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## SOLID participatory research from UK: A farm case study of rearing calves on milking cows

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**May 2015**

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This work was undertaken as part of the SOLID Project (Agreement no. 266367 (<http://www.solidairy.eu/>), with financial support from the European Community under the 7th Framework Programme. The publication reflects the views of the author(s) and not those of the European Community, which is not to be held liable for any use that may be made of the information contained.

## Summary

There is a notion that rearing calves on milking cows is a more “natural” and “welfare friendly” practice compared to the conventional practices (i.e. bucket feeding) currently applied. Rearing calves on cows can also be perceived as a method to reduce labour costs and costs of purchasing milk replacer. However, this practice may impose some negative effects as cow contact with calves running loose in the herd may increase the risk of mastitis. The implications that this rearing method will have on the system as a whole have not been studied systematically in the UK.

A farmer in South West Scotland has commenced rearing calves on their mothers as a component within a move to a “lean farming” approach and wished to monitor the effects of this practice on animal health, welfare, productivity and economic viability of the farm. A participatory case-study approach was adopted with the farmer and his family being the main responsible for carrying out the management operations and the collection of the data. Contrary to the farmer’s expectations systematic analysis of the data showed that under conditions of unrestricted suckling the amount of the sellable milk available was too low to maintain the economic viability of the farm and the calf-rearing system appeared to be financially questionable. Rough teats in terms of dryness were more prevalent in the group of cows suckling calves than in the group of (late lactation) cows that were not suckled by calves. The body-weight gain of the suckled calves was exceptionally high (0.9kg/day) compared to bucket fed calves (0.65 kg/day).

The study suggest that further adaptation of the management system is necessary to achieve a financially viable way of producing milk for sale while rearing calves naturally on their dams. It is foreseen that the results of this case study will be brought together with the experience of Danish Organic Farmers rearing calves naturally.

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## 1 Aims and Research question

The aim of this study was to study whether rearing calves on milking cows affects positively animal growth rate, health and welfare and economic viability of the farm. More specifically this participatory project aims to evaluate the effect of rearing calves on milking cows on:

- a) available milk for sale
- b) calf growth rates
- c) health implications for cows and calves
- d) management challenges, and the solutions to these
- e) cow-calf behaviour

## 2 Background

### 2.1 Research Background

In modern dairy systems, calves from the dairy herd are most commonly removed from their dams after one to two days and reared separately on systems using buckets, troughs or automatic feeders. This separates the management tasks of taking care of milking the cows and rearing the calves, whether these are destined for herd replacements or beef production. Calves of suckler cows on the other hand, are naturally reared, being left with their dams until weaning at 8 – 10 months.

Rearing calves on milking cows would clearly reduce the amount of milk available for human consumption, but could be argued to be more “natural” and “welfare friendly”. In particular, it would allow the cow to express her maternal instinct, in line with the principle of meeting species-specific behavioural needs (see Article 3biv of Regulation (EC) 834/2007). It is also perceived to reduce labour costs, and the costs of purchasing milk replacer (if this is used), but these aspects have not been studied in the UK. On the other hand, there are some suspicions that calves running loose will increase the risk of mastitis, both through cross contamination of cows’ udders as a result of cross-suckling, and the opening of the teat sphincter. Wagenaar et al. (2007) showed no negative effects on either somatic cell count of cows or general animal health, of suckling up to 3 months of age compared with bucket feeding of milk replacer or cows’ milk. Although remaining with the cow longer may appear to provide a welfare benefit to the young calf, there is some evidence that breaking the maternal bond later in life causes greater distress. However, the distress is reduced by separating the events of milk withdrawal and physical separation, or by gradual weaning (Verwer & Kok 2012). This rearing method will have implications for the dairy system as a whole, which also have not been studied.

