hand, there appears to be a gap between less developed countries, facing hunger, and well developed countries, having the ability to access more for less (Tripathi et al., 2019). Even though progress is achieved, concerning

feed conversion ratio of animals, enabling to produce animal based products more efficiently, the use of grains such as wheat, maize or soy for feed is still common, while these could potentially as well be used as food for human consumption in order to feed the world population (Schader et al., 2015).

Another considerable factor is the issue of climate change, which is partly caused by agriculture. The aspect of sustainability has gained attention with the desire to preserve our planet for future generations. It is widely known that agriculture is an essential cause of greenhouse gas emissions with livestock contributing remarkably high, due to their great intake of feed. A significant proportion of methane emissions are caused by cattle industry (Rojas-Downing et al., 2017). Ruminants' digestive systems as well as their manure are a contributor of CH4. According to the FAO, out of all anthropogenic emissions, 18% can be attributed to the livestock production chain (Food et al., 2010).

In addition to that, the practices of handling animals in these intensified production systems have become more questionable but also less acquainted among the population (Miele, 2010). Products simply pass the supermarket counter with no connection to its production. Marketing strategies delude urbanized population and convey an impression of livestock production far from reality.

The more industrialized farming practices have evolved, the more concerns have been expressed. People these days are considering animal welfare and sustainability issues more frequently; public engagement is increasing and a movement of ethicist and biologists has worked towards the implementation of "animal rights" and acknowledgement of the urgency of respecting animals' natural behaviors and expression of feelings. As a result, this has led to a higher proportion of the population willing to reduce their intake of animal products, and a trend towards higher willingness to buy more animal friendly products (Ingenbleek et al., 2012). Anyone buying a steak is aware of the fact that an animal died for it. As a result of moral considerations, 5% of the European population is omitting meat and living on a vegetarian diet and 2% living a vegan lifestyle, also omitting dairy and eggs (Saari et al., 2021). The substantial question of right and wrong, when it comes to raising, using and killing animals for human satisfaction needs to be considered.

Even though the issue has gained attention, the gap between awareness and knowledge still appears to be noteworthy. While issues such as cow-calf separation have been considered more frequently, other ethical issues occurring in the dairy industry have not been taken note of so much. A plethora of grievances exist that need to be discussed.

While I am aware of the importance of the dairy sector socially, economically but also culturally, with this master thesis, I aim to point out the ethical issues arising with dairy industry and possible ways to reduce them. The goal is not to recommend omitting dairy per se, but to find suitable practices that increase welfare of animals and enable an industry that can be approved of from an ethical standpoint, even though from some ethical theories no industry that uses animals

could be approved. Therefore, an investigation of the history and evolution of dairy industry through a literature review, as well as the current situation and future outlook will be performed. Additionally, a brief introduction to the basics of animal ethics, mainly shaped by philosophers such as Peter Singer and Tom Regan, will be covered. Primarily the situation in the European Union will be investigated with emphasis on Austria, my home country, as well as Germany, one of the main producers of dairy products in Europe. Subsequently, the focus will be on the dairy calf industry, and the issues arising with it, ranging from early separation of calf and dam to transportation of calves as well as the killing of male calves, unable to bring any economic benefit. The implementation of artificial insemination as well as sexed semen and crossbreeding in order to prevent the above-named issues will be discussed and its benefits and downsides analyzed.

While reproduction techniques may bear an economic benefit and ensure more animals to be raised, some ethical drawbacks should be considered. Furthermore, the role of governments and legislative initiatives will be given attention to as they play a major role in paving the way to a more welfare focused livestock production. Subsequently, possible combinations of these approaches will be considered and long-term solutions will be evaluated.

2. Material and Methods

A review of recent literature on the dairy industry in Europe was conducted. The goal was to investigate the most common issues in dairy industry and obtain a better understanding of the legislation on practices on a European basis. In further consequence, possibilities to circumvent or reduce these discrepancies will be analysed and ethical perspectives on these implementations considered.

Literature Search Strategy

When searching for literature on the European dairy sector, the database Google Scholar was used. Different combinations of keywords such as "dairy industry Europe", "cow-calf separation", "transportation of calves", "market for veal", "colostrum management", "consumers awareness" etc. were used, dependent on the topic in alignment with the titles of each section. Literature was then scanned and selected by relevance. Emphasis was given to studies performed in Europe to ensure similar practices, however, to support statements, a few studies from other countries such as the USA, New Zealand and Australia were consulted. In addition to that, the European Parliamentary Research Service as well as the European Commission were searched for relevant information and national legislations investigated.

2.1. Factual Background

Dairy industry is unambiguously important for European agriculture both economically and socially. Nevertheless, with intensified farming methods, practices evolved that need to be discussed and evaluated from an ethical and animal welfare point of view, considering the theories of Tom Regan and Peter Singer in addition to European legislation in regard to dairy cattle. A fundamental knowledge of common practices in dairy industry provides a profound basis to ensure better understanding of dairy industry. The evolution and intensification of the dairy sector in Europe will be analysed and the practices coming along with it, potentially reducing welfare of calves.

2.1.1. Evolution of Dairy Farming

With a growing population, expected to increase by 34% in only 20 years' time, food production will have to increase by 70% to assure nutrition of the world population (Tomlinson, 2013). As middle class is increasing, a shift in product demand is recorded, as we have seen in China or Brazil over the past years, requiring more animal protein, especially dairy (Boland et al., 2013). This shift in income and increasing "middle class" is therefore accompanied by an increase of animal protein intake which led and still leads to restructuring farm sectors. International trade of dairy products, including milk powder, whey and cheese also has increased, causing Europe to be one of the main players in the dairy sector (Lagrange et al., 2015). The EU exports its dairy products all over the world and stands out due to its safe production with limitations on bacteria and somatic cell counts (Bórawski et al., 2020).

While dairy consumption has increased, within only 30 years, between 1983 to 2013, an 81% decrease in dairy farms was reported across the EU member states accompanied by an increase of farm size (Commission, 2013). Although all 28 EU member states still produce milk, the number of farms over all decreased, whereas the specialization, intensification and herd size among the ones still practicing increased thanks to technology, feed efficiency and genetics (Arendonk and Liinamo, 2003). Dairy production increased from 151 million tons in 1998 by 10% up to 165 million tons in 2017 (Bórawski et al., 2020).

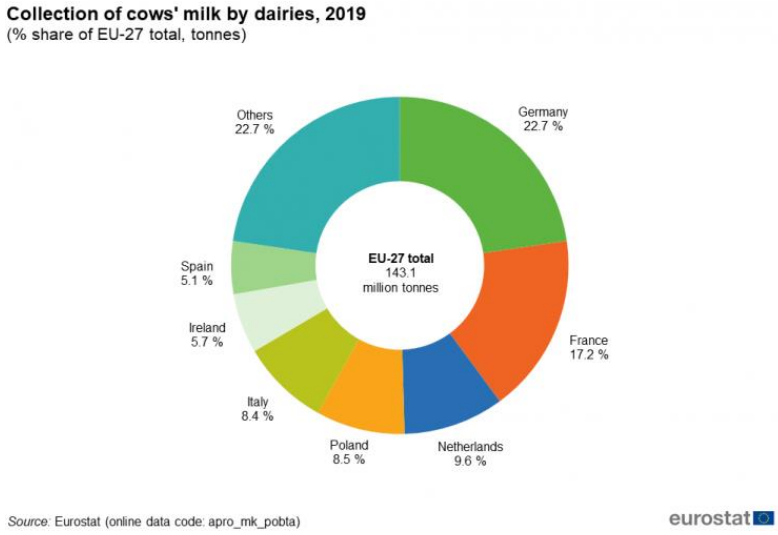

***Figure 1**: Distribution of dairy production in the EU in 2019*

The variety of production systems, however, is still enormous, ranging from small herds in Alpine regions with low output cattle, to large dairy farms that are for instance located in Germany or France. Large farms, located mainly in the north-

western part of the EU make up more than 50% of the dairy produced across Europe. As displayed in *Figure 1*, the main producers of dairy are (ranked from high to low) Germany, France, the United Kingdom (not included in figure due to the fact that they left the EU), the Netherlands, Poland, Italy and Ireland that together make up the majority of production in Europe, more precisely three quarters of all dairy produced in Europe (Augère-Granier, 2018).

