Final report

for the CORE Organic Cofund funded project

"Innovative and sustainable grazing-based systems integrating cows and youngstock; GrazyDaiSy "

Period covered: 1st April 2018-30th September 2021

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Project period: December 2016 - May 2022

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1. General information

1.1 Project information

Project information			
Project acronym	GrazyDaiSy	**Project ID**	1871
Project title	Innovative and sustainable grazing-based systems integrating cows and youngstock		
Project website	https://projects.au.dk/coreorganiccofund/core-organic-cofund-projects/grazydaisy/		
Details of the project coordinator			
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Institution	Aarhus University	**Country**	Denmark
Start of project	1st April 2018	**End date of project**	31st March 2021
Duration in months	(36) 42	**New end date in case of a project extension due to COVID-19**	30th September 2021

1.2 Consortium

Partner no.	Country	Institution/ organisation name	Type of institution/ organisation[1)]	Functions[2)]	Involved in WPs	Contact person[3)]
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12	DK	OD	OD + Them became sub-contractors in AU's budget with co-finance from AU, due to change of funding body in Denmark, after time of application (explained at time of midterm-report; Annex 5 attached to final report too).			
13	DK	THEM				
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1) University, Public research centre, Private research centre, Company, Other

2) PC = Project coordinator, WPL = Work package leader, WPCL = Work package co-leader, P = Participant

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2. Summary

2.1 Final project summary suitable for web publication for a wider audience

Organic dairy farming is based on grazing systems and with a strong focus on health promotion, but many organic farms search for solutions to rely less on imported concentrate feed, as well as the use of antibiotics and anthelminthics. Most calves are removed from their dam one day after birth, despite emphasis on naturalness. GrazyDaiSy was built on the aim to develop innovative, resilient and sustainable organic grazing-based dairy systems, and make a better integration of cows and their calves, e.g. allowing mother-infant contact, and to promote health to minimize anthelminthic and antibiotic use. GrazyDaiSy was based on participatory on-farm research, and used an interdisciplinary approach. The project consisted of four work packges, which were: 1) Novel innovative grazing systems, 2) Sustainable maternal care, bonding and debonding between dam and calf, 3) Effective novel animal health and welfare promotion, and 4) Strategies and practices for resilience in a range of European dairy systems. A cross-cutting focus of GrazyDaiSy was on perceptions, visions, and barriers related to transition and use of novel strategies, as well as their daily practices, mostly focused on CCC systems, but also more broadly. Based on interview with farmers and other actors, perceptions, visions, barriers and experience was analysed in relation to views from the cow, the calf, the system and the human actors, emphasizing nutrition, care and learning aspects of dam-rearing and CCC systems. Case studies and interviews were analysed using change and transition theories in a range from behavioural and motivational individual change to community of practice and larger transition theories, and concluded that all levels of change needs to be considered when making radical systemic changes in well-established dairy sectors.

GrazyDaiSy researched the use of semi-natural to natural pastures and the results demonstrated a great potential contribution of the forage on semi-natural to natural pastures to forage (protein) supply to grazing lactating cows on organic dairy farms in Europe. In Estonia, e.g., the share of grass in the diets of lactating cows was estimated to be up to 76.7% of the DM consumed during the grazing season. This depends of course on available pasture area and the extent of its use, and there is a great diversity of organic dairy farms differing in farm size and structure, agro-ecological conditions, and pasture, herd, and grazing management strategies. Timing, farmer strategies and environmental and other conditions influence the outcome. Timely adjustment of the onset and frequency of grazing, of the stocking densities on pastures, as well as of the amount and timing of supplement feeding appear to be valuable options for an improved pasture use, whereas the rotation scheme, the duration of daily pasture access, and the type of supplement feed appeared to be of less importance. Observed climate change related issues such as extreme heat and dry weather, called for urgency and the project team focused particularly on strategies addressing these issues.

GrazyDaiSy had a strong focus on rearing calves with the dam for an extended period after calving, compared to the practice in most organic dairy farms. One particular focus was male calves, which should be transferred to a fattening farm. Trials showed that keeping calves until 4 weeks of age with the dam at the dairy farm led to improved weights and immune competence at arrival at the fattening farm. Although dam-rearing weight and immune system advantages did not seem to translate to better health at the fattening farm, these calves benefitted from a reduced prevalence of treatments with medicines. Providing hides on pasture to dairy cows show that cows calving for the first time move further away from herd members at calving, and seemed to prefer to isolate themselves more through distance. Results suggested that hides facilitated maternal bonding. Furthermore, it seemed that dams showed more affiliative behaviour to their calves when having full-time cow-calf contact (CCC), rather than part-time contact, later than 48hrs after calving, and that the bond between cow and calf became stronger when the calf suckled the cow, compared to contact without suckling. Environmental and economic dimensions of sustainability of CCC systems were analysed using models based on data, lining up different scenarios with CCC, and concluding that the higher amount of milk drunk by the calves in these systems, influenced the environmental impact of these systems. However, it also called for a broader focus on systems changes and inclusion of other factors such as animal welfare and biodiversity, and a more combined view on dairy herds as milk and meat producing.

In GrazyDaiSy, animal health and welfare promoting strategies were researched through observational case studies, and repeatedly demonstrated the importance of context to analyse problems and find solutions, which allowed for co-learning across countries, until activities were partly interrupted due to Covid-19. The difference in management antibiotics was very big, within the frame of EU organic legislation. A strong focus was on calf and heifer health in innovative dairy systems with nurse cows, based on grazing. Cryptosporidiosis was and identified problem, but seemed to be less serious than traditionally reared calves, especially in the mixed grazing systems, where resistant (nurse cows) and susceptible calves grazed together, and they also seemed to avoid problems with intestinal parasites, and were immunised at the second grazing season when they had spent their summer as young calved on grass.

2.2 Process update of the whole project

GrazyDaiSy was built on the aim to develop innovative, resilient and sustainable organic grazing-based dairy systems, and contribute to making a better integration of cows and their calves, e.g. allowing mother-infant contact, and to promote health to minimize anthelminthic and antibiotic use. GrazyDaiSy was based on participatory on-farm research, and used an interdisciplinary approach in its four work packges: 1) Novel innovative grazing systems, 2) Sustainable maternal care, bonding and debonding between dam and calf, 3) Effective novel animal health and welfare promotion, and 4) Strategies and practices for resilience in a range of European dairy systems. With its cross-cutting focus, GrazyDaiSy included research on perceptions, visions, and barriers related to transition and use of novel strategies, as well as their daily practices, mostly focused on CCC systems, but also more broadly. In this way, the GrazyDaiSy project was a highly ambitious and complex project, which was based on bringing partners together in a young consortium, where some partners met each other for the first time at the kick-off-meeting. Our collaboration was developed in a multidisciplinary team and fashion, using natural and social scientific methods, and combining different specialisations. Furthermore, we worked across different fields (health, reduced medicine use, cow-calf-contact and grazing), which can be seen as intimately connected, when viewed from a holistic perspective, but which in terms of scientific specialisations can also be viewed as widely different. This partly succeeded, because a lot of interesting results and interactions came out of it, and looking at the dissemination plan list: also a huge amount of products in terms of written contributions, presentations and workshops. Importantly, too, was that most of the partners stated or explained by the end of the project that new angles, thoughts, methods and/or insights had been inspirational for themselves as well as their institutions.

We must also conclude that we did not reach entirely everything, which we had set out to reach, and some ambitions were higher than what we turned out to achieve. We had organised a project, which was highly dependent on interactions. Most activities were built on on-farm research, and stakeholder engagement. We had organised 'learning exchange visits' between countries, where researchers, farmers and actors from one country should visit another, and exchange should happen, within all the focus areas of the project: grazing, health promotion + medicine reduction and cow-calf systems. However, only one of the learning trips succeeded before the Covid-19 situation overwhelmed all partners. It is not a surprise that a project based on such structures and elements would be severely challenged by the pandemic, and in long periods between early March 2020 to the end of the project, meetings in person were impossible, as well as on-farm research, and travels between countries were never carried through. This explains why consortia meetings, write-shops, and stakeholder meetings were not held, and interviews, farm-activities were postponed, re-planned or carried through under restrictive conditions. A very serious impact was made on the common analysis and writing processes between consortium partners, because we all had relatively little knowledge about each other and each others' contexts, and no previous experience in collaborating. Consequently, many ambitions to be together to analyse, write and discuss, could not happen. In some cases, in-person meetings are almost necessary to gain mutual understanding, and since some consortium members had very little knowledge and experience regarding organic agriculture, and came from a huge range of contexts (N, Tr, EE, D, F, Dk, NL, Pl), much effort was needed to understand and commonly interpret findings in their context. Although we reached far through virtual meetings, we also had to give up some ambitions of combining data and conduct analyses together.
As can be seen under each WP description, all partners and WPs have reached important conclusions and milestones of importance for their contexts, in combination with having brought insights through the

interaction with partners and across contexts, into their own research and interaction with stakeholders. Some of the outcomes went beyond the ambitions and reached further than originally planned, or came up with new angles to the issues.

- The analysis of change and transition perspectives related especially to changes of dairy farming to implement CCC systems brings in new angles, which emphasis the necessity of acknowledging the structural changes in farming and food systems, far beyond 'motivation of farmers'.
- New tools were brought into action, such as e.g. actually conducting a participatory on-farm test in WP1 of a set of grazing management tools, which were related to the choice of animal breed and the supplement feeding of cows.
- Different pasture rotation schemes as well as durations and timings of pasture access were evaluated.
- The collaboration on discussing issues of resilience and diversity across animal related CORE Organic projects, and the joint WS just before the end of projects, held in collaboration between ProYoungStock and GrazyDaiSy was a major achievement with many mutual inspirations.

3. Outcomes of the project

3.1. Main results, discussion, conclusions and fulfilment of objectives

WP1	*Novel grazing systems*

WP leader: Uta Dickhoefer (UHOH)
Responsible partners: UHOH (DE), Bioland BBG (DE), Demeter (DE), NRIAP (PL), EMU (EE)

Overall summary of main results, discussion and conclusions of WP1

Results of WP1 demonstrate the great potential contribution of the forage on semi-natural to natural pastures to forage (protein) supply to grazing lactating cows on organic dairy farms in Europe, depending on available pasture area and the extent of its use. There is a great diversity of organic dairy farms differing in farm size and structure, agro-ecological conditions, and pasture, herd, and grazing management strategies. The combination of environmental factors determines the efficiency of the use of available pasture forage and its contribution to feed intake and milk performance of dairy cows. Hence, there is no one-size-fits-all grazing system, which generally enhances yield and use of forages on (semi-)natural pastures. Instead, pasture, grazing, and herd management strategies need to be coordinated closely and adapted to agro-ecological situations, prevailing weather conditions, vegetation and animal physiological status, as well as farmers' objectives. Timely adjustment of the onset and frequency of grazing, of the stocking densities on pastures, as well as of the amount and timing of supplement feeding appear to be valuable options for an improved pasture use, whereas the rotation scheme, the duration of daily pasture access, and the type of supplement feed appear to be of lesser importance. In Estonia, it was estimated that the share of grass in the diets of lactating cows was between 60.6 and 76.7% of the DM consumed during the grazing season. Mainly rotational grazing systems were used in the five case farms, and the main differences were related to paddock size, rotation length and the stocking density. A closer monitoring of quantity and quality of available herbage on pastures and of the animals' forage intake and performance is needed to efficiently and sustainably use the pasture forage resources and to increase robustness of grazing-based organic dairy systems. Comparing the results across the countries emphasized the importance of context relevant strategies, as well as involvement of farmers and advisors to understand and create solutions. The urgency of climate change related issues as shown in the first project year with extreme heat, partly changed original research ideas in favour of addressing urgent issues for the farming sectors in particular in Germany and Estonia.

