

Review of the regulations concerning organic dairy calf rearing in seven European countries

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Abstract

This review constitutes a part of the Core Organic project ‘ProYoungStock’ – Promoting young stock and cow health and welfare by natural feeding systems. The overarching aim of the project is to improve young stock rearing systems concerning animal welfare-friendly husbandry, feeding and disease prevention by identifying approaches on different levels. More natural rearing systems are one approach to solve welfare problems in current calf rearing. Previous studies have shown considerable variations in herd characteristics and management strategies between organic dairy farms in Europe. The differences have been associated with regional and national conditions for organic farming. However, it is possible that differences in national legislation also play a part in these variations. Relevant EU and national rules on organic production and animal welfare were compiled in the following seven European countries: Sweden (SE), France (FR), Poland (PL), Germany (DE), Italy (IT), Austria (AT), and Switzerland (CH). The purpose was to provide information on drivers and barriers for cow-calf contact systems in organic dairy production and to identify possible areas for improvement and/or harmonization. Our results did not identify any major barriers in national rules for the use of rearing systems allowing cow-calf contact. Instead, cow-calf contact is promoted by the requirement to feed organic calves preferably maternal milk during the first three months of their life. Specifications regarding calf rearing derives from animal protection legislation rather than regulations of organic farming but milk hygiene regulations can also have an influence on practicability of cow-calf contact. Variations in national legislation can affect details of design and implementation of cow-calf systems, however, other factors (e.g. overall conditions for organic dairy farming, traditions, economics and disease prevention strategies) rather than regulations likely play more important roles.

Keywords: Organic dairy production, EU regulation, national legislation, calf rearing, natural feeding systems, animal welfare

1 Introduction

According to Council regulation (EC) No 834/2007 organic production is defined as “*an overall system of farm management and food production that combines best environmental practices, a high level of biodiversity, the preservation of natural sources, the application of high animal welfare standards and a production method in line with the preference of certain consumers for products produced using natural substances and processes*”. Organic production therefore has a binary role to play; providing goods to meet consumer demands for organic products and also delivering public goods contributing to the protection of the environment, animal welfare and rural development (Escribano et al. 2015; Jespersen et al. 2017). Animal production systems are changing with a shift to a more intensive production with an increase in herd size and specialization leading to regions with livestock-dense areas (Sørensen et al. 2006). This has given rise to environmental concerns as well as apprehensions on the impact of such production on animal welfare and food safety. An increasing pressure from the public as well as increasing concerns and desires of farmers are moving animal-based production towards organic production (Rosati & Aumaitre 2004; Sørensen et al. 2006). Consumer demand for organic food and farmers’ will to improve animal welfare are on the rise and in Europe there is a steady increase in organic production (Eurostat 2017). Organic farming does not automatically improve animal health and increase animal welfare (Rosati & Aumaitre 2004; Emanuelson et al. 2018), although certain favourable preconditions such as enriched and more spacious housing are expected to contribute to the prevention of disease and reduction in the use of antimicrobials. However, the actual welfare outcomes depend on the interaction between individual production conditions and their management. Studies show variations in herd characteristics and management strategies between organic dairy farms in European countries (Sørensen et al. 2006; Krieger et al. 2017; Wallenbeck et al. 2018). According to Wallenbeck et al. (2018) these differences seem to be associated partly with different conditions for organic dairy production such as topography, cultural, traditional and socio-economic differences and partly by differences in laws and regulations in-between countries and regions.

One aspect of dairy farming is the rearing of the progeny. Under near-natural conditions the calf is raised by the dam until gradual weaning around nine to 12 months of age (Albertsen and Held 2017; Reinhardt and Reinhardt 1981). During the preweaning period the calf is dependent upon milk from the mother and suckles several times a day (Reinhardt and Reinhardt 1981), drinking up to 13 l milk per day dependent on age (de Passillé et al. 2008). During the first days after birth, grooming and frequent vocalizations are exchanged between dam and calf, strengthening the bond between them. After introduction to the group, the calf increasingly interacts with other calves. This interaction with other members of the group is an important learning period for the calf where it e.g. forms social bonds, learns about grazing and which feed to consume (reviews by Cantor et al. 2019; Von Keyserlingk and Weary