The smallest producers are Malta, Cyprus, Luxembourg, Slovenia, Croatia, Latvia, Bulgaria, Estonia, Greece and Slovakia (Bórawski et al., 2020). This partly is a result of small country size, yet some countries, such as Poland, were limited in growth due to a lack of capital for investments, lack of profitability, poor loans as well as land consolidation (Bórawski et al., 2020).

With a total of 23.4 million dairy cattle kept in the EU in 2015, the distribution among countries differs remarkably (Augère-Granier, 2018). Germany is leading the "dairy cattle board", counting 4.2 million dairy cows in 2017 and therefore keeping 18% of all European dairy cows, while it is followed by France with 3.6 million cows accounting for 15% (Augère-Granier, 2018).

Not only do the largest milk-producing countries account for the majority of dairy cows kept in Europe, but they also report the highest milk yield per cow (Augère-Granier, 2018). This means that the remaining 21 European Union countries only account for one quarter of the dairy production. This can be explained by farm size, that differs a lot among countries and appears to show large farm concentration in the EU-15, whereas the EU-13 tends to work on a smaller scale. In 2016 the EU-15 member states even contributed 85% of all dairy produced in the EU (Augère-Granier, 2018).

Up until 1984, when only ten states were members of the EU, the dairy farmers within these countries received an above world market price for their milk which led to an overproduction. Therefore, the Common Agricultural Policy (CAP) introduced the so called "milk quotas", limiting the amount produced by charging a fine when exceeding the maximum amount (Arendonk and Liinamo, 2003). This rule was set up until 2003 when the higher demand for dairy and exports increased considerably and it was therefore decided to be phased out by 2015 (Arendonk and Liinamo, 2003). The milk quota resulted in a stable production of milk, however an increase of 26% for production of cheese with high demand for exports has been reported within ten years between 2003 and 2013.

Dairy industry worldwide and the EU's role

Worldwide the main players in dairy industry are New Zealand, the United States and the EU (Augère-Granier, 2018). The EU is leading the board when it comes to exporting cheese, with the USA being the largest customer (Augère-Granier, 2018). Skimmed milk powder (SMP) and packaged milk are also commonly sold to countries outside the EU. China is the main consumer of European packaged milk (Augère-Granier, 2018).

Accounting for 12% of the total agricultural output, the dairy industry is the second biggest agricultural sector in the EU. In 2016, the European dairy farmers produced 168.3 million tons of cow milk, which accounts for 97% of all milk produced within the member states (3% comes from ewes, goats and buffalo) (Augère-Granier, 2018).

EU framework

Since the 1960's the EU dairy industry is mainly organized by the Common Market Organization (CMO), aiming to stabilize markets even during imbalance. One of these tools was the "Milk Package", introduced in 2012 in order to smoothen the transition coming along with the end of the milk quotas in 2015 (Augère-Granier, 2018).

While in 2013 and 2014 the price per liter of milk was historically high in the EU, thanks to the high demand in China, the production was increased even further leading to price fall. Even worse, Russia banned imports and the expected growth in demand did not take place which in further consequence led to a price fall again. Financial difficulties for many farmers were the result, causing the European Commission to take measures. The Common Agricultural Policy (CAP) plays an essential role in supporting milk industry (Augère-Granier, 2018).

Future outlook of dairy sector in Europe:

In 2017 the European Commission presented an outlook for the agricultural dairy sector (Union, 2017). The expectation is that China will continue to be the leading importer of dairy products (Union, 2017). While demand for consumption of liquid milk is expected to decrease, butter will be produced and sold in higher proportions. Milk powder, SMP and cheese are expected to be higher demanded but with a gradually lower increase than in the past 10 years (Union, 2017).

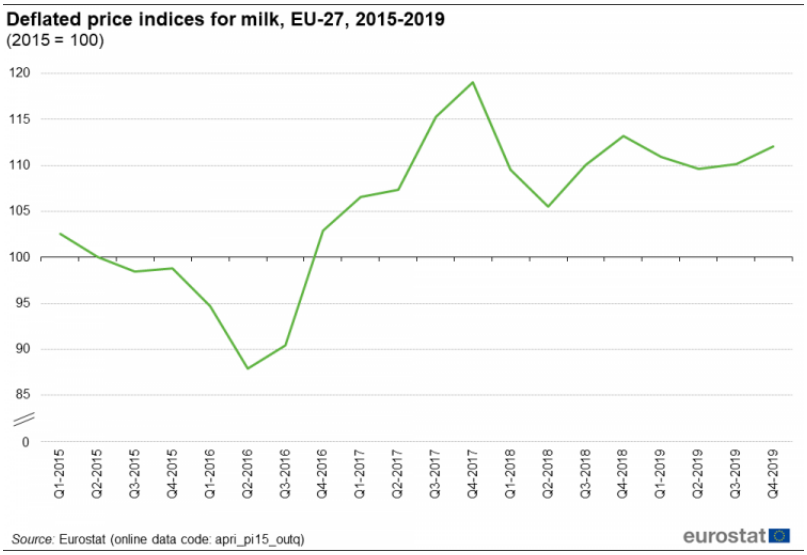

***Figure 2**: Price indices for milk in the EU-27*

Milk prices have fluctuated tremendously within the past years (see Figure 2), yet they seemed to have stabilized in 2019 with this trend expected to persist (Augère-Granier, 2018).

The main goal of European dairy industry will be to further increase production at a reasonable level of approximately 1% per year while taking into consideration natural capacities, respecting nature and working in a resource efficient, resilient and sustainable way (Augère-Granier, 2018). Economically, however, it will be necessary to work at a lower production cost in order to keep up with the competitive market. Organic dairy production will be implemented more frequently, adapted to the consumers' demands.

Contradictive to that, the possibility of a fall in dairy production due to environmental factors such as cold weather delaying pasture growth and hot summer droughts impacting grassland, and therefore feed production, have been considered as limiting factors (Bórawski et al., 2020). Additionally, the volatile price for milk and alternatives to cow-based milk – both plant based as well as milk produced by other species like sheep and goat - bear a constant threat for dairy farmers and dairy markets (Bórawski et al., 2020) (Augère-Granier, 2018) (Commission, 2016).

2.1.2. Dairy Breeds in Europe

A breed is defined as "a group of animals with common ancestry and usually with similar physical characteristics". Cattle have been domesticated, bred and kept for human purposes for hundreds of years, due to their high production of milk but also high yield in meat (Buchanan, 2016). Various breeds exist and their appearance differs remarkably around the globe, dependent on purpose, climate, adaptability and herd management.

Europe records high amounts of both beef as well as dairy production. One might think that these two sectors would go hand in hand. Yet, as demand for dairy started to increase, breeding for specific characteristics started. This resulted in breeds performing great for some trait, like in dairy cows' milk yield, calving interval, fertility and resilience while scoring lower on carcass quality than beef breeds (Pfuhl et al., 2007). Even though dual-purpose breeds, used for both milk and meat exist, it is more common in Europe to use specialized breeds performing remarkably well for one purpose only. As a consequence, many dairy breeds that are bred and used for milk industry, show poorer characteristics in traits like meat quality (Vestergaard et al., 2019). The result is a breed specific separation of dairy cattle and beef cattle farming and a surplus of dairy calves that do not meet either market. When viewed from an economic point of view, the competition with beef markets that breed specifically for high meat yield and quality, offspring of dairy

cows of some breeds do not have any quality relevant for marketing, making male dairy calves a by-product of dairy industry that cannot be made use of (Hopkinson, 2017).

I have chosen to present breed descriptions from Wikipedia, assuming that different breed organizations have scrutinized and edited the description of their breed. Thus, the descriptions reflect how the breeds' stakeholders want to describe it.

On European dairy farms, the most commonly used dairy breed is the Friesian Holstein. This breed originates in the Netherlands and is commonly used for dairy production around the globe. Holstein Friesian are characterized by their red or black and white color. Their production is currently around 7,655 liters/year throughout 3.2 lactations which sums up to an approximated total production of 26,000 liters throughout a lifetime.