Report on the results obtained (A), and fulfilment of objectives (B) comparing to the original project proposal

A- results obtained and structured in relation to the user groups they are relevant for:

Pasture use is a central element of organic dairy cattle farming and is associated with numerous advantages, such as the conversion of local, inedible feed resources into high-quality food, improved

animal health, a high level of animal welfare or the protection of biodiversity and cultivated landscapes. While lots of research has been on productivity and use of improved, cultivated grasslands, limited knowledge exists related to the contribution of natural and semi-natural pastures to dairy cattle nutrition. Forage biomass yields of the vegetation on (semi-)natural unimproved pastures is often lower and its botanical composition is commonly more diverse. The performance of dairy cows on these pasture locations is therefore lower than that of animals on improved grassland and it is difficult to predict their nutrient and energy intake from pasture forage. The latter, however, is a prerequisite for an efficient and sustainable use of these feed resources, an optimized grazing management, and a supplement feeding of animals according to their requirements. The consequences of climate change with lower and more variable precipitation and higher ambient temperatures exacerbate these challenges and go hand in hand with significant fluctuations in plant growth, in the botanical composition and the nutritional value of the pasture vegetation. Hence, the potential contribution of such pastures to organic dairy cattle feeding needs to be assessed and innovative grazing systems developed to increase productivity and resilience of pastures and cattle, enhance robustness of organic dairy farms, and maximize local forage protein supply.
In the **first phase** of the project, **semi-quantitative face-to-face or online interviews** partly combined with spot-sampling of pasture forage and animal parameters were conducted on organic dairy farms in Germany (28 face-to-face interviews, and 18 farms with sampling and available data), Estonia (20 online-interviews and 3 in-depth interviews with sampling), and Poland (20 farms involved) in 2018. Information from Germany and Estonia was complemented with data from official databases. Farms were characterised with respect to their farm size and structure as well as their herd and grazing management. Animal productivity, forage supply and use, and forage self-sufficiency were assessed on the organic dairy cattle farms in diverse agro-ecological conditions, with emphasis on the dry year 2018. Factors that influence the contribution of the pasture forage to feed intake and milk performance of dairy cows and the efficiency of its use were analysed.
There was a great diversity of organic dairy cattle systems varying in land endowment and use, available pasture area, as well as their grazing and herd management strategies (Dickhoefer et al. 2021a,b; Egle et al. 2021). Similarly, the amount and quality of pasture growth as well as the feed consumption and performance of the animals varied greatly between farms (Velasco et al. 2019; Dickhoefer et al. 2021; Velasco et al. 2021). However, analysis in Germany showed, that they did not differ between individual farm types, pasture systems, or pastures with different species composition of the vegetation (Dickhoefer et al. 2021a,b). There was also no correlation between precipitation and the amount and quality of forage biomass on pastures, and hardly any other correlations between weather, management, pasture, and animal characteristics (Dickhoefer et al. 2021 a,b). This indicates that it is not individual, but a combination of various factors and their interactions that determine the availability and nutritional value of the pasture herbage, the feed intake and performance of the cows as well as the milk yield from the pasture (Dickhoefer et al. in prep.; Perdana-Decker et al. 2021; Perdana-Decker et al. in prep.). Rainfall and thus forage availability were below average during the growing season in 2018, so that in particular in farms, in which dairy cattle feeding is largely grazing-based, valuable winter feed resources had to be used already during summer (Dickhoefer et al. 2021 a,b; Egle et al. 2021). Nevertheless, daily forage intake on pastures accounted for a considerable share of dairy cows' total feed intake. Most farms were able to produce a relevant proportion of milk from the pasture forage, highlighting its great potential to contribute to dairy cattle feeding, even in dry years and on semi-natural, permanent pasture sites (Dickhoefer et al. 2021a,b; Egle et al. 2021). In the **second phase,** grazing studies were established in a participatory approach on seven farms in Germany in spring 2019 to analyse the yield, nutritional quality, and botanical composition of pasture vegetation as well as the grazing behaviour, forage (protein) intake, and milk yield and composition of lactating dairy cows during early and late grazing season. In Estonia, in 2019, grassland productivity, nutritional value and grazing management were studied in 5 selected organic dairy farms. The farms were located in South and West part of the country and were characterised as main organic milk producers in Estonia. As an average, the farms had 432 ha (197 to 791) of agricultural land and 111 (87 to 152) dairy cows.

In Germany, based on the results from 2019, foci of these grazing studies were adjusted together with farmers and advisors for further on-farm trials in the **third phase** in 2020. Special focus was on forage availability and use in short-grass grazing systems and on elements of meal grazing such as the choice of

animal breed or the timing and type of supplement feeding. Annual yields and growth rates on pastures forage varied between farms and years, which can at least partly be explained by differences in site and weather conditions. Daily forage growth rates steadily and available herbage mass on pastures varied between seasons, suggesting that intensity of pasture use and/or of supplement feeding is not well adjusted to growth and nutritional quality of pasture forage (Velasco et al. 2021). Hence, a closer **adjustment of the intensity and frequency** of grazing and/or of the supplementation level to available herbage is needed, in particular in the short-grass grazing systems. Feeding good-quality **grass hay vs. grass clover** did not reduce total feed intake, feed intake on pasture, or milk yield of animals (Perdana-Decker et al. 2021; Velasco in prep.). Hence, grass hay can almost completely replace grass-clover mixtures in grazing dairy cattle without adversely affecting efficiency of pasture forage use. However, **supplementation before than after grazing** of the majority of grass hay or of concentrate mixtures reduced forage intake of cows on pasture, with no effects on milk performance (Velasco in prep.). Instead, there were no or only minor differences between **cattle breeds** in feed intake, grazing behaviour, and milk yield from pasture of Simmental and Brown Swiss cows. In Estonia, in the year 2020, approx. 35% of the country's total organic milk was produced in the 5 selected case farms. However, the Covid-19 situation made it impossible to go on the farms during the main part of the grazing season, and some activities were pushed to 2021. The share of grassland was high in all the farms, ranging from 55 to 90% from which the share of permanent grasslands was around 60-80%. In Poland, observational studies were carred out on 20 farms and included 3 selected methods of improving pasture productivity: replacing the free system with a quarters system, introducing a greater proportion of low varieties of fast-growing grasses in the quarters system, and replacement of pasture-mowing use with the division into only pasture and only mowing with appropriate adjustment of the floristic composition of grasses (low vs. high). More special studies on replacing the free grazing system with the quarters system was carried out in 7 farms located in the south and north-east of the country, where extensive use of grasslands and free grazing dominate. A total of 360 HF cows were included in the work. Forage and hay were the basis of nutrition in these herds, respectively summer (100%) and winter (75%). The obtained results of WP1 indicate the great importance of pasture rotation in the improvement of pasture productivity, both in hilly and lowland areas. In order to obtain such a result, it is necessary to change the fertilization and use some natural fertilizers not only for GO, but also for pasture.

B- fulfilment of objectives:

WP1 aimed at developing innovative, regionally adapted grazing systems that are robust to variable weather conditions, increase production of forages as protein sources in dairy cow feeding, and allow for co-grazing of animals of different age groups. These objectives were partly fulfilled, and other objectives were developed in addition, among others strongly influenced by the fact that 2018 was extremely dry in Germany and Estonia, and farmers realised the urgency of developing more robust grazing systems. Three main partners were planned involved in WP1 (UHOH, EMU and NRIAP), and others (e.g. INRAE and NORSØK) could contribute with some of the information specifically on cow-calf-systems on grass. Much exchange became difficult because of lack of in-person meetings after M23. The general scope of the work in WP1 became much smaller than intended, e.g. no grazing systems for mixed age groups were tested in Germany or elsewhere. Nevertheless, results of WP1 clearly show the high potential contribution of pasture forages as feed (protein) resources to organic dairy cattle feeding, even in semi-natural, unimproved grasslands and in dry years as 2018. It also became clear that combinations of environmental and management factors seemed to determine forage availability on pastures, the efficiency of its use, and thus its contribution to milk production of cows. Hence, there is no one-size-fits-all grazing system, which enhances forage yields and use. Context-specific, complementary adaptation of pasture and grazing management strategies and supplement feeding to prevailing agroecological and weather conditions and farming system context is needed. A set of grazing management tools, for instance, related to the choice of animal breed and the supplement feeding of cows were tested under on-farm conditions in a participatory approach. Different pasture rotation schemes as well as durations and timings of pasture access were evaluated. In this respect, the work in WP1 reached much further than originally planned. A major article across countries are still under development, and will include at least Estonia and Germany.

WP2	*Sustainable maternal care*

WP leader: Eddie Bokkers (WUR-APS)

Responsible partners: Wageningen University (NL), Aarhus University (DK), Louis Bolk Institute (NL)

Overall summary of main results, discussion and conclusions of WP2

In WP2 we found that rearing calves with the dam and keeping calves until 4 weeks of age at the dairy farm leads to improved weights and immune competence at arrival at the fattening farm. Although dam-rearing weight and immune system advantages did not seem to translate to better health at the fattening farm, the 4wk-transport calves did benefit from a reduced prevalence of treatments with medicines. Given that the productivity of the cow and health of the calves was not worse in dam-reared and 4-week transport calves, these may be advantageous management action to improve calf and cow welfare

Pros and cons of different innovative rearing systems for surplus calves have been inventoried and discussed with stakeholders which have led to different ideas and scenarios on how to improve welfare of these calves.

Providing hides on pasture to dairy cows show that primiparous dams move further away from herd members at calving than multiparous dams and suggest that primiparous dams prefer to isolate themselves through distance. Although hides did not make dams calve more evenly distributed throughout the paddock, the increase in maternal behaviour of multiparous dams with access to hides suggests that hides facilitate maternal bonding in these dams

Except for the hours succeeding parturition, type of cow-calf contact (CCC) affects the expression of calf-directed affiliative behaviour in dairy cows. Partial CCC resulted in less calf-directed affiliative behaviours compared to full CCC, except in the 48 hours following parturition. However, large inter-individual differences were found and the expression of calf-directed affiliative behaviour in the free stall barn could not be predicted based on the behavioural responses expressed in the maternity pen. Last, it was concluded that motivation for calf contact is greater for cows that are suckled, which indicates a stronger bond between dam and calf.

Report on the results obtained (A), and fulfilment of objectives (B) comparing to the original project proposal

A- results obtained and structured in relation to the user groups they are relevant for:

The majority of dairy calves, both in organic and conventional dairy systems, are removed from their dam within 24-48 hours after birth. This early separation of the calf from its dam is justified by an increase in financial profits due to more milk being harvested and sold; an improved monitoring of colostrum and milk intake due to artificial feeding of calves; a facilitation of milk let-down in the parlour; and a minimisation of the stress response at separation for both cow and calf. The early separation of the calf from its dam, however, constitutes an important animal welfare dilemma in conventional and organic dairy systems, as it prevents certain natural behaviours being expressed in both the cow and calf, including licking and nursing the calf, and suckling at the udder. This dilemma is increasingly debated and is linked to growing public concern. Research has demonstrated that dam-calf contact for an extended period of time can improve the social skills of the calves, and later the heifers and cows, in addition to promoting natural behaviours. Improved social skills and sociability could promote future welfare via an increase in positive social interaction and decrease in agonistic interactions.

In many countries, organic and conventional calves not wanted for herd replacement, predominantly males, are transported to specialised fattening farms at approximately 14 days of age. Both of these practices, separation and transport at a young age, present welfare concerns. In the Netherlands we studied the impact of dam rearing and transport age on calf welfare. The experiment was a 2x2 factorial design, with rearing (with or without dam) and transport age (14 or 28 days) as factors and were followed until 6 months of age. We found that an improved weight and immune system at arrival at the fattening farm is likely to improve robustness and mitigate morbidity and mortality in calves. The study identified two dairy farm management areas that can lead to improved weights and immune competence at arrival at the fattening farm: rearing with the dam and keeping calves until 4 weeks of age. Although dam-rearing weight and immune system advantages did not seem to translate to better health at the fattening farm, the 4wk-transport calves did benefit from a reduced prevalence of treatments with medicines. Larger numbers of calves in the treatments may still lead to more significant differences in terms of health in future research. Given that the productivity of the cow and health of the calves was not worse in dam-reared and 4-week transport calves, these may be advantageous management action to improve calf and

cow welfare (details can be found in Webb et al. in prep).