2007). In conventional dairy calf rearing systems, the calf is separated from the dam shortly after birth (immediately or often within 24 h) and is raised individually or in pairs/groups. Individual rearing in single pens is the most common strategy depriving the calf of maternal care and social interactions (Cantor et al. 2019). In organic farming, single housing is only allowed during the first week of life. The calves are usually fed restricted amounts of milk. One common practice is to provide 10 % of the calf's body weight twice daily until weaning, which usually occurs at 8 weeks of age (Jasper and Weary 2002). This common practice, including early separation of cow and calf and restricted feeding of the calf, is being questioned mainly because of animal welfare concerns (Agenäs, 2017; Ventura et al. 2013). Practices more closely resembling the nutritional and social environment under natural conditions such as systems allowing longer cow-calf contact are being increasingly adopted by farmers and scientifically investigated (e.g. reviews by Johnsen et al. 2016, Meagher et al. 2019). However, our survey in Task 1.1 revealed differences between countries in types of cow-calf contact systems and extent of their adoption. It is therefore a question whether national differences in legislation may contribute to these differences.

Aim

The aim of this study was to compare current rules that affect calf rearing in organic dairy farming in seven European countries and to provide information on possible drivers and barriers for natural rearing systems (cow-calf systems). This information could be used to understand differences in calf rearing methods and to identify possible areas for improvement and/or harmonisation.

2 Methods

The inventory was performed through a questionnaire distributed to each of the seven consortium countries (SE, FR, PL, DE, IT, AT and CH) in order to identify similarities and differences in legal standards. The questionnaire covered the EU regulations (EC) No 834/2007, (EC) No. 889/2008, hereby referred to as EU regulations on organic farming, as well as national organic standards and private standards from organic associations. In addition, animal welfare legislation, e.g. EU regulation 1/2005 on the protection of animals during transport and related operations, and national rules, e.g. based on Directive 2008/119/EC laying down minimum standards for the protection of calves as well as milk hygiene regulations, were taken into account when they were relevant for systems practising calf rearing with mother contact and milk production. The comparisons of national rules were organized into five categories (Table 1).

Table 1. Categories of comparison of standards (national and EU legislation, national and private production standards)

Category				
Housing	Minimum demands for indoor areas	Minimum demands for outdoor areas	Requirements for indoor flooring	
Management	Management (dehorning)	Calving and cow-calf contact (with biological mother)	Keeping calves (outdoors)	Moving calves
Feeding	Feed and milk supply	Species specific behaviour while feeding		
Treatment and preventive herd health management	Treatment of unhealthy or injured animals (use of medication, phytotherapy, homeopathy, veterinarian etc.)	Preventive herd health management		
Milk hygiene regulation	Number of milkings	Definition of a milk output		

3 Results

For EU member states, the EU regulations on organic farming set the minimum standards, with Swiss regulation being largely harmonized. However, some countries also have stricter national provisions or private standards from organic associations in place. In addition, EU animal welfare legislation partly, but not completely harmonizes rules on calf transport and husbandry.

The national rules for each country involved in the study are listed in Table 2. In the following, first European and then deviating national rules are presented for each category of Table 1.

