



DAIRY TRAINING CENTRE

TO ASSESS THE KNOWLEDGE AND CAPACITY NEEDS OF INSEMINATORS IN NAKURU AND  
DIRECTORATE OF VETERINARY SERVICES



June 2023



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**TO ASSESS THE KNOWLEDGE AND CAPACITY NEEDS OF INSEMINATORS IN NAKURU AND  
DIRECTORATE OF VETERINARY SERVICES**

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**June 2023**



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## TABLE OF CONTENTS

TO ASSESS THE KNOWLEDGE AND CAPACITY NEEDS OF INSEMINATORS IN NAKURU AND DIRECTORATE OF VETERINARY SERVICES .....	i
TO ASSESS THE KNOWLEDGE AND CAPACITY NEEDS OF INSEMINATORS IN NAKURU AND DIRECTORATE OF VETERINARY SERVICES .....	ii
TABLE OF CONTENTS.....	iii
LIST OF TABLES.....	v
LIST OF FIGURES.....	vi
LIST OF ANNEXES .....	vii
LIST OF APPENDICES .....	viii
LIST OF ABBREVIATIONS AND ACRONYMS .....	ix
EXECUTIVE SUMMARY .....	xi
CHAPTER 1: INTRODUCTION.....	1
1. The Objectives of the Embassy .....	2
2. The Goal of the Overall Cooperation .....	2
3. Approach and Methodology .....	2
CHAPTER 2: KENYA’S BREEDING SECTOR.....	3
1. Background .....	3
2. Structure of the Breeding Sector in Kenya.....	7
3. State Department of Livestock (SDL) .....	8
4. Directorate of Veterinary Services (DVS).....	9
5. Kenya Veterinary Board (KVB) .....	13
6. Animal Health and Industry Training Institutes (AHITIs).....	14
7. Kenya Animal Genetic Resources Centre (KAGRC) .....	14
8. Agricultural Development Corporation (ADC) .....	16
9. Agricultural Development Corporation Livestock Genetics Centre (ADC LGC) .....	17
10. Nakuru County Government.....	18
11. County Directors of Veterinary Services .....	19
12. Nakuru County Dairy Cooperative Union (NCDCU) .....	20
13. Inseminators .....	22
14. Bovine Semen Distributors in Nakuru County .....	25
15. Kenya Livestock Breeders Association (KLBA) .....	27



DAIRY TRAINING CENTRE

16. Breeding Companies Doing Business in Kenya .....	29
CHAPTER 3: KNOWLEDGE CAPACITY AND TRAINING NEEDS OF NAKURU COUNTY INSEMINATORS AND DVS STAFF .....	31
1. The Knowledge and Training Needs of Nakuru County Inseminators .....	31
2. The Knowledge and Capacity Needs of DVS Staff .....	33
3. Opportunities to Provide the Knowledge and Capacity Needs of DVS Staff and Nakuru County Inseminators .....	35
CHAPTER 4: CONCLUSION .....	36
CHAPTER 5: RECOMMENDATIONS .....	37
1. Directorate of Veterinary Services (DVS) .....	37
2. County Government of Nakuru (CGN) .....	39
3. Other AI Stakeholders .....	40
CHAPTER 6: REFERENCES .....	69



DAIRY TRAINING CENTRE

## LIST OF TABLES

Table 1: Dairy production systems and their proportions (experts' and stakeholders' knowledge) .....	3
Table 2: <i>Fertility Management KPIs as given by the Cooperative Union Respondents</i> .....	21
Table 3: Number and distribution of inseminators in Nakuru County .....	26
Table 4: Cattle breeds and breed societies .....	28
Table 5: Goat breeds and breed societies.....	28
Table 6: Sheep breeds and breed societies .....	29
Table 7: Pig breeds and breed societies.....	29
Table 8: Short- and Long-Term Steps to be taken for increased successful insemination in Nakuru County and nationally.....	34



DAIRY TRAINING CENTRE

## LIST OF FIGURES

Figure 1: (L to R) Mr. Han Tellegen (DTC), Dr. Immaculate Maina (Nakuru County CECM for DALF),.....	1
Figure 2: Structure of the Breeding Sector in Kenya (Source: Adopted from DVS, 2022) .....	8
Figure 3: Directorate of Veterinary Services Organization Structure (Source: DVS, 2022) .....	12
Figure 4: L to R, Boran bull, LN <sub>2</sub> Plant building and LN <sub>2</sub> processing unit at KAGRC in Kabete.....	16
Figure 5: ADC Livestock Genetics Centre in Kitale .....	18
Figure 6: Presentation by one of the KLBA extension staff .....	27



DAIRY TRAINING CENTRE

## LIST OF ANNEXES

Annex 1: DVS App that captures diseases, real- time, on mobile smartphone (L & R) .....	55
Annex 2: Inside one of the bovine semen agent’s premises in Nakuru City.....	55
Annex 3: First photo - Mr Han Tellegen (DTC), Mr. Johnstone Sang (Nakuru Dairy Union Chairperson), Mr. Joe Marema (Secretary, Dairy Union) and Mr. Eric Kimalit (DTC/PDTC Kenya); Second photo – KVB poster on its CPD.....	56
Annex 4: Left – A Focus Group Discussion session with Nakuru Artificial Inseminators conducted by Mr. Han Tellegen and Mr. Eric Kimalit in Nakuru City. Right – Dr. John (Nairobi Veterinary Centre, a bovine semen supplier, Nakuru) after an interview by DTC team .....	56
Annex 5: Left – KLBA signage at its headquarters, Nakuru City; Right – Mr. Han Tellegen (DTC), Mr. Leonard Muganda (KLBA CEO), and Mr. Eric Kimalit (DTC/PDTC Kenya) .....	57



