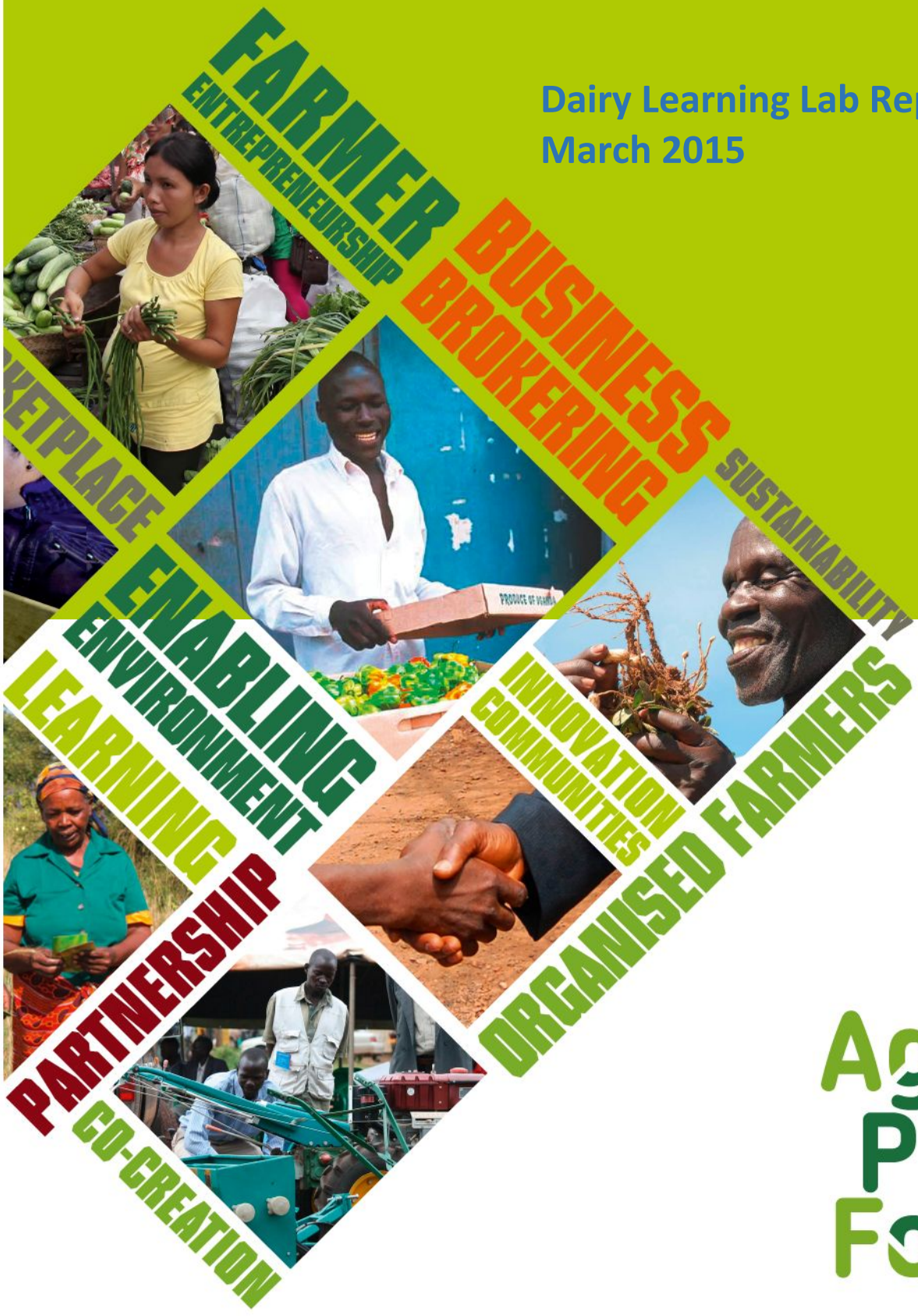
AgriProFocus Uganda

Dairy Learning Lab Report
March 2015



Agri Pro Focus

Promoting farmer entrepreneurship

AgriProFocus Dairy Learning Lab Report - Uganda

Introductin

This report on the first Dairy Learning Lab in Uganda has been prepared by the organisers. The Dairy Learning Lab was held on 11 and 12 March 2015 in Kampala and focused on 'fodder management for milk production'. The Learning Lab consisted of morning visits to dairy farms and afternoon training and discussion on the topic. There were 17 participants with varied backgrounds, but all were dairy farmers. The Learning Lab was organised by AgriProFocus Uganda with expert input by Mr. GidiSmolders from PUM.