Table 2. National standards per country included in this study

Country	Standards
Sweden	Djurskyddslag SFS 1988:534 Djurskyddsförordning SFS 1988:539 SJVFS 2019:7, L5, om transport av levande djur SJVFS 2015:29 om ekologisk produktion och kontroll av ekologisk produktion Organic certification by KRAV 2018
Austria	Tierschutzgesetz (<i>BGBI. I Nr. 118/2004, last modified through BGBI. I Nr. 37/2018</i>) = animal welfare act Tierhaltungsverordnung (<i>BGBI. II Nr. 485/2004, last modified through BGBI. II Nr. 151/2017</i>) = animal welfare regulation. National interpretation of the EU regulations for organic production Organic certification by BioAustria (https://www.bio-austria.at/bio-bauern/beratung/richtlinien/bio-austria-richtlinien/bio-austria-richtlinien/) Organic certification by Demeter (https://www.demeter.at/richtlinien/) Richtlinie des Beirats für die biologische Produktion gemäß § 13 des EU-Qualitätsregelungen-Durchführungsgesetzes (EU-QuaDG) (in effect since 01.07.2018) = national interpretation of the EU regulations for organic production (https://www.verbrauchergesundheits.gv.at/lebensmittel/bio/biobeirat.html) Bundesgesetz, mit dem ein Tiertransportgesetz erlassen wird, und das Tierschutzgesetz und das Tierseuchengesetz geändert werden (<i>BGBI. I Nr. 54/2007</i>) = national transport act
Germany	Tierschutz-Nutztierhaltungsverordnung (2006; <i>BGBI. I p. 2043, last amended 30 June 2017, BGBI. I p. 2147</i>) = animal welfare regulation Tierschutzgesetz (2006, <i>BGBI. I pp. 1206, 1313, last amended 20 November 2019, BGBI. I S. 1626</i>) = animal welfare act National organic labels: Bioland (http://www.bioland.de/bioland/richtlinien.html), Naturland (http://www.naturland.de/de/naturland/richtlinien.html), Demeter (http://demeter.de/fachwelt/landwirte/richtlinien/gesamtausgabe) Verordnung zum Schutz von Tieren beim Transport und zur Durchführung der Verordnung (EG) Nr. 1/2005 des Rates (2009, <i>BGBI. I S. 375</i>), last amended 3 December 2015, <i>BGBI. I S. 2178</i>) = national transport regulation
Poland	Not specified (same as EU)
Italy	National guidelines for organic production based on the EU regulations (Italian Decree n. 18354 of November 27th 2009 and n. 3286 of August 5th 2016 laid out by the Italian Agriculture Ministry) Italian national rules and regulations (Italian Decrees, n. 146 of March 26th 2001; n. 18354 of November 27th 2009; n. 3286 of August 5th 2016)
Switzerland	Regulation on animal protection (TSchV, SR 455.1) Regulation on organic agriculture (BioV, SR 910.18) Regulation on milk hygiene (VhyM, SR 916.351.021.1) Bio Suisse-Regulation and Demeter regulation (private) Animal breeding regulation (TZV, SR 916.310)
France	National lecture guide for the application of regulations (N 834/2007 and 889/2008) by INAO (National Institute of Origin and Quality) Organic certification by the French Ministry of Agriculture Demeter: French organic association (private) Nature & Progrès: French organic association (private) Bio Cohérence: French organic association (private)

3.1 Housing

3.1.1 Minimum demands for indoor areas

The Commission Regulation (EC) No 889/2008 (Annex III, Table 1) stipulates detailed rules for the implementation of Council Regulation (EC) No 834/2007 on organic production and labelling of organic products and specifies minimum demands for indoor areas (Table 3).

Table 3. Minimum demands for indoor areas for cattle (Commission Regulation (EC) No 889/2008)

Live weight (kg)	m ² /animal
0-100	1.5
100-200	2.5
200-350	4.0
>350	5.0 (with a minimum of 1 m ² /100 kg)
Dairy cow	6.0

The minimum demand for indoor surface area in SE is divided into more narrow categories than in Table 3. For cattle in Sweden with a live weight of 60-90 kg, 1.7 m² per animal is needed). For cattle with a live weight of 90-150 kg and for adult dairy cows with calves, 2.2 m² and 8.5 m², respectively, is needed. Furthermore, in CH 3.5 m² (outdoor and indoor area together) are required for calves after the age of 10 days). In other live weight categories in CH, the rules are about the same as in the EU regulations. The private rules of Nature & Progrès in FR also demand higher space allowances for small calves (< 100 kg: 2m² versus 1.5 m²). For the other five countries, the national rules are equivalent to the EU specifications (no stricter measurements stated), but with some specific conditions stated for CH and DE (see specifications in Table 4). The Swedish standards are the only ones with specific reference to dairy cows and foster cows with calves under three months.

Table 4. Additional rules in national legislation regarding minimum demands for indoor areas

Country	Standards	Minimum demands for indoor areas
Austria, Italy & Poland	See Table 2	No specific rules beyond the EU regulations.
France	Nature & Progrès: French organic rules	2 m ² minimum per calf.
Germany	animal welfare regulation	For single housing: min. 120 x 80 x 80 cm (l/w/h). Area of group housing pen min. 4.5 m ² ≤ 8 weeks, 6 m ² > 8 weeks of age.
Sweden	Organic certification by KRAV, based on Swedish animal protection legislation (SL) as well as requirements of the EU regulation (EU)	<60kg 1.5 m ² (SL); <90kg 1.7 m ² (SL); <150kg 2.2 m ² (SL); <200kg 2.5 m ² (EU); <250kg 2.9 m ² (SL); <350kg 4.0 m ² (EU); >350kg >5 m ² (EU) Dairy cows and foster cows with calves <3months 8.5 m ² (SL)
Switzerland	Regulation on organic agriculture (BioV)	Calves: indoor and outdoor area together: 3.5 m ² Cows: Indoor and outdoor area together: 10 m ²

