
PUM-KMDP BUSINESS LINK PROGRAM

NETHERLAND MISSION REPORT

27 May - 3 June 2018



1.0 SCOPE OF PUM-KMDP BUSINESS LINK

The PUM-KMDP Business Link Program included participants' visits to dairy companies and dairy farms, learning sessions, adventures & possibly creating business linkages among the following dairy actors:-

Company / Dairy Actor	Activity / objective
Bles Dairies	Introduction to Dutch dairy sector, export of animals and genetics
DeLaval	Milk equipment, milking techniques and milk hygiene
Spinder	Barn equipment, barn interior, and cow comfort
Erik Apperloo	Veterinarian providing animal and fertility management services
Cargill –Animal Nutrition Innovation Centre	Animal nutrition, feed formulation & manure analysis
CRV	Breeding, genetics and farm management
Dutch Dairy Farm	On-farm practical sessions (a day at the farm). Farm assignments (Key Performance Indicators / observations)
Afsluitdijk Wadden Center, De Oldehove & Sea Tour	Learning and adventure

2.0 ACKNOWLEDGEMENTS

We sincerely thank the various stakeholders who spent their valuable time and effort to make PUM-KMDP Business Link Program 2018 mission a success, from idea development to implementation. This was PUM and SNV- KMDP planned and funded mission, whose continued support to the development of Kenyan Local Capacity Builders (LCBs) is highly acknowledged.

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3.0 BACKGROUND

SNV-Kenya has been implementing the Kenya Market-led Dairy Program (KMDP I) as the flagship dairy project in Kenya from 2012 and KMDP II from October 2016 to 30th June 2019 financed by the Netherlands Embassy in Nairobi. KMDP-II seeks to deepen KMDP-I outputs with a deliberate strategy and design to facilitate transitioning from aid-to-trade relations. KMDP –II has two key pillars. Pillar-I is market development related, focusing on intensifying and upscaling the most relevant interventions such as practical skills training infrastructure, fodder supply, raw milk quality and inclusive dairy value chains. Thereby deepening involvement and engagement of Dutch companies and experts, Input Suppliers, Service Providers and Investors (ISPIs) to expand market share or start business in Kenya. Pillar-II focuses on business brokering and trade promotion related interventions, in close collaboration with the Netherlands Business Hub and Dutch agencies that represent the dairy sector in the Netherlands. Through these two pillars, KMDP-II will invest in enhancing professionalism and competitiveness of the Kenyan dairy sector, contribute to improved business and investment climate; invest in the capacity of private sector and knowledge providers to be inclusive and relevant for the Kenyan market.

SNV Kenya-KMDP has a Memorandum of Understanding with PUM Netherlands Senior Experts (PUM), based in Den Haag, the Netherlands, to support KMDP clients and to build capacity of the KMDP team of local dairy advisors. PUM invited eight Local Capacity Builders (Picture 1) who have been implementing KMDP for over four years for a Business Link Programme that took place in The Netherlands from 27 May 2018 to 3rd of June 2018. The LCB invited are;

Matt Agesa based in Kitale and Christine Korir based in Eldoret, Uasin Gishu County. Susan Njuguna and Renny Chemtai based in Nakuru County. Susan and Renny supports Ngorika and Olenguruone Dairy Cooperatives that supply milk to Happy Cow (the processor) where KMDP is piloting quality-based milk payment system. Kennedy Khisa, Fredrick Ochido and Philip Okech based in Meru Region and support Meru Union's (the processor) primary cooperatives. Cyrus Kabuga based in Nairobi and supports medium-scale farmers (MSF) across different counties. This has been PUM- KMDP



Picture 1: LCB Team on arrival at JKIA. From left: Matt, Khisa, Philip, Christine, Susan, Renny, Cyrus & Fredrick

highly placed localization agenda to build the capacity of KMDP implementing team. It has been a plan that included outward exposure missions to strategic companies in Netherland and an incoming mission of appropriately skilled senior experts.

PUM- KMDP Business Link program targeted to cover strategic companies that have business network in Kenya, potential companies applicable to East Africa business environment and LCB learning about Dutch dairy practices, interacting with farmers, contractors and consultants at farm level.

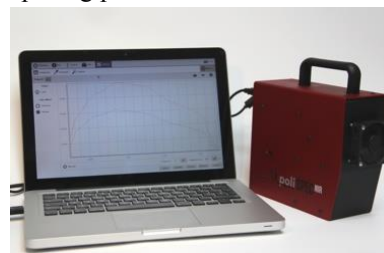
4.0 SUMMARY OF LESSONS LEARNT

I) Access to Superior Quality Farm Inputs

Farmers visited indicated to have easy access to high quality production inputs and flow of reliable information. Some of the inputs of high quality accessible and available to dairy farmers include; Fodder seeds (grass & maize) with high germination rate (Picture 2). On-farm feed analysis tools (Picture 3), fertilizer / manure, conventional and sexed semen, productive replacement heifers / productive breeds, feed premixes, quality milk replacers (guaranteed quality), protective clothing. There is high level of specialization & collaboration among dairy consultants thus farmers' access skilled and equipped workforce (veterinary services, hoof trimming, nutrition, farm planning, contractor and accounting). Timely dissemination of specific research findings and publications from research institutions (public and private) keeps farmers informed on new developments and timely updates on projected weather conditions. Innovative cow barn products and their accessories.



Picture 2: SNV-LCB at farm assessing maize germination rate & spacing precision



Picture 3: On-farm Feed Analysis Tool – Portable NIRS & Laptop

II) Integrated & Reliable Logistical Network

Dairy farms had well drained fields, their vast tracks of grassland and maize fields easily accessible. Farms connected with networked waterways, well-maintained roads and railway transport. Centralized data management and charging services (invoicing) system mostly done at cooperative and processor level. An example of CRV & DeLaval supports in data collection and analysis, providing farms with progress reports every 6 weeks for decision-making. Bles Dairies utilizes a hybrid business model, own dairy farm, semen supply (SEMEX), livestock trading, consulting (the Friesian) and projects (dairy investment). This ensures accuracy, timeliness and reliability of data among the concerned dairy actors, (breeding companies, accountants, feed nutritionists, and veterinarians) and government. Shared data creates a win-win situation, improved transparency, accountability and competitiveness. The Dutch dairy sector is highly service-oriented, (collaborative /supportive, mechanized and automated) consolidated /interconnected and export-oriented. High flexibility and openness of cross border trade foster healthy competition. Some of the farms visited import feeds and brewers by-products from Germany

III) Optimization Attitude

Mechanized most of the farm operations and others automated from land preparation, planting (use of GPS to optimize on plant population per hectare), irrigation system, modern cow barns that accommodate large herd of cattle (Picture 4), shared machinery among neighbours during harvesting season. High utilization of optimizing tools at farm level especially on feed analysis / diet digestibility and fertility, improved calf rearing skills. Shared offices and other equipment among the consulting team.



Picture 4: Modern Cow Housing Tour

IV) Business Context Efficiency Attitude

Labour efficiency: Among the visited farms, on average there were two farm managers (usually the owners) managing over 85 milking cows. Each farm had a daily routine to schedule activities and consultants on the farm. Labour cost based on hours worked motivate farmers (managers) to prepare farm activities on time so that consultants / contractors spend the least time possible but with high rate of labour productivity.

Operational Efficiency: the dairy sector is highly mechanized and automated. Dairy managers are multi-tasking / talented and utilize optimizing tools to increase efficiency. Farm plan & cow barn design consider flows efficiency in and out of the farm as demonstrated by Spinder Dairy Housing Concepts (Picture 5).

