SOW FEEDING MANAGEMENT DURING LACTATION

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ABSTRACT

The challenge of feeding the lactating sow is not new and improvement to the genetic potential of lean and prolific dam lines make this issue of critical importance for any breeding herd. Precise feeding programs in gestation to avoid over-feeding will help. Management practices after farrowing can encourage early and quick increases of feed allowance and these include wet-feeding, giving time to sows to eat, monitoring of intake or simply feeding to appetite. The impacts of too warm ambient temperature on sow feeding behaviour and performance should also not be neglected. Finally, the effects of people, water availability, comfort of sows and control of automated systems are briefly reviewed.

INTRODUCTION

Anyone could consider sow feeding management during lactation as anything but a new topic. It is however still evident, from current field experience and observation, that there are numerous approaches to managing this part of the breeding herd. Eight years ago, the late Dr Frank Aherne (2001) stated the following: '*In an age of interplanetary travel, how can we still be arguing about how to feed the lactating sow? If we can crack the animal's genetic code, why can't we understand the interrelationship between feed intake and lactating sow performance? But perhaps we do understand these relationships but we are unable to translate the science into good farm practice. Perhaps we too often try to apply general rules or guidelines to fit very individualistic situations, be these genotype, farm or individual animal? Each individual lactating sow is different and applying general rules to individual animals will generally be less than satisfactory. But as farm size increases it may become more difficult to treat each sow as an individual. So what can we compromise and what aspect of sow management must stay sow specific?'* This paper will try to describe today's context and challenges for lactation, identify the main factors affecting lactation feed intake and management strategies contributing to improved performance. Finally, examples of the benefits of proper feed intake management of nursing sows will be presented in support of the suggested management practices.

CONTEXT AND CHALLENGES OF MODERN SOWS DURING LACTATION

One of the challenges of feeding the modern sow is how to support increased milk production associated with increased litter size. Today sows have to support litter growth rates of 2 to 3 kg/day or more (Etienne et al., 2000). This corresponds to milk production of 8-12 litres/day or more (Noblet et al, 1998). Secondly, the weight of sows at maturity (260-290 kg) has increased with concomitant increases in maintenance requirements (Noblet et al., 1998; Dourmad et al., 2001). Also, at the start of their breeding career the replacement gilts are put in service with less fatty tissue reserves (Aherne, 2001) and therefore with less ‘buffer’ energy stores. The length of lactation has declined (75% at less then 21 days, Aherne (2001)) allowing for less time to attain higher feed intakes after farrowing. Genetic improvement for both weight gain and lean has resulted in either a reduction in the sow appetite (Aherne, 2001) or intakes have not increased in the same proportion as their energy requirements (Noblet et al., 1998). The end result of the above is best summarized in Table 1 which shows energy requirements and feed required/day for the entire lactation, irrespective of the duration. As the ME content of the diet referred to in this table is fairly typical of current practices (13.6 MJ ME/kg or 3250 kcal ME/kg), the amount of feed actually required could represent a real challenge in many farm situations. In reality, appetite is often not sufficient and sows have to draw form their body reserves.

Table 1. Energy and feed requirements of lactating sows according to bodyweight and litter weight gain. (Noblet, Étienne and Dourmad, 1998)

Litter weight gain (kg/day)	2.0		3.0	
Sow bodyweight (kg)	200	300	200	300
Maintenance requirement (MJ ME/day)	24.5	28.9	24.5	28.9
Milk production requirement (MJ ME/day)	52.0	52.0	79.6	79.6
Total energy requirement (MJ ME/day)	76.5	80.9	104.1	108.5
Feed required for the entire lactation (kg/day)	5.63	5.95	7.65	7.98

Using body reserves could lead to excessive weight loss accompanied by a reduced litter weight gain (lowered milk production) and subsequent reproductive problems for sows (Aherne, 2001). These conclusions are widely accepted and documented with the body of evidence showing why lactation is such a crucial cornerstone of sow production and reproductive efficiency. Therefore, for the modern lean and prolific sow *everything must be done to maximize lactation feed intake* (Goodband et al, 2006).