To develop innovative rearing strategies for male calves several initiatives have started in which the Dutch researchers of GrazyDaisy were involved. The Dutch Ministry of Agriculture, Nature and Food Quality organised meetings to discuss this topic which resulted in a report on innovative rearing systems for surplus dairy calves (2021). The report describes three alternative scenarios, which are system changes essentially aimed at improving calf welfare. For all three scenarios three main focuses were: 1. Better collaboration within the chain for better transfer of knowledge between dairy and veal producers; 2. Transportation of calves at a later age; and 3. Minimizing contact between calves from different origins. In addition, the Dutch Society for the Protection of Animals has announced their intention to incorporate stricter requirements for dairy and veal calves into their three star welfare labelling scheme called 'Better life' (BeterLeven). In particular they aim for the immediate inclusion into their basic requirements (1 star) a teat for milk drinking, a high amount of solid feed from 2 weeks of age that way surpasses the EU requirement. Specially for veal calves, they additionally require transport from 4 weeks instead of 2 weeks of age and group housing in straw bedded pens from 4 weeks. In the future, they will also add pair-housing in the first 14 days and cow-calf contact in their three star level. These requirements will also benefit the welfare of organic calves.
Due to Covid-19 restrictions it was not possible to organise a workshop in person about innovative rearing strategies with organic dairy farmers as was planned in the Grazy Daisy project. Also too many stakeholders were reluctant to take part in an online meeting on this topic. Therefore we decided to send out a questionnaire to receive input from them. Based on four responses of Dutch organic dairy farmers it revealed that they are not pleased with the current way in which veal calves are raised and the fact that their surplus calves leave the organic system and essentially constitute a gap in the organic dairy system. Important considerations for the raising of calves on the dairy farm which were mentioned included the need to suckle, contact with the mother, herd and other calves, the possibility of running around freely as well as good health and growth. Important considerations for the raising of calves on the veal farm which were mentioned included space allowance, access to pasture, group housing, good care and a clean soft place to lie. Most of these respondents wished to keep the surplus calves for longer on their dairy farm, either until weaning at 3 months or for the entire fattening period. Barriers to improvements in raising calves which were mentioned included money, space, time, consumer ignorance, and the absence of a niche market for animal-friendly or organic veal.
Based on the diverse input via different ways we have started to write an opinion paper to discuss the pros and cons of innovative rearing systems for surplus calves. This paper is very topical because in many countries the debate around how to raise surplus calves in a responsible way gets increasingly urgent.

In Denmark the focus was on selection of calving sites. Under natural conditions, cows seek isolation and visual cover when calving becomes imminent. Studies conducted on calving site selection indoors show that predominantly older and dominant cows calve in hides offering visual cover. In an experiment conducted in Denmark, we studied the effect of visual cover under spacious outdoor conditions at pasture. One- hundred-and eighty Danish Holstein cows were allocated to three groups of 14 cows according to expected date of calving and moved to a 75 x 150 m paddock. The paddock had a designated feeding area at one end while the opposite end bordered a wood. One paddock had 12 hides distributed evenly throughout the area and another paddock had no hides. From 3 h before parturition until 3 h after parturition, the location, posture and behaviour of cows were recorded. Location, posture and behaviour of the calves were recorded during the 3 h after birth. Results showed that hides did not affect selection of calving site, but more primiparous than multiparous dams calved in zone 4 furthest away from the feeding area. Before calving, primiparous dams were more likely to be positioned in zone 4 and less likely to contact herd mates. After calving primiparous dams and their calves tended to be more likely to be positioned in zone 4, i.e. furthest away from the feeding area. Among multiparous dams, the presence of hides in the paddock increased the duration of sniffing and licking their calf, as well as the duration of time nursing their calf (indications of bonding). The more cows in the paddock at the time of calving, the fewer dams were observed to be further than 30 m away from other cows. In addition, calves spent less time lying down the higher the number of cows in the paddock at the time of calving. The results show that primiparous dams move further away from herd members at calving than multiparous dams and suggest

that primiparous dams prefer to isolate themselves through distance. Although hides did not make dams calve more evenly distributed throughout the paddock as expected, the increase in maternal behaviour of multiparous dams with access to hides suggests that hides facilitate maternal bonding in these dams (Details can be found in M. Bak Jensen et al. in prep).

The parallel PhD project conducted in the Netherlands (not financed by CORE-Organic Cofund, but strongly connected and related to questions addressed in the original call) studied three main treatments: direct separation of dam and calf, partial contact (cow and calf could have contact but no suckling), full contact (dam and calf could have full contact including suckling). In these studies behaviour, physiology, immunology, clinical health and microbiome of dam-calf pairs were studied until 6 months after calving. Different weaning-separation strategies were studied, such as first gradual weaning then separating, abrupt weaning and gradual separating which provided insight into de-bonding process. The first two scientific papers have been published (Wenker et al 2021, Calf-directed affiliative behaviour of dairy cows in two types of cow-calf contact systems, Applied Animal Behaviour 243 105461; Wenker et al. 2021, Effect of cow-calf contact on cow motivation to reunite with their calf, Scientific Reports 10, 14233) and three papers are currently prepared for submission. The main conclusions from the first two papers are that, except for the hours succeeding parturition, type of cow-calf contact (CCC) affects the expression of calf-directed affiliative behaviour in dairy cows. Partial CCC resulted in less calf-directed affiliative behaviours compared to full CCC, except in the 48 hours following parturition. This may be due to the fact that the partial CCC set-up limited the accessibility of the calf or because in the full CCC set-up calves could also initiate contact. Moreover, large inter-individual differences were found and the expression of calf-directed affiliative behaviour in the free stall barn could not be predicted based on the behavioural responses expressed in the maternity pen. Furthermore it was concluded that motivation for calf contact is greater for cows that are suckled, which indicates a stronger bond between dam and calf.

B- fulfilment of objectives:
WP2 aimed to develop and test methods to strengthen the dam-calf bond to ensure maternal care of the calf when kept with the dam in the herd at pasture, and to facilitate the de-bonding process at weaning, while minimizing negative consequences for the cow and calf, documented through multi-faceted animal health and welfare based indicators developed in a parallel conducted PhD project at WUR-APS. These objectives must be concluded fulfilled.

WP2 has obtained insight and new knowledge about the effect of dam-calf contact and age of leaving the home farm on later performance, health and welfare. Also, several methods to facilitate the bonding and debonding process have been studied by applying different rearing strategies and different weaning and separating strategies. Providing hides when cows calve on pasture seem to be preferred and seem to facilitate the bond between dam and calf. Although dams are motivated to be in contact with their calf, large inter individual differences exists among dams on how often and intense they would like to have contact with their calves. Several innovative ideas around rearing surplus calves have been discussed with several stakeholders, which will contribute to developments to improve calf welfare in organic dairy farming in the near future. By the end of the project, we saw possibilities to adopt some of the suggested rearing strategies beyond the projects (e.g. by farmers, advisory service or in the commercial context), among other secured by the close contact to and involvement with the farmers, advisors and other stakeholders regarding development of CCC systems.

WP3	*Effective novel animal health and welfare promotion*

WP leader: Nathalie Bareille (INRAE)
Responsible partners: INRAE (FR), Aarhus University (DK), Louis Bolk Institute (NL), EMU (EE), NRIAP (PL), ULUDAG (TR)

Overall summary of main results, discussion and conclusions of WP3

WP3 had the focus on analysing the potential influences of different management systems on animal health and welfare, as well as use of antibiotics and anthelminthics. The focus differed significantly across countries, as foreseen in the application phase, because the contexts and the issues around organic dairy farming are so fundamentally different between countries. This allowed for co-learning across countries, as well as mutual understanding. However, many activities were interrupted at the start of the Covid-19-outbreak, and some exchange visits between countries had to be cancelled, both in relation to the third project meeting in Turkey and a farmer exchange visit in Estonia (planned August 2020) as well as to Denmark and potentially the Netherlands (autumn 2020). Therefore, many activities related to the antibiotic reducing strategies were re-planned or cancelled, observational studies have been carried out on case farms in Estonia, Turkey, and Norway, focusing on broader topic of production diseases and antibiotic use, combined with questionnaires, and with a focus on options for health promoting and medicine reducing strategies. In Turkey, milk yield is low in native and cross breeds. However, mastitis and other diseases have not seen often in those breeds, therefore, there is no significant need relating to antibiotic use. The conclusion which came out of the Turkish case studies was that native genotypes seem more disease resistant, and could be more feasible to use in organic milk production. One interesting aspect, which came out of the collaboration in WP3 on antibiotic use, was the difference in management of the organic legislation and rules, and of antibiotics in general. In recent years, antibiotic use in dairy herds of Turkey has been more under inspection and control comparing to previous years. The team initiated a common analysis of this, which is still not finished, and still have ambitions to finish it after the project.

However, the main body of scientific results in this WP by the end of the project came from studies in France, where on-farm assessment of calf and heifer health in an innovative dairy system where calves are reared with nurse cows. During the first month of age, this nurse-calf rearing system usually consisted of a first phase with the dam, followed by an optional phase of artificial milk feeding and a final phase of fostering by a nurse cow. At this stage, calves were mainly confronted with neonatal diarrhoea due to cryptosporidiosis but the intensity of *Cryptosporidium* oocyst shedding and the prevalence of diarrhoea appeared to be lower than for classically reared calves. After fostering, nurse cows and calves turnout together on pasture and have a long first grazing season. The dilution effect due to the mixed grazing of resistant (nurse cows) and susceptible (calves) animals associated with predominant milk diet of calves allowed a low level of gastrointestinal strongylosis. No anthelmintic treatment was given to the calves. During the second grazing season, heifers were considered immunized towards gastrointestinal strongylosis, except for the ones born in the autumn who had a high parasite risk in spring (common situation).

Report on the results obtained (A), and fulfilment of objectives (B) comparing to the original project proposal

A- results obtained and structured in relation to the user groups they are relevant for:

The main results from WP3 come from the on-farm assessment of calf and heifer health in an innovative dairy system where calves are reared with nurse cows mainly on pasture. This work is the purpose of Caroline Constancis' PhD, funded by INRAE (https://orgprints.org/id/eprint/42815/). A preliminary study with farmers who have developed this system has allowed the health assessment to be focused on neonatal diarrhoea and gastrointestinal strongylosis of heifers. Although these diseases were of most concern to farmers, epidemiological studies conducted in GrazyDaiSy (see below) showed that this system could mitigate them compared to the classically reared calves.

During the first month of age, this nurse-calf rearing system usually consisted of a first phase with the dam, followed by an optional phase of artificial milk feeding and a final phase of fostering by a nurse cow. Each nurse was suckled from one to five calves of close age with a fostering age of 8 days on average. Faeces were sampled once from 611 animals (from 20 organic farms) aged between 5 and 21 days. The samples classified as diarrheic were tested for the presence of Coronavirus, Rotavirus and Escherichia coli and all the samples were analysed for *Cryptosporidium* oocyst shedding. Only 88 faecal samples (14.4 %) were diarrheic. Among these diarrheic samples, 69 % were positive for Cryptosporidium oocysts while 14

% were positive for Coronavirus, 9 % for Rotavirus and none for E. coli F5 (K99). The *Cryptosporidium* oocyst shedding prevalence was 40.2 % and similar to classically reared calves, but the intensity of shedding and the prevalence of diarrhoea appeared to be lower. The identified six risk factors for *Cryptosporidium* oocyst shedding emphasize the role of the environment for the direct and indirect contamination, particularly that related to the accumulation of oocysts from previous or peer calves facilitating the faecal-oral route of transmission. This highlights the crucial role of the premises used intensively during the winter and spring months with higher densities of calves in the barn compared to outdoor situations promoted by this rearing system (https://doi.org/10.1016/j.prevetmed.2021.105321).

After fostering, nurse cows and calves turnout on pasture at around one month of age and have a long first grazing season with mixed grazing of calves and adults at a ratio of 2-4 calves per nurse cow until 7 to 9 months of age. This rearing system has the potential to change the epidemiology of gastrointestinal nematodes infections, in particular of *Ostertagia ostertagi*, the most frequent and pathogenic in grazing cattle. The epidemiology of gastrointestinal infections was assessed through 3 indicators, Faecal egg count (FEC), pepsinogen (PEP) concentration and Ostertagia ELISA optical density ratio (ODR), in around 900 heifers throughout their first grazing season and 400 of them throughout their second grazing season. Results indicated that the level of GIN infection was overall low for calves during the first grazing season. Ostertagia ODR values increased with the duration of the first grazing season (>240 d) and with the ratio calves/nurse (>2). The dilution effect due to the mixed grazing of resistant (nurse cows) and susceptible (calves) animals associated with predominant milk diet of calves during the first months of grazing in combination with protective grazing management allow calves to be turned out at an early age without need of anthelmintic treatments. During the second grazing season, heifers were considered immunized towards GIN infection, except for the ones born in the autumn. Indeed, for them, the first grazing season was short and they were mainly milk fed during the whole season. Their infestation was so low that this season was negligible. So, parasite indicators during the second grazing season were similar to those of the first grazing season. However, in this situation, there are no nurse cows to sanitise the paddocks. The infestation of the paddocks can be so high that there is a GIN risk on the heifers with growth retardations and diarrhea. However, because of the long season, immunity developed in at the end of the grazing season.