DAIRY TRAINING CENTRE

## LIST OF APPENDICES

APPENDIX I: Dairy Sector News in Nakuru County .....	58
APPENDIX II: News on Nakuru County Government Funding to Dairy Sub-sector.....	60
APPENDIX III: Description of Genetic Terms used in Bull Catalogues.....	62
APPENDIX IV: Milk production in Nakuru County.....	64
APPENDIX V: Programme for the Kenya Mission; 24-28 January 2022 By Han Tellegen & Eric Kimalit, DTC Netherlands/PDTC Kenya.....	65
APPENDIX VI: List of Artificial Inseminators interviewed in the afternoon of Wednesday, 26.1.2022 in Nakuru.....	68





DAIRY TRAINING CENTRE

## LIST OF ABBREVIATIONS AND ACRONYMS

ABS	American Breeders Society
ADC	Agricultural Development Corporation
AHITI	Animal Health
AI	Artificial Insemination
AISPs	Artificial Insemination Service Providers
AMR	Anti-Microbial Resistance
CDVS	County Directorate of Veterinary Services
CECM	County Executive Committee Member
CIDR	Controlled Intra-vaginal Drug Release
CL	Corpus Luteum
CPD	Continuous Professional Development
DALF	Department of Agricultural Livestock Fisheries
DRI	Dairy Research Institute
DTC	Dairy Training Centre
DTI	Dairy Training Institute
DVS	Directorate of Veterinary Services
GDFPs	Good Dairy Farming Practices
GoK	Government of Kenya
ICT	Information and Communication Technology
KAGRC	Kenya Animal Genetic Resources Centre
KALRO	Kenya Agricultural and Livestock Research Organization
KeLCoP	Kenya Livestock Commercialization Project
KLBA	Kenya Livestock Breeders Association
KMDP	Kenya Market-led Dairy Programme
KNA	Kenya News Agency
KNBS	Kenya National Bureau of Statistics



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KPIs	Key Performance Indicators
KVB	Kenya Veterinary Board
PD	Pregnancy Diagnosis
PDTCKE	Practical Dairy Training Centre Kenya
RVIST	Rift Valley Institute of Science and Technology
SCC	Somatic Cell Count
SCVO	Sub-County Veterinary Officer
SDL	State Department of Livestock
TOTs	Trainer of Trainers
VWG	Veterinary Working Group
WWS	World Wide Sires



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## EXECUTIVE SUMMARY

This report responds to the terms of reference from the Embassy of the kingdom of The Netherlands (EKN) with the general objectives to assess the knowledge and capacity needs of Nakuru County inseminators and directorate of Veterinary Service (DVS) staff at the national level.

The study was conducted in 2022 and finalized in 2023 using desk studies and other secondary information and data sources. Primary data was obtained from stakeholders by holding focus group discussions (FGDs), key informants' interviews (KIs), and administering questionnaires to some individual respondents on one-on-one basis as well. The study targeted and interviewed respondents from both Kenya and The Netherlands drawn from various breeding sector actors. The questionnaires focused on three (3) areas, namely, basic information on Kenya's breeding sector; characteristics of inseminators of Kenya and knowledge gap of DVS staff; and, the needs of inseminators of Nakuru County and DVS staff. The data was collated and compiled so that a report would be generated for the Contracting Authority (EKN).

Dairy cattle production in Kenya is the second largest contributor to the country's agricultural GDP. Livestock production as a whole contributes about 13.4% (USD.3.1 billion) to agricultural value-added incomes. The country produced over 5.52 billion litres of milk in 2019, of which 3.98 billion litres were from cows and the rest from camels (1.16), dairy goats (0.273) and sheep (0.107) according to Kenya Dairy Board (2021). Per capita consumption was approximately 117 litres of milk per year by 2014, one of the highest in the African continent. The dairy sector is a major source of employment in rural areas with smallholder farms producing about 80 percent of the total milk in the country.

At the national level, Kenya's breeding sector is domiciled in the State Department of Livestock (SDL) under the Ministry of Agriculture, Livestock, Fisheries and Cooperatives. Under the purview of the SDL, at the national level, are the Directorate of Veterinary Services (DVS), Kenya Veterinary Board (KVB), Agricultural Development Corporation (ADC), and Kenya Animal Genetic Resources Centre (KAGRC) among others. Animal Health and Industry Training Institutes (AHITIs), which offer training in artificial insemination (AI) to veterinary para-professionals, are under the purview of the DVS.

At the county level, the breeding sector is domiciled in the Departments of Livestock in the ministries of Agriculture, Livestock and Fisheries of respective counties and this function is discharged by the County Directors for Veterinary Services (CDVSs). Under the CDVSs are the Sub-County Veterinary Officers (SCVOs) who supervise inseminators. The inseminators operate under the SCVOs in their respective sub-counties whether they operate as private practitioners or employees of cooperatives societies, commercial large-scale farms and agrovets respectively. The DVS, at national level, collaborates with the CDVSs at the county level with respect to discharging their respective mandates; the CDVSs do not report to or do consultation with DVS regarding their operational activities.



DAIRY TRAINING CENTRE

The DVS role include livestock industry policy management and development, veterinary services and disease control, as well as dairy industry promotion. It also builds the capacity of the CDVSs in the counties who are the supervisors of inseminators. KVB regulates and maintains an updated register of veterinary surgeons and veterinary para-professionals all veterinary private practice in the country; it also licenses these professionals. The report has stipulated the roles of the other AI value chain stakeholders.