Economic Efficiency: the sector is generally outward looking and export-oriented. Farmers and support industries (such as Spinder) have an economic attitude and are adapted to sophisticated business operations. Feed efficiency and sustainability is at the heart of every dairy farmer and technology-prone industries supports dairy automation. With a



Picture 5: A farm with over 100 cows feeding at once, utilizes own grown forages. Robots in milking & floor cleaning. Rumination frequency summarized in the office computer. Farm managed by one Manager, has 240 cows of which 216 are lactating, average production of 35 litres daily /cow. Calving interval of 379 days. Veterinary visit the farm twice a month.

centralized data processing and analysis, it makes it easier to discuss among the concerned consultants and make informed decisions. On the other hand, farmers have access to summarized data on their farm performance regularly.

V) Business Context Sustainability (Complementarity and Environmental Compatibility)

Dutch dairy sector advancement is attributable to structural integration of interrelated factors over the years in research, extension and education. The education system that emphasized on transferrable skills and character skills created a pool of talented labour-force that Dutch dairy sector utilize productively. Supportive yet stringent regulatory standards that protect the environment and consumers forced dairy farmers to increase farm productivity and produce quality resulting in a food secure and healthy nation.

Dutch dairy sector anchored on long-term objectives in terms of management practices (when to apply manure and surplus disposal, stock herd level per farm, animal welfare, processing standards), consumer welfare, use of chemicals (herbicides, pesticides, antibiotics) and waste disposal.

Dairy farmers with surplus farmyard manure trade with crop farmers in manure disposal in exchange for fodder (wheat /barley straw). Much of the citizen's concern is the welfare of the general environment, (Picture 6). Common words from every Dutch Dairy actor we interacted with during Business Link Program were, "Strategy, Quality, Efficiency and Optimization". Dairy production has moved from farm to processor level and barriers to entry are high due to strict regulations, highly competition landscape and capital-intensive undertaking.



Picture 6: Intersection of Waterways, Roads, Housing, Farming and Environment (ecosystem planning)

5.0 INTRODUCTION TO DUTCH DAIRY

The Dutch dairy sector has evolved over the years making certain breakthroughs in operations and technology. The dairy cooperative structure triggered specialization, investment in mechanization and automation. Main drivers of dairy change has been industrialization, labour shortage and high cost of labour. The European market policies that imposed quota system and food security regulation. Major exports of cheese (gourmet Cheese) exclusively having Dutch taste and limited in supply within European countries. Table 1 summarizes the history of Dutch dairy development.

Particulars / Year	→ 1950	→	Improvements	→	2017
Mode of operation	Manual	→	Mechanization	→	Automation
Farming System	Intensification	→	Sustainability	→	Public opinion dairy
Product /Skills	Specialization	→	Diversification	→	Consumer preferences

Table 1: Historical development of Dutch dairy farming

1.5 Introduction to Dutch Dairy Practices



Bles family farm started in 1854 and Bles Dairies (the company) founded in 1990 as Livestock Export Company initially trading livestock in Germany, England, Spain, Portugal, North Africa, Russia and Middle East. Subsidiary companies of Bles Dairies include SEMEX for semen distribution formed in 1997, the Friesian for consultancy services formed in 2001 and Bles Dairy (the Farm) acquired in 2004 and started milking in 2015 located at Bloksleat 5, Broek, Friesland.

Bles Dairies growth attributed to development of dairy sector in the Netherlands, PTO driven milking machines, improved milking parlour, (herringbone, rotor parlours) and robotic milking in 2017. Industrialization driven processes, local and export market demand, and government support (PTC dairy training). Dairy farming then became more specialized and intensified (business unit) with a continuous chain of enlargement (sustainable herd sizes and technology). Bles Dairies focuses on up-scaled farm management practices, improvement of herd genetic potential and turnkey projects in dairy. A leading supplier of Holstein-Friesian cows globally as core business. The company has made sustainable developments in Netherlands. It is a major player in the international dairy sector with presence in Kenya to serve East Africa, Russia and Hong Kong to serve Asian Countries.

Bles Dairy (the Farm) had 140 milking cows and 150 young stock managed by two staff. A lot of focus being on young stock to reduce stress factors, increase hygiene and to achieve a higher growth and early udder tissue development summarized as “The healthier the calves the better the growth rate”. This ensures surplus heifers and cows for local sale and exports. Average milk production at the time of farm visit was 39 litres per cow daily and an average of 37.5 litres daily on 305 days. Farm TMR consist of roughage (Lucerne hay artificially dried, maize & grass silage), concentrates (tailor-made premix with wheat booster) and minerals calculated on dry matter basis.

Importantly, the farm outsources technical but periodical services such as, silage contracting and nutrition. The farm is highly automated, high-level technology adoption from cow barn, milk robots (Picture 7), milk replacer mixing machine, a self-loading feed mixer, manure scrapping system, manure-drying machine for use as bedding and dairy herd management system. Mr. Wytze Heida indicated that dairy farming needs passion, logical thinking and discipline, supported by strict data recording, education and research (Picture 8). Farm data recording is compulsory as it aides in management decision and keep in track key performance indicators in technical aspects such as calving interval and farm financials. Some of the data recording is automated through robots and other entered manually by farm manager.

Bles Dairies Founder and CEO, Mr. Henk Bles receives timely information of farm performance through his mobile phone and large database accessible at farm computers. On arrival to the farm, Mr. Bles starts on assessing young stock, moves to all other cow groups, office computer and afterwards meeting with farm staff in the farm meeting room (skybox with views of the entire stable).



Picture 7: Mr. Wytze Heida introducing Kenyan LCB Team to milking robot functionalities



Picture 8: Mr. Bles & Wytze guiding discussing on passion, discipline, data analysis, logical thinking, attitude and skills in dairy farming

2.5 Business opportunities

- ❖ Distribution of semen (SEMEX)
- ❖ Farm management, consultancy and training
- ❖ Dairy farming turnkey project
- ❖ Livestock trading in East Africa /Africa

6.0 MILKING TECHNOLOGY



A world leader in the dairy farming industry, providing integrated milking solutions designed to improve dairy farmers' production, animal welfare and overall quality of life. The company develops, manufactures and markets equipment and complete systems for milk production and animal husbandry worldwide. Service and sales of a wide range of accessories are also key aspects of DeLaval's operations. The company supplies highly efficient system solutions for milking, herd management, animal traffic control, feeding, cooling, manure handling, ventilation and energy recovery

LCB team were taken through the twelve rules of milking; health udder monitor, milking order, cleaning, foremilk, checking milking system, attaching milking clusters at appropriate time & closed air, timely & appropriate removal of clusters, teat sensitization, timely & appropriate cleaning of milking equipment, timely milk cooling (manual system) and monitoring milk quality.

There were practical session on machine operations and maintenance. (Picture 9) illustrates practical sessions on mobile milking machine operations and regular checking points.

Company engineer presented on proper machine milking techniques, mastitis control and a practical session on mobile milking machine servicing. Follow-up session through DeLaval representative offices in Nairobi and Eldoret.



Picture 9: DeLaval staff demonstrating milking machine operation & maintenance



Kenyan LCB Team and DeLaval Staff at the Company Premises, at the end of training session

Learning Points

- ❖ Choose a milking system compatible with your farming system (grassland, tie up, loose housing, herd stock) and in line with your farm objective.
- ❖ Continuous and 60:40 pulsation per minute is the best for Kenyan situation
- ❖ Replace liners after 2500 milking's or after 6 months whichever comes first, (logical thinking)
- ❖ Manage milking system (pulsation, vacuum level & hygiene) for healthy udder and to reduce rate of mastitis
- ❖ Apply clusters within 60 - 90 seconds , (not earlier, not later)
- ❖ It's a long-time investment, the best option is to choose quality & company with after sale services

7.0 spinder

DAIRY HOUSING CONCEPTS



The manufacturing company started its operations in 1973 as a metal workshop dealing with only cubicle dividers and feed-fronts. It later grew into small factory and eventually developed into an advanced manufacturing company with a modern range of cow barn products for the contemporary dairy farms. Table 2 summarizes Spinder Dairy Housing Concepts; resting, eating, drinking, cow traffic, attention and manure disposal. Spinder manufactures barn products that match the housing concept (objectives).