3.1.2 Minimum demands for outdoor areas

Minimum demands for outdoor areas in organic dairy production are laid down in Annex III, Table 1 in Commission Regulation (EC) No 889/2008 and are presented in Table 5. However, “in cases where herbivores have access to pasture during the grazing period and where the winter-housing system gives freedom of movement to the animals, the obligation to provide open air areas during the winter months may be waived” (Article 14.3). In tethered cattle (authorised by competent authorities for small holdings) access to the outdoor areas is required at least twice weekly beside pasture access during the grazing period (Article 39). In addition, cattle shall have access to pasturage for grazing whenever conditions allow (Article 14.2) and a maximum use of grazing pasturage according to the availability of pastures in the different periods of the year is demanded (Article 20.2).

Table 5. Minimum demands for outdoor areas (Commission Regulation (EC) No 889/2008)

Live weight (kg)	m ² /animal
0-100	1.1
100-200	1.9
200-350	3.0
>350	3.7 (with a minimum of 0,75 m ² /100 kg)
Dairy cow	4.5

In DE, IT and PL minimum demands for outdoor areas are equivalent to the EU regulations. Additional comments were made by AU and CH (Table 6). In the Commission regulation (EC) No 889/2008, there is no stipulated demand of keeping cattle on pasture. The additional pasture requirements in FR, SE and CH are described in table 6.

Table 6. Rules in national legislation regarding minimum demands for outdoor areas

Country	Standards	Min demands for outdoor areas
Germany, Italy, Poland & Switzerland	See Table 1.	No specific rules beyond the EU regulations.
Austria	National interpretation of the EU regulations for organic production	Outdoor areas have to be open on at least one side, they may be partly roofed. Outdoor areas may be alternately used by two groups of cattle (i.e. both groups get access to the outdoor area on the same day but at different times - no continuous access to the outdoor area).
France Sweden	Nature & Progrès Organic certification by KRAV	Minimum 5 months on pasture Dairy cattle more than 4 months old should be kept on pasture (more than 12h a day) during the grazing period (2-4 months depending on region).

Switzerland	Regulation on organic agriculture (BioV)	Calves up to 100 kg: 3.5 m ² : 1 m ² uncovered. Calves up to 300 kg: 4.5 m ² total space, 1.3 m ² uncovered Calves up to 400 kg: 5.5 m ² total space, 1.5 m ² uncovered Heifers > 400 kg: 6.5 m ² total space, 1.8 m ² uncovered Access to pasture is mandatory for all categories on 26 days/month in the vegetation period Cows: loose housing: 2.5 m ² per animal uncovered plus pasture in summer on 26 days/month Tethered cows: 8.4 m ² area per cow for horned and 5.6 m ² for dehorned cows, access during winter on 13 days/month, plus pasture in the vegetation period on 26 days/month (25% of intake have to be eaten on pasture)
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3.1.3 Requirements for indoor flooring

Commission Regulation (EC) No 889/2008 states that “*Livestock housing shall have smooth, but not slippery floors. At least half of the indoor surface area shall be solid, that is, not of slatted or of grid construction*”. Additional rules in national legislation regarding slat width was reported from AT, DE and SE (Table 7). According to national organic regulations in FR, at least 75% of the indoor surface area must not be of slatted or of grid construction.

Table 7. Rules in national legislation regarding indoor flooring

Country	Standards	Requirements for indoor flooring
Italy & Poland	See Table 1.	No specific rules beyond the EU regulations.
Austria	Animal welfare act and regulation	If slatted floors are used, max. gap width is 25 mm (30 mm if kept with cows), wooden slats may not be installed anymore.
France	Bio Cohérence: French organic rules	At least 75% of the indoor surface area shall be not of slatted or of grid construction.
Germany	Animal welfare regulation	Grippy and non-slippery; slatted floors with max. 25 mm gap width (30 mm if bars are covered with elastic material); slats width min. 80 mm.
Sweden	Statens jordbruksverks föreskrifter och allmänna råd om nötkreaturshållning inom lantbruket m.m.; (L104)	Calves <90 kg: Max slot width 25 mm. Young stock 90-400 kg: Max slot width 30 mm. Adult animals: Max slot width 35 mm. Max open proportion: 28%.
Switzerland	Specification see table 1.	Lying area with bedding material (calves): 1 m ² per calf up to 3 weeks; 1.2-1.5 m ² per calf from 4 weeks to 4 months

3.2 Management

3.2.1 Management (dehorning)

Dehorning shall not be carried out routinely in organic farming (Regulation (EC) No 889/2008, Article 18.1). However, dehorning may be authorized by the competent authority for reasons of safety or if intended to improve the health, welfare or hygiene of the livestock on a case-by-case basis. Any suffering of the animals shall be reduced to a minimum by applying adequate anesthesia and/or analgesia and by carrying out the operation only at the most appropriate age by qualified personnel. National rules and regulations regarding dehorning can be found in Table 8.