Another important breed in dairy industry are Jersey cows. The British breed is comparably small; however, it can produce remarkably high amounts of milk in relation to body size. This breed is known to be very adaptive to external factors such as different environments and temperatures. Jersey cattle are bred and used among several European countries such as Denmark and France but also in New Zealand and the USA. They are known for their high fertility, calving ease but also great milk qualities, scoring high in butterfat and protein. Yet, due to its small body, they are characterized as a one purpose breed.

Fleckvieh, which is a breed that originates in Austria and Bavaria, was originally created through crossbreeding local stock with imported Simmental cattle from Switzerland. It displays good milk qualities, can handle draught but most importantly can be used for beef as well, which makes it a great dual-purpose breed. Its carcass qualities can even be expanded by crossing Fleckvieh with beef breeds.

Braunvieh or Brown Swiss is another cattle breed, producing extensively, mainly used in alpine mountain areas across Austria, Switzerland, Italy, Spain and Germany. Depending on location and production system their milk yield can range between 7,200 in mountain areas and 12,000 liters per year. Just like Fleckvieh, this breed can be used as dual purpose, allowing bull calves to be marketed or fattened and sold.

Numerous other breeds such as the Normande, Simmental, Ayrshire and many more are domesticated and commonly used.

All these breeds display different qualities for different traits. While some of them can be used for beef industry as well, the majority of domesticated dairy cattle among European industry belong to the one purpose breeds.

With the awareness that the main dairy producers among European countries, Germany, France, the Netherlands and Italy, mainly use dairy breeds for production, the question arises what the consequence for the approximately 50% male offspring calves is. While some of them are used for veal or beef, and new technologies allow to circumvent the situation of purebred dairy bull calves, a

plethora of issues arise that need to be addressed. These will be discussed subsequently.

2.1.3. Handling of Dairy Calves

With the increase in dairy milk production, the shift in farm size accompanied by new technologies, less smallholder farmers, and the use of superior dairy breeds scoring low on meat yield and quality, new challenges have started to arise. While several issues such as castration of piglets without anesthesia, tail cutting in pigs, shredding of male chicks of laying hens, and many more issues seem to be acknowledged by more people, issues of the dairy sector appear neglected (Aerts and De Tavernier, 2016). Marie J. Haskell addressed this issue with her paper "What to do with surplus dairy calves?" that was published in January 2020. As the main goal of a dairy farm is producing milk, the sale of cows and calves ends up being of much less importance (Haskell, 2020).

Physiologically a cow only produces decent amounts of milk if she gives birth regularly. Another considerable factor is that milk is naturally produced to actually feed the offspring, yet dam and calf are usually prohibited suckling and immediately separated. In further consequence, issues in the handling of dairy cows and calves arise, and many more problems such as 'zero-grazing', dehorning, but also the killing of male offspring, due to the fact that they cannot produce enough meat to be economically profitable, can be named. Some of these issues, with the main focus on surplus calves, will be addressed throughout this report.

Placzek et. al. addressed several important concerns in the handling and rearing of calves in dairy farming and conducted a systematic review of the situation and the public awareness and attitude towards the topics among several countries with emphasis on Europe and the USA. Plenty of common practices that lead to pain, discomfort and death were named. Tail docking is known to cause pain (Placzek et al., 2020), however is widely prohibited due to the Council of Europe Recommendation (CoE) (Duval et al., 2020). Disbudding, that still is used frequently across the world, is carried out for hygiene reasons by enhancing the udders cleanness but also supposed to reduce the risk of injuries as well as the transmission of diseases. Additionally, without horns cows require less space both on farm and during transportation, which is of economic importance (Faulkner and Weary, 2000). This is partly carried out with the use of an anesthetic, for instance in Austria, however, the CoE lies down that on a European level the use of sedation and pain killers is only mandatory for calves after 4 weeks of age (Duval et al., 2020), even though the use of hot iron or caustic paste is experienced as very painful also by young animals (Faulkner and Weary, 2000, Stewart et al., 2009, Stafford and Mellor, 2011).

Placzek et.al. stated that the majority of the population was unaware of all these practices. Albeit, among several European countries the demand and willingness to pay more for products that enlarge or ensure better animal welfare appears to be present in most consumers (Clark et al., 2017, Janssen et al., 2016). Additionally, a study conducted in Germany displays that this willingness is often correlated to environmental concern, altruism and less apathy towards sustainability and animal welfare (Frey and Pirscher, 2018).

2.1.4. Cow-Calf Separation

The topic of cow-calf separation is a critically discussed topic that involves several contradictory arguments. It is common to take away the calf from its dam within only a few hours after birth (Ventura et al., 2013). This practice is carried out in any country providing a functioning dairy industry. Both in conventional as well as organic dairy industry this practice is used routinely, with differences in legislation among EU-countries. While for conventional systems dam and offspring are often separated immediately, EU-organic lies down that the minimum time they need to be kept together is 24h (Duval et al., 2020). Opinions on separation differ where one view is that leaving mother and calf together for a longer time increases stress when finally separated, as they have more time to form a bond, while others argue the opposite, stating it is unnatural to take away a newborn from its mother (Enríquez et al., 2011). As a matter of fact, the underlying issue arises herewith, questioning how "natural" farming a domesticated animal under unnatural conditions is anyways. While natural behavior can be found in legislative documents aiming to increase animal welfare, consensus has not been achieved (Segerdahl, 2007). However, Placzek et.al. state that several questionnaires carried out by researchers across different countries, most consumers were unaware of this practice and rejected it after being informed. This issue concerns not only health or welfare aspects but also the economic point of view, taking into consideration that suckling most certainly would turn out more expensive as less milk can be sold. Additionally, the topic of bull calves of dairy breeds comes back to light, as fattening them is economically unbeneficial, due to their low weight (Placzek et al., 2020).

Johnsen et.al. addressed this issue by conducting research questioning whether it is feasible to rear calves with their mother on dairy farms or not. Several forms of cow-calf systems exist that need to be considered separately. While "free cow-calf contact" enables mother and offspring to be together 24/7, this also means nursing is unlimited. This system results in higher weight gains for the calves than in conventional systems where they are separated early. Yet, this strategy certainly leads to high loss of saleable milk, which is why separation usually takes place at

8-12 weeks, by far earlier than it would happen naturally at 8-12 months of age. While it does sound great to keep them together for a certain amount of time, it has to be considered that after all the separation leads to severe distress for both dam and calf, as well as abnormal oral behaviors and lower weight gain due to the quick change in diet (Johnsen et al., 2015b). Alternatives are "restricted suckling contact" that limits contact of dam and offspring to short periods once or twice a day (Johnsen et al., 2015b). Comparably little research exists on this system causing uncertainty about emotional effects on animals. According to Johnsen et al. daily weight gains of calves varied, yet ingestion of milk can be high even in the short amount of time together, which over all makes this system appear to be inefficient both from an economic as well as a welfare perspective. Even less research is carried out on the "half day calf-cow contact" system where animals are together 12h/day and separated for the other 12h (Johnsen et al., 2015b). Veissier et al. investigated and compared this system and showed that the most striking result was that calves showed high weight gains, even post-weaning, which distinguishes this system in a positive way from the "free cow-calf contact". Animals appeared to be more independent and deal well with milk feeder as exposed to it in the 12h separated from the dam (Veissier et al., 2013). In addition to that, cows and calves even displayed bonding behaviors when suckling was prevented which indicates the relevance of the relationship of two individuals on a non-nutritional basis (Johnsen et al., 2015a).

The last system is the so called "Foster Cow System", that implies that on average two to four calves are kept and nursed by one cow (Johnsen et al., 2015b). Differences in affection are displayed for the calves and weight gain varies, however, benefits in development of social behaviors should be considered.

While all of these options have their positive aspects on animal welfare as related to group housing, affection and natural suckling, they all have economic impact on saleable milk yield (De Passillé et al., 2008). As a matter of fact, in natural suckling the amount of milk absorbed by the calve is higher than what they would be fed in conventional systems. Additionally, milk ejection problems during milking are faced as well as a possible change in fat composition of the milk, caused by fluctuations of oxytocin levels (De Passillé et al., 2008). Furthermore, issues such as transmissible diseases when all housed together arise. However, it has to be kept in mind that with arising public concerns about early separation of dam and offspring, further research could lead to promising options for modern dairy systems allowing restrictive suckling and development of calf with the cow (Johnsen et al., 2016).