The study revealed that the value of Kenya's AI business is USD.11 million at the current rate of breeding heifers and cows in the country's dairy herds. AI use in these herds has a potential to generate over USD.37.6 million at the current 60% of dairy cattle insemination rate. The organization of the AI value chain is in place with institutional instruments that provide for the governing the roles of the various stakeholders.

In the report, too, are the identified knowledge and capacity needs of the inseminators in Nakuru County and DVS staff at the national level as well as the business opportunities areas that this knowledge could generate in Kenya for potential investors in bovine breeding field.

Recommendations to DVS, Nakuru County Government and other AI value chain stakeholders on the way forward with respect to how to increase successful insemination in Nakuru County in particular, and Kenya in general, have been stated as well.

## CHAPTER 1: INTRODUCTION

In the past, various programmes and projects have been done in Kenya to benefit the livestock sector. Examples are the Kenya Market-led Dairy Programme (KMDP) and the Market Study on Artificial Insemination and Vaccine Production Value Chains in Kenya. Both studies revealed the potential and benefit of having a variety of bovine species depending on the needs of the farmer. This has led to stakeholder meetings with the sector in Kenya and the possibility of importing bovine semen from The Netherlands under agreed conditions. Apart from working with the national government, there is also cooperation between the Embassy and various county governments. An important county, due to the agricultural activity of the Dutch private sector and the cooperation with the ENK in the past, is Nakuru. The large sectors here are the potato, floriculture and dairy sector which are all important for Nakuru County and The Netherlands. In the recent past, the County Government of Nakuru expressed a need for training of her inseminators to enhance their level of expertise so that they could inform smallholder dairy farmers about insemination in a way that the farmer could make informed decisions in that respect. As partners in sustainable agriculture, DTC wished to participate in this need by assessing the training needs in the field of artificial insemination for the over 80 inseminators based in Nakuru County and for the diverse organizational levels of Directorate of Veterinary Services (DVS) in the country.



**Figure 1:** (L to R) Mr. Han Tellegen (DTC), Dr. Immaculate Maina (former Nakuru County CECM for DALF), Mr. Eric Kimalit (DTC), and Dr. V. W. Wanjohi (Ag. CDVS, Nakuru) in the CECM Office, Nakuru



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## 1. The Objectives of the Embassy

*To Assess the Knowledge and Capacity Needs of Inseminators in Nakuru and Directorate of Veterinary Services*

The reason DTC and her partners were asked to carry out this assessment was due to the fact that it does train in the dairy sector in Nakuru County and that it has had, already, a long history in identifying training needs and implementing training in Kenya as well as in surrounding countries, concerning the dairy farm management, all professional practical trainings for service providers as well as farmers.

Also, DTC and her partners are now duly accredited by the Kenya Veterinary Board (KVB), meaning if there would be a follow up of this assessment, the participants will be gathering their accreditation points for their professional skills through Continuous Professional Development (CPD), see also [CPD – KENYA VETERINARY BOARD \(kenyavetboard.or.ke\)](http://kenyavetboard.or.ke)

The Embassy is involved in the dairy sector in relation to genetics and cooperation with DVS through the Agriculture Working Group.

## 2. The Goal of the Overall Cooperation

The goal of this research is to understand the breeding sector in Kenya better and identify the knowledge and training needs of the inseminators of Nakuru county and DVS to ultimately increase successful inseminations in Kenya.

## 3. Approach and Methodology

The study was conducted from desk studies and other secondary information and data sources. Primary data was obtained from interviewing the stakeholders by holding focus group discussions (FGDs), key informants' interviews (KIIs), and administering questionnaires to some individual respondents on one-on-one basis as well. Some respondents filled in the questionnaires and e-mailed to the research/study team. The questionnaires contained both closed and open questions for all the stakeholder categories. The study targeted and interviewed respondents from both Kenya and The Netherlands drawn from various breeding sector stakeholders. The questionnaires focused on three (3) areas, namely, basic information on Kenya's breeding sector; characteristics of inseminators of Kenya and knowledge gap of DVS staff; and, the needs of inseminators of Nakuru County and DVS staff. The data was collated and compiled so that a report would be generated for the Contracting Authority (EKN).

## 1. Background

Dairy cattle production in Kenya is the second largest contributor to the country's agricultural GDP (FAO, 2018). Livestock production as a whole contributes about 13.4% (USD.3.1 billion) to agricultural value-added incomes - cattle being the most important contributor. The country produced over 5.52 billion litres of milk in 2019, of which 3.98 billion litres were from cows and the rest from camels (1.16), dairy goats (0.273) and sheep (0.107) according to Kenya Dairy Board (2021). Per capita consumption was approximately 117 litres of milk per year by 2014, one of the highest in the African continent (FAO, 2018). The dairy sector is a major source of employment in rural areas with small-scale farms being pervasive and producing about 80% of the total milk in the country (FAO, 2018). Livestock stakeholders have identified three dairy production systems in Kenya, namely, intensive, semi intensive and extensive systems. The intensive and semi-intensive systems comprise about 85% of all dairy farms in Kenya (See Table 1).