Table 8. Rules in national legislation regarding management (dehorning)

Country	Standards	Management (dehorning)
Poland	See Table 1.	No specific rules beyond the EU regulations.
Austria	Animal welfare act and regulation	In calves up to 6 weeks of age by a competent person using sedation, local anesthesia (by veterinarian) and post-surgical pain treatment or in any age by a veterinarian using sedation, local anesthesia and post-surgical pain treatment.
France	Organic label: Demeter Organic labels: Demeter, Nature & Progrès, Bio Cohérence	Dehorning is not allowed. Demeter: Dehorning and dehorned animals are prohibited. Nature & Progrès: Dehorning is prohibited. Bio Cohérence: Disbudding is the only method allowed for dehorning, and should not be systematic.
Germany	Organic labels: Bioland, Naturland, Demeter Animal welfare act	Bioland/Naturland: disbudding only with authorisation from competent authority (as for all organic German farms, although derogation procedure varies between Federal States); anaesthetics and pain treatment mandatory. Disbudding by caustic paste not allowed (as in general in Germany). Genetically polled cattle preferred. Demeter (bio-dynamic): Disbudding and keeping genetically hornless dairy cattle is in principle not allowed (polled suckler breeds excepted). Purchase of a single dehorned animal (e.g. breeding bull) is possible. Anaesthesia must be performed by a veterinarian, disbudding by qualified person (e.g. farmer).
Italy	Italian national rules and regulations (Italian Decrees, n. 146 of March 26th 2001; n. 18354 of November 27th 2009; n. 3286 of August 5th 2016)	Dehorning should be carried out under the supervision of Vet officer of the National Health Authority (Italian Decree, n.3286 of August 5th 2016) and is allowed within 3 weeks of age (Italian Decree, n. 146 of March 26th 2001).

Sweden	SJVFS 2015:29 om ekologisk produktion och kontroll av ekologisk produktion, kap. 3, 14§	Within 8 weeks using a hot-iron and by qualified personnel.
Switzerland	Regulation on animal protection (TSchV), Regulation on organic agriculture (BioV), Bio Suisse-Regulation;	Same as EU-regulation. In addition: calves have to be locally anaesthetised and provided with analgesics when they are disbudded. Up to the age of 3 weeks this can be done by especially trained animal keepers. Demeter (bio-dynamic): Disbudding and keeping genetically hornless dairy cattle is in principle not allowed (polled suckler breeds accepted).

3.2.2 Calving and cow-calf contact (with biological mother)

The EU regulations on organic farming do not contain any specific rules on calving and cow-calf contact. The Directive 2008/119/EC for the protection of calves only stipulates that “each calf must receive bovine colostrum as soon as possible after it is born and in any case within the first six hours of life” (Annex I (15)). Consequently, no deviations were found in four of the seven consortium countries (i.e. AT, FR, IT, and PL), but SE, CH and DE reported additions (Table 9).

Table 9. Rules in national legislation regarding calving and cow-calf contact

Country	Standards	Calving and cow-calf contact
Austria, Italy & Poland	<i>See Table 1.</i>	<i>No specific rules.</i>
France	Organic label: Nature & Progrès	Free suckling by the mother during the first days of life is recommended.
Germany	Organic labels: Bioland, Naturland, Demeter	Bioland: The calves should stay with the mother for at least 1 day after birth. Naturland: Recommendation to allow the calf to suckle from the mother cow in the first days after birth (calving pen).
Sweden	Animal welfare regulation Organic certification by KRAV 2018	Each calf must receive colostrum within 4 hours after birth Cows shall calve separated from other animals. Calving indoors should be performed in calving pens. Calving on deep litter with the rest of the cows is only allowed if the calving is monitored.
Switzerland	Regulation on animal protection (TSchV), Regulation on organic agriculture (BioV), Bio Suisse-Regulation;	Calf and cow can stay together in a calving pen without an outdoor run for not more than 10 days. All animals must be able to show their species-specific behaviour while feeding

3.2.3 Keeping of calves (outdoors)

Calves are to be kept in groups. The housing of calves in individual boxes shall be forbidden after the age of one week (Regulation (EC) No 889/2008, Article 11.3). There are no specific rules on keeping of calves outdoors in the EU regulations. No specific rules were reported

from IT or PL. For the remaining five consortium countries additional standards were reported and consist of among others; shelter from adverse weather conditions, housing in single pens vs. group boxes and the need for outside access (Table 10).