### 2.2 Farm Background

A farmer in South West Scotland has commenced rearing calves on their mothers as a component within a move to a “lean farming” approach. The farmer believed that this will reduce the costs of rearing calves for beef due to lower bought in feed costs, contribute to better animal welfare, and prolong the productive life of the cows. He approached the SOLID team with the wish to monitor the effects on animal health, welfare and productivity, within the whole system. The objective of this single farm case study were to record the impact of the change in rearing practises on the health and

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performance of cows and calves in this system, and the system level inputs and outputs. It is acknowledged that there is no “control” group and this can only be seen as one observational case study. Some organic farmer in Denmark are also using natural rearing systems and it envisaged that the experience of this farm will be brought together with their experience.

### 3 Methodology and data collection

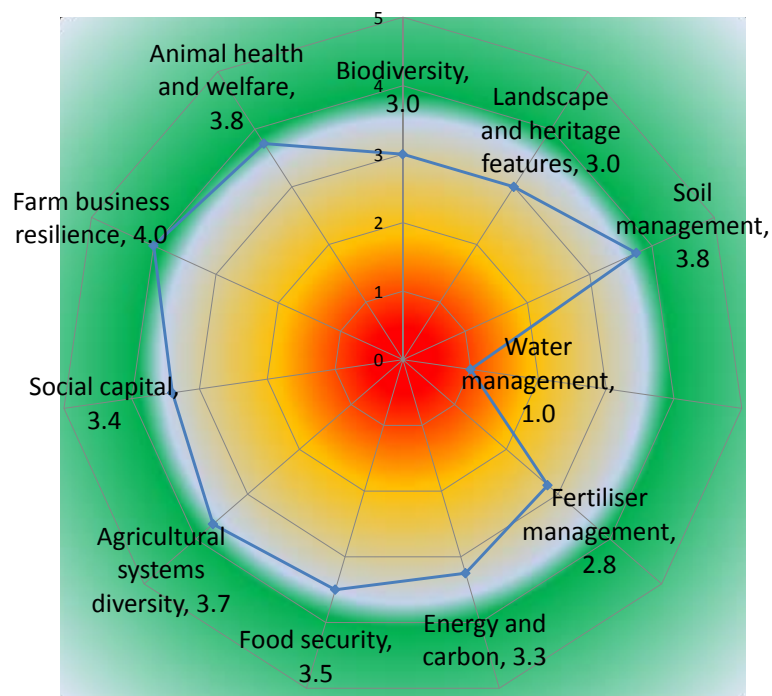
#### 3.1 Location of the farms

The farm that participated in the study was located near Castle Douglas, Kirkcudbrightshire, in Scotland.

#### 3.2 Description of the participatory study

A participatory case-study approach was adopted as this allowed the farmer to use his own initiatives in the system tested. The farmer was responsible for carrying out the management operations and the initiative (i.e. rearing calves on milking cows) that he wanted to test in his farm. The farmer was free to make modifications in the system and he and a member of his family were also the main responsible persons for the collection of the data on the farm.

An assessment of whole farm sustainability for the year before prolonged suckling was introduced was carried out in October 2012, using the ORC Public Goods Tool (Figure 1).



**Figure 1.** Results of the sustainability assessment carried out using the ORC's Public Goods Tool during for the period 1st Sept 2011 to 31 Aug 2012.

### 3.2.1 Monitoring of farm records and data collection

The table below summarises the type of data that were collected and the methodology used for data collection.

**Table 1. Summary of the methodology of data collection Dec 2012 – Feb 2013**

Parameter	Method	Frequency of data collection	Person responsible
Milk yield	Recorded in parlour electronically	2 x day	Farmer and ORC
Cow body condition score	DairyCo method	At calving and then monthly	Farm / Margaret Finlay
Cow teat condition	National Mastitis Council method	Monthly	Farm Margaret Finlay
Calf weights	Weigh tape	a. At birth b. When sold	Farm Charles & Farm David Farm and Glasgow University*
Feed use – for cows	Farm records/parlour	Annual summary	Farm / David Finlay
Feed use – for calves	Farm diary	Use of calf creep feed during feeding period	Farm / Margaret - David – Worker
Cow and calf behaviour	General informal daily observations Two specific observations of calf feeding area	Two occasions when creep feed first introduced	Farm staff Margaret Finlay
Overall farm inputs and outputs	Invoices	Annual summary	Farm / David and ORC PG tool
Farm energy data	Invoices	Annual summary	Farm David Finlay, then ORC FAST tool