This report is best read together with the following documents

- Flyer of Dairy Learning Lab
- Programme of dairy learning lab
- Questionnaire for farm visits.
- Photos of farm visits- find our facebook page; https://www.facebook.com/media/set/?set=a.876108669115682.1073741829.209143989145490&type=1
- Powerpoint presentation by GidiSmolders.

All these documents are found on webpage: http://agriprofocus.com/dairy-learning-lab-uganda

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1. Farm visit (day 1) – LUBUS Mixed Farm- Kayunga

LUBUS Mixed Dairy Farm is 1h30 drive from Kampala. The road sign indicates this is a model farm for dairy cows and a salespoint for animal drugs and microbe mixtures helping digestion. The farm manager Bruhan Lugolobi gives us a tour of the farm (passing a disinfection mat). He shows us among others:

- Well with plenty of water, cows drink from tubs placed in the sun on purpose to warm the water (cows need 3 buckets of water, which is 35 liter/head/day!)
- Small concrete bunkers for brewers grain and a permanent store for molasses.
- Hay/straw placed above poultry.
- Calf rearing and the importance of feeding colostrum as soon as possible after being born.
- Zero grazing area with a concrete floor, a feeding alley, water trough, and cubicles with some mattresses. Also a molasses lick inside the cowshed.
- Herd consists now of 4 cows in-calf and 10 youngsters, all in one 'family-herd'.The best cows have been sold.
- 2 silage pits with an entry slope, under a roof.

- Some demo plots with grass and legume species: Giant Seritaria, Crorisgayana(Bomarodes), Lablab, Brachiaria, lucern, desmodium

The farm manager referred to a small dairy farmers handbook, published by Molaplus company. This booklet (for sale at UGX 5000) promotes the use of molasses.

2. Afternoon Session

After a late lunch, we had a session at Kati Kati Restaurant from 15 to 17h.

Sylvia presented about AgriProFocus and the online platform where one can find manuals and videos on the topic of fodder and feeding. The aim is to have practical information only. Find the information on http://agriprofocus.com/dairy-learning-lab-uganda. People who want help with online registration and access can call **Marion Alyek on Tel: 0706580997 or via email: uganda@agriprofocus.com**

Next, we discussed and commented on 3 topics from the questionnaire developed for the farmvisits. For each topic below, we shared observations, practices on our own farms and bits of theoretical back-ground (see powerpoint by GidiSmolders).

a) On soils and plots

The farm has 10 acres (4 hectare) of suitable soils for agriculture and dairy. There is plenty of water although it is not used for irrigation (seeing the dry fields).The size is too small for the alleged 37 heads if all feeds requirements are sourced from the farm. The maximum is 10 dairy cows.
This calculation is as follows: one average a dairy cow of 450 kg producing 10 kg of milk needs 12 kg of dry matter from roughage per day. In a year this is about 4400 kg DM(365 days * 12 kg) needed per cow. For ten cows it is 44 tons of dry matter.
The farm can produce maize and grass: the maize yields 14 ton/acre and contains 35% dry matter (DM) (this is 5 ton DM /acre or 12 ton DM/hectare). The grass yields 9 ton/acre and contains 45 % dry matter (this is 4 ton DM/acre or 10 ton DM/hectare. If the farm uses 5 acres for maize (25 ton dry matter) and 5 acres for grass (20 ton dry matter), then the farm produces 45 tons of dry matter per year. That is enough for about 10 cows a whole year.
Note that this calculation does not consider 1) crop production: coffee, food crops and 2) feeding other animals (calves, goats and chicken) and 3) the external feed sources like brewers grain and molasses. With the use of irrigation, the year round production of fodder is possible, this is important to avoid a drop in milk production during the dry period.
We did not see how manure was used for fertilizing the fodder production. When designing lay-out of dairy, best avoid the crossing of pathways for manure, feed and milk. Consider separate entrances like on this farm. And construct the storage for silage and hay close to the stable.
The area for the cows was partly roofed with metal plates. It may become hot in summer. The roof of the shed over the silage pit was much higher and allowed for natural ventilation. The outdoor area for the cattle is small and has a concrete floor. This does not invite animals to move around. The area was clean and some cows lay down on mattresses. Cows did show claw and leg problems.
The learning lab advice on this topic is:

- Reconstruct the barn and the outdoor run for the cows. Give them more space and do not use concrete floor.
- Calculate how much cows can be fed during the year with the roughage at the farm.