Table 10. Rules in national legislation regarding keeping of calves (outdoors)

Country	Standards	Keeping calves (outdoors)
Italy & Poland	See Table 1.	No specific rules beyond the EU regulations.
Austria	Animal welfare act and regulation	When keeping calves outdoors, calves have to be provided with a shelter that is closed on three sides and animals have to be protected from adverse weather conditions.
	National interpretation of the EU regulations for organic production	Calves may be kept individually for health or behaviour reasons (e.g., risk of disease transmission, intersucking) up to an age of 8 weeks, the reasons have to be approved by a veterinarian.
France	Organic label: Demeter	Dairy cows and calves kept with their mother for suckling must have access to pasture in summer, or an outdoor access year-round.
Germany	Animal welfare regulation	No tethering of calves (< 6 months), only for max. 1 hour each during feeding in group housing.
Sweden	Organic certification by KRAV 2018	Calves older than 4 months shall have outdoor access with hutches or other protection.
Switzerland	Regulation on animal protection (TSchV), Regulation on organic agriculture (BioV), Bio Suisse-Regulation.	Exception from group housing after one week of age: calves in igloos where they have an outdoor run and can see each other; for 8 weeks (Bio Suisse)

3.2.4 Transport of calves

Transportation of calves is not included in the EU regulations on organic farming. However, Council Regulation (EC) No. 1/2005 on the protection of animals during transport and related operations states that: long journeys are only permitted for domestic animals of bovine species if: calves are older than fourteen days, except accompanied by their mother (Annex I, Chapter VI, 1.9). “Animals that are injured or that present physiological weaknesses or pathological processes shall not be considered fit for transport” and in particular if: they are calves of less than ten days of age, unless they are transported less than 100 km (Annex 1, Chapter I, 2(e)). Four of the seven consortium countries (i.e. AT, CH, DE and SE) reported to have additions in national legislation regarding transportation of calves whereas the remaining three countries reported no specific rules deviating from the EU transport regulation (Table 11).

Table 11. Rules in national legislation regarding moving/transportation of calves

Country	Standards	Moving/transportation of calves
France, Italy, Poland	See Table 1.	No specific rules beyond EU transport regulation.
Austria	National transport act	4.5 h maximum duration of national transports
Germany	National transport regulation	Calves < 14 days of age may not be transported nationally
Sweden	SJVFS 2019:7, L5, om transport av levande djur	A calf has to be at least 14 days old and the umbilicus has to be fully healed before transportation.
Switzerland	TSchV	Animals are not allowed to be transported longer than 6 hours

3.3 Feeding

3.3.1 Milk and feed supply

Calves should be fed maternal milk in preference to natural milk for at least three months (Regulation (EC) 834/2007, Article 14.1(d) (VI); 889/2008, Article 20.1). The Directive 2008/119/EC for the protection of calves further stipulates that “all calves must be fed at least twice a day. Where calves are housed in groups and not fed ad libitum or by an automatic feeding system, each calf must have access to the food at the same time as the others in the group”. Their “food must contain sufficient iron to ensure an average blood haemoglobin level of at least 4,5 mmol/litre, and a minimum daily ration of fibrous food for each calf over two weeks old”. At least “from 50 g to 250 g per day for calves from eight to 20 weeks old” must be provided. “All calves over two weeks of age must have access to fresh water or other liquids. However, in hot weather conditions or for calves which are ill, fresh drinking water must be available at all time.” “Feeding and watering equipment must be designed, constructed, placed and maintained so that contamination of the calves’ feed and water is minimized.” Furthermore, calves may not be muzzled.