Factors Influencing Lactation Feed Intake

The following factors influencing lactation feed intake will be reviewed and discussed based on current scientific knowledge and the author’s experiences: gestation feeding, managing feeding during the nursing period, ambient temperature, water supply, people and equipment. This list has no pretention of being exhaustive.

1. Feeding during previous gestation. Any overfeeding during gestation will systematically compromise the feed intake of sows or gilts in the following lactation (Quiniou et al, 1998; Whittemore, 1998; Noblet et al., 1998). In addition the long term consequence of this overfeeding will lead to overweight and premature culling due to productivity or various locomotors problems. Very often, the problem with dry sow feeding is the feed allowance is set according to subjective assessment of the need of each sow or group of sows, often leading to incorrect assumptions concerning the sows condition and therefore systematic over-feeding (Goodband et al., 2002). Dry sows should be fed as precisely as possible using more objective techniques to assess individual body weight, body condition (score determined following visual appraisal and palpation at hip bone level), and ideally, measurement of back-fat depth (Dourmad et al., 2001; Goodband et al., 2006). Research conducted at Kansas State University has demonstrated that fatter sows at farrowing have lower feed intakes during lactation, lose more of their reserve and are less prolific at the next parity (Young et al., 2004). These results are summarized in Table 2.

Table 2. Effect of backfat at farrowing on feed intake, performance of sows in lactation and subsequent performances. (Young et al., 2004)

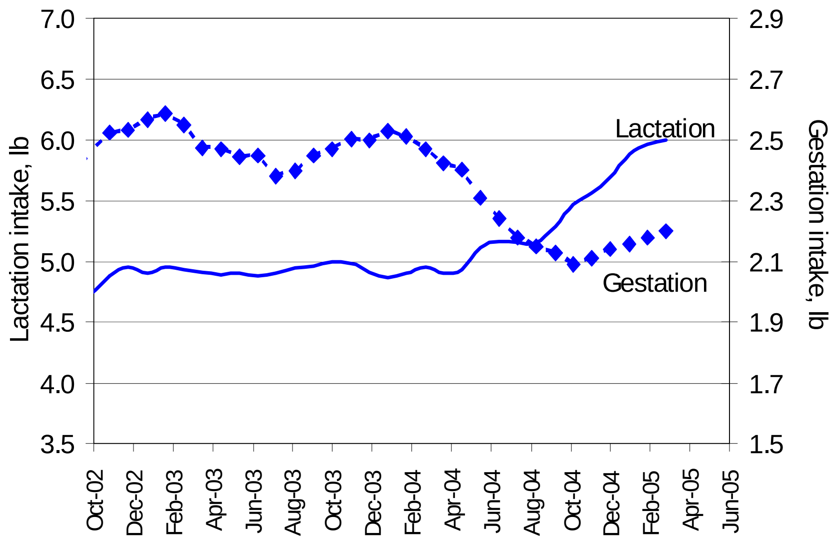
Item	P2 Backfat at farrowing, mm			P<
	< 17	17 to 21	> 21	
No. of sows	123	258	162	
Lactation daily feed intake, kg	6.06	5.93	5.73	0.04
Estimated maternal weight loss, kg	1.9	5.6	6.3	0.08
Sow Backfat loss, mm	2.1	3.2	4.8	0.01
Subsequent performance: Nb of sows	93	200	131	
Subsequent performance: Total Born	11.8	12.1	11.1	0.02

Most authors agree that feed intake problems during lactation will most likely occur in sows with back-fat depths of 23 mm or more at farrowing (Aherne, 2001; Dourmad et al, 2001, Goodband et al., 2006). The precision of the actual amount of dry sow feed delivered manually or by automatic feeding systems (drop boxes, canisters, etc.) needs to be checked on a regular basis because feed density (bushel weight of grains, diet composition) and therefore volumetric measurements will vary with each load of feed delivered (Goodband et al., 2006). Gestation feeding programs need to be validated by your nutritionist in order to more precisely adjust feed allowance settings to the specific diet density used on your farm and feeding targets (bodyweight and back-fat gains which could be genotype specific). Figure 1 illustrates the lactation intake results from a large US production system that lowered their gestation intakes after initially overfeeding during gestation.