In September 2021, the French scientists involved in the ProYoungStock and GrazyDaiSy project presented the results on the welfare and health of dairy calves reared with adults during a webinar entitled "Rethinking dairy calf rearing to restore the mother-calf bond: A cross study of rearing calves under mother's care and rearing calves under nurse cows". This 2-hour webinar was repeated twice, bringing together an audience of 140 farmers, advisors and veterinarians.

A scientific collaboration within the GrazyDaiSy-partners on the topic of gastrointestinal nematodes took place in 2019, in order to assess the risk of parasites of heifers reared without adults in Northern Europe. A simplified protocol, based on blood samples in autumn at turn out, was applied in a few farms in Estonia (2) and Norway (2). The results collected during the first grazing season of dairy heifers showed a low risk of gastrointestinal strongylosis.

In Estonia, there were no recent studies about the situation and potential limitations of organic milk production at the project start, and therefore one of the aims was to investigate the health status in organic dairy farms. This was investigated in 18 dairy farms (herd size 20-210 cows) having totally 1300 (approx. 72% of all organic dairy cows in the country) dairy cows. Herds average somatic cell count in bulk milk was constantly high in all 3 project years (over 500 thousand cells/ml), confirming that this was one of the biggest challenges regarding animal health and milk quality. However, it must be stated that there were 4 smaller farms out of 18, with extremely high SCC and affected therefore the overall result. Generally, the SCC was lower during the grazing period. Fertility problems were identified as the main reason (22% of all cases) for culling organic cows, followed by mastitis (16%) and leg problems (13%). According to the interviews in selected farms, the most common type of mastitis was related to the environment (mainly S. uberis), and antibiotics (including selective dry cow therapy and teat sealant) were still the most used methods to treat the animals, although clinical signs also were treated with Salicam or ichthyol-camphor ointment, sometimes with honey. Neither homeopathic remedies nor anthelmintics were used in interviewed organic dairy farms. Grassland parasite indicators, after the first

grazing period, were also measured in two case farms. Very low level of nematodes were found in these farms. In Turkey, case studies on four farms in different regions are currently being analysed and described in a case study report. A strong outcome is the need for context specific approaches, and conditions were widely different for the different regions. Milk yield was measured and found low in native and cross breeds, where very low incidences of clinical diseases and high SCC was seen, and antibiotic use very low too. The conclusion which came out of the Turkish case studies was that native genotypes seem more disease resistant, and could be more feasible to use in organic milk production. In Poland, obtained differences between herds regarding disease occurrence and milk yield was found statistically significant, and related to the time of the grazing season. The amount and composition of milk is strongly influenced by grazing. A very high SCC was observed, and this was mainly explained by the Polish team as related to stress and insect bites, in addition to other factors.

Health indicators were collected by the Norwegian team, and analysed together with cortisone levels in faeces and hair, as multi-faceted relevant *indicators* of chronic stress in cattle. This created a collaboration across WP2 and WP3, because hair samples were collected in France and Netherlands in calves, w hich were expected to be stressed because of separation from cows. Additional funds made it possible for the Norwegian team to analyse part of these samples, and analysis is currently under completion.

B- fulfilment of objectives:
WP3 aimed to assess, document and analyse consequences of different management systems (depending on the country, rearing different age groups together, or implementing novel strategies to minimize disease and promote health), in grazing-based dairy systems, on animal health and welfare, as well as use of antibiotics and anthelminthics.

The experimentation on farms with strategies for reducing antibiotics very quickly turned out to be challenging, for many reasons, but mostly because it would take more time to analyse the problems, and secondly because it could be risky to do new things. In Estonia and Turkey, the distance between farms was big, so it was not possible to create farmer groups around it for mutual support. Therefore, the studies turned into individual farm-observational studies with updates by the involved scientists. There were no pre-existing network of grazing organic dairy farms in Turkey, Estonia and Poland, which means that the scientific teams to a large extent has focused on identifying and exploring these dairy herds. However, since this had not been a previous main focus in EE nor TR, the results were interesting, and farmers as well as stakeholder were interested in discussing them at conferences and in workshops.

Other deviations were related to factors such as dependencies on collaborating projects, e.g. in Norway, where there were original plans to test plant components against nematodes – but due to delays in another project, this turned out to not being possible.

Covid-19 interrupted all on-farm-activities for long periods, and forced us to cancel important learning and experience exchange trip on issues connected to antibiotic reduction. After having faced economic constraints, we found a way to plan such visits in 2020, but then had to cancel it. Some of the 'inspiration material' originally planned to come directly out of these joint ventures therefore had to be based on Danish and Dutch experiences, and a small booklet is currently under translation.

WP4	Strategies and practices for resilient dairy systems

WP leader: Mette Vaarst (AU)
Responsible partners: All, in particular LBI, INRAE & NORSØK and for the sustainability analysis AU + WUR

Overall summary of main results, discussion and conclusions WP4
This WP consisted of two parts: 1) analysing farmers' perceptions, visions, barriers related to transition and use of novel strategies, as well as their daily practices, 2) develop and test a sustainability analysis.

Regarding 1) was mostly focused on developing CCC systems, and involved four country teams, where it was possible to carry out qualitative interviews and use farmer and actor based insights, experiences and

perceptions (N (3 interviews with dam-rearing farmers), F (4 interviews with dam-rearing farmers, and 20 in total including nurse cow farmers), Nl (>50 interviews in previous projects re-used for the analysis) and Dk (31 qualitative interviews of 22 actors related to cow-calf systems)). The first part of the work was to interview and analyse the interviews regarding perceptions, visions, barriers and experience with dam-rearing systems. In NL, time did not allow for new interviews, but were based on 12 years of research involving among others interviews, questionnaires and student works on farm-based experiences on CCC systems. Farmer manuals, practice abstracts, and website material has been developed on strategies for dam-rearing systems across contexts. In the last part of the project, more interviews were done in Norway and Denmark, and in France, the development of the nurse cow system was investigated in-depth in relation to the French PhD thesis developed. This material is analysed in relation to change and transition theories (behavioural change in relation to individual farmer motivation, triggering events, as well as community of practice and larger transition theories). This was partly presented at the IAHA conference in Rennes in Sep. 2021, and currently is written into an article manuscript.

Regarding 2) Sustainability analysis: Data collection for the sustainability analysis of cow-calf rearing systems with focus on environmental and economic dimensions, was initiated and analysed in collaboration between the Dutch and the Danish partners. The final analysis was based on DK system (comparable conditions), and were presented at IAHA Sep. 2021 and a Danish workshop as well as the ProYoungStock-GrazyDaiSy joint online-WS in September 2021, and an article manuscript was submitted mid-December 2021. The German team still uses RISE as originally planned as a discussion tool with the farmers.

Report on the results obtained (A), and fulfilment of objectives (B) comparing to the original project proposal

A- results obtained:

Much of the work in WP4 focused on how novel strategies of dam-calf contact systems were managed in four of the participating countries, and was based on interviews, case studies and on-farm studies across The Netherlands, France, Norway and Denmark. The diversity between systems came strongly out, and it was clear that no dairy herd was originally designed for dam-rearing or CCC systems. When organizing a dam-calf contact system to fit the context and strategies as well as daily practice of the farm, four main angles should be considered: calf, cow, farmers and farming system. A number of considerations on this, given by farmers and other actors in the environment, give basis for practice advise and discussion tools for future development of dam-calf contact systems. The actors described furthermore three important qualities in dam-calf contact systems: 1) nutrition, 2) care, and 3) learning. These aspects led the priorities and development of dam-calf contact systems. When having established a dam-calf contact system, farmers were generally motivated to continue the system by the pleasure of seeing interactions between the dam and her calf, and they learned to observe their animals in new ways. Farmers with no experience on dam-rearing, feared the 'loss of control' over the calf. There was a repeated questioning of 'naturalness' in relation to dam-rearing. Whilst considering the potentials of organic dairy systems to encompass such systems, as well as acknowledging the 'naturalness' of cow and calf including their motivation and need to be together, 'unnatural elements' were also highlighted, e.g. the high milk yield, deep udders and big herd sizes in today's dairy sector. Some issues remained currently unsolved for future organic dairy sector to find solutions to, such as to organize new systems which are friendly and less restrictive for cows and calves at the same time. A multitude of systems allowing cow–calf contact have since been developed based on existing farm structures. Interviews and case studies show that the development requires significant changes in practices, attitudes and farm structures, all of which require a lot of investment. Research during the GrazyDaiSy project period considered several potential ways in which organic dairy systems could encompass forms of cow–calf contact. In Denmark, in-depth case studies allowed to follow the development over three grazing seasons and winters, and in Norway, a new PhD study on the topic was initiated. Change and transition perspectives have been analysed and balance between behavioural individual motivation and change at farm level, and on the other hand the formation of communities of practice and larger institutional and organisational transitions. The two latter involve larger societal changes and transitions, including the way in which we articulate things. For example,

acknowledging the 'naturalness' of cow and calf systems, including the motivation behind them and the need for the cow and calf to be together, 'unnatural elements' have also been highlighted related to dairy farming in general, for example the high milk yields, deep udders and large herd sizes in today's dairy sector. Questions were raised as to whether the current development of dam-rearing and other types of cow–calf contact systems can be seen as niche innovations, or as part of a larger change in the socio-technological landscape around dairy farming and calves. These changes are still ongoing in terms of organising new systems that are friendly and less restrictive for cows and calves, and could potentially be part of a larger transition at the systemic dairy farming level.

In the sustainability analysis, the environmental aspects were particularly in focus, and scenarios were set up of organic dairy systems to analyze the effect of different dam-calf systems with either half-time or full-time contact between cow and calf for 28, 51 or 91 days. Based on experience from practice and literature, we assumed a total milk uptake of 1,110 kg ECM milk with part-time contact and 1,207 kg ECM milk with full-time contact over 91 days. These scenarios were compared to traditional calf rearing systems with direct separation after birth and milk feeding from a bucket with low or high milk feeding levels of 460 and 630 kg ECM, respectively, in the first 91 days. The scenarios were analyzed at different milk production levels, e.g. at a level of 9000 kg milk produced, only 85% of the milk produced was delivered to the dairy company, compared to 93% when a low-level of milk is fed via from a bucket. The important question raised and discussed in relation to this was whether the milk or the calf should be assigned the environmental impacts, and it was suggested that the carbon footprint and land use from production should be shared between milk and meat. It was also emphasised that the sustainability of a dam-calf contact system needs to be discussed in a broader context, and include the system's positive effects on animal welfare and other factors such as biodiversity, as well as the discussion of and the economic effect for the farmer.

B – fulfilment of objectives:
part of the WP has deviated significantly from the originally proposed of involving all partners in all topics, simply due to the fact that skills and experience in qualitative interview methods did not exist among all partners, and individual partner budgets were targeted their main focus areas. So were the participating farmers as well as the research teams, which made it illogic to go beyond the focus areas. At the second project workshop (June 2019) we decided to focus on change processes in relation to implementation of new strategies in dairy herds, and select case studies in the participating counties, and this will create the foundation to scientifically analyse change and transition processes related to implementation of new practices and strategies.
Originally, qualitative interviews were thought into the plans for all countries, but due to lack of researchers with skills in interviewing, we have changed to a case study approach in combination with focus group interviews where possible, to describe the perceptions and attitudes of farmers and other actors. Furthermore, we have added an element to the studies on antibiotic reducing strategies, namely an actor mapping and more systematic description on how different animal health professionals are involved in the treatment process, and how the organic regulation is working in relation to disease treatment and animal health promoting strategies. These mappings will be done in collaboration with national partners or persons pointed to by them, with insight into practices on organic farms and medicine use.
At the kick-off meeting, the team realised that they would need to develop new relevant parameters for special focus areas for cow-calf-systems. The milestones and deliverables connected to this task were postponed to M24 at the kick-off meeting.
Although with some delay for some of the milestones, all objectives are foreseen fulfilled. Meaningful and highly relevant products to develop the future organic animal agriculture are envisioned from this WP.