Housing Concept	Activity / Check-list	Products / Broad Assortment
Resting	<ul style="list-style-type: none"> Apply dry bedding Adequate space for each cow 16 hours cows lying down Rumination Sloped cubicles 	<ul style="list-style-type: none"> Free-stall dividers (4 types) Waved neck bar PE retaining knee rail Meadow next mattress Water beds (single & dual) Studded rubber mat
Eating	<ul style="list-style-type: none"> High quality roughage /supplements Feeding 24 hours in groups Use feed fence as management tool Safe & gentle environment 	<ul style="list-style-type: none"> Highline safety feed front Limoline self-locking feed front Baseline self-locking feed front Openline self-locking feed front Tombstone feed front Diagonal feed front
Drinking	<ul style="list-style-type: none"> 8-10 water drinking sessions (150ltr) Create the right water supply Create right height & dimensions 	<ul style="list-style-type: none"> Group drinking troughs Individual drinking troughs Drinking bowls Circulation unit /eyelet
Cow traffic	<ul style="list-style-type: none"> Simplicity – straight lines Adequate walking area /width 3.5M between boxes 4M behind feed fence 	<ul style="list-style-type: none"> Draw gates (heavy & light duty) Barrier gates Partition barriers
Attention	<ul style="list-style-type: none"> Check calving cow & calf Check cow in need Use labour saving tools 	<ul style="list-style-type: none"> Cuddle Box Individual calf pens Full automatic brush Krazzmaxx Bull pen
Manure disposal	<ul style="list-style-type: none"> Minimal disturbance / injury Optimize manure nutrients Optimize on labour /fuel 	<ul style="list-style-type: none"> Manure scrapers Control panels Slatted floor scrapers Slotted floor scrapers Tractor driven manure mixers Submersible manure mixers

Table 2: Spinder Dairy Housing Concepts

1.7 Cow comfort (Spinder main focus)

- ✦ Provide adequate space where all animals are able to walk around comfortably safe and stress free, willing and able to lay down as much as they prefer (Picture 10)
- ✦ Every cow and young stock have access to palatable feed of the right composition.
- ✦ Provide clean and fresh water through out.
- ✦ Fresh air and light – good ventilation
- ✦ Animals free from wound, infections or disease. The barns designs should support a high level of hygiene and biosecurity.



Picture 10: Most cows resting (>80%), others eating & drinking

2.7 Flexibility and expandability

Barns designed on straight lines in mind to optimize different flows and to allow easy expansion at minimum cost and interruptions. The working environment must be open and easy to clean.

3.7 Simple and Economical

The structures are durable, require minimum maintenance, and offer a comfortable working condition for the farm workers

4.7 Optimization of movements /flows and labour efficiency

The designs assure separation of the six different flows in and round the cow barn.

- ✦ Cow flow- movement of all the animals comfortably.
- ✦ Feed flow – movement of all feed materials, storage, feeding, mixing, cutting etc.
- ✦ Manure flow – Movement of manure /urine from cleaning of floors.
- ✦ People flow – movement of people during work, in and around the barn.
- ✦ Milk flow - in & out of parlour / cooling system. Transportation to the factory / sale point
- ✦ Material flow – Storage use, handling, maintenance and disposal of materials, equipment and machinery on the farm
- ✦ Information flow includes all farm recording.

5.7 Cuddle Box (Extra Attention)

The cuddle box consists of an individual calf pen and cow section installed in the calving pen to optimize condition for the calf, cow and farm manager. Calf section has detachable lightweight plastic panels for ease of cleaning & disinfecting. Freshly calved cow located in the cow section has easy access to the calf for licking the calf dry while milking of colostrum is ongoing. This stimulates release of oxytocin and ease of feeding the colostrum to the calf. Picture 11 Illustrate freshly calved cow licking the newborn calf at cuddle box and freshly milked colostrum bottle-feeding the newborn calf at the same cuddle box.



Picture 11: Calved cow licking the newborn calf at cuddle box and colostrum bottle-feeding at cuddle box

6.7 Company Competitiveness

Spinder competitive edge is on quality, “Everything that leaves Spinder premises is of absolute top quality. We are proud of that and that’s what we work for, together”, commitment and behaviour (professionalism attitude). Table 3 summarizes Spinder marketing strategy and market knowledge. Spinder distribute its products through independent dealers with or without milk equipment to serve Europe and Canada markets. The major market outlet for Spinder products has been Netherland followed by Germany

Market Strategy	Spinder Approach / Industry Knowledge
I) High Customer Service Levels / Efficient Item Fill Rate (IFR)	<ul style="list-style-type: none"> A Lean but experienced workforce of 45 staff (family) that supports continuous production. Capacity to hold large quantity of cow barn inventory. Documented knowledge of supply chain capabilities (demand & supply predictable trend).
II) Superior Quality Products	<ul style="list-style-type: none"> Innovative technologies and quality crafts-manship. Workshop equipped with precision cutting machine (laser cutting), robots, old-fashioned quality machines (heavy duty), experienced and talented workforce
III) Customer Experience / Organic Growth (Branding)	<ul style="list-style-type: none"> Spinder has been in dairy housing concepts since 1973. Established customer relations and higher market share
IV) Proximity /Social Connection	<ul style="list-style-type: none"> Established in the Netherlands, manufacturing in the Netherlands. Create value for sophisticated customers (high tech and quick adapter). Business set in a strategic location close to wealthy neighbouring countries of innovative producers
V) Innovative Products. R&D Investment	<ul style="list-style-type: none"> Able to tailor make, engineer and manufacture. Farm Visit & after Sale Services. Target niche market (segmented market)
VI) Integrated Business Approach / Focus on core business competencies	<ul style="list-style-type: none"> Combining own and external knowledge and experience. Staff training /career development. Outsource some of the services and products /accessories.

Table 3: Spinder Industry Knowledge & Marketing Strategy

8.0 ERIK APPERLOO -THE VETERINARY

Antonides farm at a glance; the farm had a total herd of 240 cows of which 216 were lactating cows with an average daily lactating cow yield of 35 litres. The farm has two milking robots. Calving interval of 379 days and heifer first insemination achieved at 15 months of age. The farm has adopted semi intensive grazing system, partial grazing of lactating cows during the day and ad-lib grass silage in the evening. Hay provided for rumen functioning, corn gluten and concentrates provided according to level of milk production and stage of lactation. Young calves of 0-3months fed with whey about 8 litres per day spread throughout the day, ad-lib feeding on hay and concentrates for rumen development.

The purpose of LCBs' farm visit was to learn fertility management and health issues at farm level guided by farm manager and Erik Apperloo, the veterinarian (Picture 12). He visits the farm twice a month to check on general animal health including dehorning and fertility. He started the afternoon session by collecting blood samples of young stock (heifers of 3-6 months) to test BVD.



Picture 12: Erik Apperloo (the veterinarian) demonstrating fertility management and health checks to Kenyan LCBs

The vet scanned four cows that were between 40-45 days after calving to check uterus status and heat cycle. Focus of the day was on cows over 40 days after calving with no heat signs, checking status of ovaries and uterus normalcy. High producing animals tended to delay a bit to come on heat after calving but farm manages fertilization within 100 days as a fertility target for the farm. Vet scanned two recently inseminated cows and pregnant status was positive, with support of portable Pregnancy Diagnosis Scanner.