Finally, feed allowance toward the end of gestation needs to be increased in order to avoid a negative energy balance in the sow prior to farrowing. This also paves the way to higher feed intake in early lactation (Whittemore, 1998; Aherne, 2001) and easier farrowing (Quiniou, 2005).

2. Management of feeding during lactation. A good principle is to ensure that the feed allowance the day after farrowing resumes to the same amount fed during the last 14 days of gestation: feed allowances should be at least 2.5 kg but I regularly see sows eating 3 to 4 kg the day after parturition in situations where dry sow feeding is well controlled and the sows are in good condition (not overweight). The amount of feed offered daily should rapidly increase in the following days by at least 0.5 kg/day and ideally by 1.0 to 1.5 kg/day. Research has repeatedly shown that too restrictive feeding patterns in early lactation (to prevent udder congestion, hypogalactia, piglet scouring, sow constipation and off feed events) can reduce total lactation feed intake for two reasons: 1) Feed intake in the last three weeks of lactation is not influenced by the intake in early lactation; and 2) The lost feed intake opportunities of early lactation cannot be recuperated in the later stages of lactation (Quiniou et al., 1998; Aherne, 2001; Quiniou et al., 2000; Noblet et al., 1998). Finally, large surveys have demonstrated that 30-35% show a marked dip in feed intake for 2-3 days in the second week of lactation, while 30% of sows show no feed refusals at all (Aherne, 2001). Therefore, it is better to tailor our feeding management toward the 2/3 of sows which do not show a marked drop in intake and target appropriate management strategies for those sows that do refuse feed, rather than the other way round. Common targets should then be based on the following: over 50% of sows reach their maximum before 10 days post-partum; less then 25% of sows have a blockage for 2 or more days (it is normal to have some refusals between 5 and 10 days post-partum: the frequency is influenced by the control of gestation feeding and the sow's well-being/comfort during lactation). If a sow reduces or stops feeding 1 meal or 1 day, check vitals signs (temperature, udder state, etc.), empty feeder when necessary and resume as soon as possible to the amount distributed the day preceding feed refusal.

Figure 1. Change in lactation feed intake after reducing dry sow feed allowance following stricter feeding program: six month rolling average. (Goodband et al., 2006)



The amount of feed fed daily should be captured using a feed budget card, clothes pins clipped on the crate or feeder or any other system to track daily feed intake (Goodband et al., 2006). This also improves communication and coordination between different workers. Alternatively, the KSU feeding method for lactating sows could work fine and calls for high feed allowance right after farrowing. See Table 3.

Sows should always be given enough time to eat, there is no hurry as they are hourly milking a litter of 10-12 piglets. It is preferable to distribute 2 to 3 meals daily at equal time intervals. Feeding as gruel by adding water stimulates intake by 3 to 12% (Quiniou et al., 1998; Genest and D'Allaire, 1995) but we should not add too much water as this could lead to feed wastage and too much dilution of the feed as well as possible fermentation and hygiene problems. There must be feed available in the feeder during most time of the day but feeders must be kept clean. These practices are referred to as ''feed to appetite'' which should be as close as possible to 'ad libitum’ feeding. According to KSU, as soon as 20% of feeders are empty at any given time during lactation*, the sows are restricted at the producer’s will* (Tokach, 2002).

Table 3. KSU suggested feeding procedure during lactation. (Goodband et al., 2006)

Number of 1.8 kg (4 lb) scoops to feed at each feeding from day 0 to 2

Feed in Feeder	Feeding AM	Feeding PM
Empty	1	1
< ½ scoop	0	0.5
> ½ scoop lb	0	0

Number of 1.8 kg (4 lb) scoops to feed at each feeding from day 2 to weaning

Feed in Feeder	Feeding AM	Feeding Noon	Feeding PM
Empty	2	2	2
< ½ scoop	1	1	2
> ½ scoop lb	0	0	1