*\*An additional Glasgow University student project involved analysis of growth rates of suckled and bucket fed calves*

### 3.2.2 Data analyses and calculation

The initial aim was to evaluate the physical and financial performance as well as health and welfare aspects of the system over several years. Milk yields and cow somatic cell counts, and weights of calves/beef animals at sale from previous years would be available for comparison, but information on cow body condition, calf growth rates and teat condition had not previously been recorded. In fact, (see results) due to difficulties with the system, the practice was only carried out with the autumn born calves of 2012, and therefore there was no opportunity for long term study.

### 3.3 Time scale

2013: Observations were started to be recorded in 2013 until the practice of rearing calves on cows was stopped.

During 2014: A review of results and wider literature was carried out.

## 4 Results and Discussion

Contrary to the farmer's original expectations only one group of calves was reared on their mother's milk as part of the study and involved the calves born in Autumn 2012 onwards (i.e. calving dates 20/10/2012 to 20/01/2013). The reason that the study did not continue was that this calf-rearing system appeared to be financially questionable, as the results will show below.

#### 4.1 Farm sustainability assessment

The results of the whole farm sustainability assessment of the year before prolonged suckling was introduced carried out in October 2012 are summarised in Figure 2. At this point the farm scored very well on business resilience and relatively well on animal health and welfare, and soil management. The greatest weakness was water management. This was largely because the farm is in a high rainfall area so did not employ any water saving techniques.

#### 4.2 Milk yield

During the first two weeks after calving the overall milk yield per cow per day of the animals autumn calving in 2012 averaged 4 to 5 litres, an amount that was disappointingly low for the farmers' expectations. The farmer was reluctant to physically separate calves from cows for long periods of time. To increase the amount of the sellable milk the farmer decided to start milking the cows twice a day while maintaining the free access of the calves to their mothers 24h. The addition of the afternoon milking did not affect considerably as overall milk production. On the 7th March 2013 calves were partially separated from their dams and restricted suckling was introduced. Under this regime the calves were kept separated from their mothers as the cows went for the morning milking and were allowed unrestricted access to their mothers from after the afternoon milking onwards. During the day, the cows and calves could still see each other and interact through gates. Partial suckling did not allow for sufficient milk yield recovery and the overall milk yield still remained below the expected level (Figure 2) which caused a significant impact on farm's economy. The overall monthly milk production and quality from bulk tank analysis is shown in Table 2.

**Table 2.** Monthly milk production and quality from bulk tank analysis

Month	Cows in milk	Milk produced <sup>a</sup>	Milk Sold <sup>a</sup>	Fat %	Protein %	SCC <sup>b</sup>	Bactoscan <sup>c</sup>	Urea %
Oct 2012	68	30203	29963	4.75	3.63	269	23	
Nov 2012	81	30685	25365	4.76	3.65	285	25	
Dec 2012	76	38502	26642	4.52	3.56	312	35	0.012
Jan 2013	60	41360	21272	4.25	3.35	307	40	0.008
Feb 2013	48	30078	11926	4.18	3.27	318	36	0.008
Mar 2013	63	27817	16657	4.19	3.34	278	35	0.012
Apr 2013	92	50964	44904	4.19	2.97	136	9	0.013
May 2013	94	65748	58618	4.16	3.08	194	14	0.012
Jun 2013	94	65656	64156	3.80	3.19	197	9	0.007