Vet indicated that uterus normalizes to size after 14 days after calving as lactating cows naturally cleans themselves and sometimes show signs of heat (false heat). Flushing fresh cows with iodine (as is the case in Kenya) cause more damage to the uterus and sometimes leading to infertility. The best alternative to treat metritis would be injecting prostaglandins hormone to stimulate cow to come on heat. Uterus contractions process aids in uterus cleaning naturally. In extreme cases however, inject antibiotics to treat metritis.

The farm has dry cow vaccination program to prevent diarrhoea /hygiene related problems on newborn calves. The farm injects Rotavec vaccine to dry cows between 12 and 21 days before calving against E.coli, Rotavirus and corona virus. Immune transferred to the new born through the colostrum. The farm has also calf vaccination program.

9.0 CARGILL- NUTRITION INNOVATIONCENTRE

One of the two Global Animal Nutritional Innovation Centres of US-based Cargill is located at Velddriël (Veilingweg 23), The Netherlands. The Centre was established in order to promote collaborative research among experts (in-house & universities), accelerate innovation and increase customer service level (quick delivery of new products & services). It is the hub of the company's global network of 15 animal nutrition research and technology centres. The Centre serves customers of dairy, poultry and swine. It has 16 rumen-fistulated dairy cows with an average milk production of 38 litres daily, 11,000 litres per lactation and the best fistulated cow had 100,000litres lifelong production. The barn utilizes sand bedding, tie-up system and an outside resting area. The Centre houses broiler grow-out facility and a state of the art broiler breeder facility and swine facility. All the facilities designed to meet all European regulations and to provide additional capabilities. Visitors' viewing corridors facilitates convenient view of animal R&D facilities without changing footwear or clothes in a hygienic standard.

Cargill global operations at a glance: - more than 150 years of experience in business, over 155,000 employees and located in over 70 countries. A diversified company that provides food (high quality ingredients, meat & poultry products, healthy promoting ingredients), agriculture (deals in grains, oilseeds, farm services & products), financial (risk management & financial solutions) and industrial products and services

Provimi™ is a brand of Cargill, dealing with innovative animal feeds, calf milk replacer, premix products, additives, digital modelling and feed formulation solutions.

1.9 Feed Analysis

Kenyan team at Cargill started the day with a practical session of estimating dry matter and nutritive value (crude protein) of grass silage and maize silage through observations and experience. Provimi -Cargill staff applied a portable NIRS on the same sample of feed for comparison and learning purposes (Picture 13). The team identified a greater variance on comparing LCB visual assessment and NIRS results (NIRS - Near Infrared Spectrophotometer). NIRS (PoliSPEC) analysed the following variables, DM, CP, sCP, Fat, Ash, cADF, ADICP, cNDF, dNDF, Fiber, AStarch, RUM-Sugar, preRUP, Lignin, AGel, Ca, P, K, Mg. Henceforth LCBs' long-term objective should be increased reliability of feed analysis results, and diet formulation.



Picture 13: Provimi Staff (Geert Kuijpers) explaining functionalities of NIRS apparatus & demonstration of feed analysis using portable NIRS on grass & maize silage sample

2.9 Manure Analysis (Digestion Analyzer)

Manure reflects what the cow eats. It was LCBs' second on-farm practical session to assess diet of high yielder lactating cow (peak milk production at 60 litres) and dry cow. Provimi staff explained on manure colour in relation to protein intake, manure thickness in relation to absorption rate and passage rate. Digestion Analyzer sieve has three layers (level) and each layer has different hole size dimensions. Top layer assesses rumen health



Digestion Analyzer - Three layers

where poor rumen health (low digestion) indicated by the quantity of large to medium particles retained in first layer. The first layer alerts the consultant on signs of acidosis and prompts to check selective feeding at feed fence check roughage quality & quantity. The target biomass in first layer would be less than 10% of the total sieved manure. Second layer assesses the health of microorganisms in rumen (bacteria /protozoa) and targets 30% biomass of the sieved manure and the third layer (with the finest residues) indicate results of bacteria and target 60% biomass of the sieved manure. It was a simple yet effective tool to help LCB visualise exactly what is happening in the rumen. Figure 1 summarizes the range of Provimi -Cargill practical on-farm tools that assesses diets more precisely and detects visible effects of improved feed efficiency

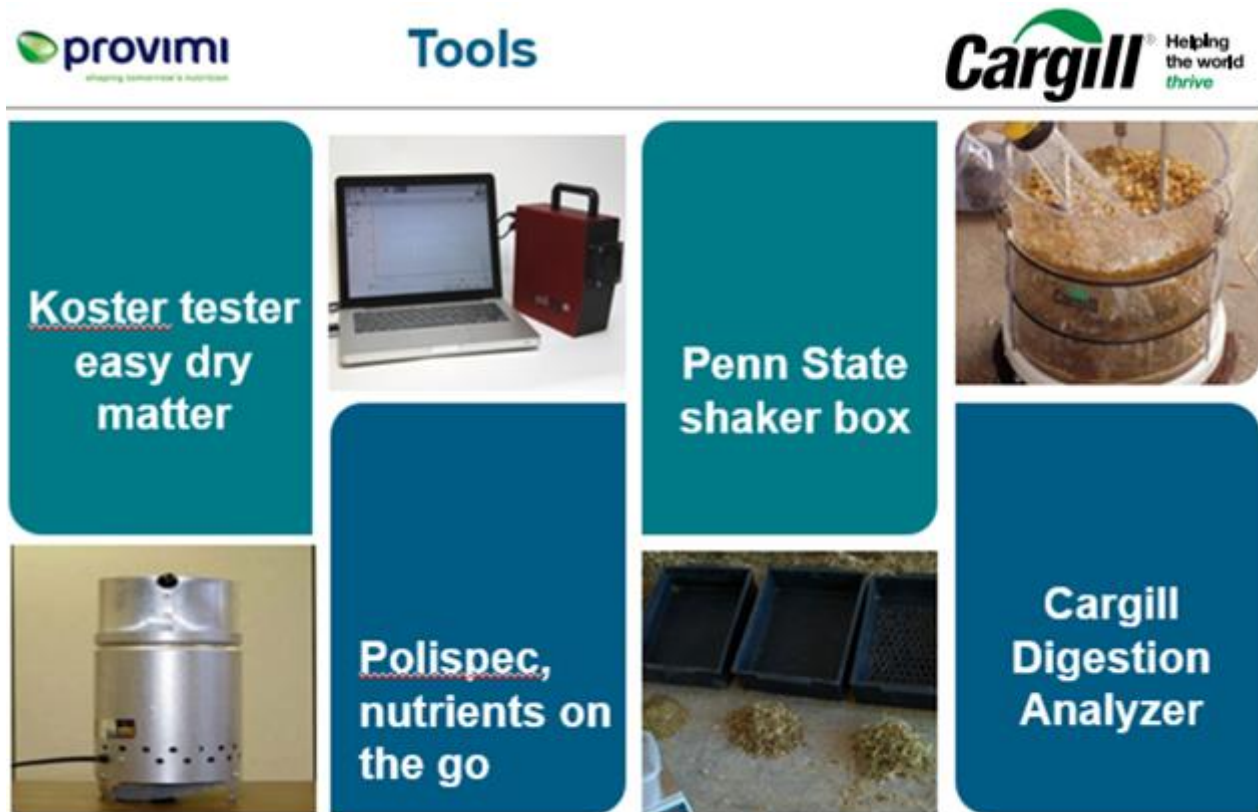


Figure 1: A List of Provimi Diet Analysis Tools applicable to Kenyan Dairy Market

In order to optimize on feed efficiency, take a walk around the farm for situational assessment from animal health status to raw material characteristics, then apply the optimizing tools.