3. **Room temperature.** The ambient temperature in the farrowing room is often overlooked as a source of intake problems. Sows are homeothermic animals producing a large amount of heat due to their high feed intake and rapid rate of milk synthesis. Due to these high metabolic demands there is a zone of thermal comfort between 12 and 20ºC (Quiniou et al, 2000; Quiniou and Noblet, 1999; Makkink and Schrama, 1998). Research conducted on the impact of various ambient temperatures on behaviour and performance of lactating sows has demonstrated that sows start “feeling” hot between 18 and 22ºC (Quiniou et al., 2000) (Figure 2). A consequence of which is a reduction in feed intake with the magnitude of the reduction more severe when temperatures exceed 22ºC, as shown in Figure 3. These results highlight how the requirements of piglets at birth and during suckling are significantly warmer (26-30ºC) compared to those of sows. Therefore, there is the need to compromise the choice for room temperature based on minimizing the negative effects for both the sow and the piglet. Practical recommendations would be to maintain the room temperature at 18-20ºC (65-68ºF, remembering for each ºC above 20, the sow’s appetite drops 0.15 kg/day) and provide additional heating (infra-red lamp, pad, covered creep area) for the piglets. Supplementary IR lamps should be switched off at the end of farrowing. However, during summer time the room temperature will inevitably be too warm leading to heat stress for the sows.

Research has also measured the impact of sows under heat stress in order to determine if the impact on production was exclusively a consequence of a depressed feed intake. Trial results are presented in Table 4 and they indicate that at levels of intake similar to sows exposed to heat stress, sows housed at 20ºC produce much more milk as measured by weaning weight and litter gain. This milk production was supported by depletion of body reserves (bodyweight and backfat) which were much more intense than at 30ºC. It was also observed that milking frequency was not reduced during heat stress so the reduced production observed is not piglet mediated. However, piglets suckling from sows that are under heat stress would benefit from extra milk (or possibly creep feed) to support their growth. The reduction in milk production from heat stressed sows is, therefore, linked directly to the metabolism of the sow and is probably caused by an alteration of the level of circulating hormones reducing its capacity to mobilize body reserves or by a redistribution of blood flow from mammary gland toward the skin in order to increase heat loss, thus decreasing milk production (Quiniou et al., 2000; Williams, 1998).

Figure 2. Body temperature and respiratory rate of sows exposed to increasing ambient temperature. (Quiniou et al., 2000)

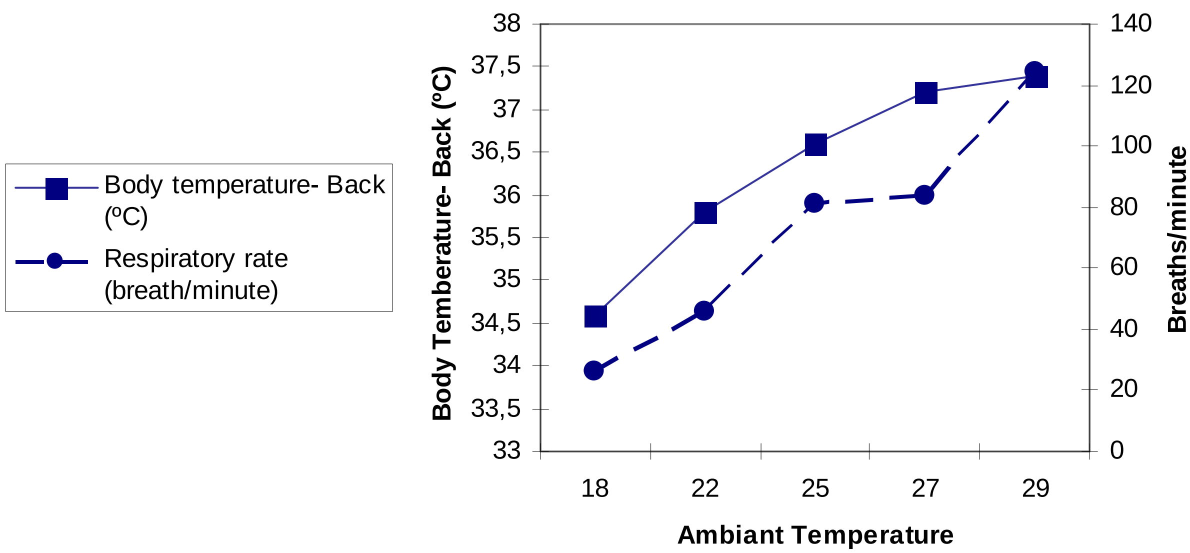


Figure 3. Average daily feed intake of lactating sows exposed to increasing ambient temperature for the farrowing to weaning or from day 9 to 19. (Quiniou et al., 2000)