**Table 1:** Dairy production systems and their proportions (experts' and stakeholders' knowledge)

Dairy production system	Intensive		Semi-intensive	Extensive	
	Large-scale	Small-scale	(Semi-grazing)	production systems Controlled dairy	production systems Uncontrolled dairy
Proportion of farms (%)	5%	35%	45%	10%	5%

Source: FAO, 2018

In the country, 95% of the artificial inseminations (AI) carried out in cattle go to dairy cattle whereas the beef cattle take the remaining 5%. AI in Kenya started with the establishment of the Central Artificial Insemination Station (CAIS) in 1946 for the production of bovine semen. Countrywide delivery of AI services since 1966, through the Kenya National Artificial Insemination Services (KNAIS), had been a major contributor to the growth of dairy farming in Kenya (Gachie, J., 2020). KNAIS role has now been taken by KAGRC.

According to Makoni N., *et al* (2015), the main Kenya livestock species include dairy and beef cattle, pigs, sheep, goats, poultry and camels. AI is largely in dairy cattle using deep frozen and fresh bull semen. However, there have been records of AI in pigs using fresh semen (99% of all inseminations), in goats using imported deep-frozen semen, and in poultry on a few commercial breeding farms. AI has also been used to a small extent in horses and breeding dogs by horse breeders and security service provider companies, respectively.



DAIRY TRAINING CENTRE

It was further showed that the statistics on current demand and supply of local and imported semen largely exists for dairy cattle and, to a smaller extent, beef cattle. As reported above, the national percentage use of AI in the Kenya dairy sector is estimated at 18% (Makoni *et al.*, 2015; CAK Report, 2014). Local supply of semen is from KAGRC and currently stands at 650,000 units (doses) per year and this, until a few years ago, represented more than 80% of national AI use with about 20% being supplemented by imports. Data for Years 2013 to 2014 indicated an increase in imported semen market share which stood at 350,000 semen units constituting just over 40% of national AI use. The estimated potential supply gap was 1,600,000 units of dairy bovine semen and 15,000 units of beef semen at 1% of beef population using AI. Therefore, based on current livestock data that Kenya dairy cattle population is 3.5 million and given that the current dairy cattle inseminations only represent 18% of the dairy cattle population, Kenya's potential annual demand for dairy cattle AI stands at about 630,000 units. Potential dairy semen demand at the possible 60% of cattle breedings is estimated to be 2.1 million units.

The recorded annual inseminations averaged about 1.7 million from 2006 to 2013. Most of these inseminations were conducted in the former Central Province. The former Central Province of Kenya (comprising of the present-day Kiambu, Kirinyaga, Murang'a, Nyandarua and Nyeri counties) commanded 71% of all AIs while the rest of the provinces accounted for 29% of the inseminations. The proximity of local semen production at KAGRC, located in the former Central Province, positively influenced AI adoption in the Province. Specifically, proximity to KAGRC facilitated quick access to breeding inputs including semen, AI consumables and liquid nitrogen.

Consistent with liberalization of the economy, during the last over eight years, the public sector AI services provision declined. In this regard, the role of the KNAIS declined. The total recorded inseminations indicate that the privatization of AI services initiated in 1991, resulted in almost all inseminations being carried out by private AISP, cooperatives and commercial farmers. According to the Makoni, N., *et al* (2014), usage of AI is in the range 18 - 27% of total cattle breedings; 83% of the inseminations is carried out by private inseminators, 13% by dairy cooperatives and <4% by the public sector.

According to the study, projections for the next 10 years, from 2014, indicated an increase in inseminations that will also increase imported and local semen supplies. Annual increase for both local and imported semen demand would range from about 6 - 9% as stated above. AI services are now being delivered by private sector players. Since 2007, in the former Central and Rift Valley provinces KNAIS has now been completely replaced by private AISP. Demand for AI services has also been increasing over the given years.

Despite the projected increase in AI services demand, data collected for the inseminations carried out from 2006 to 2013 did not account for semen produced locally and imports. The number of inseminations recorded averaged 30% of total available semen units suggesting that there was a challenge in getting returns for actual inseminations carried out. If this were the case, therefore, then about 70% of inseminations carried out are not being reported to the DVS office.

It was also established in the study that AI service costs on average ranged from KES.950 to over KES.1,000 depending on the semen used, that is, whether it is local, imported conventional or





DAIRY TRAINING CENTRE

imported or sexed semen. Imported semen prices range from KES.300 for conventional up to KES.7,000 for sexed semen doses. The key cost drivers for an AI service are bull semen, insemination service and transport with percent shares of 43%, 37% and 14%, respectively. The rest of the costs individually account for less than 3% of the total AI costs. The advent of devolution from provincial to county governance systems has resulted in differences in AI models and cost elements.

Most counties including Bomet, Bungoma, Embu, Kakamega, Murang'a, Machakos, Taita and Makueni (Wote) have since resorted to AI subsidies, particularly for semen purchases. In Machakos and Makueni counties, semen subsidies have resulted in increased uptake of AI technology with AISPs recording increased number of monthly services from 15 to over 50.

Farmers have accused AI Service Providers (AISPs) of bad business practices including overcharging, lack of transparency concerning whether the semen is imported or local, refusing to divulge straw identification details and suppressing use of sire directories (bull catalogues) as most do not understand how to use them. Due to their ignorance about semen and their breeding value, farmers rarely select semen or bulls to be used for their cows. Instead they rely on the AISPs choice or whatever is available.