3.9 Feed Formulation (Dairy MAX™ Program & Rumen8)

This involved comparing the reliability and functional capability of the two-ration formulation software (Dairy MAX™ & Rumen8) guided by Cargill-Provimi Staff (Rob Hulshof) and PUM senior expert (Hink Perdok) respectively. Results indicated that both software had similar features and, importantly, the predicted DMI and milk yield were similar in both systems. Hink explained the functionality of Rumen8 software, optimization options that suits Kenyan circumstance due to differences in feed qualities and their availability compared to The Netherlands. Optimizing rumen digestive system, through balanced energy and protein requirements.

Comparing the results of NIRS on grass and maize silage, and Dairy MAX™ and Rumen8, the team concluded that Dry matter intake (DMI) and milk yield are intrinsically higher in temperate areas than tropical regions due to higher nutrient densities and lower NDF hence higher DMI & milk yield. On average, Kenya has poor quality roughages incapable of supporting extremely high milk yields thus the genetic potential of cows in the tropics do not need to be as high as in temperate areas. Cows with a potential to produce 40 to 60 kg of milk per day simply cannot cope with the climate and low digestibility roughages. Kenya requires cows tolerant to high

temperature, tick resistance and high capability of converting low digestible feeds into milk, preferably crossbreeds as opposed to temperate dairy cow pure breeds such as Holsteins.

Table 4 summarizes effects of climatic conditions (zone) on feed quality. Using a simplified example of a 500 kg cow fed on C3 grass (temperate) or C4 grass (tropical) from Australia and Kenya respectively. Milk price of KES 35/kg with 4.2% BF & 3.1% Protein. Australian cow is on pasture & walks 5 km/day; Kenyan cow grazed on Boma Rhodes, stall-fed on Napier

Table 4: Climatic Zone Effect on feed quality & Dry Matter Intake

Diet Number & Grass	DM	ME, MJ	CP, g	NDF, g	DMI (Body Weight)	DMI	Milk	MAFC
Ryegrass is a C3 Grass and Napier is a C4 Grass	g/kg	/kg DM	/kg DM	/kg DM	Driver	kg/d	kg/day	KES
1. Ryegrass annual, spring, high quality, Australia	181	10.5	217	485	NRC, 2001	17.6	20	?
2. Boma Rhodes grass fresh, grazed Kenya	274	8.3	94	706	NDF 1.3%	9.3	0.5	-47
3. Napier fresh, 120 cm	180	8	87	688	NDF 1.3%	9.5	2	-144
4. Napier fresh, 60 cm (diet 4. as percentage of diet 1.)	211	8.8 (88%)	150	600	NDF 1.3%	10.8	5.5	-22
5. Napier fresh, 60 cm + 6.2 kg maize grain DM; but starch in diet too high	302	10.7	127	410	NDF 1.3%	16	20	288

Source: Hink Perdok presentation, 2018

4.9 Business Opportunities

Cargill-Provimi has innovative products that suits Kenyan market especially to lactating cows that have limited access to balanced diets to achieve optimal milk production.

Rupromin Econ to boost rumen microbial activity stimulates digestion and maximises nutrient use. Rupromin Balance buffers rumen environment and improve fermentation. Amaferm increases fibre digestibility. Figure 2 summarizes feed additives and their intended function in the rumen.

Other products that suit Kenya market include Calf milk replacer. Young stock development to first calving has been below par, one way to improve this is proper feeding of high quality milk replacer, pellets and hay

Grains & oilseeds of which quality soya has ready market at feeds manufactures' level and farmer level. Soya bulk sales through dairy cooperatives and MSF study groups would be appropriate entry point. Quality yet competitive oilseed is a feasible business.

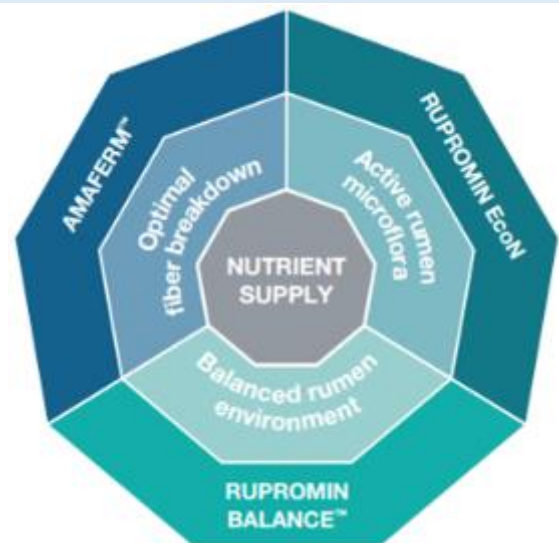


Figure 2: List of Feed Additives that suits Kenya

10.0 CRV

CRV is a Dutch / Flemish owned farmer co-operative. It has about 26,000 dairy and beef farmers that have great influence on CRV's policy through the co-operative's advisory bodies and member committees.

CRV core business include breeding, herd management, fertility and health. CRV has business units organized in such a way that they do business in the same time and culture zones as their customers (on-farm services under one roof). CRV deliver products and services to approximately 60 countries.



Picture 14: CRV Dairy Breeding Centre – Delta Nucleus

1.10 Summary of 2017 Dutch Dairy Statistics

CRV staff (Gert-Jan van den Bosch) introduced 2017 Dutch annual national dairy data. The country had 18,000 farms that recorded milk production of 12.7 billion litres and 1.6 million head of dairy cows. About 85% of the dairy farms participated in milk production recording (MPR) and classification with about 95% of their heifers registered in Herd Book. Figure 3 summarizes performance of lifetime production of Dutch Dairy cows in 2017 with an average milk production of 27.5 kg / cow / daily. Average 305 days milk production of 8,400kg and 29.845kg in 1084 milk days, fat 4.36%, protein 3.53%, 2.354Kg fat & protein, 413 days calving interval and 3.4 calvings (Parity 3.4).



Figure 3: Statistics of Lifetime Production of Dutch Dairy Cows in 2017

Much of the discussion revolved around calving interval and appropriate measures to improve Kenyan situation, from over 600 days to below 400 days. On milk components (fat & protein), Kenyan market still has limited incentives for farmers to breed or select for fat and protein. On-farm data recording identified as an area that LCBs could make much contribution through lead farmers. Support farmers calculate milk produced per lactation and analyse effects of prolonged calving interval. At strategic level, lobbying for milk quality payment at processors and government level being an agenda of consideration.

2.10 Dairy Cow Lifetime Profitability

Herd replacement presents an opportunity for farms to improve genetics as a cost management approach. This approach involves decreasing involuntary culling, increasing feed efficiency, increase health & fertility. Increasing herd stock value and turn over through increased milk production & quality. Figure 4 summarizes cow income on monthly basis and income cumulatively. On average, first calving in Netherland is at 24 months and breakeven at 35 months, thus rearing costs recovered at the end of the first lactation.

On average, most of the Kenyan farmers have limited data to compute national average first calving age and breakeven period. However, a sample of 12 “medium sized farms” had an average first calving at 29.1 months.

In conclusion, LCBs should influence and support lead farmers / model farms in data capture and profitability calculations. Innovate around record management to improve on technical and financial data.