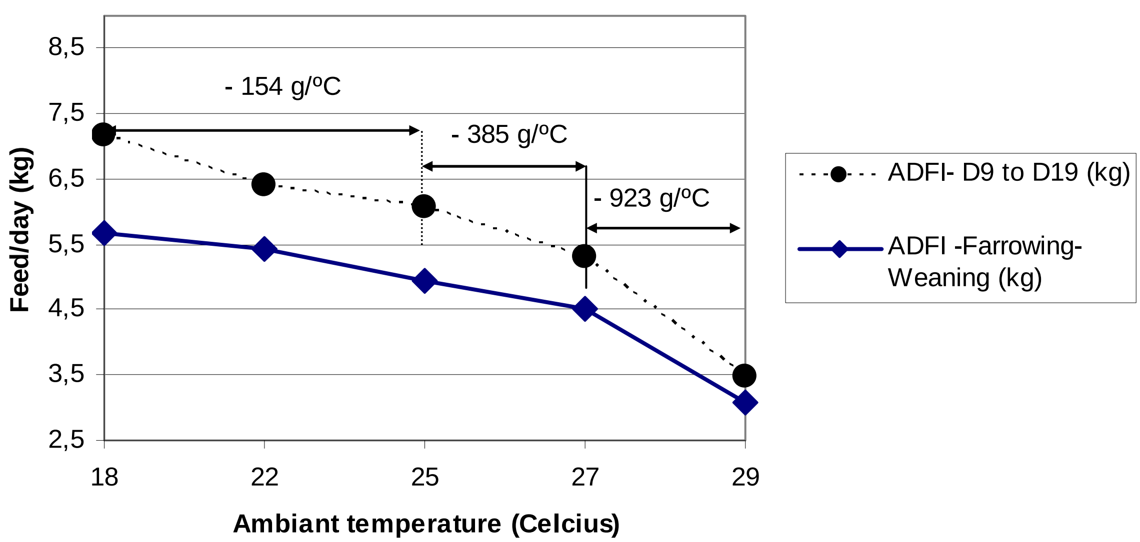


Table 4. Effect of ambient temperature and level of intake of performance of lactating sows (Messias de Gragança et al., 1997 in Étienne et al., 2000)

Room temperature (ºC)	20	20	30
Level of feeding	Ad libitum	Restricted	Ad libitum
Feed intake (kg/d)	4.9	3.1	2.8
Weight loss (kg)	8.3	31.5	21.7
Backfat loss (mm)	0.9	3.5	2.8
Average pig weaning weight (kg)	6.44	6.29	5.80
Litter weight gain (kg/d)	2.05	1.97	1.62

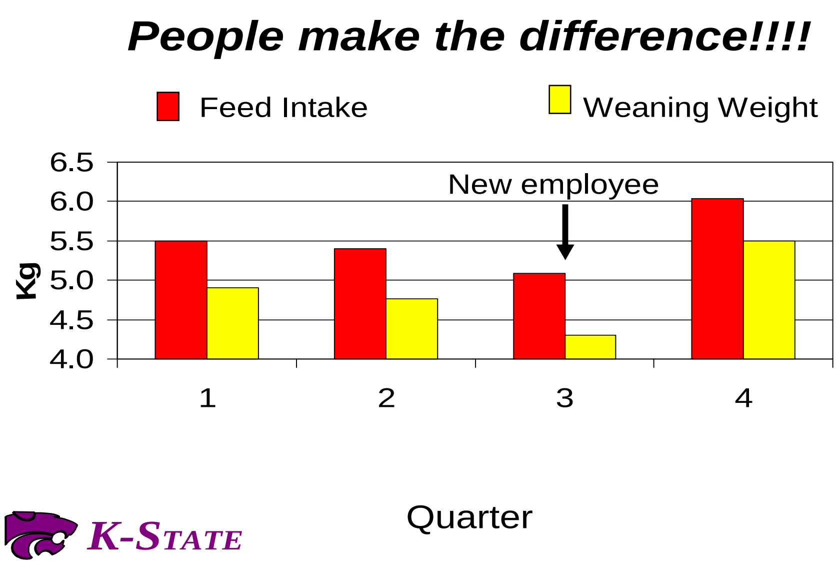
Some strategies to reduce the effects of heat stress include: 1) use high energy feeds with lower fibre and crude protein content; 2) practice nocturnal feeding when outside temperature cools down; 3) multiply feeding times; 4) use of air cooling or water dripping equipment (Quiniou et al., 2000; Mavromichalis, 2008). Large addition of fat in the feed is not a cure-all. This additional source of energy is principally used by the mammary glands to produce very rich milk and it will not be an exceptionally efficient source of energy for the sow (Noblet and al., 1998; Goodband et al., 2006). High fat addition could improve piglet weaning weight but could also impair subsequent reproductive performance by reducing the number of LH peaks in the early lactation (Kemp et al, 1995).