According to a market study conducted by Makoni, N. *et al* (2015), the current total value of the Kenya's AI business exceeds USD.11 million (Makoni, N. *et al*, 2015) at the current 18% of total dairy cattle breedings with a potential to generate over USD.37.6 million at 60% of total dairy cattle breedings. AI use is predominant in dairy cattle while less than 1% of the beef herd is bred using AI. The AI use is projected to grow by 1.5% - 5% in the Kenya dairy herd to reach up to 2.3 million inseminations per year by 2023 compared to the current 650,000. Consistent with privatization of AI service delivery, as much as 95% inseminations are now conducted by private AI service providers and cooperatives. In addition, semen imports increased from 20% in the 1990s to the current 40% of the semen distributed. This bodes well for private sector semen distribution market share growth. Both semen distribution and AI service provision generate sufficient returns to guarantee business growth. However, returns on investment for semen production business may not be guaranteed unless the critical number of doses of about 3 million per annum are produced.

Of concern, the study revealed, has been the market distortion from parastatals engaged in semen production (KAGRC) and Agricultural Development Corporation (ADC) that charge subsidized prices and are not subject to import levies and taxes, product quality checks and standards applied to imported AI products. Inefficient semen production is prevalent in these parastatals which creates opportunities for partnerships with competent, well-resourced private sector players to improve production efficiency.



DAIRY TRAINING CENTRE

Further, the report of the said study stipulated that the market for AI supplies and services is well defined and relatively more developed. Investment in semen production level can be considered, but initial investment by potential investor companies should first be at the warehousing and distribution level - supply through product importation- to establish distribution channels and demand before investing in production facilities. Strategically, it is essential for Dutch investors to work with local partners to understand the markets before fully engaging and making heavy investments. All breeding products from semen to supplies should be tailored to the markets regarding pack sizes and/or specifications. However, these companies can consider investing in local AI companion product manufacture (Makoni, N. *et al*, 2015).

Given that breeding programmes take long to realize results, this makes the AI sub-sector vulnerable to public sector and donor-funded programmes that often distort markets. In this regard, it is important to scope the NGOs working in the area to form strategic buying-down risk partnerships or alliances, hence, preclude market distortions.

It is purported that Dutch companies have interest in investing in the Kenya AI value chain, but based on activities of the companies there is more interest and presence in the AI value chain. In general, if Dutch companies were interested in production business, they should set-up their bases in existing institutions such as KAGRC bull stud. As suggested by some Dutch companies, a precondition for partnership with public sector institutions is operation according to a commercial and realistic business model. Such a model operates free of subsidies and government interference. Dutch companies should also consider investing in after-sales service provision for specialized equipment and special technology to existing institutions such as, LN<sub>2</sub> generation equipment after-sales service (Makoni, N. *et al*, 2015).

Dutch companies should exploit existing bilateral cooperation between Kenya and The Netherlands, for example, on bovine semen import to Kenya. Finally, because the AI businesses is largely anchored on the dairy sub-sector, the major changes in the sector that include the advent of international milk processors such as Danone and Brookside joint venture, investors should be prepared for long-run business model modifications (Makoni, N. *et al*, 2015).

Kenya has one of the largest dairy herds in Africa and there is a high market demand for dairy products at both the national and regional level. Milk production is, however, not sufficient to meet this ever-growing demand and for that reason development of the dairy industry in the region has enormous potential. However, there is a huge gap between milk yields in East Africa and in developed countries, mainly due to poor management, feeding regimes and cow breeds. To remain competitive and meet the demand, Kenya will have to address these challenges and will need dairy cows with a higher milk production capacities (Makoni, N. *et al*, 2015).

The Embassy of the Kingdom of The Netherlands in Kenya supports various initiatives to improve the dairy sector as part of the new policy agenda linking trade and development. The SNV Kenya Market-led Dairy Programme (KMDP) was said to be instrumental in a stronger, more efficient,



DAIRY TRAINING CENTRE

effective and inclusive value chain and addressed systemic issues that hamper growth of the sector, such as, inadequate dairy farm management, feed production, milk collection, processing and quality. Furthermore, through government-to-government cooperation, import of bovine semen from The Netherlands to Kenya is now possible. Dutch companies in the dairy sector, aware of the opportunities for dairy development in the East African region, are eager to invest in the Kenyan dairy sector, as witnessed by trade missions of the Dutch Dairy Development Partners (DDDP), a consortium of Dutch dairy companies with international ambitions. The quality of cow breeds, adapted to the local environmental conditions, and animal health are important determinants of the productivity of dairy cows. Improvement of the cow genetics, through AI in Kenya is, however, subject to constraints to effectiveness, efficiency and growth that limit the performance of the dairy sector (Makoni, N. *et al*, 2015).

A research study by Omondi, I.A., *et al* (2016), revealed that dairy farmers in Kenya prefer to have AI services offered rather than having no service. Farmers, too, prefer AI services to be available at dairy hubs (e.g. cooperative societies) rather than provided by private agents not affiliated to the hubs, to have follow-up services for pregnancy detections, and to use sexed semen rather than conventional semen. It was also established that farmers would further like some flexibility in payment systems which include input credit, and are willing to share the costs of any AI repeats that may need to occur. These results provide evidence of a positive attitude to AI services provided through the hubs, which could mean that AI uptake would improve if service characteristics are improved to match farmer preferences. The dairy hubs concept is currently in the implementation phase with most hubs at startup phase, hence, understanding which AI service characteristics farmers prefer can inform the design of high-quality and cost-effective AI services in the future.