With the exception of periods of transhumance (subject to Article 17.4), at least 60 % of the feed on organic farms shall be produced on the farm itself. In case this is not feasible, forage can be produced in cooperation with other organic farmers in the same region (Regulation (EU) 505/2012, amending Regulation (EC) 889/2008, Article 19). Synthetic vitamins A, D and E, if identical to vitamins derived from agricultural products may be used for ruminants; the use is subject to prior authorization of the Member States based on the assessment of the possibility for organic ruminants to fulfil their requirements through their feed rations (Regulation (EU) 673/2016, amending Regulation (EC) 889/2008, Annex VI, Vitamins and provitamins). In general, feed must be of 100% organic origin (Regulation (EC) 889/2008, Article 43). Additional national rules regarding feed supply were reported from DE and CH (Table 12).

Table 12. Rules in national legislation regarding milk and feed supply

Country	Standards	Milk and feed supply
Austria, Italy, Poland & Sweden	See Table 1.	No specific rules beyond the EU regulations.
Germany	Organic labels: Bioland, Demeter	Demeter: Ruminants shall be fed at least 3 kg DM hay/day per livestock unit during the period when they are not grazing. Pure silage feeding in relation to the daily ration is excluded. Demeter, Bioland: The summer feeding of all roughage eaters must predominantly (> 50 % DM) contain green fodder in the daily ration, provided the weather permits. Roughage supply for calves ad libitum at latest after 7th day of life, water access ad libitum at least after 2 weeks of life.
Switzerland	Regulation on animal protection (TSchV), Regulation on organic agriculture (BioV), Bio Suisse-Regulation;	Cows have to pasture during the vegetation period on 26 days per month and eat there at least 1/4 of the whole ration. 90% of feed (yearly ration) has to be roughage; not more than 10% concentrates for cows and calves (Bio Suisse). Bought-in feed from organic farms is allowed.

3.4 Treatment and preventive herd health management

3.4.1 Treatment of unhealthy or injured animals (use of medication, phytotherapy, homeopathy, veterinarian etc.)

Phytotherapeutic, homeopathic products and trace elements shall be used in preference to chemically-synthesized allopathic veterinary treatment or antibiotics, provided that their therapeutic effect is effective for the species of animal, and the condition for which the treatment is intended (Regulation (EU) 889/2008, Article 24.2). The withdrawal period after the last administration of an allopathic veterinary medicinal product is double, compared to the legal withdrawal period as referred to in Article 11 of Directive 2001/82/EC (Regulation (EU) 889/2008, Article 24.5). None of the participating countries reported any additions to the EU regulations on this aspect.

3.4.2 Preventive herd health management

The use of chemically synthesized allopathic veterinary medicinal products or antibiotics for preventive treatment is prohibited (Regulation (EU) 889/2008, Article 23.1). According to the Directive 2008/119/EC for the protection of calves all housed calves must be inspected at least twice daily and calves kept outside must be inspected at least once daily. If an animal is sick or injured it shall be treated immediately and if necessary be isolated in adequate accommodation with dry, comfortable bedding, and (as stated above) phytotherapeutic, homeopathic products and trace elements shall be used in preference to chemically-synthesized allopathic veterinary treatment or antibiotics, provided that their therapeutic effect is effective for the species of animal, and the condition for which the treatment is intended. If these measures “is not effective in combating illness or injury, and if treatment is essential to avoid suffering or distress of the animal, chemically synthesized allopathic veterinary medicinal products or antibiotics may be used under the responsibility of a veterinarian”

(Regulation (EU) 889/2008, Article 24.3). Records must be kept about diagnoses, treatments and details of any animals lost and reasons thereof (Article 67).

Regarding preventive measures DE and SE reported additions to the EU regulations (Table 13).

Table 13. Rules in national legislation regarding preventive herd health management

Country	Standards	Preventive herd health management
Austria, France, Italy, Poland	See Table 1.	No specific rules beyond the EU regulations.
Germany	Animal welfare act	Animal welfare self-assessments must be carried out using animal-based welfare measures (but no further details on scope, methods, and documentation).
Sweden	Organic certification by KRAV 2018	Prior to the use of antibiotics (against mammary infections) and the use of anthelmintics milk samples and faeces samples have to be analysed to identify the need and the adequate remedy.
Switzerland	Bio Suisse regulation	Prior to the use of antibiotics against mammary infections, milk samples have to be analysed and adequate antibiotics have to be chosen Prior to the use of anthelmintics, faeces samples have to be analysed to identify the need and the adequate remedy