<sup>a</sup> Total litres

<sup>b</sup> Somatic Cell Counts, measured as thousand cells/ml

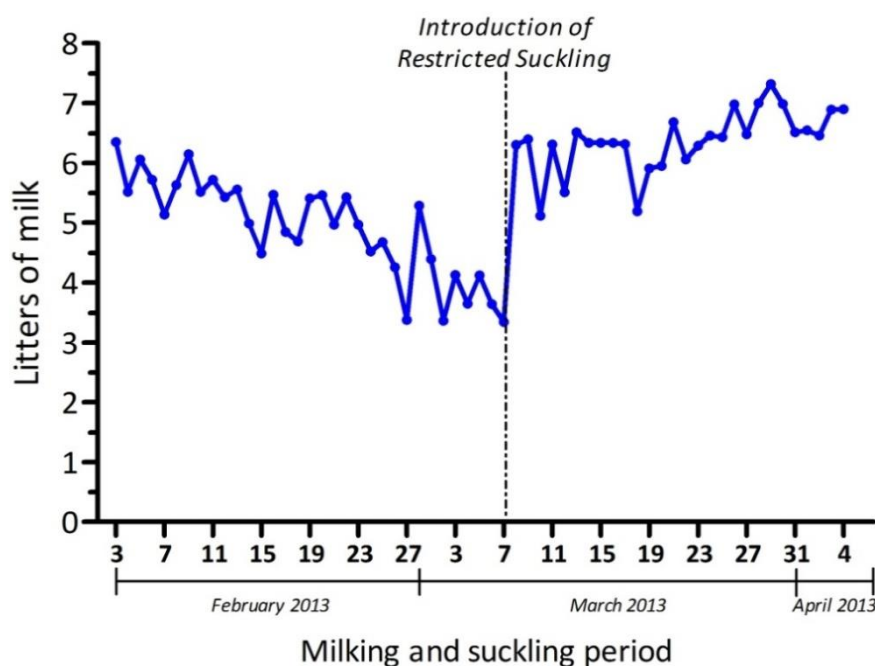
<sup>c</sup> Number of bacteria present in milk expressed as thousand bacteria/ml

#### 4.3 On-farm amendments to increase amount of sellable milk

In an attempt to reduce milk intake by the calves and increase milk yield in the parlour the farmer encouraged calves to eat creep feed. A short observational study was carried out to evaluate whether creep feeding would be adopted by the calves. The number of calves eating creep feed was recorded at half hour intervals from 09:00 to 12:00 over two consecutive days (December 2012). Only 7 out of the 30 different individuals were observed eating the creep feed over these particular two days. During a period of 7 days 20 kg of creep feed was consumed in total, resulting in 0.4 kg per calf per day, but intakes are likely to be less than this as other calves may have started eating creep



feed in the meanwhile. An additional attempt was made to encourage calves into the creep area by providing haylage in racks and a similar observational study was carried out. Haylage attracted more calves -20 in total- and new individuals were observed in the creep area including some smaller and younger calves. Another approach was to introduce some novel objects to appeal to the calves' interest in exploring, and encourage them into the creep area. These did attract some additional calves into the area initially but the effect on feed consumption cannot be quantified. While calves had unlimited access to their mothers' milk the estimated concentrate intake averaged from 0.3 – to 0.5 kg per calf per day but following the partial separation of the calves from their mothers on the 7th of March, individual concentrate intake increased to approximately 2 kg/day.



**Figure 2.** Daily milk production retrieved at the parlour of cows that were suckled by their calves during the period 1<sup>st</sup> February 2012 to 4 April 2012.

#### 4.4 Cow housing and cow-calf interactions

The maternal suckling was introduced at the same time as the herd had moved into a new housing system. The new design of the cubicles as shown in Pictures 1 and 2 allowed cows to lie in a variety of positions, including diagonally across the cubicle space, and even parallel to the dung passage, underneath the cubicle divisions. This resulted in some soiling of the beds. The cows rarely lay in adjacent cubicles, and often their bodies overlapped into the adjoining cubicle, underneath the divider. To rise, the cows generally lunged to the side, over the cubicle division. The cubicle use behaviour needs to be reassessed when the stocking rate is increased to the building's full capacity. The farmer (i.e. David Finlay) considered that the low stocking rate of the cubicles (2-3 cubicles per cow) encouraged the calves to stay in the adult cow areas, because of the high availability of lying places, particularly as the calves could lie in any position, not being restricted by the cubicle design. When the cow numbers increase calves may be more likely to enter the creep area for rest and consume more feed while they are there.