WP5	Coordination and dissemination
WP leader: Mette Vaarst Responsible partners: All; the SC consisted of the four WP leaders and one representative from each country not leading a WP (EE, N, PL, TR), and representatives from Bioland and Demeter.	

Overall summary of main results, discussion and conclusions of WP5

In the project period, 37 Steering Committee meetings were held at every second Monday in each month except some holiday months. Several (>100) smaller group meetings (e.g. WP and joint analysis / writings) were held, mostly online. Positive and productive interaction developed between most partners, and the composition of experienced and many young researchers contributed generally to interesting and valuable exchange and collaboration. The project team was young, meaning with no previous collaboration experience, which was challenging, but some new networks emerged. However, the Covid-19 had very severe negative impact and came just few weeks before a much-needed 4-day project-WS. Some interesting dynamics and mutual learnings within the consortium kept coming up, and some major challenges due to the Covid-19-lock-down influenced the work and collaboration: many consortium members struggled during the pandemic with home-schooling, reorganisation of activities, and many farms were inaccessible. This led to more national focus and less focus across countries, and also less focus on and possibilities for collaboration to improve the interactions between the areas which the project targeted (health and reduction of medicine, grazing and CCC systems). During the period up to the midterm report, the PL partners showed a generally low degree of collaboration and performance, explained by institutional dis- and re-organisation, financial constraints and other institutional unfortunate events. This was discussed at the midterm-reporting meeting, followed up by the Polish funding body, the CORE-Organic coordinator, as well as the GrazyDaiSy coordinator. Unfortunately, this situation stayed a major challenge. A meeting in WP1 + WP3 was held in Krakow in Jan. 2020 to catch up on results, but shortly afterwards, the Covid-19-outbreak happened, which caused that contact was lost during long periods. The national PL reports showed performance, activities and results, which despite attempts from the WP-leaders and coordinator did not extend to the international partners and hence was not involved in joint discussions. However, generally all partners contributed and collaborated constructively, and many additional outputs came out of the project, e.g. new networks, projects and PhD studies. Constructive, useful advice and communication and support was given several times from the CORE Cofund coordinator.

Report on the results obtained (A), and fulfilment of objectives (B) comparing to the original project proposal

A- results obtained:

Regarding the coordination of the project, the Steering Committee (SC) met monthly on skype, Zoom or Teams with email exchange before and after to ensure that everybody could give updates and comment on the discussed issues. A 'WP5-Newsletter' with all project updates was sent regularly to all project participants, containing information about what was going on in the different countries, allowing everybody to write national updates when relevant. Four project workshops were held in March 2018 (NL), June 2019 (D), and online April 2020 as well as June 2021. In addition to this, WP-related project meetings and workshops were held online in 2020 and 2021, and a combined WP1 + WP3 meeting was held in January 2020 in Poland, to update the responsible partners on all the work done in different countries. It was regarded as necessary to try and stimulate the collaboration, especially with the Polish team, which seemed to be in a very difficult situation, constantly faced with challenges. In January 2021, a meeting between German, Estonian, Polish and Danish partners were held online to plan how results could be combined into a common publication. This publication is still under development, and the online-approach proved to be difficult.

At the time of the midterm report, we concluded that the stakeholder groups and collaboration partners in each country were involved in many different ways, and no uniform model of a stakeholder group has been suitable. As can be seen in the dissemination plan, the GrazyDaiSy project was interactive with many research and stakeholder activities in most countries, even during Covid-19 times.

WP5 aimed at helping organising learning trips per focus area, but only one was held and was very successful, since it explicitly had great impact on the development of the project. This was a learning trip for Danish farmers and other stakeholders (13 persons in total) with focus on cow-calf systems to the Netherlands and Germany and included a workshop with Dutch partner LBI. The other planned learning

visits planned were about reduction of medicine, and were planned to be held in August and the autumn of 2020, and were cancelled due to Covid-19.

However, many challenges were present regarding sharing and writing together some of the results, and coordination of write-workshops in different countries, to facilitate collaboration between partners with less previous experience of each other, and working together across widely different contexts, was a big challenge. In the year, where joint analyses and writing should have been done, all countries were closed down, and only online meetings could be held, which was far less effective and stimulating.

In November 2020, a 5 ECTS PhD course on change and transition in agricultural and veterinary science was carried through in Denmark, partly online and partly in-person. This was very successful, and 10 PhD-students passed the exam between January-June 2021.

Dissemination: WP5 managed the project's outreach strategy, and attempted to coordinate a number of national and international dissemination elements. Most partners have participated at different levels in the production of multiple deliverables. At the time of the midterm report, we called for improved competencies regarding making videos, but the re-allocation of the coordination budget allowed both the French and Danish team to engage professional video-makers.

B - fulfilment of objectives:
WP5 aimed at bringing partners together in a young consortium, where some partners met each other for the first time at the kick-off-workshop, and collaborate across areas in a multidisciplinary fashion, using natural and social scientific methods. Furthermore, WP5 aimed at facilitate collaboration across fields (health, reduced medicine use, cow-calf-contact and grazing), which can be seen as intimately connected, when viewed from a holistic perspective, but which in terms of scientific specialisations can also be viewed as widely different. This partly succeeded, and partly did not, because the ambitions were higher than what we reached.

Some plans for interactions between partners would help significantly to reaching the aim of mutual understanding and finding common directions, e.g. learning trips within all the focus area (grazing, health promotion + medicine reduction and cow-calf systems). However, only one of the learning trips succeeded before the Covid-19 situation overwhelmed all partners, and we had to cancel two planned trips. In long periods between early March 2020 to the end of the project, meetings in person were impossible, and even on-farm research. This explains why e.g. stakeholder meetings were not held during periods, interviews, farm-activities etc. also not. A very serious impact was made on the common analysis and writing processes between consortium partners, because we all had relatively little knowledge about each other and no previous experience in collaborating. Consequently, much of the ambitions to write together, failed. In addition, many had no previous knowledge about organic agriculture, hence the common learning regarding this was very difficult. Finally the huge range of contexts (N, Tr, EE, D, F, Dk, NL, Pl), and the triple focus on grazing, non-medicine use and dam-rearing, made it challenging, and although a lot of interesting results came out of individual WPs and countries, some plans were changed and some were cancelled, due to these constraints.

3.2 Deliverables and milestones status

Deliverable No.	Deliverable name	Link to the document[2)]	Planned delivery month[1)]	Actual delivery month[1)]	Reasons for changes/delay and explanation of consequences in case of delay, if any
D1.1.	Description of relevant grazing systems based on 1st season; stakeholder article	No links	11	12	NA
D1.2.	Paper on interrelationships between animal and vegetation parameters in grazing cattle	To appear	24	42	Some delay due to Covid-19 which hampered field work and sample analysis [3)]. Publication already submitted in 2019; yet, conference only took place in 2021. Additional publications in preparation.
D1.3.	Factsheets on grazing systems	(is under upload)	30	42	Some delay due to Covid-19 which hampered field work and sample analysis [3)].
D1.4.	Conference contributions on grazing results	https://orgprints.org/id/eprint/41886/ and https://orgprints.org/id/eprint/42527/	31	11-42	Numerous conference contributions with some still being presented in fall 2021 and more to come in 2022. Several of the conferences were postponed due to Covid-19.
D1.5.	Innovative grazing systems		32	40	Some delay due to Covid-19 which hampered field work and sample analysis[3)].
D1.5.	Paper on innovative grazing strategies across countries	Under development	36/42	After project end.	Paper in preparation.
D2.1.	WS on dam-calf systems, challenges and experiences1	No link	15	36	The WS was more fruitful when the gathered knowledge and results of the different teams was available.
D2.2.	WS developing innovative rearing systems for organic male calves	No link	35	41	Ideas around innovative rearing systems have been developed with different stakeholders, but not via a WS due to Covid-19, and online presentation was given by the end of the project.
D2.3.	Paper on effect of full time/part time and debonding method on cow	No link	36	Post-project	One paper is in preparation. Some delay has occurred due to Covid-19 and related issues[3)]

	and calf behaviour				
D2.4.	Paper on effect of rearing on performance of male calves	No link	36	Post-project	Paper is in preparation. Planned to be submitted in January 2022. Some delay has occurred due to Covid-19 and related issues [3)]
D2.5	Paper on effect of debonding method on cow and calf welfare	No link	36	Post-project	Paper is in preparation. Planned to be submitted in December 2021. Some delay has occurred due to Covid-19 and related issues[3)] .
D2.6.	Paper on economic, environmental and welfare consequences of different dam-calf rearing strategies	No link	36	42 + post-project	One paper submitted reg. environmental aspects and one in preparation. Planned to be submitted in January 2022. Some delay has occurred due to Covid-19 and related issues[3)].
D3.1.	Booklet on health, disease and antibiotic-reduction for farmers and other stakeholders	No link; https://orgprints.org/id/eprint/13771/1/13771.pdf one source of inspiration	24	After the project; in translation now	Based on Danish and Dutch experiences, since two planned learning visits (April 2020 and August 2020) were cancelled due to Covid-19.
D3.2.	WS: reducing medicine in organic dairy, with ProjectWS in Turkey	No link	24	14	Seminar about animal welfare and reduction of antibiotic use for the dairy farmers by participation of M. Vaarst as presenter in Bursa, Turkey (May 2019), and extended version planned April 2020 but cancelled. Virtual presentation about animal welfare and reduction of antibiotic use by M. Vaarst, 27th Nov 2021 virtually in 3rd International and 12th National Animal Science Congress, Turkey.
D3.3.	Paper on health and disease issues in dam-calf-systems across different contexts	https://orgprints.org/id/eprint/42815/	33	36	Focused on Cryptosporiosis which was identified as particularly important, and focused broadly on CCC systems.
D3.4.	Paper on GIS in grazing systems with mixed age groups		34	42	Available on Constancis PhD; paper was submitted in Oct. 2021 (Vet Parasit.). The survey delayed due to Covid-19
D3.5	National seminar	No link	35	42	Rescheduled in the last

	(F) on selected innovative development options				month of the project
D4.1	Paper on farmer perceptions on novel strategies	https://orgprints.org/id/eprint/39654/	14	26	Took longer time, and the process from submission to publishing took almost a year.
D4.3	NORSØK-Report on economic modelling	https://orgprints.org/id/eprint/43022/	34	41	Broadened to a report about different aspects of GrazyDaiSy (NORSØK responsible).
D4.2 and D4.4	'Sustainability of long-term maternal care system' and 'Sustainability assessment across countries'	(to appear)	34	42 + one to come	Aspects of sustainability investigated based on modelling; manus under development in collaboration between AU and WUR, and one submitted.
D4.5	Synthesis on innovative strategies and transition across contexts	https://orgprints.org/id/eprint/42509/ p 35 and 38	35	30 and continuous	Not developed as one report, but written into conference proceedings. Several presentations on this synthesis done in collaboration with 5 other CORE-Organic projects.
D4.6	International presentation of innovative and resilient strategies	https://orgprints.org/id/eprint/42173/	36		
D5.1	Project WS reports	No links	1, 15, 27, 35	1, 15, 26, 39.	Shared among partners and project officers.
D5.2	Brief project updates for immediate publication	No links	12,24,36	Continuous	Published in many local conference/WS proceedings and magazines, focused on one of the selected topics at a time.
D5.3	Stakeholder meeting reports	Not public	7/19/25/34	Continuous	In national languages, but several stakeholder meetings cancelled after M23.
D5.4	Midterm report	No link	18		Submitted in due time
D5.5	National field days incl. stakeholder articles	No links	19/29	12-onwards	Several held and some cancelled due to Covid-19.
D5.6	Farmer-to-student-learning-lab	No link – did not take place	24	Cancelled	Should have been in DK, but could not be carried through due to Covid-19, but several excursions involved students.
D5.7	Video clips: dam-calf rearing, innovative grazing, animal health promoting	https://www.youtube.com/watch?v=P9XERIIX--U&list=PLJG	25	40 - onwards	In France 6 movies were showing aspects of CCC systems and grazing, and in Denmark 7 movies shows considerations on different

	strategies	HaoiN0RENIdTNypZcnTz-Pqfw9DVLD&index=1 and https://www.youtube.com/watch?v=f4Kubh4MX70			types of CCC systems.
D5.8	PhD course in organic dairy systems innovations and assessment methods	https://events.au.dk/transitionandchange/conference.html	28	32	Was postponed several times, but could be held partly in-person at this time.
D5.9	Farmer manuals: dam-calf rearing, innovative grazing, animal health promoting strategies	No links	30	33 - onwards	See factsheets and practice abstracts.
D5.10	Policy brief on development potentials for resilient organic dairy systems	(Paper in organic eprints)	34	27	The conference paper on this made in collaboration with other CORE Organic Cofund partners was the most profound and holistic possibility to present possible development potentials, and participation in two position papers on methodologies related to CCC systems outlined current potentials. A policy brief at this stage would be very preliminary, and this will be explicitly explained in the article on change and transition.
D5.11	Policy brief on development potentials for dam-calf systems in relation to organic farming	https://doi.org/10.1017/S0022029920000448 https://doi.org/10.1017/S0022029920000564	34	26	
D5.12	Web-based case-studies on organic dairy systems minimum 1 per country	No links; cancelled	36	Cancelled	This will not happen; organisation too difficult when joint farm visits were not possible.
D5.13	Final report and cost statement	No link	36	42	Submitted on time