3.5. Milking and performance testing

Only in Switzerland the Regulation on milk hygiene (VhyMP) states explicitly that milk is the whole milk output of a milking of one or several cows that are regularly milked with unvaried contents. Also in Germany it is defined that during milking the udder has to be emptied completely, but there is no remark on milk contents. All dairy farms in Switzerland with cow-calf contact get in conflict with this regulation, because quite often cows nursing a calf don't let down all the milk during milking and therefore usually show altered, not normal fat contents in their milk. Some farmers don't convert to a dam rearing system because of this obstacle. But there is a political process ongoing in Switzerland with the aim to change that regulation. Another obstacle is the inaccuracy of data during performance testing. Farmers who are also breeders and aim to sell breeding animals claim the problem that – because of the regulations on animal breeding (TZV) and performance testing in Switzerland they are not allowed to skip performance testing for the first few months of lactation therefore cows nursing a calf always get irregular and unrealistic results.

General discussion

This study aimed to capture variations in national legislation that affects organic calf rearing with the purpose of providing information on drivers or barriers for natural rearing systems (cow-calf systems) in seven European countries. The compilation shows that there are certain variations in national rules concerning organic production in Europe in the areas of housing and management including feeding. Between the seven consortium countries, the number of more extensive rules furthermore varied from no or nearly no to additional standards in almost every area. In previous studies, regional and national variations in EU organic dairy farming regarding herd characteristics and management have been presented (Sørensen et al. 2006; Krieger et al. 2017; Wallenbeck et al. 2018). Wallenbeck et al. (2018) associated these variations not only with differences in the overall conditions for organic dairy farming, but also with differences in regulations between countries and regions. Krieger et al. (2017) studied organic dairy production in Europe and found large differences, not only regarding herd characteristics and management, but also in disease prevalence. Krieger et al. (2017) concluded that there is a risk that many dairy producers may not provide the management needed to ensure a good animal welfare and that it is important to harmonize national legislations and management in organic dairy production.

Calf rearing is an important area concerning the health and behaviour of dairy cows and their young, but received relatively little attention in the past. Proponents of early cow-calf separation (conventional rearing) argue that separation benefits the health of the calf in that the calf can be moved to a clean area providing a means to break disease transmission and making it easier to have good routines for the delivering and monitoring of colostrum intake (Ventura et al. 2013). However, other studies and reviews question this view (Beaver et al. 2019) and claim possible short- and long-term advantages of dairy cow-calf contact systems regarding the opportunity to perform natural behaviour, body development, health, performance, social and cognitive skills (e.g. Johnsen et al. 2016; Korst et al. 2017; Cantor et al. 2019; Meagher et al. 2019). In addition, these systems appeal to consumers (Busch et al. 2017). Thus, dairy cow-calf contact systems are receiving more and more attention in farming practice and the scientific community. Our survey in Task 1.1 showed that there are farmers already practicing dam rearing for nearly 30 years, but a wider interest from practice and scientists developed only recently, also reflected by the great number of current reviews cited above. At this stage it appears important to examine whether current legislation may hinder or promote this development.

One result of the present study is the virtual absence of rules in the EU regulations on organic farming concerning the rearing of calves. One exception is the requirement to feed calves natural milk (and preferably maternal milk) for the first 3 months of life, which makes cow-calf contact during this time less costly for organic farmers than for farmers who are allowed to feed cheaper milk substitutes. However, also side effects of regulations of other housing or management aspects are possible. These come mainly from animal welfare rules such as the Directive 2008/119/EC for the protection of calves which is implemented by respective national legislation. For example, its requirement that feeding and watering equipment must

be protected from soiling may lead to the necessity of a calf creep to which the adult cows do not have access. Furthermore, use of muzzles for the purpose of weaning is not allowed. Specifications in some national legislation (e.g. AT and DE) regarding slatted floors for calves (e.g. gap widths of no more than 25 mm or 30 mm) may pose a problem for some dairy farms with slatted floors in the cow barn with wider gaps. Otherwise cow-calf contact in loose housing systems can most likely be implemented without major impediments. Furthermore, differences between countries in the adoption of this more natural rearing method are likely not due to differing legislation in this area.

Conclusions

We conclude that there are no major barriers in national rules in the seven countries involved in this study, for the use of cow-calf systems in organic dairy production. Cow-calf contact is promoted by the requirement to feed organic calves preferably maternal milk during the first three months of their life. Otherwise more specifications regarding calf rearing come from welfare legislation than from the regulations of organic farming. Variations in national legislation can affect details of design and implementation of cow-calf systems, however, it seems that other factors (e.g. overall conditions for organic dairy farming, tradition, economics and disease prevention strategies) rather than regulations play more important roles.

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