More research is conducted in this field, pointing out the benefits for calves as well as cows when kept together for longer. Calves display a better social behavior, higher daily gains and develop less abnormal oral behaviors (Gundersen, 2020). Cows have healthier udders and longer lactation periods which is of economic benefit (Gundersen, 2020). Studying cow-calf contact and evaluation of long term

effects is of interest and currently studied in an automatic milking system with results on milk yield, calf growth, health and fertility at SLU (de Oliveira et al., 2020).

2.1.5. Colostrum Management

An important factor in the early development of calves is the impact of colostrum on survival, health and welfare. In the uterus of a pregnant cow the blood supply is separated between mother and its offspring, leading to a lack of immunoglobulins (Ig) in newborn calves after birth (Godden, 2008). This lack of antibodies in the blood makes it entirely dependent on absorption of immunoglobulins from milk. Therefore, the availability of colostrum for neonatal calves is determining its future, ensuring to be protected against disease before its own immune system starts to function. Not only survival rate is higher in calves that have proper access to colostrum, but also longevity, weight gain and many factors related to calving and lactations are benefitted (Godden, 2008). The importance of colostrum management is widely acknowledged; therefore, calves have to be provided colostrum after birth. However, colostrum quality and practices might differ and due to the fact that some calves do not have a strong motivation to drink after birth, the use of oesophageal tube (OT) feeders is used in case calves are unable or unwilling to consume the necessary amount of colostrum voluntarily, which is preventing calves from their natural behavior by invasive force feeding (Boyle et al., 2019). While from an economic point of view the use of OT might be reasonable and linked to improved calve health, from an ethical perspective the intubation procedure is unnatural and at the expense of the calves welfare (Röcklinsberg et al., 2016).

2.1.6. Transportation of Calves

Dairy cattle breeding programs include several desired traits of which most aim to promote milk production. Male offspring do not produce any milk and are therefore of no further use for the dairy farm. Since price per male calf is low and feeding them milk, means less saleable milk and therefore less income for dairy farmers, they are sold early in life. This requires some kind of transportation, either to auction markets, slaughterhouses or other farms (Knowles, 1999). European law lies down two minimum requirements for transportation of calves, namely age of 10 days as well as a healed navel, unless distance is shorter than 100km (Dinu, 2018). Transportation has been directly linked to unpleasant physiological reactions ranging from shipping fever, also referred to as bovine respiratory disease caused

by stress, shifts in blood plasma levels, heart and respiration rate, increase in white blood cells and several other unfavorable side effect (Knowles, 1999). Besides considerable mortality rates and therefore loss of some animals, impact on carcass quality and meat quality have been reported (Knowles, 1999). These are only the effects on product quality, when neglecting the unfavorable effects on the wellbeing of animals.

Wilson et al. (2020) considered the issues associated with young calves being sold and transported with focus on Canada and the USA. However, the issues arising also apply for Europe. Even though countries are distinctly smaller, the dairy bulls are often transported across several countries to their final destinations and even to regions outside of Europe, where they are often shipped or occasionally flew by plane, with stops and transfer stations (Bernardini et al., 2012). In Canada the average age at transport was less than a week, most of them being transported only 3 to 7 days after birth (Wilson et al., 2020). The transports were documented to last for 12 up to 24 hours on average or even longer (Wilson et al., 2020). Due to the fact that bull calves were small and light at the point of transportation this can be associated with decreased weight gain (Scott et al., 2019) and higher chance of mortality (Winder et al., 2016).

Marquou et al. stated that 43% of male calves exhibited a minimum of one abnormal finding when checked by a veterinarian afterwards (Marquou et al., 2019) and almost half of them were dehydrated (Renaud et al., 2017). A study in Europe even exceeded this amount with 70% of the calves found dehydrated (Marcato et al., 2020). While in the European Union the minimum age of 10 days at transportation is an improvement ((EPRS), 2018), it still has to be kept in mind that it was documented that health and welfare challenges were not only dependent on age of the calf but also differs depending on factors on the farm (Marcato et al., 2020). Management and environment on the farm of origin should be taken into consideration. Factors such as type and cleanliness of housing play a significant role and even more important if the individuals received enough colostrum which all determines body condition ranging from healthy to weak (Wilson et al., 2020). This differentiation in fitness can determine whether a calf is physically capable of handling transport or not. This supports the presumption that age alone cannot express properly if a calf is ready for transport. Possibilities of finding methods to test fitness for calves are arising and should therefore be emphasized.

Within the EU the advantage is that distances between towns are comparably small. Neighboring dairy and beef farmers often have a cooperation where contracts ensure that the calves do not have to undergo long transportations, but stay in the area. However, an important factor that still needs to be taken into consideration is the biosecurity risk that animals are subjected to when collected from several different farms, possibly allowing pathogens to transfer from one to another (Wilson et al., 2020). This leads to the use of antimicrobials which, however, should be reduced to a minimum (Wilson et al., 2020). According to Wilson et al., another

important factor is education that can be a supportive tool in informing producers and veterinarians. Addressing them with the issue and encouraging them to participate in ensuring proper handling and neonatal care of animals, to enlarge welfare and likelihood of healthiness, could have major impact in solving the problem (Wilson et al., 2020).

Nevertheless, the topic of animal transportation and especially cow and calf transportation has started to gain attention among the European population. Reporting in the daily news on animals born in Germany or Austria being culled in Lebanon, or the Guardian, publishing an article on Ireland planning to fly calves to Europe to cut long transportation through shipping, as well as stories on cattle being stranded on ships for months and finally being euthanized, due to the fact that no country was willing to take them, keep raising voices (McSweeney, 2021) (Pölsler, 2021) (Sophie Kevany, 2021, Patsch, 2021). Demand for transparency on these issues is arising, asking for a change in current practices.

2.1.7. Market for veal

Male dairy calves used for production may either enter the beef rearing system, where they spend 18-24 months on pasture or are fed on roughage indoors, or the veal production depending on consumers preference and prevalence of production systems (Haskell, 2020). One market that has gained attention is the one for veal. Veal is defined as meat derived from cattle younger than eight months that in most cases is fed on milk replacers, whereas only around one tenth of all slaughtered calves is provided to suckle directly from their mothers twice a day (Sans and Fontguyon, 2009). These are mostly dairy or cross-breed calves that would not be profitable in conventional beef industry. In 2008 approximately 20% of all cattle slaughtered in the EU were for veal industry and one third of them were dairy cattle calves, of which three quarters were male calves (Sans and Fontguyon, 2009). While France, the Netherlands and Italy are the main producers among European countries, the meat is sold and consumed in all European countries (Sans and Fontguyon, 2009). The competition is big and smaller countries such as Austria, that are less specialized on veal industry, cannot keep up with the low prices offered by the countries mentioned above. This results in export and transportation of calves and import of the meat after slaughter.

Preferences for veal meat differ among consumers. As a result, the industry produces on different feeds. The Netherlands, as one of the main veal producers mainly aims for “white veal” that is purely fed on milk and milk products. Additionally, “rosé-veal” that is fed on a combination of milk and cereal and slaughtered slightly older is produced there.

In 2016 around 4.460.400 calves were slaughtered in the EU. Of these, 31% were carried out in the Netherlands while 28% were carried out in France (Eurostat, 2018).

While demand for veal is steadily declining, the market is still of major importance as an outlet for milk producers. However, as solely a couple of countries focus on veal industry, calves from several countries across Europe have to face long transportation to the veal farms.

2.1.8. Killing of dairy bull calves

For dairy bull calves several options of handling exist, dependent on diverse factors such as the cattle breed, the area, the purpose and economic considerations like an existing market for veal meat. As many of the dairy farms in Europe do not keep and raise bull calves for production, they are mainly sold, however some are euthanized on the farm after birth (Hopkinson, 2017).

The book "The end of animal life: a start for ethical debate: Ethical and societal considerations on killing animals" covers several aspects of animal husbandry and their killing for different reasons. One of their chapters' states that some animals are killed as a matter of collateral damage (Meijboom and Stassen, 2016). These are more or less side effects of economic realities as some animals cannot be profitable anymore. This addresses hobby animals, animal shelters, sports animals but also egg and dairy industry resulting in not needed offspring (Meijboom and Stassen, 2016).