- Improve production of roughage: use manure, urine and (green) plant material to fertilize the fields.With compost, the soil gets higher organic matter. This way it can better hold water, nutrients and air, leading to higher production.
- Allow the cows for grazing (at least some time of the day). Establish separate plots and rotate the grazing as to avoid overgrazing.

b) On the grass species

At the farm visited, there were3 small grass plots with Lucern, Brachiaria, Giant Seritaria, Crorisgayana(Bomarodes), Lablab, desmodium. Each plot had a name tag. There were no signs of daily cutting and watering of plots.
A specific question was about the feeding value of the Wandering Jew herb: one participant reported very high protein content. The feeding value of this plant *(Tradescantia pallid)* is not found in literature.
Participants shared about their own grass production. Depending on soil, climate and the varieties of grasses and legumes, yields were reported up to 13 tons of dry matter per ha of silage maize, 10 tons of dry matter for legumes and 12 tons of dry matter for grassland per ha per year in 4 to 6 harvests.
The best time to mow the grass is during the day, as sugar content varies about 12% during the day (rising with the sun).
There was discussion about the availability of seed of grasses and legumes (see also day 2). There is confusion about the scientific and popular names of these grasses and legumes. It was suggested to list all known grasses in Uganda with the official name and with all the local names in the different regions in Uganda to make it easier for farmers to get familiar with improved grasses and legumes. Actually this had already been done in the Ruminant Feeding Table (See Gidi presentation).

Mr Gidi Smolders observed that growing legumes as a protein source may be costly when yields are low. When it is possible to buy alternative sources of protein, then one could calculate the costs and benefits of growing grass instead. This may be cheaper than growing own legumes on the farm.
The learning lab advice on this topic is:

- The quality of fodder improves when mixing legumes in grass swards. The mixture gives a palatable roughage with appropriate protein content.
- When growing legumes is difficult, consider the alternative of buying protein sources where possible.
- During the day, grass has higher sugar levels. Mow in the afternoon.

c) On conservation of roughage

The farm visited had the practice of stacking hay above the poultry run. We found no literature on the claim that this leads to a more nutritious fodder. The capture of ammonia in the hay does not happen spontaneously. Besides, the dust from poultry may lead to less palatable fodder.
The practice of treating roughage with urea is well known. In this urea treatment, the crude fibre becomes digestible, and the feeding value improves by 10-15%.
The silage pit at this farm is about 13 feet (4m) wide and 6 feet (2m) deep. This size allows tractors to enter, but it is far too large for the amount of animals fed with the silage. The problem is that the feeding quality of silage goes down when it is in contact with air (oxygen). The feeding speed should be 1foot/day (or 1,5m/week) to avoid feed losses. The silage pit should be long and narrow/low.
It is possible to calculate how many cows are needed to eat the silage quickly enough. In the previous example we used an average cow (450 kilo, 10 litres of milk/day). This cow needs 12 kilo of dry matter per day, it eats 6 kilo DM from silage and the rest from hay or grass. A compacted block of silage of 1 cubic foot is about 26 kilo. Thisblock contains about 9 kilo of dry matter (250 kg DM/m3). So, our average cow eats about two thirds of a cubic feet (6 kilo DM) of silage per day. The silage pit we visited could feed 118 such cows at a speed of 1 foot a day (13 x 6 x 1 = 78 cubic feet or 2,6 m3). As there were only 5 cows, the feeding speed on this farm is only 1 foot in 3 weeks.
Nevertheless, the silage at the farm smelled good and there were no signs of rejection by the cows. A good fermentation process in the silage pit needs sugars for bacteria to make lactic acid. Sometimes these sugars are not available, such as in very wet grass, or in high crude fibre mature grass. Some participants add molasses to help the fermentation process. Plastic to cover silage is not always available, it is expensive, and it gets perforated after rough handling. Other materials (plastic bags) can be used. Compaction by a tractor, or heavy drums and a thick layer of soil to cover the silage helps the fermentation as it pushes out air.

The advice on this topic is

- Making hay requires less resources than making silage. Hay just needs a dry place. Its nutritious value is less. Cows like a combination of silage, hay and grass.
- Silage needs plastic and molasses, extra work to keep it airtight and under pressure. It is also sensitive for moulding and getting warm after opening the pit.
- The size of the silage pit should fit the amount of feed used per week: the cows should eat 1 foot a day.

3. Farm visit Day 2 Muyomba Dairy Centre Farm Limited, Muyomba - Wakiso

This farm is less than 1 hour from Kampala. The owner is from Denmark, which is visible in the big European stylestable and the impressive diversity of machinery for cultivating the soil, planting maize, seeding grass and for harvesting grass. Paulo Kityo is since a few month the new farm manager leading a team of 3 with responsibilities for grass production, for dairy cows and for young stock.