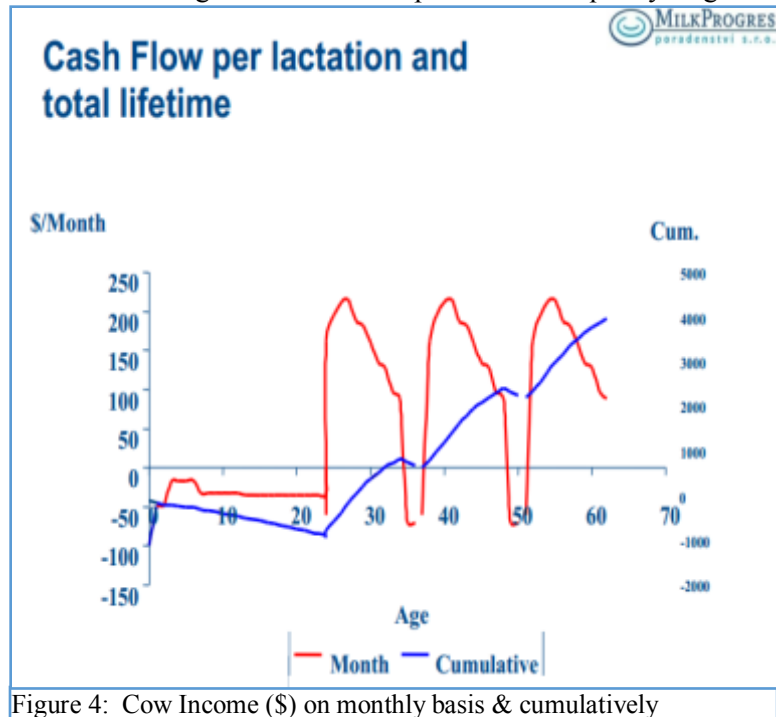


Figure 4: Cow Income (\$) on monthly basis & cumulatively

3.10 Breeding Objective –Lifetime Efficiency

Breeding is an essential part of optimal herd management, calves raised should therefore contribute to herd improvement, and in such way, that maximizes the number of days a cow spends in milk production. With increased feed costs, farmers should aim at maximizing lifetime cow profitability (Figure 5). A greater percentage of costs incurred by farms are between calf births to first calving. Farmers focus should reduce the non-productive rearing period of young stock to below 24 months and in conditions, that ensures optimal milk production; right weight, height and body condition score (BCS).

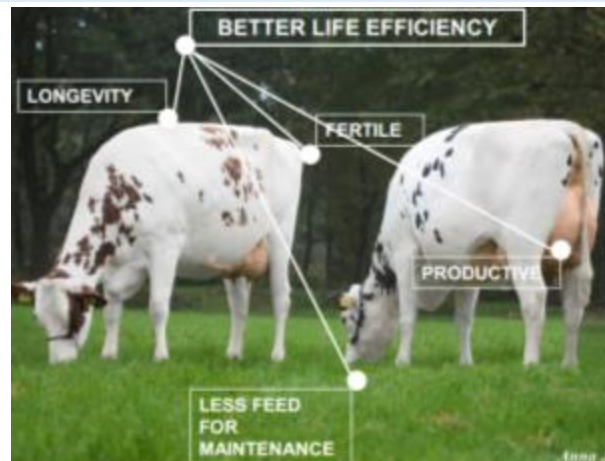


Figure 5: Breeding Objectives- Efficiency & Health

Another focal point is to raise age at culling, thus maximising yield per day of life. Removing unproductive animals from the herd to raise mean yield per day of life.

4.10 CRV Farm Visit –Jersey Farm

Melkveebedrijf farm at a glance, the farm started in 1964 with Holstein –Friesian cows. Piloting with 10 Jersey cows started in 2011 and in 2014 the farm became fully-fledged Jersey farm. The farm had 75 lactating cows and 10 dry cows on pasture grazing at the time of farm visit, (Picture 15) and young-stock in-house.



Picture 15: Field visit to a Jersey farm. Christine in the pasture where 85 milking cows (Pedigree Jersey cows) were grazing

The farm has experience of managing two breeds, Holstein –Friesian herd replaced with Jersey, the farmer indicated that Jersey cows are 40% more profitable than Holstein –Friesian cows per lactation. The farm identified the following advantages of rearing Jersey cows; ease of calving, milk quality in terms of fat & protein, 5.0% & 4.3% respectively, calm, hardy hooves and lifelong efficiency such as 6,500 litres of milk in 305 days, high feed efficiency, calving interval and resilient health status.

As the farm replaced breeds (breeding goal), from Holstein –Friesian into Jersey, it necessitated change of market segmentation from bulk raw milk supply into value addition and own milk outlet. With a higher milk fat and protein components, the farm increased capacity to make superior quality cheese that they supply on contract basis to one of the cheese factory in Arnhem. The farm has installed ice cream dispensing machine and milk ATM (Picture 16) located at the entrance of the farm; in addition, they make yoghurt.



Picture 16: Ice Cream Dispenser, Milk ATM and Money bowl

This is a self-service and high-level trust based business. The shop has automatic milk ATM for pasteurized milk but money bowl for ice cream is an open payment point where customers pay and may also get change from the same bowl, “modern silent trade system”.

There were six items sold at the shop and price list that ranges between 20 cents to one Euro tucked next to the money bowl. The owner comes in to assist on need basis.

The farm has movable individual calf pens made of plastic for ease of cleaning and relocation. Calf pens mostly place under a high roofed house and one side open, in a separate section from the main cow barn.



Picture 17: Individual Movable Calf Pen with milk bucket

The milk feeding buckets installed with slow feeder teats to increase production of saliva and placed on a normal cow udder height, (Picture 17), with bedding of barley /wheat straw

11.0 A DAY AT A DAIRY FARM

1.11 Straathof Farm

Fred and Bianca leased Straathof farm in 2004. However, they had started dairy farming in New Zealand but got home sick and relocated back to The Netherlands. On arrival, they were land constrained since Fred's parents were not farmers and they opted to lease 40 hectares of land. They started with 29 cows, all purchased. The Farm had 100 milking cows in 2017 but sold 20 cows to adhere to phosphate based government directives of stocking level, based on 2015 stock level. The couple plans to retire at 65 years old and as dairy farmers.



Picture 18: Farm managers & Kenya LCB at Straathof milking parlor:
From right: Renny, Bianca, Cyrus & Fred

The farm has installed 10,000 litres milk cooling tank and 2*10-herringbone system (Picture 18). Cow milk yield of 27.1 litres based on 305 days and bulk milk collected after every 3 days. The farm had 74 lactating cows, 12 dry cows, 41 young-stock and 1 mating bull. About 95% of cows are Red Friesian. Manager places a ribbon on the tail or leg to mark cows that require attention (mastitis, blocked teat / slow milking). Post disinfection implemented fully and fresh meals after milking. Lactating cows pasture grazed for 6 months annually during the day in late spring, summer and autumn (Picture 19). In the evening, they feed on grass & maize silage, brewers waste, concentrate & minerals. Dry cows and pregnant heifers eat the mixes leftover of lactating cows with additional minerals. Early in-calf, heifers (3 months in-calf) and 15 months heifers get grass silage. Young heifers (3-14 months) get grass silage, maize silage and concentrate. Calves (0-3) months get colostrum for 3 days and shift to 6 litres of milk replacers to Red Friesian and ad libitum to Belgium Blue calves that are sold at 8 weeks. Calf pellets and quality hay fed ad libitum. The farm targets to reduce replacement rate, reduce young stock in farm and reduce culling rate of cows in production, resulting in a higher yield per day of life



Picture 19: Renny & Cyrus collecting 74 lactating cows from pastures of 36.5 hectares of grassland, controlled grazing with electric fence

On-Farm Learning Points

Contract farming is much efficient and easily implemented, from land preparation to silaging (Picture 20)

Farm productivity, 3.5 hectares of fodder maize producing 50 Tons / Ha (As Fed) and 36.5 hectares of Rye grass producing 2.5 Tons (DM) /Ha of 35 days old / cut & manages seven cuts.



Picture 20: Fred & Renny assessing status of maize field

Feed quality vs. cow productivity), 27.1 litres (305days) mostly from quality grass grazing & grass silage of 1st & 2nd cuts (harvest)

More healthy cows in production over total herd, average DIM of 185 & 403 days calving interval significantly reduces farm costs, Test milk of cows dried with antibiotics when they calve.

Farm Tops

Passion & Teamwork of Fred & Bianca. They really love “Dairy Farming”. They understand input and outputs of the farm thus possible to meet most of their set targets. Training school going children around the “village” on dairy farming. Creativity (improvised feed pusher, cow marking, silage covering). Calf of 0-2.5months average daily gain (ADG) of 1.1Kg & 348Kg at 12 months.