Placzek et.al. (2020) is covering public attitudes towards practices of calves on dairy farms. This includes the topic of disposing of male calves. Due to breeding for specific traits, as in the dairy industry milk yield, the genetic merit for meat is comparably low, leading to the issue of male dairy calves being economically unprofitable. Their lower slaughter weights make them an unprofitable side product of dairy industry. Within only two years, between 1998 and 2000, 600.000 male calves were slaughtered while still less than a week old in Victoria, Australia (Cave et al., 2005). On Canadian farms an average of 19% of all bull calves were stated to be culled after birth even though proportions differed and even reached 100% on some farms (Renaud et al., 2017). The majority of the people, more precisely 79%, in a questionnaire conducted by (Cardoso et al., 2017) were unaware of this strategy, and a total of 90% rejected it. In European countries the practice of killing calves is less common and partly prohibited. Nevertheless, in Denmark for instance, 80% of all born male Jersey calves were slaughtered after birth, even in organic farms as Denmark's Radio states (DR, 2018). However, several countries such as Germany prohibited the killing of animals without proper reasoning (BMJV, 1972).

While a similar issue exists with the killing of male layer chicks, which has been discussed and addressed in many areas, the awareness for killing male calves needs to be more emphasized (Placzek et al., 2020).

Gillian C. Hopkinson, a senior lecturer in marketing in the UK, published an article in 2016 on "making a market for male dairy calves". While in 1995 about 500.000 young calves were exported and shipped to mainland Europe for fattening and production of veal, animal welfare organizations were protesting. Only a year later the transport stopped for ten years due to health reasons and an assumed association between Bovine Spongiform Encephalopathy (BSE) and the human disease Creuzfeldt-Jacob Disease (CJD) (Hopkinson, 2017).

Even though the killing of surplus calves in dairy farms is still happening in several countries in Europe and the rest of the world, there is comparably little literature or written proof of it to be found. This issue hence seems to be little acknowledged. More emphasis should be given and evaluation of the current situation conducted.

2.1.9. Consumers' Awareness

Throughout the previously discussed issues, a lack of knowledge on animal-based products was mentioned. While surveys state that more than half of those polled wanted animal-welfare friendly products, studies also showed that there are many more factors affecting food choices (Nocella et al., 2010). While price and directly verifiable factors are easy to address, insufficient information flow about production systems and its impact on animal welfare make it a less comprehensible for the consumer to take into consideration (Cembalo et al., 2016).

A major factor that should be given more attention to is the unawareness of consumers about food of animal origin. There appears to be a huge gap between the knowledge of the consumers and the actual practicalities. As a matter of fact, the final driver for decision making in the store is still the price, which ultimately differs a lot depending on the product (Aboah and Lees, 2020). While both intrinsic as well as extrinsic quality matter to consumers, a ranking of important quality cues by Aboah and Lees showed that price is the 3rd important thing considered whereas animal welfare is 8th on the list and traceability only 15th.

Lack of knowledge can be due to several factors. One of them is the insufficient labelling of packages that easily could be addressed and changed comparably quickly (Commission, 2012).

2.1.10. Goal Conflicts and Synergies

Opinions diverge over the question if dairy and meat is healthy or not. Independent of that, the most striking question is whether it is necessary for developed countries, more precisely Europe or the USA, to consume these enormous amounts of animal products leading to production systems far beyond life quality for the animals raised. There is evidence stating that a balanced diet with occasional consumption of meat and dairy would be ideal (Westhoek et al., 2014). Westhoek et al. studied the environmental and health effect if the European population would cut half of its dairy and meat intake. The results were pretty clear and showed that greenhouse gas emissions as well as nitrogen emissions would decrease up to 40% and Europe could even become a cereal exporter which will be of great importance in the future, given the increasing global demand for food (Westhoek et al., 2014). In addition to that, health benefits could be expected, given the lower intake of saturated fats that are linked to an increased risk for cardiovascular diseases, strokes, inflammatory bowel diseases and in further consequence colorectal cancer (Westhoek et al., 2014). Lower animal production and consumption is also directly linked to improved water and air quality as well as a better efficiency of antibiotics use due to the lower passive intake through animals (Westhoek et al., 2014).

2.2. Identification of Alternatives

After considering the side effects of dairy products one might ask if it is morally reprehensible to consume them. Several approaches can be taken into consideration when reconsidering food choices, several measurements should be pondered when aiming for a long-term solution.

This can be either legislative impacts, prohibiting euthanasia of calves after birth, supporting dual purpose breeds or crossbreeding with beef cattle to result in more profitable offspring. Additionally, more people consider the downsides of animal farming, on the one hand by worrying about environmental impacts and sustainability, on the other hand by disagreeing with the practices carried out on farm animals. These factors can support a move towards a vegan or vegetarian diet or even a flexitarian diet by only buying products that declare origin and handling of animals. A few of them will be discussed below.

2.2.1. Veganism

While dairy industry is steadily evolving, the number of consumers preferring plant based alternatives over milk products is rising as well (Bórawski et al., 2020). This puts forth one approach to avoid unnecessary suffering of animals and the killing of sentient beings: to choose a vegetarian diet and when considering the handling of animals in dairy industry even a vegan diet. A shift in diet does not necessarily lead to decrease or even prohibition of animal industry, yet every individual does have an impact. Animals are subjects of exploitation and therefore it should be reconsidered what our relation to them is, if we should consider them as food and what environmental impacts their production can lead to (Linzey and Linzey, 2019).

While it is often believed that veganism leads to a lack in nutrients and it is unnatural to relinquish animal based products from our diet, there is evidence that all essential nutrients can be obtained by plant products (Linzey and Linzey, 2019). Even more striking, it is shown that people following a vegan lifestyle have higher intake of fiber, folate and vitamin C in addition to better digestible protein from plant based sources especially grains and legumes (Linzey and Linzey, 2019). In addition to that, mimicking meat by producing products similar in texture, taste and nutritional value have brought veganism to a point where it no longer is associated to sacrificing. While opinions differ on this question, studies have been conducted arguing for the health benefits of omitting meat and have come to the conclusion that heart related diseases seem to be less common among people on a plant-based diet (Mariotti, 2017).

While relinquishing all animal products will most certainly not be the long-term solution for everyone, it does have the highest benefit for anyone having moral issues with the industry. In the case of dairy industry, cows will still produce surplus offspring and as a consequence veganism is a rational approach for anyone trying to omit supporting this industry. On a large scale it is more realistic that a reduction of dairy consumption and replacement with plant-based products could be an option. However, as animal industry will still be carried out, alternatives should be considered for a more comprehensive solution on the long run.

2.2.2. Reproduction techniques

Technological innovations have created possibilities adequate to help restructure animal agriculture aiming to make production more efficient. After breeding for more specialized animals, selecting superior individuals through genomic selection for decades, new issues arose that will need to be addressed. Several initiatives have been taken to realize changes in dealing with the lack of utility of dairy bull calves and female surplus calves.

While artificial insemination is used extensively across the world, more recent developments such as genetical modification and genome editing are emerging. It brings along a lot of potential, for humans, environment but also productivity and animal welfare when used in proper ways (Eriksson et al., 2018).

Artificial Insemination

With new technologies arising, Artificial Insemination (AI) is one of the most important biotechnological advances to revolutionize animal farming (Foote, 2010) and was already described and endorsed in 1939 (Burrows and Quinn, 1939). It enables to increase accuracy of genetic evaluation by genetic ties between herds, but also to collect semen from superior male animals with high breeding values for desirable traits, and fertilize several female animals with that semen without the need of natural mating (Rego, 2019). The greatest impact has been achieved in dairy farming enabling rapid genetic improvement. Rigid selection for superior bulls and the transportation of frozen sperm created offspring generations that performed even better than their dams. Technologies kept advancing, allowing to select sexed semen (Foote, 2010). Besides the capability to improve genetics through AI, the availability for superior semen across farms and countries without the need of transportation of bulls is assured (Rego, 2019). Differences in pregnancy rate occur with fresh semen scoring remarkably higher than frozen-thawed semen (Rego, 2019). While AI requires qualified and experienced farmers, veterinarians or professional AI technicians, it still appears to bring along many economic benefits

and enables better control of breeding and reduction of inbreeding than when keeping a bull in the herd.