The farm is 500 acres, this is including swampy and sloping areas unfit for grass production. A second farm unit is dedicated to crop production. The 20 cows are held in zero grazing in a big cubicle house on concrete. The milking is done by hand, the milking parlour is not in use. All milk is sold at the farm gate. The production is about 10 kg on average and is too low for the Holstein Frisian cows. Average body condition on average does not reach 3 on a scale of 0 to 5. A few cows are really skinny. There is shortage of good quality feed.

In the morning, cows get fresh grass. A cutter/chopperalongside the tractor is used that blows grass onto a trailer pulled by the same tractor. The trailer is open with low boarding, so cut grass may fly over the trailer and go to waste.After grass harvest, slurry is applied with a tractor and slurry tanker.

The grass sward is a mixture of grasses and legumes (Rhodes grass, Desmodium, Napier grass and lucern a legume). The quality of some grass-legumes mixed plots worsened in a 4 yearsperiod and reseeding is now underway. The farm is to introduce perennial rye grass from Denmark (and a grass seeding machine). According to the farm manager, this rye grass has not been used before in Uganda. In an aim to get more quality grassland they also bought seeds for a mixture of Rhodes grass, and two legumes, being lucern and desmodium. It will be sown at respectively 10 kg, 2 kg and 2 kg per ha (in total 14 kg seeds per ha). On a separate field lucerne will be sown as a standalone crop. The seeds were available from Ugandan seed companies.

In the evening, silage is fed to the cows. There are 3 separate pits on compacted soil. The dimensions are roughly30 feet long x 12feet wide x 2 feet high. The pits are covered with a layer of soil over a plastic sheet. The silage in the open pit is almost used up, the last part is smelly and very warm.

The grass or silage is placed on a concrete floor in front of the feeding rack and there is no real feed gutter. Cows can easily push the feed away, so they need to push it back to the cows a few times a day. Otherwise the cows go hungry or hurt themselves stretching. This leads to bad claws at the front legs. On the other hand this way of feeding trough is easy to access for feeding and easy to clean.

There are 7 calves in 5 x 6 feet boxes in a separate building, with straw in the front part where calves can eat and one part concrete (intended for easy cleaning faeces and urine through holes in the wall in the back). The calves are about 2 months of age and get maize bran and water beside 2 times 2.5 litre of milk daily. They do not get roughage and don't have a well-developed rumen (the calves have a thin belly). Most have diarrhoea, the straw is dirty.

The afternoon was dedicated to a presentation and discussing the remaming 3 topics;

d. On feed rations

Observations shared: the farm size can support much more than 20 cows. There should be enough grass produced and possibly also fodder from the crop production.

The trial with perennial rye grass is interesting, so we like to hear about results.

Second, the feed ration for the calves is not balanced. The diarrhoea indicates this. The calves lack roughage to develop the ruminant function. Calves need as much colostrum (the first milk of a cow after calving) as there is and within 3 hours. The colostrum boosts resistance/immunity of the calf. Give calves 2,5 litre of milk in the morning and 2,5 in the evening (5 kg/day). Also supply them with fresh water and easy digestible concentrates. Get them used to roughage from week one on and give them soft roughage: can be fresh grass but also soft hay or silage. Let them grow as fast as possible in the first year to reach 50% of adult weight and be ready to be served at 15-16 month.

The presentation by Gidi on this topic explained that cows use the feed for maintenance, for growth (meat) and for milk production. Calculations are done in metabolic energy (or ME, expressed in megajoules). The system with ME energy values of feedstuffs is also used in Uganda and in other African countries and Europe. The US uses a system based on TDN or total digestible nutrients value.

Choose and use one system to compare animal requirements with the energy in feedstuffs. A ruminant must ruminate: that means a cow should have a ration that it enables to act as a ruminant: after swallowing the feed very fast, find a quiet place and re-chew the feed for proper digestion. Therefore it needs crude fibres and some long stems to keep a healthy stomach.

The advice on this topic is:

- Feed a cow (a ruminant) 4-5 kg of fibrous feed to ruminate and not only concentrates to avoid off feed symptoms and rumen acidosis. Monitor whether cows are ruminating.
- A big cow has more maintenance needs than a small one. But 1 big cow producing 20 litres of milk needs less maintenance feed than 2 cows producing 10 litres each.
- Jersey cows are efficient as they have low body weight and relatively high production.

e. On feeding for dairy

The energy and protein requirement for 1 litre of milk about 5,2 Megajoule and 90 grams of protein.

A general rule is that in addition to roughage, an extra kilo of by-products or concentrates should increase the yield with 2 litres of milk. This means that the price of by-products should be half the price of milk.