Calf-cow behaviour was assessed at the time the cows were going to the milking parlour and observations took place in December 2012. Calves were somewhat unruly, but as calf numbers increased, the majority of them were content to remain in the cubicle area and await their mothers' return. Some calves were occasionally eager to go to the collecting yard, possibly even pass through the parlour, but this did not cause problems. Human appearance (i.e. herdsman arrival) did cause disturbance among the cows and calves, and promoting cow-calf interaction with suckling taking place. Common time of suckling was after the morning milking and feeding. Multiple suckling was also observed occasionally; for example five different cows were observed to have two calves suckling them at once. The "roving" calves generally approached the cow from behind, when her own calf was suckling.



**Picture 1** . A combination of cubicle design and adjustment, and low stocking rate, allowed cows to adopt unconventional and undesirable lying positions



**Picture 2 .** Calves were able to lie with their dams

#### 4.5 Cow teat condition

Slightly rough and very rough teats in terms of dryness assessed in December 2012 were more prevalent in the group of cows suckling calves than in the group of late lactation cows that had calved in spring 2012 and were not suckled by calves. In contrast, occurrences of warts were less common in the teats of the suckled cows calved in December 2012 compared to that of the non-suckled cows calved in spring 2012 (Figure 2). Chi-squared analysis indicated significant differences between suckled and un-suckled cows both for the dryness of the teats ( $P < 0.01$ ) and the presence of warts ( $P < 0.01$ ) [NB It is not possible to separate the possible confounding effects of suckling and stage of lactation]. The proportion of teats with these lesions in each group was calculated and results are summarised in Table 3.

**Table 3.** Percentages of teat condition in terms of dryness, warts and lesions in suckled or un-suckled cows

Cow group	DRYNESS		WARTS		LESIONS HORIZ		LESIONS VERT		
	YES	NO	YES	NO	YES	NO	YES	NO	
DEC	Suckling	70.7%	29.3%	20.7%	79.3%	*	*	*	*
	Non-suckling	7.8%	92.2%	16.7%	83.3%	*	*	*	*
JAN	Suckling	*	*	0.0%	100.0%	39.6%	60.4%	7.6%	92.4%
	Non-suckling	*	*	11.8%	88.2%	3.9%	96.1%	0.0%	100.0%
FEB	Suckling	*	*	0.0%	100.0%	41.0%	59.0%	11.8%	88.2%
	Non-suckling	*	*	10.0%	90.0%	3.8%	96.3%	0.0%	100.0%

#### 4.6 Calf performance

Calf weights at birth were estimated using a weigh tape. Measuring growth rates was not practicable due to the difficulties of physical handling of the calves and the lack of funds for the purchase of weighing facilities. However, a subsequent Glasgow University student project provided data on lifetime growth rates of the suckled calves compared with previous bucket reared calves. On average, suckled calves were slaughtered 193 days earlier than the previous bucket reared calves (T Harris, unpublished data). Calculated from birth weights and estimated slaughter weights (assuming a killing out percentage of 48%), suckled calves achieved a daily live weight gain of 0.9 kg/day and bucket fed calves 0.65 kg/day.

#### 4.7 Cow fertility

Although not recorded during the period of SOLID project monitoring, the Glasgow University Student project refers to extended anoestrus associated with the calves suckling (D Finlay, personal communication, cited by T Harris)

### 5 Conclusions/Recommendations

The collected data indicate that restricting the amount of milk taken by calves is necessary to retain an economic level of milk for sale. Further adaptation of the management system is necessary to achieve a financially viable way of producing milk for sale while rearing calves naturally on their dams. One alternative system would be using multiple suckling which can be considered a compromise between increased 'natural living' and practical and economic implications. It is foreseen that the results of this case study will be compared with the findings of Danish Organic Farmers rearing calves naturally.

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