Crossbreeding - Beef cattle sires + dairy cattle dams

Crossbreeding is a commonly used practice in animal industry. While finisher pigs are nearly always crossbred, it is less frequently used in dairy industry. Several aspects of it can be beneficial for dairy industry. Crossbreeding results in heterosis or hybrid vigor which states that an offspring performs better in one or more traits than the average performance of dam and sire. While purebred animals are of interest for specific traits, crossbreeding is a great option to combine several of them.

As commonly known a cow needs to give birth in order to produce milk. Amount of milk varies throughout lactation and in order to increase efficiency, a cow must be inseminated approximately once a year to function most profitably. However, differences between dairy cattle and beef cattle are quite immense, scoring high for different traits. If a cow gives birth every year but only gets culled at an age of approximately 50 months this means around three calves are born per cow. Only one out of these three offspring will need to serve as replacement resulting in the other two being side product of dairy production. In Sweden, the most commonly used breeds – Swedish Red or Swedish Holstein – performs well on dairy specific traits but comparably low on beef traits (Bieber et al., 2020). This leads to the approach of crossbreeding dairy breeds with sexed semen of beef breeds in order to produce bull calves that score better for weight gain, carcass conformation and fatness. These traits most often lead to larger and heavier calves at birth that might be of economic interest but can cause calving difficulties. Eriksson et. al compared different bull breeds used for crossbreeding with dairy cattle such as Angus, Hereford, Limousin, Simmental or Charolais. They concluded that calving difficulties were mainly found for breed combinations where sires were fast growing and late maturing beef breeds Charolais and Simmental (Eriksson et al., 2018). The advice was therefore to rather use early maturing beef breeds. Calving difficulty was shown to be correlated to weight at birth and muscular development possibly leading to an increased risk of dystocia (Eriksson et al., 2018). Beneficial effects were shown on the frequency of stillbirths in crossbreeds. These were recorded to be lower than in purebred dairy cattle (Eriksson et al., 2019).

Sørensen et al. conducted a review on "Crossbreeding in Dairy Cattle: A Danish Perspective" in 2008. The economic benefits for dairy cattle producers when implementing crossbreeding are highlighted allowing to not only profit from genetic gain created by pure breeding but also from the heterosis effect obtained by crossing breeds. Further benefits are genetic variation and the combination of favorable traits from the two breeds as desired goals in sustainable breeding programs. Due to the long-lasting intensive selection, the negative influence on welfare of animals has gained attention which can be reduced by crossing breeds. Sørensen et al. concluded that longevity and functional traits profit most from

crossbreeding, whereas mastitis and milk production seem to be influenced the least. However, issues in calving ease and higher frequency of stillbirths arise (Sørensen et al., 2008).

Use of sexed semen

Making use of sexed semen has started to be implemented more frequently in recent years. Since most inseminations are already conducted as artificial inseminations, sexing the semen in advance is only one more step of advancing this technology and enabling to reduce the number of purebred surplus calves in dairy industry (Balzani et al., 2020). Benefits can be achieved both for dairy cattle replacement, enabling to ensure female offspring when inseminating with superior dairy bulls, but also in crossing with beef bull sires for meat production where bull calves usually score higher than females. These options enhance economic benefits. Nonetheless, issues such as higher costs of using sexed semen as well as reduced fertility need to be taken into consideration (Pahmeyer and Britz, 2020). On the long run, however, studies do show that implementing a combination of sexed semen and crossbreeding does result in benefits for both dairy industry as well as beef production (Hietala et al., 2014).

2.2.3. Legislation

Throughout the past 50 years the increasing population, the industrialization and economic stability have created a higher demand for products of animal origin and led to advancing technologies. This includes the dairy market that has and still is undergoing shifts and changes partly shaped and followed by authorities.

Another important factor in minimizing unfavorable side effects of meat and dairy production is the legislation. While within the European Union some minimum guidelines exist to ensure animal welfare targeting requirements that need to be fulfilled when it comes to handling animals, these standards are set rather vaguely with several obscurities. This enables industry to execute questionable practices, mostly for economic reasons. While consumers most certainly are unaware of what system they are supporting when buying a piece of cheese or a liter of milk, the authorities have a tool potentially powerful enough to make a change.

Intensification and competition in the dairy industry has increased tremendously and there is little room for individual changes without bearing the risk of economic losses. Since most dairy farmers could not make a living without their animals they are more or less bound to adapt to these changes in order to keep up with the market.

The main authorities, setting the legislation in the European Union are the EU Commission as well as the Council Directive 98/58/EC also referred to as the “General Farm Animals Directive” (Nalon and Stevenson, 2019). Its main message

is “to ensure the welfare of animals and avoid any unnecessary pain, injury or suffering (Nalon and Stevenson, 2019). In addition to that, the Council of Europe (CoE) sets some recommendations concerning cattle as well as the World Organization for Animal Health (OIE) that set some standards in 2015 (Nalon and Stevenson, 2019). Even with these institutions providing some basic outline in handling cattle on dairy farms, most of these only give advice and do not enforce specific steps of protection of animals’ wellbeing. While more precise standards might be set for each individual country, the issue still arises when it comes to the common practice of selling farm animals cross-border to other European countries. Stricter regulations are present for organic dairy industry in the EU as seen in Table 1. when compared to conventional farming, however, some limitations remain enabling a broad number of exceptions (Duval et al., 2020). Therefore, stressing stricter, more animal welfare focused European standards would be a reasonable approach in reducing animal suffering in the dairy sector.

Another authority performing risk assessment and formulating scientific reports to underpin regulations, in regard to animal welfare related issues is the European Food Safety Authority (EFSA) that was founded in 2002 and is based in Italy. It is a cooperation supporting the European Commission on factors impacting food safety and security both for animals as well as plants. Risk assessment and management on the food and feed chain are the main aim and the consumers’ safety is priority. All 28 EU Member states have their own authorities that cooperate with the EFSA.

While the European Union most certainly has set some minimum guidelines better than several other countries, as seen in Table 1., there is still room for improvement concerning animal welfare standards. While efficiency and rentability will always be in focus there are several steps that could be taken in order to enlarge welfare on farm.

As there are different products on the market with different standards for housing, feed, free movement, expression of natural behavior, etc. the government could imply stricter rules in general and for instance reward consumers for purchasing more sustainable and “animal-friendly” products and farmers for restructuring their animal husbandry more animal welfare oriented.

Table 1: Legislation on practices in dairy industry in EU, EU-organic, Austria and Germany

Issue	*EU*	*EU organic*	*Austria*	*Germany*
Cow calf separation	Not defined, mostly within 24h after birth	Not defined	Not defined, mostly within <24h after birth	Not defined
Colostrum after birth	Yes, within 6 hours after birth (Parliament, 2009)	Yes (Parliament, 2009)	Yes, within 6h after birth (RIS)	Yes within 4 hours after birth (TierSchNutztV, 2016)
Transport (>8hours) age	>10 days of age (Parliament, 2009, (EPRS), 2018)	Not defined	>14 days of age (Österreich, 2019)	→ in alignment with EU legislation > 10 days
Killing of newborn	Differences within EU members	Not defined	No (RIS)	No (Tierschutzgesetz)
Tail docking	Member State legislation applies (Union, 1998)	Prohibited (Europe, 2018)	Yes, but only if necessary (RIS)	Yes, if necessary < 3 months of age (Tierschutzgesetz)
Disbudding	Yes (Europe, 2018) (Giulio et al., 2015)	Yes, if necessary, with pain mitigation (Duval et al., 2020, Regulation(EC), 2008)	Yes (up to 6 weeks of age, with anesthesia) (RIS)	Yes, without anesthesia <6 weeks of age (Tierschutzgesetz)
Feed	Roughage from week 2 (Parliament, 2009)	Whole milk for min 3 months (Duval et al., 2020, Regulation(EC), 2008)	Roughage from 2nd week of life (RIS)	Roughage obligatory from day 8 (TierSchNutztV, 2016)
Group housing	Obligatory from 8 weeks (Parliament, 2009)	Obligatory after 1 week of age (Regulation(EC), 2008)	Obligatory from 8 weeks (RIS)	Obligatory from 8 weeks (TierSchNutztV, 2016)

2.3. Evaluation of Alternatives

While possibilities of adaptation or even improvement of the current situation in handling animals through change in diet, reproduction techniques and legislation exist, there are still some moral limitations to what extent these practices can or should be implemented in order to bring along long-term change. Philosophers have considered the ethical aspects of consumption and food production per se and highlighted the issues emerging through industry. These aspects should be taken into consideration when deciding on purchasing and consuming goods.