Some by-products are so low in energy that they only provide energy for 1 litre of milk. The example in the handout powerpoint is a table with different types of rice bran: the bran highest in energy has three times more energy than the bran with the lowest energy content.

So one should ask the composition and feeding value when buying concentrate or by products.

The requirements for dairy cows have been listed in the table below. Our average cow of 450 kilo and 10 liters a day has an energy requirement of 110 MJ (mega joules of ME) and 1234 grams of crude protein.

Cow live-weight (kg)	Milk yield Kg (4% fat)	DMI	ME Energy (MJ)	Crude protein (g)	Calcium (g)	Phosphorus (g)
350	0	10	45.5	294	14	10
	5	10	72	806	27	27
	10	11	97	1093	42	36
	15	13	123	1393	57	45
400	0	10	50.3	318	16	11
	5	11	78	874	29	29
	10	12	103	1161	44	39
	15	14	129	1448	58	48
450	0	11	54.9	341	18	13
	5	11	84	946	31	32
	10	13	110	1234	45	41
	15	15	135	1521	60	50
	20	17	161	1826	75	59
500	0	12	59.4	364	20	14
	10	14	113	1275	46	43
	15	16	138	1560	59	51
	20	18	162	1823	74	59
550	0	13.	63.8	386	22	16
	10	15	121	1359	48	46
	15	17	145	1635	61	53
	20	19	168	1892	75	62
	25	21	194	2179	90	71

The ration this cow needs is then for example:

- A wheelbarrow of 65 kg fresh grass (which contains 80% of water).
  The dry matter content is 20% or 65*0.20 = 13 kg of dry matter.
  The ME from grass is7.9 megajoule ME per kg of dry matter
  So with 13 kg of dry matter (out of 65 kg of grass) the cow gets 13*7.9 => 103mj ME.
- A half kilo of concentrate contains 6,5Megajoules. With the grass (103), this ration balances with the requirement of 110 Megajoules.
- In the dry season the fresh grass could be replaced by another ration, for example maize silage and hay, with similar values. One can replace only part of the roughage by concentrate. Cows need 4-5 kg dry matter of fibrous feed to keep the rumen in good function
- The cow also needs 60 litres of water per day. In the 65 kg of fresh grass there is already 52 litres (the cow is eating water), so 1 extra bucket of 10 litres water is needed. Note that when feeding hay, the water content is only20%. So the cow gets 3 liters water out of 16 kg of hay, and needs 6 buckets of water. This means that for 3 cows you have to carry 18 buckets of water.

The advice for this topic is:

- Ask for the quality of purchased by-products and cakes. Calculate cost – benefit.
- Cows eat water hidden in grass, but they always need extra water.

f. on herd and cow management

One observation from the first visit is having all animals together in a family herd. The advantage is that there is a stable group and hierarchy is established for a long time. But the challenge is to feed each animal according to its requirements. In zero grazing one can feed each cow individually, depending on the type of stable. In a tethered system cows can be fed individually.

One can calculate the requirements for every cow according to body weight, age and production. There are requirement tables for young stock, with different growth rates and with different adult weights. For milking cows there is a requirement table as you can see with the weight of the cow and the milk production in litres per day.

How to feed a herd, as each animal is different. Best, find out what the average of the herd is, or calculate the average for each production group. A production groups separates the high productive animals from other groups like cows at the end of lactation.

There was a discussion whether feeding adlibitum (always feed available) is preferred over taking the feed away after 2 hours. Gidi advised is to have palatable feed available 24 hours. Dominant cows eat first and in most (free stall) barns the feeding space is limited. So the cows with lower rank need their time to eat too. A related issue in this context is that cows are able to select in feed.

Balanced feeding also helps to manage cow fertility. Imagine that the average cow of 450 kilo has a dry period of 8 months. It needs a lot of maintenance feed, while it is not producing 10 liters a day.

The value of reducing the interval between calvings with 6 months is 1500 liters of milk. With 18 months between calving, a lactation of 3000 liters means 2000 liters a year. With 12 months between calving, the same lactation comes down to 3000 liters a year.

The advice on this topic is:

- First, make sure that cows can take as much good quality feed and fresh water they want to eat and drink. Only then it is possible to reach a high production when your cows are genetically equipped for it.
- When you feed your cow enough high quality feed at all times, you can reduce the dry period and have more milk production.
- When farm conditions are not optimal, cross breeds or indigenous cows perform better than exotic cows (Friesians). The animal that fits the farm does not get skinny, or ill, or looses production and does not have fertility problems.
- Decreasing the dry period has a dramatic effect on the yield per cow per year.

Dairy Learning Lab March 2015

1st Pilot Report

Uganda



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