## 2. Structure of the Breeding Sector in Kenya

At the national level, the study revealed that the Kenya's breeding sector is domiciled in the State Department of Livestock (SDL) under the Ministry of Agriculture, Livestock, Fisheries and Cooperatives. Under the purview of the SDL, at the national level, are the Directorate of Veterinary Services (DVS), Kenya Veterinary Board (KVB), Agricultural Development Corporation (ADC), and Kenya Animal Genetic Resources Centre (KAGRC) among others. Animal Health and Industry Training Institutes (AHITIs) are under the purview of the DVS (**See Figure 2**).

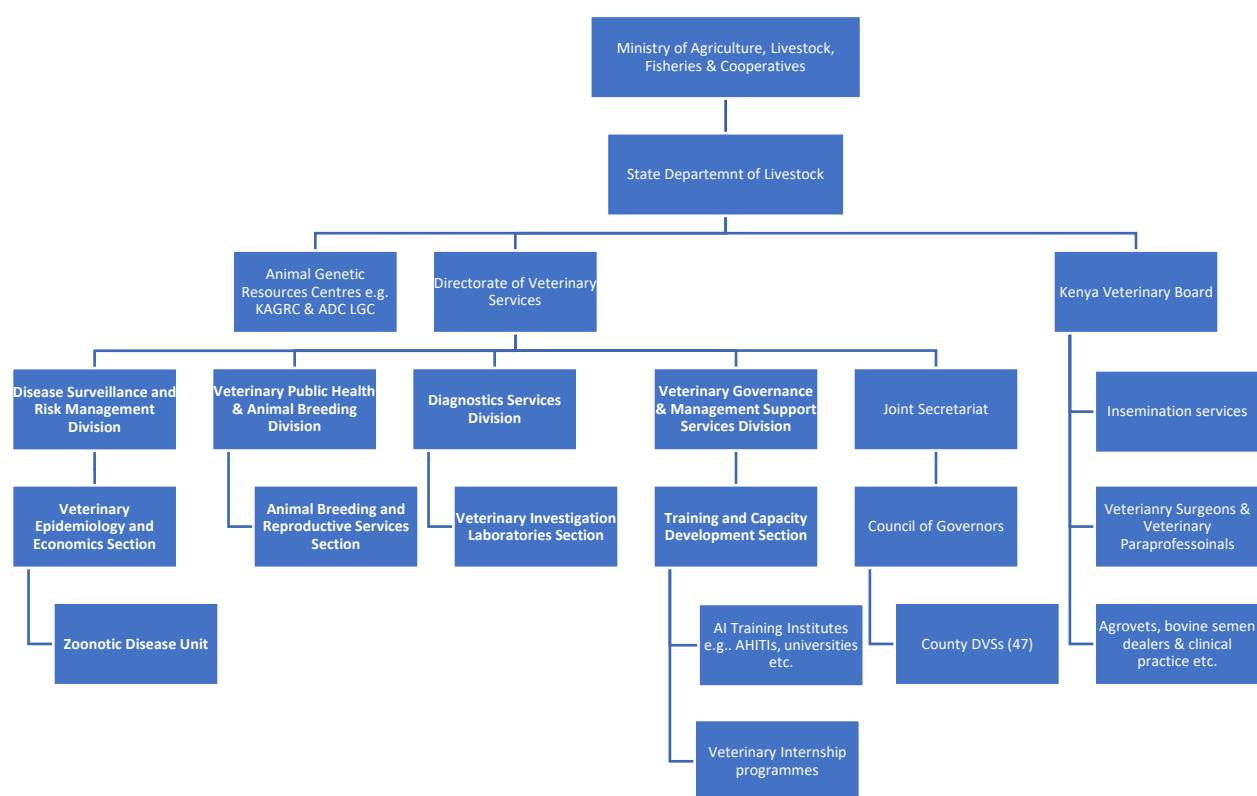
At the county level, it further revealed that the breeding sector is domiciled in the Department of Livestock in the ministries of Agriculture, Livestock and Fisheries of respective counties and this function is discharged by the County Directors for Veterinary Services (CDVSs). Under the CDVSs are the Sub-County Veterinary Officers (SCVOs). The inseminators operate under and supervised by the CDVSs in their respective sub-counties whether they operate as private practitioners or employees of cooperatives, commercial large-scale farms and agrovets, but they are all regulated by the KVB.



DAIRY TRAINING CENTRE

From the study’s finding, it was established that the DVS, at national level, collaborates with the CDVSs at the county level with respect to discharging their respective mandates; the CDVSs do not report to or consult DVS regarding their county operational activities.

There are also other stakeholders of the breeding sector in Kenya, such as, Kenya Livestock Breeders Association (KLBA), KAGRC semen agents and regional distributors, Artificial Insemination Service Providers (AISPs), foreign bovine semen companies, agrovets, commercial farmers, and dairy farmers’ cooperative societies mainly for smallholder farmers.



**Figure 2:** Structure of the Breeding Sector in Kenya (Source: Adopted from DVS, 2022)

The respective roles of the Kenya’s Breeding Sector stakeholders according to the findings of the study are stipulated under the following headings: -

### 3. State Department of Livestock (SDL)

The study revealed that SDL is one of the four state departments in the Ministry of Agriculture, Livestock, Fisheries and Cooperatives established through Executive Order No.1 of June 2018



DAIRY TRAINING CENTRE

(<https://kilimo.go.ke/wp-content/uploads/2021/02/SDL-Strategic-Plan-for-2018-2022-Final-Version.pdf> ), with the following mandate: -

1. livestock policy management
2. development of livestock industry
3. promotion of quality of hides and skins
4. veterinary services and disease control
5. range development and management
6. livestock marketing
7. promotion of dairy industry
8. livestock insurance policy
9. livestock branding, and
10. promotion of beekeeping

The SDL Strategic Plan for 2018-2022 focuses on delivering this mandate, the study showed.