1) Measured in months from the project start date (month 1)
2) E.g. documents as orgprints.org/33121 or other types of deliverable (e.g. APPs or devices)
3) Several project participants had severe challenges with farms visits, children at home and expected to be home-schooled sometimes with the help from parents, more time spent on teaching, less efficient procedures, re-planning activities etc.

Mile-stone No.	Milestone name	Planned delivery month[1]	Actual delivery month	Reasons for changes/delay and explanation of consequences
5.1	Kick-off WS incl. SC meeting planned and conducted	2	1	No comments
5.2	National project & stakeholder meetings	(3) 6	8	In some cases combined with other fora, conferences and meetings
5.3	Website established and running	3	3	No comments
2.1 & 2.2	Baseline survey WP2	(3) 9	9	Few farms planned to be involved, and only those were involved, in DK and NL.
3.1 & 3.5	Baseline survey completed WP3	(3) 9	12	Combined with WP4-questionnaires
3.2	Observational studies planned	(3) 9	9	No comments
4.1	Baseline interviews prepared & farmers selected	(3) 9	9	In WP4: mostly for interviews on cow-calf contact
3.3	Planning of animal health and welfare promoting strategies	(4) 9	15	See comments to M3.8 below.
3.4	Animal stress studies planned	(4) 9	12	Norway involved partners and planned analyses; dependency on extra funds.
1.1	Baseline survey completed WP1	(6) 9	9	Basically done during the first couple of month.
4.2	Sustainability assessment conducted	(9) 24	-	Rescheduled because of development of new variables.
1.2	Detailed protocol and farm selection for grazing trials completed	10	11	No consequences and no comments
2.3	Novel, refined, and established indicators for welfare & performance in calves and dams	12	(12)	In brackets because they are on-going and refined after having been tested.
3.6	Observational studies in Phase 2 (F) planned based on results from Phase 1	12	12	No comments
4.3	Initial interviews conducted and analysed	12	17	Focus on cow-calf contact systems
5.1	2nd project WS planned and conducted	(12) 14	15	Postponed so that participants could see working grazing systems, which was not possible in April
1.3	Grazing systems established	13	13	No comments
3.7	Observational studies of health and disease patterns planned (EE, TR, PL)	12	14	Plans discussed at 2nd Consortium meeting
3.8	Experimental studies on antibiotic reducing strategies planned Phase 2	14	Re-planned to observa-tional	At the time of the midterm-report, no experiments were possible others than discussing strategies with participating farmers and

			studies	follow the change in observational studies. Only the Turkish and Estonian teams had discussed this with the farmers in an informal way. The Covid-19-situation futher complicated it, and other activities than observations were cancelled, and even that had to be done over phone part of the time.
1.4	Grazing trials completed, first year	18	19-20	The grazing season does not end before November.
2.4	Trials (bonding & debonding) planned and conducted	18	18	No comments
2.5	Comparative study on male calf rearing planned and conducted (NL)	18	18	No comments
3.9	Observational studies: animal health and disease patterns analysed (EE,TR,PL)	18	30/post-project	Delayed; included in manuscript in preparation separately for Turkey
1.5	Field days demonstrating grazing trials	19,31	19	2nd planned event cancelled due to Covid-19; meeting notes
3.10	Observational studies on mixed age groups grazing strategies analysed	21	21	Analysis document as part of PhD study
4.4	Follow-up interviews planned	22	22	Only conducted in DK
4.5	Synthesis planned	23	24	Plans for synthesis work
2.6	Controlled trials analysed	24	24	Data base and analysis document; 1st trials
5.5	Third project-WS planned and conducted	24	25	WS meeting notes available; online due to Covid-19
3.11	Experimental studies on antibiotic strategies evaluated and plans for phase 3 made (EE/TR)	24	Cancelled, see MS 3.8	Not possible to go to farms for a long period; follow-up over phone
3.12	Planning study on old and new calf-dam-systems (F)	24	24	Protocol; PhD activities still possible in Covid-19 times
1.6	Refined grazing systems established based on learning from Phase 2	25	25	Phase 2 conclusion report; very difficult due to Covid-19-lock-down
2.7	Innovative male calf rearing planned based on results from Phase 2	25	27	Verified and approved plans
3.13	Study on anthelminthic reduction in old & new calf-dam-systems planned	26	26	Protocol; plan followed by PhD student
3.14	Experimental studies on antibiotic strategies analysed (TR,EE)	30	Cancelled	Analysis results document; see MS 3.8 and 3.11; cancelled
1.7	Grazing trials completed, second year	30	31	Results entered into database by 2 German PhD students
2.8	Trials on time+debonding conducted	30	42	Data base; postponed due to Covid-19; not possible to set up farm trials for almost a

				year
5.6	Fourth project-WS planned and conducted	31	38	WS minutes and meeting notes; planned in Brussels but changed to online
2.9	Trials on time+debonding analysed	33	42 onwards	Being finalised winter 2021-2022; some articles submitted late 2021.
2.10	Studies on innovative male calf rearing completed and analysed	33	40	Analysis document
3.15	Anthelminthic reduction in old & new dam-calf systems concluded and analysed	33	40	Data base and analysis document; part of PhD study
4.6	Follow-up interviews completed and analysed	20	42	Data base ; reported interview results; under completion
4.7	Economic modelling planned	28	28	Plans for economic modelling
4.8	Interviews with farmers conducted and ready for analysis and syntheses	29	42	Interviews described and reported
4.9	Sustainability assessment analysed	33	42	Analysis results in report; article submitted 17th December 2021
4.10	International WS on synthesis planned	34	37	Plans for WS announced

[1)] Measured in months from the project start date (month 1)

[2)] E.g orgprints.org/33121

4. Publications and dissemination activities

4.1 List extracted from Organic Eprints – from next page

Below the extracted list from Organic Eprint on projects mentioning GrazyDaiSy.

Research affiliation matches any of "GrazyDaiSy"

Displaying results 1 to 67 of 67.
Refine search | **New search**

Order the results: by year (most recent first)
Reorder

Export 67 results as ASCII Citation
Export

RSS 1.0 **RSS 2.0**
Atom

1. Den Grimme Ølling Aps, Morten Telling (2022) **Changing to cow-calf system in dairy farms – English subtitles.** Den Grimme Ølling Aps.

2. Den Grimme Ølling Aps., Morten Telling (2022) **Forandring til ko-kalv system i malkekvægbesætninger – med danske undertekster.** [Change to cow-calf system in dairy herds - with Danish subtitles.] Den Grimme Ølling.

3. Mogensen, Lisbeth; Kudahl, Anne Braad; Kristensen, Troels; Bokkers, Eddie A.M.; Webb, Laura; Vaarst, Mette and Lehmann, Jesper Overgaard (2022) **Environmental impact of dam-calf contact in organic dairy systems: A scenario study.** *Livestock Sciences*, p. 104890. [In Press]

4. {Tool} ***Bio-Milchviehweidehaltung auf unterschiedlichen Standorten in Baden-Württemberg: Ergebnisse und Handlungsempfehlungen aus einem Praxisforschungsprojekt.*** Creator(s): Velasco, Elizabeth; Perdana-Decker, Sari; Werner, Jessica; Dickhoefer, Uta; Egle, Bettina and Binder, Sören. Issuing Organisation(s): Uni Hohenheim, Demeter e.V., Bioland Beratung GmbH. Merkblatt. (2022)

5. Perdana-Decker, Sari; Velasco, Elizabeth; Werner, Jessica and Dickhoefer, Uta (2022) **„Abends wie ein Bettler“ gilt nicht für Kühe.** *Badische Bauernzeitung*, 8 January 2022, p. 25.

6. Velasco, Elizabeth; Perdana-Decker, Sari; Werner, Jessica; Dickhoefer, Uta; Egle, Bettina and Binder, Soeren (2021) **Mahepiimaveiste karjatamine Baden-Württembergi liidumaa erinevates kohtades: praktilise uurimisprojekti tulemused ja soovitused.** [Organic dairy cattle grazing on different sites in Baden-Württemberg: results and recommendations from a practical research project.] . [Completed]

7. Constancis, Caroline; Bareille, Nathalie and Morgan, Guillaume (2021) **Série de 6 vidéos courtes sur l'élevage des veaux laitiers par des nourrices : témoignages d'éleveurs et contribution à la production scientifique.** [6 small videos about nurse cow systems: testimonies from farmers, including their contribution to the production of knowledge within the project.] .

8. {Tool} ***Nurse cow dairy system to promote calf health and welfare.*** Creator(s): Bareille, Nathalie; Brunet, Laurent; Constancis, Caroline and Hellec, Florence. Issuing Organisation(s): INRAE BIOEPAR, INRAE ASTER. (2021)

9. {Tool} ***Foster cows and calves in co-grazing systems in Norway.*** Creator(s): Sørheim, Kristin and Johanssen, Juni Rosann E.. Issuing Organisation(s): Norwegian Centre of Organic Agriculture. (2021)

10. {Tool} ***Hair cortisol – a practical method for measuring chronic stress in cattle?*** Creator(s): Sørheim, Kristin; Wenker, Margret L. and Cao, Yanran. Issuing Organisation(s): Norwegian Centre of Organic Agriculture. (2021)

11. Jensen, Margit Bak; Webb, Laura E.; Vaarst, Mette and Bokkers, Eddie A.M. (2021) **The effect of artificial hides on peri-parturient behavior of dairy cows at pasture.** *Journal of Dairy Science*, xx, xx-xx. [Submitted]

12. Channaux, Vicky (2021) **Suivi d'infestation par les strongles gastro-intestinaux chez les génisses laitières de seconde saison de pâture élevées sous nourrices en première saison de pâturage.** [Monitoring of gastrointestinal strongyles infestation in second season dairy heifers reared by nurses in the first grazing season.] Masters thesis, ONIRIS INRAE , BIOEPAR. .

13. Constancis, Caroline (2021) **L'élevage des veaux laitiers sous nourrices en agriculture biologique : description des pratiques et étude épidémiologique de la cryptosporidiose et des strongyloses digestives et respiratoires.** [Dairy calf rearing with nurse cow in organic farming: description of practices and epidemiological study of cryptosporidiosis and digestive and respiratory strongylosis.] PhD thesis, UMR BIOEPAR INRAE Oniris . .

14. Johanssen, Juni Rosann E. (2021) **Interviews with Norwegian farmers with cow-calf contact systems.** Speech at: GrazyDaiSy and ProYoungStock joint workshop, Online Zoom, 30.09.21.