Picture 21; Fred, Bianca & Renny discussing farm KPIs

Full range of contract farming on maize & grass establishment, management, preservation, feed formulation and annual supply of brewers’ by-product. Scheduling regular farm visits of service providers and input suppliers; DeLaval every 2 months and CRV report analysis every six weeks and discussion on milk production and quality, fertility, breeding, income & expenses. Knowledge of milk cell counts and its management. Minimal use of antibiotics to dry cows. Manure storage capacity (1700 M³) and its utilization to fertilize grass and maize fields within the specified period. Shared machineries among neighbours.

Farm Tips / Constraints

Limited calf-monitoring program; weighing at birth & regularly. Limited aeration at calf pens /young stock barn. Limited documentation on farm objectives and targets. Some losses at silage bunker.

Government restrictions on herd stock level constraining farmer’s expansion plan hence forced sales. Weather constraints on manure application and grazing, (September to February). High labour & concentrate costs.

2.11 Zeinstra Farm

The farm at a glance; it's a family owned farm, 100 ha of English rye grass and 20ha for maize. 232 lactating cows, 30 dry cows, 127 young stock and 2 mating bulls. Average daily milk yield of 32 litres and 9500 litres per lactation. Average calving interval of 383 days.

Fodder Establishment: Maize establishment and harvesting done by a contractor. Spacing of 75cm inter-row by 15 cm intra-row, 1 seed per hole. Precision is key during establishment (Picture 22). Grass established in pure stand and other fields intercropped with clovers (leguminous) to enrich the soil with nitrogen beneficial to grass and harvested for silage at about 25cm with good leaf to stem ratio.

Silage Making: Maize and grass silage had good compaction, dry matter for maize and grass silage estimated at 40% and 45% respectively (grass had good leaf to stem ratio, nice smell of vinegar. Silage bunker accessible (open) at both ends. The farm contractor uses heavy rollers for compaction. Silage at bunker has four layers; three layers are of grass and one layer of maize silage on top. A new machine with canvass filled with water rolled on top of the silage for covering and compaction (Picture 23)

Nutrition Expert Farm Visit: The animal nutrition expert (Mr. Andries) visited the farm to review feed ration due to raised concern on reduced butterfat and protein in milk. He assessed the condition of silage namely temperature, smell and dry matter. He indicated that the slight heating up on silage resulted to losses in nutrients and hence low dry matter intake. He analyzed manure to assess rumen health, time of fodder in the rumen and energy and protein in the diet. He assessed feed in the trough (Picture 24) namely, smell, mixing and selective feeding as it may affect dry matter intake. He recommended increasing supplementation of brewers waste to improve on protein level of the current diet. The farm TMR consisted of grass & maize silage, concentrates and brewers waste. TMR wagon facilitate loading, mixing and offloading.

Fertility Expert Farm Visit: The farm has contracted a fertility expert who visits the farm once a month to conduct pregnancy diagnosis and to assess reproductive health of the cows, (Picture 25).



Picture 22: Fred & Jan in maize field



Picture 23: Movable Silage Covering Machine



Picture 24: Cows feeding on grass & maize silage
He recommended increasing supplementation of



Picture 25: Fred & Jan marking animals that require vet check-up prior to vet arrival

We observed that with a Pregnancy Diagnosis Scanner / Ultra Sound Machine you manage to attend to many animals in a short time, conduct accurate examination, report on uterus health and administer the right treatment. The fertility expert keeps the farm on track to attaining average calving interval of 383 days. His report raises red light on animals taking long to come on heat. This ensures timely administration of right medication and confirmation of pregnancy.

Recording and Record Keeping: The farm had record keeping system supported by a herd management system. Cows have neck chips that monitors herd activity. Farm records updated automatically & some manually for ease of retrieval from the farm computer. During the visit, we were able to track the below records but also Mr. Jan had them in mind; Herd size and number, (young stock, heifers, dry and lactating), Fertility records (insemination, births, bull names) Milk records, Existence of cow cards from CRV and tags, Existence of cost records and sales records and existence of health record.

Young Stock: Farm estimates an annual replacement of 25 %. The farm had invested in young stock management in order to grow the herd with a better genetic and increased milk production. All calves weighed at birth and ear tagged for record purposes, housed in individual pens, fed on quality colostrum then milk replacer and concentrates. Group housing after 14 days in groups of five calves for socialization purposes. The farm utilizes straw beddings in these calf pens ad libitum concentrate feeding implemented at weaning, including water and straws. Young stock weighed at 12 months to determine the right mating time using farm mating bull.

Young Stock Observation

- ❖ At 12 months, most heifers are more than 350 kg, average weight for breeding Friesian heifers.
- ❖ Bull service for heifer helps detect heat service is timely.
- ❖ Good hygiene standards; quality feeds (concentrates and fodder for fast growth)

Milking: The farm had Rotary Milking Parlour serving 232 lactating cows. Milk from treated cows and colostrum handle separately. Cows fed on concentrates at milking.

General observation

- ❖ Record keeping is management tool, farm make decisions based on records / data.
- ❖ The farm engages experts; nutrition, fertility, soil health experts and fodder contractors. This helps them understand their limiting factor and work towards it to attain their objectives.
- ❖ Dairy farming driven by passion, farmer and his colleagues are very enthusiastic, hands on and open with sharing information.
- ❖ Transition of best practices such as farm goal and strategies from old generation to young generation. This ensures continuity of best practices, supported by experienced consultants and growing technologies within and outside livestock value chain.

Farm Tips

Increasing air circulation and light at young stock housing

3.11 Miedema Farm

The farm utilizes 100 hectares of land. The farmer owns 70 hectares and leases 30 hectares in a distant village to establish fodder corn as own farm has deep clay soil full of iron. The farm has a total herd of 170 cows.

Farm Tops

Fodder Planning: The farmer has quality-grazing grass (Picture 26), sufficient grass silage, corn silage and grass hay all harvested at the right stage, cut with efficient machines with minimal physical wastage and well compacted.



Picture 26: Johannes demonstrating soil structure to Matt at the grass field

Milk Quality: Observes high standard on milk quality, from the cow's udder, milking machine pumped into milk cooling tanks, chilled to around 4 degrees centigrade, milk cool tank trucks transport it to Friesland Campina (the co-operative milk processor).

Record Keeping: The farmer has embraced technology in record keeping. His software record keeping system captures everything from production, breeding, feeding and calf (Picture 27)



Picture 27: Johannes & Matt checking on computer records

Efficiency and Machinery: Efficiency is the order of the day as one man manages the farm operation, Herman sometimes assistance by his son Johannes who most of the time is in school. Most of the work done by machines except milking that is hand-operated machine milking (2*16)

Cow Comfort: The farm invested in the current generation cow barn that embraces health diamond principles.

Knowledgeable, passionate, hardworking and dedicated: Father and son with shared values and dedicated to dairy farming

Farm Tips

High unit cost of producing a litre of milk.

4.11 Kinderman Farm

The farm has 100 hectares mainly on English rye grass. The farm had 164 lactating cows, 15 dry cows, 59 heifers and 47 calves. Average daily milk production of 26.8 litres /cow.

Feeding

Grass is the main forage. Cows grazed during the day and stall-feeding in the evening with grass silage, barley by-product and some hay for rumen functioning. Ration consists of 2.5 g of concentrates, 2.75 kg of barley by-product and 32 kg of forage. Calves of 0-3months get 6 litres of milk replacers spread throughout the day, quality hay and concentrates. Weaners get ad lib concentrates and grass silage.

Calf rearing

Farm has young stock barn where 0-3 months housed individually, groups housing after weaning in groups of 4-5 calves until inseminated then transferred to dry cows section in the main barn.