2.3.1. Food ethics and the" Five Freedoms"

As mentioned above, several countries have profited from industrialization. Not only the demand for food, in general, increased but especially the demand for animal-based products (Davis et al., 2016). In the last 60 years, agriculture was shaped by industrialization leading to increased intensification enabled through breeding based on genetic evaluation and improved management. As a result, meat and dairy are no longer a restricted expensive good but the majority of the average income household can afford products of animal origin on a daily basis (Smith et al., 2013). This change in farming, however has also caused environmental impacts that have negatively affected animals, nature as well as humans (Rojas-Downing et al., 2017).

The consequence is that groups of people started to form, considering factors such as sustainability, organic production, buying local but also animal welfare, with some changing their diet towards vegan, vegetarian or regional products only (Milburn, 2020).

Even though production is continuously progressing and increasing, the population has partly started to consider origin and welfare issues in livestock production aiming to buy and consume a more morally approvable and sustainable product in the market (Nocella et al., 2010). This "intrinsic quality" is perceived different among cultures and regions and therefore differs a lot across the world (Criscuolo and Sueur, 2020). Nevertheless, among several countries, this issue is starting to be addressed based on different communications. However, there appears to be a knowledge gap about the origin and handling of animal products among many consumers due to marketing strategies and difficulties in traceability of processed foods (Van Riemsdijk et al., 2017). Media is raising awareness more frequently, yet there is room for improvement.

In 1964 Ruth Harrison published the book “Animal machines” (Harrison, 2013) which started a movement, raising awareness of the negative impacts of these recent advances in animal production, aiming to consider the downsides of high growth rate, stocking densities, environmental impacts of animal farming as well as conditions and suffering in slaughterhouses (Pelluchon, 2016). Even though production achieved tremendous gains in higher yield with lowest input and costs possible, the side effect of outraging natural capacities showed its consequences. A group of animal ethicists formed, aiming to address these issues and impact the systematic decrease of animal welfare. Up to date the main approach in ethical considerations of ethics in animal agriculture were shaped by Peter Singer and Tom Regan who do have different ideas and perceptions of what is ethically right and wrong but still have in common the critical questioning of any practice involving animals calling for the necessity of animal rights (Pelluchon, 2017).

While definitions of animal welfare are diverse and personal values and attitudes towards animals play a role in what people include in their definition of animal welfare, different components such as biological functions, affective states of an animal as well as its living conditions and to which degree it can exhibit its natural behavior enable a scientific foundation to ensure welfare of farm animals (Fraser, 2008). While factors included like, feelings, pain, behavior and anatomy are diverse, some of them are observable and measurable and independent of philosophical components which makes them easier to be used as regulations (Fraser, 2008). This provides a basis for animal welfare standards and regulations that are defined for Europe as well as within separate countries. The UK, Norway and Sweden are examples of countries where minimum guidelines tend to be stricter than the EU regulations for all farm animals, in order to protect animals and increase their welfare (Veissier et al., 2008).

Another aspect considered in animal science is the scientific progress that enabled use of biotechnologies. Selection of the superior animals has been used for hundreds of years and came along with benefits such as improved health traits. However, the introduction of genomic selection also had drastic impact on the genetic progress per time unit with physiological impacts that went beyond reasonable for health causing issues such as calving difficulties. Furthermore, the reproduction techniques have advanced allowing to not only speed up selection tremendously but also introducing procedures like artificial insemination and embryo transfer. Whilst the outcome might create economic benefit, some of the above-mentioned techniques raise moral concerns whether the integrity of an animal is intruded through the adoption of these techniques (Millar and Morton, 2017).

For a better understanding of some of these questionable techniques that have been introduced would be for instance - cattle breeds, that perform well for meat industry but cannot give birth naturally and therefore need caesarian section for

calving. In a previous study most of the consumers reported to be unaware of these practicalities (Marie, 2006).

The European Commission (EC) has been working on a common minimum guideline for animal welfare among EU countries for the past 40 years. After Ruth Harrison's book was published the Brambell committee was founded where Roger Brambell defined the so-called "Five-freedoms" in 1965 that were adopted by the EC and apply for all animals that are kept for farming purposes among European countries independent of species (McCausland, 2014):

1. Freedom from hunger and thirst
2. Freedom from discomfort
3. Freedom from pain, injury and disease
4. Freedom to express normal behavior
5. Freedom from fears and distress

With respect to these five freedoms, seeming to address quite basic necessities, we might assume them to come naturally. Yet, when taking a closer look at dairy industry and the handling of male calves, these freedoms are currently not ensured generally or transferred into legislation on any general basis. As they address measurable physiological needs and expressions, their implementation by legislative enforcement could most certainly be achieved.

2.3.2. The Utilitarian Approach

Utilitarianism is an ethical theory, according to which an act is right only if it maximizes the overall outcome, considering all affected individuals compared to any alternative action. It is a form of consequentialism claiming that the consequences of an action are the basis of right and wrong while accounting for interests of all sentient beings equally (Singer, 1989). Utilitarianism requires evaluation of every single act (Singer, 1989). This concept of modern utilitarianism was originally shaped by Jeremy Bentham and adapted to the ethics of raising animals for food and any other use of human interest by Peter Singer, an Australian moral philosopher and professor. He appears to have first been triggered by "Animals, Men and Morals" a book published in 1971 by three researchers at Oxford University (Pelluchon, 2017). After summarizing this book, Singer developed a utilitarian way of thinking. He continued with writing down his considerations in "Animal Liberation" (Singer, 1973), published in 1973 which has been described as essential for the modern animal movement (Villanueva, 2018). Singer's key concepts go beyond kindness and evolve around the principle of equality of interests (Villanueva, 2018). Just like Bentham he argues that for every action all affected parties need to be taken into consideration. He defines a good

action as an "action that maximizes the expected satisfaction of interests" (Singer, 2011). He argues that ignoring a beings' interests violates the principle of equality (Singer, 1989) .

Sentience is taken as a measure and accounted as sufficient for moral worth, which includes any individual – animal or human – who is capable of suffering has interests (Singer, 1986). Singer predicts that any sentient being placed outside these moral considerations is predicted to be facing cruelty. Utilitarianism states that making use of sentient beings is only approvable if the benefit of an action is greater than the suffering it causes (Singer, 1973).

While Singer's publication might have been essential for further evolution of considering animal welfare in several disciplines, arguments against his moral points of view have been raised (Villanueva, 2018).

According to Singer, becoming a vegetarian is the most viable step to avoid unnecessary suffering while he acknowledges that egg and dairy production do cause harm by keeping birds in cages, shredding male chickens and separation of cow-calf in addition to the killing of male calves (Singer, 1973) (Villanueva, 2018). Even though veganism is the most effective way to abolish any harm caused, he still defines it as a difficult step and recommends any omission of the worst abuses first and proceed with lesser issues one at a time (Villanueva, 2018).

According to Singer, our food decisions do directly affect others, on the one hand by causing suffering among affected animals, on the other hand due to the fact that cereals produced by African farmers are sold and used to feed the animals we consume which in part causes humans to suffer from hunger (Singer, 1986).

In Singers eyes, for each individual, animal ethics starts by becoming aware of the moral status of an animal and taking moral aspects into consideration in our lifestyles (Singer, 1973). He acknowledges that this topic has entered the public debate and rethinking is taking place due to environmental costs of livestock farming, health reasons but also ethical reasons (Singer, 1973). In Practical Ethics (Singer, 2011) he distinguishes between individuals that qualify as a person and others (such as fish and reptiles) that do not meet the requirements for this category, yet he revised this position after years (Villanueva, 2018).