4. **Water.** It is essential to have good quality water but I will not discuss the details in this paper. Refer to specialised publications related to this topic and adhere to water quality guidelines especially related to chemical and microbiological specifications. Water quality should be properly checked annually. Water availability at time of feeding is important with a flow rate of 2 litres/minute being recommended as the requirement. Correct nipple position and ease of access to water are fundamental for optimum sow productivity and yet it is surprising how inaccessible some watering devices are (too high or too low). Also, beware that too high water pressure could reduce water intakes. As previously mentioned, wet or gruel feeding does help improve feed intake but be sure to correctly manage the amount of water provided and freshness of the feed.

5. People. Yes, human beings can make quite a difference as is well illustrated in the following figure. There are obvious differences among similar farms and quality of management is certainly a major contributor to this variation: caring, knowledgeable, experienced and skilled people who can take time to treat each sow properly can impact feed intake more than any other single factor (Aherne, 2001).

6. Comfort of the sows and equipments. This is more of a general comment that farrowing crate and floor designs should favour the maximum well being of lactating sows. Also, ergonomics of the feeders (size, volume, height and width) and the water nipple placement need to provide easy access to feed and water. There are a plethora of different troughs and feeders on the market with no particular type being preferable to others. Very often decisions regarding different ways or complexity of barn automation are based on cost but they should also consider the need to reduce manpower and training time. Each system has inherent pros and cons but the investment made to save time dedicated to manual repetitive tasks allows more time to observe animals and measure performance parameters and thereby increasing management proficiency.

Figure 4. Quarterly lactation feed intake and weaning weight in a pig breeding operation. (Goodband et al., 2006)



CONCLUSIONS

Successful feeding management of sows during lactation could be summarized as ‘maximize feed intake’. Positive consequences of maximizing lactation intakes on lean and prolific genotype, including improved wean to service interval, farrowing rate and subsequent litter size, have been observed in numerous research and commercial production systems (Figure 5 and 6). It looks simple, but in reality it is a daily challenge. Sometimes it is necessary to overcome some inherent ‘’belief’’ that limits change by applying sound science to practical problems. Attention to dry sow feeding, management during lactation, ambient temperature, water, equipment and people will lead to success.

ACKNOWLEDGEMENTS

Thanks to Dr. Neil S. Ferguson, Ph.D. (Nutreco Canada Agresearch) for his help in preparing and reviewing this paper and Dr. Robert G. Goodband, Ph.D. (K.S.U.) for permission to use Figures 1, 4, 5 and 6.

Figure 5. **Relationship between lactation feed intake and farrowing rate. (Goodband et al., 2006)**