Milking

Cows milked twice daily within an interval of 12 hours, using 2*15 herringbone milking system. One cooler tank with a capacity of 6,000 litres and processor collects milk after every 3 days.

Farm Tops

- ❖ High cow productivity and low unit cost of production. The farm indicated unit production cost of 23 cents and selling at 34 cents per litre.
- ❖ Good quality grass silage of 47% DM and 18% CP thus limited concentrates usage.
- ❖ Follows the grass calendar well and this is why he has enough and quality fodder
- ❖ Achieves first insemination age of 15months
- ❖ The pastures are well fertilized and some fields are inter cropped by both red and white clovers which helps in nitrogen fixation and this boosts the quality of protein in grasses
- ❖ Records are well kept
- ❖ The farmer was willing to take us round and open to share the information
- ❖ The farmer is also passionate about dairy farming

Farm Tips

Monitor calf growth rate; schedule weighing

12.0 MISSION CONCLUSION

PUM-KMP Business Link Program mission concluded with an evaluation session, highlighting success, observations and lessons learnt during the week. PUM Frans Ettema guided mission discussion on learning points for each day, drawing on best Dutch practices and what would be applicable to Kenya. Lastly, Kenyan LCB summarized their on-farm experience, a day at a Dutch dairy.

Discussion during evaluation session were on best dairy practices, what would be applicable to Kenya and East Africa. How best to equip Kenyan dairy advisors to offer quality services and products, inculcating the right attitude, skills, knowledge and appropriate application of on-farm optimizing tools.

Issuance of certificate of participation to Kenyan LCBs commenced after mission review (Picture 28). Tseard v d Kooi hosted dairy actors at his residence. The team was grateful to the host and to the program for



Picture 28: Frans Ettema issuing certificate of participation to Susan Njuguna, assisted by Tseard v d Kooi. Christine appreciating a gift issued by PUM the learning opportunity.

On-route to Amsterdam, Frans Ettema introduced the Kenyan Team to Afsluitdijk Wadden Center, for learning and adventure (Picture 29). Discussion on occurrence of floods since 1421 and mitigations put in place to protect environment and arable lands.

The Kenyan team acquired more transferrable knowledge skills, created linkages and exposure than discussed in this mission report.



Picture 29: A visit to Afsluitdijk Wadden Center. Frans Ettema explaining to the Kenyan LCB on dykes' development, mitigation measures on flooding and future plans

13.0 PUM –KMDP BUSINESS LINK PROGRAM

Table 5: Summary of PUM-KMDP Business Link Program: 27th May -3rd June 2018

Day	Activity	Address	Contact person	Remarks/logistics
Saturday 27/05 /2018	Departure	Nairobi Airport	Anton Jansen	
Sunday 27/05 /2018	Arrival Schiphol airport and transfer to the hotel at Drachten	Karmel Klooster Burgemeester Wuiteweg 162, 9203 KP Drachten T: 0512 512 103	Astrid Venema (Karmel Klooster)	Arrival 13.15 pm. Pick up service by touring car. Frans Ettema.
Monday 28/05. 08.30 am, Departure from the hotel. Program from 09.00 till 11.30 am	Bles Dairies. Introduction to Dutch dairy sector, export of animals and genetics incl. farm visit.	Bloksleat 5 8512 AA Broek T: 0582167266 M: 0646374191	Wytze Heida +31(0)646374191	Transport by: Frans Ettema Tseard v d Kooi Halbe Klijnstra
Monday 28/05 Lunch at DeLaval. Program from 13.00 till 17.00 pm	DeLaval Milking equipment, milking technics and milk hygiene	Oostermeentherand 4, 8332 JZ, Steenwijk. T:0521 537 500	Geert Jacob van Dijk. DeLaval Steenwijk T: 0521537500	Transport by: Frans Ettema, Tseard v d Kooi Halbe Klijnstra
Tuesday, 29/05 0745 am departure from the hotel. Program from 08.30 until 11.30, Lunch at Spinder.	Spinder. Barn equipment, barn interior and cow comfort etc.	Reitsmastrjitte 48 9281 LE Harkema T: 0512369191	Jehannes Bottema T: 0511472064	Transport by: Frans Ettema Tseard v d Kooi Hink Perdok
Tuesday, 29/05 Program from 13.30 till 17.00 pm.	Service providing on animal health and fertility	DAP Hardegarijp Westeromwei 71, 9254 ED Hurdegaryp T:0511 472 064	Erik Apperloo, Veterinarian.	Transport by: Frans Ettema Tseard v d Kooi Hink Perdok
Wednesday, 30/05 07.00 am Departure from the hotel. Program from 09.30 until 16.30 pm, incl. lunch.	Tour research facility, NIRS apparatus demonstration, manure analysis, diet formulation	Cargill, Nutrition Innovation Center Veilingweg 23 5334 LD Velddriel T: +31 (0)418 63 29 20	Hink Perdok / Rob Hulshof	Transport by touring car. Hink Perdok Tseard v d Kooi Halbe Klijnstra. Arend Jan Nell
Thursday, 31/05 08.30 am departure from the hotel. Program on the farm from 09.00 till 18.00 pm.	Individual farm visit. Practical management and operation, farm data.	Miedema. Kinderman. Zeinstra. Straathof.	Herman & Johannes Miedema Romke Kinderman Jan Zeinstra Fred & Bianca Straathof	Transport by: Halbe Klijnstra Tseard v d Kooi Frans Ettema
Friday, 01/06 08.30 departure from the hotel. Program from	CRV Breeding and genetics. Farm field visits (2 farms)	Dairy Breeding Centre, Wurdum - Farm visit - Farm visit	Gert Jan van den Bosch. T: +31622705019 Hielke Sportel,	Transport by: Frans Ettema Tseard v d Kooi Halbe Klijnstra Hink Perdok

09.00 till 16.00 pm Incl. lunch by CRV			Area Manager IBD CRV.	
Saturday, 02/06 Morning Departure from the hotel depends on the program.	Visit to Hummel farm at Een. Meeting Jurjen Hummel, former KMDP intern at Meru	Jurjenand Marike Hummel Een.	Jurjen Hummel +31 611975581	Frans Ettema Halbe Klijnstra Tseard v d Kooi
Saturday, 02/06 Afternoon 13.00 till 16.30 pm	Leisure and side seeing, free time	Leeuwarden city	Frans Ettema	Frans Ettema Halbe Klijnstra
Saturday, 02/06 Evening. 17.00 pm.	Closing and farewell meeting.	Tseard and Anneke van der Kooi. Tsjerkewei 19 9067, DS Roodkerk	Tseard v d Kooi	All participants, experts and host farms / companies are invited.
Sunday, 03/06 Departure from the hotel depends on travel time.	Departure	Schiphol Airport	Frans Ettema / Tseard v d Kooi	Departure 21.30 pm Transport by touring car. Frans Ettema

On- farm dairy work Experience; A day at a Dutch dairy farm

Host farms; Thursday program	Trainee / Kenyan LCB	Transport by
Herman and Johannes Miedema Wyns 10-A 9091BC Wyns M: +31(0)630506381	Matt Agesa Philip Oketch	Tseard v d Kooi
Romke en Thea Kinderman Wierewei 13, 9064DB Aldtsjerk	Christine Korir Susan Njuguna	Tseard v d Kooi
Jan Zeinstra. (Mts. Zeinstra) Rijksstraatweg 16, 9257DT Noardburgum M: +31(0)636266993	Fredrick Ochido Kennedy Khisa	Halbe Klijnstra
Fred and Bianca Straathof Kruisweg 3, 7932 PS Echten T: +31(0) 528251531 M: +31(0) 638196889	Renny Chemtai Cyrus Kabuga	Frans Ettema