#### 4. Directorate of Veterinary Services (DVS)

The Animal Breeding and Reproduction Services is one of the 4 Sections domiciled in the Division of Veterinary Public Health and Animal Breeding of the DVS (**See Figure 3**). The DVS mandate is to safeguard animal and human health, improve animal welfare, increase animal resource productivity and ensure safe and high-quality animals and their products to facilitate food security and domestic as well as international trade (DVS, 2020).

The study also established that the core functions of the DVS are as follows: -

1. country delegate to the World Organization for Animal Health (OIE)
2. World Trade Organization (WTO) enquiry point for Sanitary and Phytosanitary (SPS) measure
3. Formulation and implementation of animal health and welfare policies and strategies
4. Provision of veterinary regulatory and quality control services including breeding sector/industry
5. Compliance with national, regional and international standards in animal health, food and feed safety
6. Board and Technical Committee Member of various Government Agencies, Semi-Autonomous Government Agencies (SAGAs) and Programmes
7. *Capacity building and technical assistance to counties – targeting the CDVSS and their respective SCVOs who are trainers of trainers (TOTs) for the inseminators in the county*
8. *Training of animal health service providers*

The other specific roles of the DVS regarding the breeding sector according to some of the study findings included licensing KAGRC agents, genetic evaluation of bovine semen and its other production aspects, curriculum development and approval, examination moderation, inspection of training institutions and CDVS, licensing semen importation (scrutinizing bull catalogues for



DAIRY TRAINING CENTRE

approval or disapproval purposes), and semen analyses (e.g. motility) at Kabete veterinary laboratories, but computer analyzers are going to be used soon). DVS considers the use of imported bovine semen in Kenya but avers that benchmarking and audit of semen producing facilities in the Netherlands should be done by the DVS.

One of the study's finding was that the DVS organization structure showed that the Directorate is headed by the Director of Veterinary Services under whom there are 6 Heads of Division each with various specific functional areas as stipulated hereunder (<https://kilimo.go.ke/wp-content/uploads/2021/02/DVS-magazine-2020-A-new-dawn-at-the-directorate-of-veterinary-services.pdf> )

1. Director of Veterinary Services/OIE - Chief Veterinary Officer
2. Heads of Division (six)
  - i. Disease Surveillance and Risk Management
    - a) Veterinary Epidemiology and Economics
    - b) Disease Risk Management and Disaster Preparedness
    - c) Vector Surveillance
    - d) Quarantine, LITS and External Markets Development
    - e) Special Projects – SMAP
    - f) Zoonotic Disease Unit
    - g) Animal Welfare and Veterinary Advisory Services
  - ii. Diagnostics Services
    - a) Laboratory Services and Biological Products
    - b) Veterinary Investigation Laboratories
    - c) Veterinary Farms/Trial Centers
    - d) Quality Management
    - e) Reference Laboratories
    - f) Central Veterinary Laboratories (CVLs)
    - g) Foot and Mouth Diseases (FMD)
  - iii. Veterinary Governance and Management Support Services
    - a) Policy Coordination and Parliamentary Affairs
    - b) Training, Programmes, Monitoring and Evaluation
    - c) Training Institutes - AHITs
    - d) Veterinary Internship Programme
    - e) Human Resource Management
    - f) Information Communication Technology (ICT)
  - iv. Veterinary Public Health and Animal Breeding
    - a) Veterinary Public Health
    - b) *Animal Breeding and Reproduction*
    - c) Hides, Skins and Leather Quality Control



DAIRY TRAINING CENTRE

- v. Budget, Finance, Land and Assets
- vi. Joint Agricultural Secretariat – DVS collaboration nexus with Council of Governors through CDVs