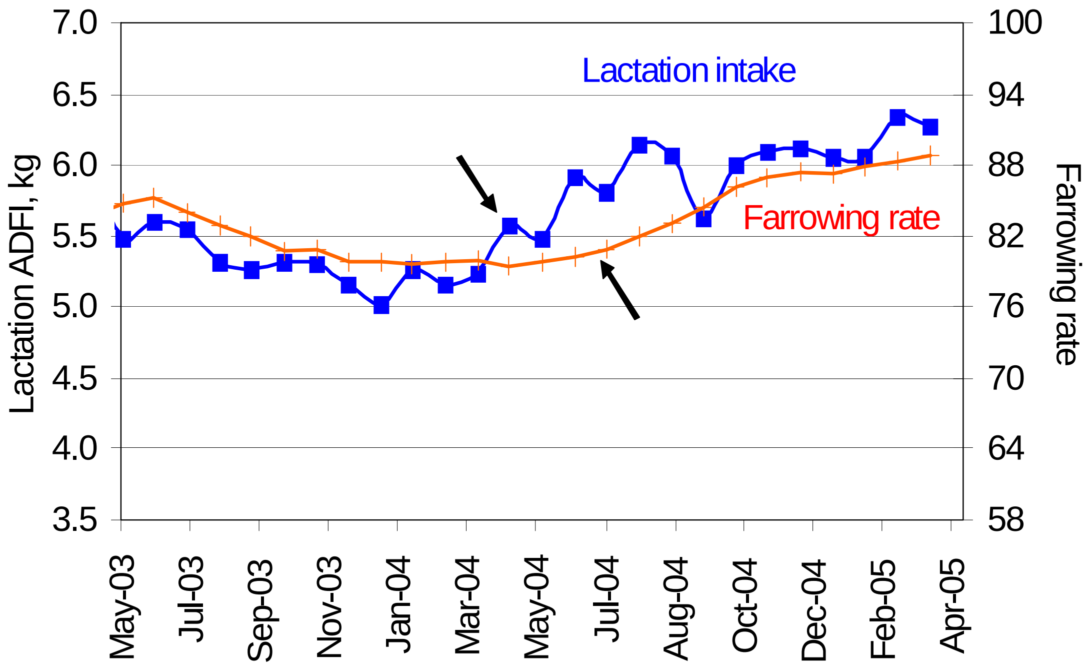
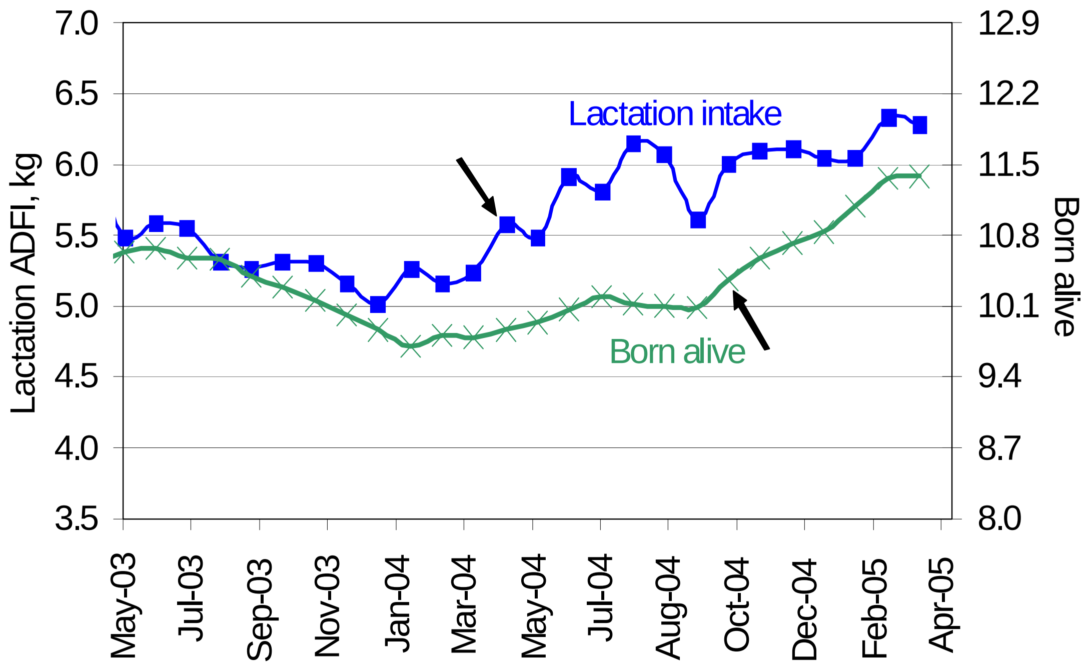


Figure 6. **Relationship between lactation feed intake and subsequent born alive. (Goodband et al., 2006)**



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