15. Bareille, Nathalie; Constancis, Caroline; Pomiès, Dominique; Hellec, Florence and Martin, Bruno (2021) **Webinaire "Repenser l'élevage des veaux laitiers pour rétablir le lien mère-jeune: Étude croisée de l'élevage de veaux sous la mère et de celui sous vaches nourrices".** [Webinar "Rethinking dairy calf rearing to re-establish the dam-calf bond: A comparative approach to rearing calves with the dam or with a nurse cow".] INRAe, Oniris .

16. Den Grimme Ølling, Den Grimme Ølling (2021) **Køer med kalve. Learn about benefits and challenges of new cow-calf-togetherness systems.** [Cows with calves. Lær om fordele og udfordringer ved nye ko-kalv-systemer.] AU, ICROFS, Denmark.

17. Vaarst, Mette; Verwer, Cynthia; Constancis, Caroline; Sørheim, Kristin and Johanssen, Juni Rosann E. (2021) **'Whose views and ways are changing?' Perspectives of change and transition related to cow-calf contact systems in European dairy farming.** In: Schmid, Otto; Johnson, Marion; Vaarst, Mette and Früh, Barbara (Eds.) *Organic Animal Husbandry Systems - ways to improvements*, Organic Eprints, pp. 35-38.

18. Sørheim, Kristin; Johanssen, Juni Rosann E. and Adler, Steffen A. (2021) **Short report Norway - Kalvelykke & GrazyDaiSy.** Working paper, Norwegian Centre for Organic Agriculture .

19. Lehmann, Jesper Overgård; Mogensen, Lisbeth; Bertelsen, Maja and Vaarst, Mette (2021) **Dam-rearing of dairy calves: Lessons from practice for future research & development.** Department of Agroecology & Department of Animal Science, Aarhus University, Tjele, Denmark.

20. Constancis, Caroline; Ravinet, Nadine; Bernard, Marion; Lehebel, Anne; Brisseau, Nadine and Chartier, Christophe (2021) **Rearing system with nurse cows and risk factors for Cryptosporidium infection in organic dairy calves.** *Preventive Veterinary Medicine*, 190, pp. 1-8.

21. Dickhoefer, Uta; Velasco, Elizabeth; Binder, Sören; Egle, Bettina; Nieland, Corinna; Griese, Sigrid and Werner, Jessica (2021) **Zufütterung auf dem Prüfstand - Kühe verwerten sogar dürre Weiden.** *Bioland Fachmagazin*, 2021 (April), pp. 36-37.

22. Dickhoefer, Uta; Werner, Jessica and Weber, Jonas F. (2021) **Digitales Weidemanagement – Status quo und Potentiale.** Paper at: Online-Workshop Digitales Weidemanagement, Online, 8. September 2021. [Completed]

23. Spengler Neff, Anet (2021) **How do separation and weaning work with little stress? How can we achieve reliable performance testing of dams that are suckled.** Paper at: Workshop ProYoungStock / GrazyDaisy, Online, 30.09.2021. [Completed]

24. Velasco, Elizabeth and Perdana-Decker, Sari (2021) **Das Potenzial der Weide - Daten und Erkentnisse aus dem Praxisforschungsprojekt „GrazyDaiSy“.** Paper at: Online-Feldtag, Online, 8. September 2021. [Completed]

25. Vaarst, Mette and Christiansen, Iben Alber (2020) **Køer med kalve - Erfaringer, overvejelser og inspiration fra danske og udenlandske økologiske malkekvægbesætninger.** Økologisk Landsforening, Aarhus.

26. Lehmann, Jesper Overgaard; Vaarst, Mette and Mogensen, Lisbeth (2020) **Dam-reared calves: Lessons from pioneer farmers for Danish dairy producers.** In: *Book of Abstracts of the 71st Annual Meeting of the European Federation of Animal Science*, Wageningen Academic Publishers, 26.

27. Perdana-Decker, Sari; Velasco, Elizabeth; Werner, Jessica and Dickhoefer, Uta (2020) **Milk performance, feed intake and nitrogen utilisation of grazing dairy cows supplemented with different roughage mixtures.** Poster at: 28th General Meeting of European Grassland Federation, online, 19-21 October 2020. [Completed]

28. Constancis, Caroline; Leligois, Morgane; Brisseau, Nadine; Lehebel, Anne; Chauvin, Alain; Chartier, Christophe and Ravinet, Nadine (2020) **Infestation par les strongles gastro-intestinaux chez les veaux laitiers élevés par des vaches nourrices pendant la première saison de pâturage dans des fermes en Agriculture Biologique.** [Gastrointestinal strongyles infestation in dairy calves raised by nurse cows during the first grazing season on organic farms.] In: *Proceedings*.

29. Constancis, Caroline; Bernard, Marion; Chartier, Christophe and Ravinet, Nadine (2020) **Les risques de cryptosporidiose chez les veaux laitiers élevés sous nourrices.** [The risk of cryptosporidiosis in dairy calves reared by nurse cows.] *Le nouveau praticien vétérinaire, élevage et santé*, September 2020, 12 (46), pp. 27-31.

30. Lehmann, Jesper Overgaard and Mogensen, Lisbeth (2020) **Mother-bonded calf rearing in organic milk production: Lessons from pioneer farmers in northern Europe.** In: *IAHA Proceedings 2021 (submitted for 2020, but postponed due to Covid-19)*. [Submitted]

31. Brunet, Laurent (2020) **Bovins laitiers et génisses sous nourrices : un compromis idéal ?** [Dairy cattle and heifers reared by nurses: an ideal compromise?] *Biofil*, July 2020, 130, pp. 38-40.

32. Kangur, Kadi (2020) **Eesti mahepiimalehmade jõudlusnäitajate analüüs aastatel 2017-2019.** [Estonian organic dairy cattle performance analysis in 2017-2019.] Thesis, Estonian University of Life Sciences , Chair of Animal Nutrition. .

33. Leming, Ragnar (2020) **Karjatamisprojekti GrazyDaiSy tulemustest.** [Results of the grazing project GrazyDaiSy.] Speech at: Terve loom ja tervislik toit, Tartu, 05.03.2020.

34. Kass, Marko and Leming, Ragnar (2020) **Üleeuroopaline projekt jagab veiste karjatamise parimaid praktikaid.** [The pan-European project shares the best practices for cattle grazing.] *Tõuloomakasvatus*, March 2020, 23 (1), pp. 26-28.

35. {Tool} ***Bio-Milchviehweidehaltung auf unterschiedlichen Standorten in Baden-Württemberg: Mit Zufütterung die***

Weidenutzung gezielt optimieren. Creator(s): Perdana-Decker, Sari; Velasco, Elizabeth; Werner, Jessica; Dickhoefer, Uta; Egle, Bettina and Binder, Sören. Issuing Organisation(s): Uni Hohenheim, Demeter e.V., Bioland Beratung GmbH. Merkblatt. (2020)

36. Christiansen, Iben Alber and Vaarst, Mette (2020) **KO MED KALV.** Økologisk Landsforening. Online at **https://okologi.dk/viden-om-oekologi/landbrugsproduktion/kvaeg/ko-med-kalv/**, accessed on: 2021.

37. Constancis, Caroline; Chartier, Christophe; Bernard, Marion; Lehebel, Anne; Brisseau, Nadine; Chauvin, Alain; Bareille, Nathalie and Ravinet, Nadine (2020) **Parasitisme et performances zootechniques des veaux laitiers conduits avec des vaches nourrices en Agriculture Biologique.** [Parasitic infection and growth in dairy calves suckled by nurse cows in Organic farms.] In: *Proceedings*, 25.

38. Vaarst, Mette; Hellec, Florence; Verwer, Cynthia; Johanssen, Juni Rosann E. and Sørheim, Kristin (2020) **Cow calf contact in dairy herds viewed from the perspectives of calves, cows, humans and the farming system. Farmers' perceptions and experiences related to dam-rearing systems.** *J.Sustainable Organic Agric.Systems*, 70 (1), pp. 49-57.

39. Vaarst, Mette; Hellec, Florence; Sørheim, Kristin; Johanssen, Juni Rosann E. and Verwer, Cynthia (2019) **Calves with their dams in dairy cow systems.** GrazyDaiSy, Randers, Denmark.

40. Bernard, Marion (2019) **La cryptosporidiose chez les veaux élevés sous nourrices en élevages laitiers biologiques.** [Cryptosporidiosis in calves reared by nurses in organic dairy herds.] Masters thesis, ONIRIS INRA , BIOEPAR. .

41. Leligois, Morgane (2019) **Description de la conduite du pâturage et du risque de strongylose digestive chez des veaux élevés sous nourrice en troupeau laitier biologique.** [Description of the pasture management and of the gastro-intestinal strongylosis risk of calves reared by nurses in organic dairy herds.] Masters thesis, INRA Oniris , BIOEPAR. .

42. Constancis, Caroline; Chartier, Christophe and Ravinet, Nadine (2019) **Quels sont les risques de cryptosporidiose chez les veaux laitiers élevés sous nourrices?** INRA , ONIRIS.

43. Constancis, Caroline; Chartier, Christophe and Ravinet, Nadine (2019) **Strongyloses digestives des veaux laitiers élevés sous nourrices en AB Présence des vaches nourrices au pâturage : diminution ou augmentation du risque parasitaire pour les veaux?** INRA, France , ONIRIS.

44. Binder, Sören (2019) **Kühe lernen im Rhythmus - Lösungen für Melkrobotor und Weide.** *Bioland Fachmagazin*, 1 September 2019, pp. 34-35.

45. Wenker, Margret L.; Keyserlingk, Marina A.G.Von; Bokkers, Eddie A.M.; Lecorps, Benjamin; Reenen, Cornelis G. van; Verwer, Cynthia and Weary, Daniel M. (2019) **Effect of cow-calf contact on motivation of dairy cows to access their calf.** In: Newberry, Ruth C. and Braastad, Bjarne O. (Eds.) *ISAE 2019 Proceedings of the 53rd Congress of the ISAE Animal Lives Worth Living*, Wageningen Academic Publisher, Wageningen, NL, 53, p. 259.

46. Dilling, Christine (2019) **Kan ko og kalv sammen give stærkere og sundere kalve?** [Can cows and calves together give stronger and healthier calves?] *ICROFS Nyt*, 9 May 2019, pp. 1-2.

47. Vetemaa, Airi; Mikk, Merit and Peetsmann, Elen (2019) **UURINGUD.** [RESEARCH.] In: *Mahepõllumajandus Eestis 2018 / Organic farming in Estonia 2018*. Estonian Organic Farming Foundation, Tartu, pp. 54-58.

48. Leming, Ragnar and Kass, Marko (2019) **GrazyDaiSy: Uuenduslikud, jätkusuutlikud ja karjatamisel põhinevad piimatootmissüsteemid, mis integreerivad lehmade ja noorloomade koos pidamise.** [GrazyDaiSy: Innovative and sustainable grazing-based dairy systems integrating cows and young stock.] In: *Konverents „Terve loom ja tervislik toit 2019“*, Eesti Maaülikool, Tartu.

49. Leming, Ragnar and Kass, Marko (2019) **Ülevaade rahvusvahelisest karjatamisalasest projektist GrazyDaiSy.** [Overview of an international project focusing on grazing - GrazyDaiSy.] In: *Konverentsi „Terve loom ja tervislik toit 2019“ artiklite kogumik*, Eesti Maaülikool, Tartu, pp. 108-110.

50. Lehmann, Jesper Overgaard; Vaarst, Mette and Holm, Sara (2019) **Ko og kalv sammen - det er ligetil.** *Økologisk Landbrug*, March 2019 (642), p. 14.

51. Velasco, Elizabeth; Werner, Jessica; Dickhöfer, Uta; Griese, Sigrid and Droscha, Anne (2019) **Innovative und nachhaltige weidebasierte Haltungssysteme für Milchkühe (GrazyDaiSy): Biodiversität auf der Weide.** Poster at: Wintertagung Ökologischer Landbau. Bio-Biodiversität: Erkenntnisse, Erfolge und Erfordernisse, HfWU Nürtingen-Geislingen Neckarsteige 6 – 10, 72622 Nürtingen, CI2 111, 21. Februar 2019.