The alternatives mentioned above – veganism, reproduction techniques and legislation /governmental interventions – would presumably be in line with Singer's theory. Veganism is a suitable approach for anyone finding the consequence to abolish all animal products, and biotechnology to an extent that it does not only open economic benefits but also welfare benefits for animals. In Singers view killing of animals is not rejected in principle, however due to the fact that in practice the amount of suffering involved in livestock industry does not outweigh the benefits that people gain from animal products he is not in favor of the industry.

2.3.3. Animal Rights Approach – Abolitionism

Abolitionism basically states that any individual – human or non-human – has the basic right not to be treated as property of another individual. This leads to the moral consequence that anyone should live vegan (Cordeiro-Rodrigues, 2017). This movement opposes any improvement in animal industry as the belief is that animal use should be abolished completely either way. Tom Regan, an American author and professor in philosophy, was the founder, and therefore the first one to formulate the modern animal rights position. He states that all animals that are subject-of-a-life, which means amongst other things they are sentient have inherent value and should not be solely used as a means to our ends (Pelluchon, 2017, Regan, 2004a).

His abolitionist approach is not in alignment with Singers' beliefs, since he does not seek improvement of animal welfare in farming practices as he states that "animal rights require empty cages, not larger cages" (Regan, 2004b). In his opinion, any living being has the basic right not to be unnecessarily harmed and killed. His theory is based on the idea that "individuals who experience life, have perception, memory, desire, belief, self-esteem, intention and a sense of the future are holders of fundamental rights" (Pelluchon, 2017).

As a consequence, it is quite clear that for an abolitionist, based on Tom Regan's Animal Rights Approach, none of the before mentioned reproduction techniques or legislation approaches towards a more animal friendly industry would be a reasonable future outlook. An acceptable way of life would be living on a vegan diet and rejecting any kind of animal industry for food, experimentation, hunting or clothing per se.

3. Conclusion

The topic of this master thesis is to question to what extent the production and consumption of animal-based milk products is morally acceptable and what "ethical price" is paid for it. While a plethora of practices in livestock farming have been criticized and awareness raised in society, it seems that the ethical issue needs to be more emphasized.

As a matter of fact, a critical literature review on dairy production points out the number of grievances of the milk industry these days. As industry and technology might be advancing and producing more efficiently, farm size is increasing while the number of farms is decreasing and in consequence the personal bonds between farmer and animals potentially are affected. Production-wise the economic benefits have been tremendous, ranging from superior animals through genomic selection, improved feed-efficiency, to more sustainable ways of production. While all of this sounds promising, the downsides of these practices are less discussed. Most certainly the majority of issues that arise are not communicated and therefore consumers often are unaware as some practices might cause a moral conflict that lets them reconsider the purchase of specific products. The dairy breeds kept in Europe score high in milk yield, udder health, fertility and partly longevity. However, the fact that these are often no dual-purpose breeds and mainly used only for dairy and less valuable for meat industry, which potentially leads to these calves not entering any market, is neglected. Crossbreeding with beef sires might sound like a promising solution, yet it has to be kept in mind that this comes along with calving difficulties. Additionally, a cow needs to give birth to a calve every year in order to produce a sufficient amount of milk. However, as replacement of a cow only happens every couple of years, this leads to a surplus of female calves that is sold and transported long distances. "*Rinderhaltung ohne Schlachtung als Agrar Care-System*", a book by Patrick Meyer-Glitza published in 2020 by Schweisfurth Stifung München, covers these aspects and assesses a cattle husbandry system where no animal is sorted out and slaughtered as a possible solution to overcome the issues arising with dairy industry (Meyer-Glitza, 2020).

Breeding has also become more sustainable in terms of feed-efficiency and reduction of greenhouse gases. While lowered feed-efficiency is economically beneficial and less greenhouse gases sound like a promising approach, in cattle this is often accompanied by feeding on silage and reduced grazing. Therefore,

sustainability does not always necessarily go hand in hand with higher welfare standards.

Even though awareness is rising, ethicists and NGOs tackle the issue more frequently and enlarge the proportion of people turning vegetarian or vegan to reduce their ecological impact and lower animal suffering, for the foreseeable future it is not likely that the world population will turn vegan and abandon animal products and therefore its production per se. This leads to the question to what extent it will be possible to change livestock farming to the better? Not everyone will be emotionally affected by current practices and feel the moral need to reduce or buy more "defensible" animal products.

I also believe any radical view that judges and refuses any other opinion than one's own is not effective on the long run as every person has other believes and moral considerations. However, raising awareness, sharing knowledge and offering alternatives can be a great benefit and possible solution. Reducing any animal-based intake that one finds not essential is one step closer to reduced suffering. Therefore, continuing farming and producing livestock is a reasonable expectation for the future, however, practices can – and need to be – changed. Legislation could have a crucial impact on how these practices are carried out. Furthermore, on an individual level, choosing to consume less meat and dairy and preferring organic products, mostly due to their promotion of higher standards for living conditions and reduced physical mutilations (Duval et al., 2020) as well as more sustainable products over conventional products is one step forward.

While a small percentage distressed with animal welfare standards might be willing to abandon or reduce them for the sentient beings, I believe that an even bigger proportion could be addressed by better understanding of health benefits of higher intake of plants and cereals. In addition to that, meat does not necessarily have to be as cheap as possible to be affordable. Finding the "right" price is challenging and consumers' decisions for quality cues differ (Aboah and Lees, 2020). Setting higher standards on animal welfare, reducing imports of cheap products from outside the country and supporting local farmers could be a feasible approach that needs to be addressed within the EU.

Another issue to be kept in mind are the Sustainable Development Goals. One of the major issues of our time is "Zero Hunger" which cannot be met at this point. However, considering the fact that tremendous amounts of foodstuff are produced all over the word just to feed animals for production gives us the opportunity to reconsider out diet and shift distribution of food.

It does not necessarily take mistreatment of animals and enormous factories-farms to produce livestock. From an ethical point of view and after discussing abolitionism and utilitarianism, there is no proper justification for it, only out of personal pleasure to buy and consume more for less money. Moreover, keeping in mind the amount of input for comparably little output, where enormous amounts of people die of hunger, should be emphasized. Genomic selection and crossbreeding

should be implemented, yet a consortium composed of specialists from different fields is needed to evaluate benefits and downsides and consider these as essentially limiting to decide to which extent it is morally justifiable

Another factor to be kept in mind – and most likely a topic that attracts more people than the animal welfare issue – is sustainability and the future of our planet. While we know that animal production is a great cause of greenhouse gas emissions, ruminants are the main players among animals. Dairy production contributes 20% of total emissions and is increasing steadily (Bórawski et al., 2020). This leads to a moral discrepancy, because we know that free range animals cause higher amounts than animals housed inside and fed on silage. Yet, we all want to perceive a planet worth living on for this and future generations and an easy viable tool to lower one's ecological footprint is to buy and consume regional, seasonal products and lower amounts of animal derived products.

Therefore, I postulate that the long-term solution to decrease the "ethical price for dairy" is a combination of personal moral thinking, legislation and making use of reproduction techniques. Most importantly a change in diet could easily be stimulated through governments, restaurants and food manufacturers by providing less meat and dairy and introducing more plant-based products and dishes as attractive alternatives (Westhoek et al., 2014). Limiting the offered meat to the one produced inside the country and subsidizing organic and welfare focused strategies could be another step, yet would mean some steep cuts in free trade among EU countries and therefore difficult to bring to practice. While livestock industry might not essentially decrease per se, it could be changed to the better. Prohibiting long distance transports, raising and slaughtering animals in the country they are born in or within a maximum distance given by legislation should be a minimum criterion at least in places like the European Union.

As a concluding remark, from an animal ethics perspective, the dairy industry is just one out of many livestock industries, that brings along some morally questionable practices. However, I also do think that we live in a time shaped by change with young generations considering more aspects of animal production. While economic benefit will continue to be the major driver and interest of any economy, there is still potential to provide fundamental changes benefitting animals, humans and our planet. Everyone has an impact and can decide on what he or she finds approvable to buy and eat.

Raising awareness, sharing knowledge, implementing stricter guidelines and providing alternatives can be a feasible step forward to a more sustainable and less cruel livestock industry.

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