52. Jensen, Margit Bak; Lehmann, Jesper Overgaard; Mogensen, Lisbeth and Vaarst, Mette (2019) **Er tidlig adskillelse af ko og kalv mest skånsomt?** [Is early separation of cow and calf most gentle?] *DCA News*, 4 February 2019, pp. 1-4.

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55. Mogensen, Lisbeth; Vaarst, Mette; Jensen, Margit Bak and Lehmann, Jesper Overgaard (2019) **Systems for mother-bonded calf rearing during the milk feeding period in organic dairy farming.** In: *Book of Abstracts of the 70th Annual Meeting of the European Federation of Animal Science*, 25.

56. Mogensen, Lisbeth; Vaarst, Mette; Jensen, Margit Bak and Lehmann, Jesper Overgaard (2019) **Systems for mother-bonded calf rearing during the milk feeding period in organic dairy farming.** In: *Book of Abstracts of the 70th Annual Meeting of the European Association for Animal Production (EAAP)*.

57. Belluz, Mathilde and Hellec, Florence (2018) **Rearing calves with nurse cows: experiences of French organic dairy farmers.** INRA, INRA.

58. Leming, Ragnar (2018) **Käivitus mahepiimakarjakasvatuse rahvusvaheline koostööprojekt.** [Initiation of international project on organic dairy production.] *Mahepõllumajanduse Leht*, October 2018, 3 (82), p. 16.

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60. Sørheim, Kristin (2018) **GrazyDaiSy - økt sambeiting for ku og kalv i økologisk melkeproduksjon.** [GrazyDaisy - cograzing

strategies in organic milk production.] Norwegian Centre of Organic Agriculture . [draft]

61. Krawczyk, Wojcieck; Walcek, Jacek and Musial, Kamila (2018) **Effect of organic fertilizers on permanent grasslands in the Lower Beskids – the Polish part of the Western Carpathians.** In: *Procc. of 1st European Symposium on Livestock Farming in Mountain Areas. 20-22.06.2018, Bolzano, Italy.*, 1. [draft]

62. Anonymous, Anonymous (2018) **Türkiye AB Organik Sür Sığırcılığı Projesi.** [Turkey in EU Organic Dairy Cattle Project.] *Sut Kardeşi Dergisi, Sayı*, 2018, 8, pp. 48-49.

63. Bareille, Nathalie (2018) **SAEB-presentation of GrazyDaiSy.** Lecture at: SAEB. [draft]

64. Bareille, Nathalie (2018) **Un programme de recherche Europeen qui se penche sur les vaches nourrices en systemes bio.** *Voix Biolactée*, 2018, 94 (Dec.18), p. 19.

65. Belluz, Mathilde and Hellec, Florence (2018) **Confier des veaux à des nourrices : expériences des éleveurs laitiers biologiques.** .

66. Belluz, Mathilde and Hellec, Florence (2018) **Rearing calves with nurse cows: experiences of French organic dairy farmers.** INRA .

67. Hellec, Florence (2018) **L'élevage des veaux laitiers par des vaches adultes. Recueil et analyse de l'expérience des éleveurs biologiques.** Speech at: SAEB, Nantes, 26th October 2018. [draft]

4.2 Stakeholders oriented articles in the CORE Organic newsletter

All address a broad range of stakeholders, who are able to read English and follow CORE Organic newsletter.

Hellec, F. & Michaud, A.: Rearing calves with adult cows: advantages and constraints https://projects.au.dk/coreorganiccofund/news-and-events/show/artikel/rearing-calves-with-adult-dairy-cows-advantages-and-constraints/

Sören Binder: Solutions for milking robots and pastures
(link cannot be found)

Mette Vaarst, Juni Rosann E. Johanssen, Florence Hellec, Cynthia Verwer, Kristin Sørheim: Farmer perceptions and experiences regarding dam-rearing in organic dairy herds https://projects.au.dk/coreorganiccofund/news-and-events/show/artikel/what-are-farmers-perceptions-and-experiences-of-dam-rearing-in-organic-dairy-herds/

Vaarst, M. & Christiansen, I.A. GrazyDaiSy conducts research on how 'Stable Schools' help developing cow-calf contact systems https://projects.au.dk/coreorganiccofund/news-and-events/show/artikel/grazydaisy-conducts-research-on-how-stable-schools-help-developing-cow-calf-contact-systems/

Vaarst, M., Roderick, S., Martin, G., Gunnarson, S., Spengler Neff, A., Bieber, A., Kongsted, A.G. Potentials, challenges and visions for future European organic animal farming across species https://projects.au.dk/coreorganiccofund/news-and-events/show/artikel/potentials-challenges-and-visions-for-future-european-organic-animal-farming-across-species/

Ak, Ibrahim, Umur, Habil and Guldas, Metin. The role of native breeds in securing a good animal health in organic cattle farming in Turkey https://projects.au.dk/coreorganiccofund/news-and-events/show/artikel/the-role-of-native-breeds-in-securing-a-good-animal-health-in-organic-cattle-farming-in-turkey/

Leming, R. Working with Estonian organic dairy farmers to set goals and improve health; https://projects.au.dk/coreorganiccofund/news-and-events/show/artikel/working-with-estonian-organic-dairy-farmers-to-set-goals-and-improve-health/

4.3. Practice abstracts

Uploaded or will be uploaded early 2022, and links inserted from the platform: https://organic-farmknowledge.org/

4.4 Other dissemination activities and material

For details, please approach the GrazyDaiSy partners.

4.5 Future dissemination actions

We will aim at uploading all disseminations coming out of the project to Organic Eprints also after the end of the project implementation.

4.6 Specific questions regarding dissemination and publications

- Will be update it early 2022.

5. Project impact

We have assessed the impact in relation to each end-user group, as requested, as well as inserted a general assessment, with examples. We do not feel able to express impact in terms of quantitative numbers.

End-user group	Impact how	Further explanation
Farmers, advisors	Farmer magazine articles, field days, study trips, farmer meetings, meetings for advisors, talks at different conferences and workshops.	Personal meetings and live-presentations was in particular possible in the first 21 mths., before Covid-19, but continued depending on country and situation, to go on online and in terms of written material.
	Involvement in research activities	The relatively close contact and continued follow-up between researchers and farmers and other actors had impact on all involved, to align joint expectations and common understanding. One example is e.g. that research activities in Germany regarding grazing met the farmers' feeling of urgency regarding climate change consequences.
	Movies made	We believe that these will be watched by a high number of farmers, advisors, students etc., who are interested in the topic.
Partners and partner institutions	Mutual learning about future development options in organic farming, and learning about the organic animal farming sector.	Some project partners had not much previous experience on organic farming, and learned about special issues, challenges and principles of organic farming and how that could influence practices and outcomes, to various degrees.
	Stimulated other research applications and continued focus	Some partners participated in a COST Action joint application, and other networks were created for future collaboration, also including colleagues of the researchers and participants in GrazyDaiSy .
	Network and collaboration	Much network and collaboration emerged, which has potentials in the future.
Scientific and academic environments	Scientific articles, synthesis on basis of case studies etc.; presentations at scientific conferences & meetings	Scientific articles, synthesis on basis of case studies Presentations at scientific conferences & meetings;
	PhD course 'Change and transition …'	Ten PhD students passed, and it enlightened everybody including course teachers, and supervisors, including some of the articles coming out from the project.
	Network on CCC systems	
The organic sector	Some organic organisations directly participated in GrazyDaiSy, and in some countries, there was close contact and mutual exchange.	Based on the disseminations, many articles and news came out in the fora for organic farmers and advisors. Awareness of the topics were taken up by a number of organisations. GrazyDaiSy was well represented at several organic conferences, including the two IAHA conferences 2020 and 2021, and the IFOAM/ISOFAR conference 2021.
	Awareness of 'cutting-edge issues'	This project contributed to bringing new, innovative practices e.g. related to CCC systems, on the agenda, in different countries, which

		potentially has much impact on the development of the organic sector.
Society as a whole Decision-makers	Covid-19 closed down for many opportunities to invite citizens and consumers to farms and meetings. However, some talks, WSs, products and farm walks also involved citizens and consumers.	Many of the products are accessible beyond farmer environments, and especially videos are used by others.
	Articulation of CCC systems	Researchers and organisations worked actively with strategies to improve organic farming, and particularly the CCC systems had interest. The fact that projects addressed these issues, contributed to keeping some attention to the topic, and in some countries, much material was uploaded on webpages which are publically accessible.

6. Added value of the transnational cooperation in relation to the subject

In the following I describe main advantages of transnational research cooperation within the consortium, as well as within the CORE-Organic community.

Within the GrazyDaisy consortium:

1) Valuable discussions on how to understand 'organic', 'sustainability', 'animal welfare', 'health' and other big concepts, widening our perspective, exchanging material and writings,
2) Helping each other on trial development, e.g. in WP2.
3) Exploring new methods, such as hair cortisol sampling, and some methods on estimating rumen activity etc., e.g. exchange visit between Estonia and Germany.
4) Internships, e.g. PhD student from France and from Norway staying at AU in Denmark.
5) Eye-opening to talk about problem areas across so widely different contexts: geographically, farmingwise, social and food system related.
6) Potentials for co-writing, especially needed by the end of the project, but it was far from exploited due to Covid-19.
7) Some partners jointly participated in new research application (which was unfortunately rejected in the first instance).
8) Very good to have some organisations and practice-near institutions onboard, with outreach to inspectors, farmers, advisors etc.; this helped the whole consortium.
9) Just very good to network and expand the network, e.g. to be able to point to potential speakers at conferences, guest lecturers, external examiners or co-authors.
10) Possible to translate or being inspired from others' material and share it nationally.

Within the CORE-Organic Cofund community

11) Good to collaborate with a 'sister-project' ProYoungStock
    a. Meeting to discuss interactions and potential collaborations, at FIBL 17th January 2019 between coordinators from
    b. Joint meeting at the 2nd GrazyDaiSy consortium meeting in Überlingen with representative from ProYoungStock, Silvia Ivemeyer, who presented the ProYoungStock, followed by discussions on interactions and synergies,
    c. Regular meeting in the European Round Table group established at Thüenen Institute, June 2019, where both representatives from ProYoungStock and GrazyDaiSy were invited,
    d. Joint final workshop on CCC systems 23rd and 30th Sep. 2021 – see dissemination plan list.
12) Joint submission of joint abstract between 5 CORE Organic Cofund coordinators + a representative from ORGANISDIARYHEALTH for the Science Forum at the IFOAM/ISOFAR Conference in Rennes,

2021 and the IAHA preconference in 2020, about potentials, strategies, challenges and visions for the future of organic animal farming. It has been held in various forms 4-5 times in different fora.

13) CORE-Organic coordinators / projects on animals were invited to help organising the IAHA preconferences in 2020 and 2021 (pre to IFOAM/ISOFAR conference).
14) Very inspiring to meet in Bari in January 2019 to the CORE-Organic Cofund meeting.

7. Suggestions for future research

In relation to all the topics in focus in GrazyDaiSy, a wealth of new and quite specific research questions popped up. Grazing based farming in relation to sustainable future development is continuously hot, and so is the urgency of finding ways to improving health and animal welfare and get free of dependencies of antibiotics and other medicines, not least because antimicrobial resistance is an urgent global threat. The whole issue of cow-calf contact in dairy farming opened up for a whole area of research and development opportunities.

In addition to this, some cross-cutting issues continued to dominate the discussion, in particular also when looking across the different animal related projects in the group of CORE Organic Cofund-funded projects, mainly 'resilience' and 'diversity', both of which are mirrored and subjected to research and discussion, also in the dairy farming research done in GrazyDaiSy. These two important key words invite to many areas of research, relevant to dairy farming. In our discussions in GrazyDaiSy on 'sustainability', there seemed to be a great need to address issues more broadly than just 'less milk to the farmer means less efficiency of dairy production, hence greater climate impact'. These aspects call for a need to address and question animal farming more broadly and in relation to positive and negative effects in relation to interaction with natural and semi-natural environments, food systems, and social systems, and embracing developments such as regenerative agriculture. Which types of animal farming does organic agriculture build on in the future? These are very big topics, which can be addressed only in parts and with a strong emphasis on inter-disciplinarity in the same research call or project. However, CORE Organic provides the opportunity and ground to create new networks, address crosscutting, novel and complex issues, and these themes could potentially guide development of new calls.