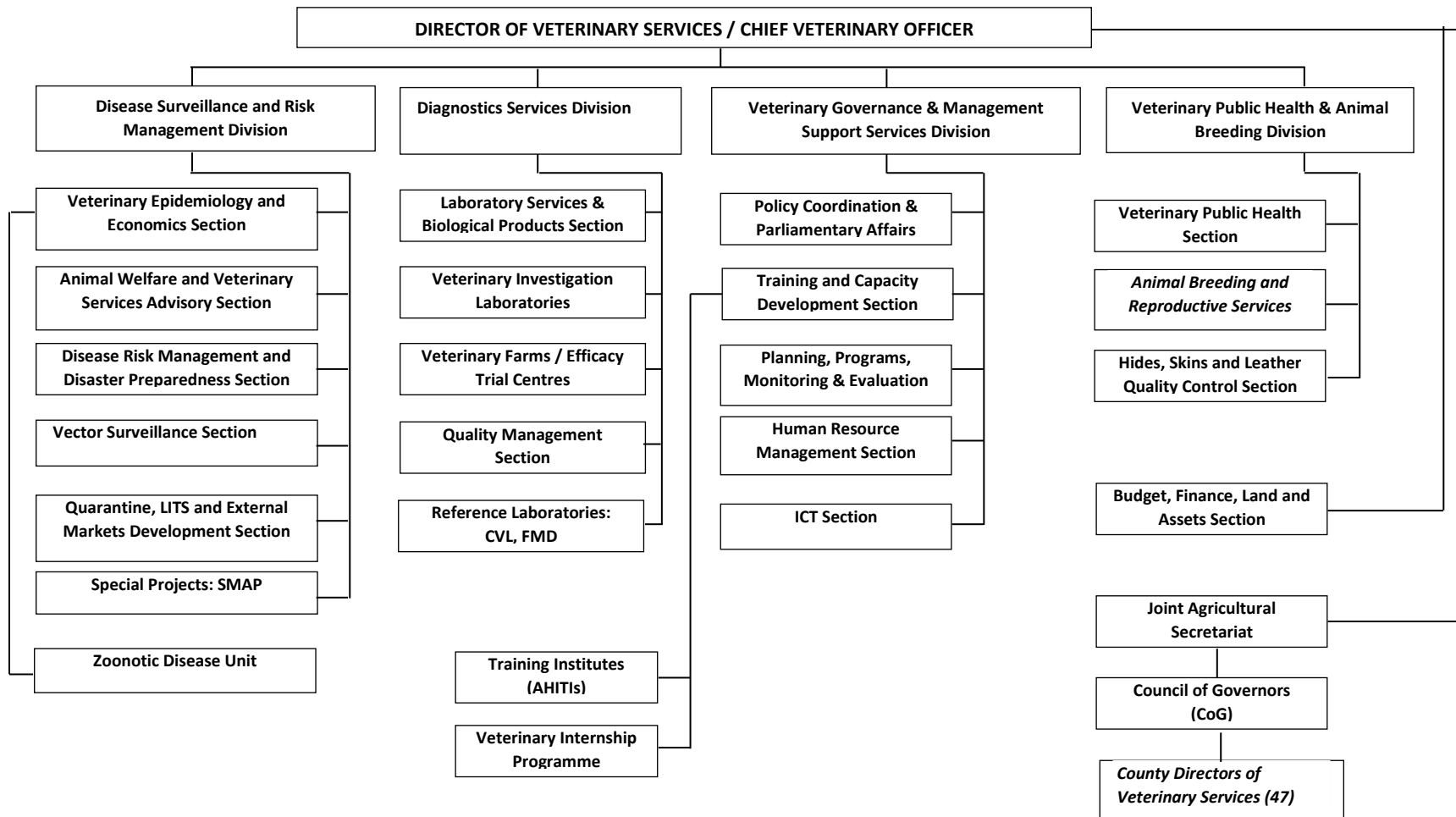


Figure 3: Directorate of Veterinary Services Organization Structure (Source: DVS, 2022)





DAIRY TRAINING CENTRE

## 5. Kenya Veterinary Board (KVB)

The Executive Order No. 1 of June 2018 (Revised) on Organization of the Government of the Republic of Kenya, places the KVB under the purview of the SDL. The mandate of KVB is to exercise general supervision and control over the training, business, practice and employment of veterinary surgeons and veterinary paraprofessionals in Kenya. This mandate is provided for under Section 6 of the Veterinary Surgeons and Veterinary Para-Professionals (VSVPs) Act, 2011 (<http://kenyavetboard.or.ke/> ; [www.kenyalaw.org](http://www.kenyalaw.org) ).

[The kvb strategic plan 2018-2022](#) outlines its key focus areas for the five-year life cycle, with the broad strategic objectives being to: -

1. promote, establish close contacts and work closely with all stakeholders
2. maintain an updated register of veterinary surgeons and veterinary para-professionals
3. maintain an updated register of all veterinary private practice in the country
4. create conducive environment for those who want to mount continuing veterinary education to do so
5. promote stakeholders' participation to see how best the profession can offer competent veterinary services so that livestock and its products could be accepted anywhere in the world
6. facilitate income generating activities

The study established that the core functions of the KVB are to: -

1. advise the Government on matters relating to veterinary training, research, practice and employment, the use of veterinary medicines, poisons and the pesticides as well as other issues relating to animal welfare
2. prescribe courses of training for veterinary surgeons and veterinary para-professionals
3. approve institutions for the training of veterinary surgeons and various categories of veterinary para-professionals
4. consider and approve the qualifications of the various categories of veterinary para-professionals for the purposes of registration
5. register, license, control and regulate veterinary practice and veterinary laboratories, clinics, animal hospitals and animal welfare institutions
6. providing continuous Professional Development (CPD) activities to surgeons and veterinary para-professionals as provided for by the Act
7. formulate and publish a code of ethics for all persons registered as provided for by the Act.
8. ensure the maintenance and improvement of the standards of practice by the registered persons
9. assess human resource and necessary training programmes to guarantee sound and efficient veterinary service delivery and advise the relevant ministries accordingly



DAIRY TRAINING CENTRE

10. create an inspectorate to work in collaboration with law enforcement agencies in structured regulation of training, locating, inspecting, and closing down premises or ambulatory clinics operated contrary to the practices prescribed in the Act, and taking legal action against the offenders
11. *regulate the use of technology for purposes of animal breeding*
12. investigating and conducting inquiries on professionals' unethical and malpractices, regulating training institutions offering animal health & food safety of animal origin and advising government on matters relating to veterinary profession.

## 6. Animal Health and Industry Training Institutes (AHITIs)

The study established that the AHITIs are under the purview of the SDL. With respect to administrative and human resource aspects, AHITIs are under and report to the SDL Principal Secretary whereas they are under the DVS regarding technical aspect of their functions. There are 3 AHITIs in the country, namely, Kabete, Ndomba and Nyahururu located in Kiambu, Kirinyaga and Nyandarua counties respectively. It is only Ndomba and Kabete that offer AI course at Certificate level while they all offer Certificate and Diploma courses in animal health and production among others. The AI course take a duration of 4 weeks. The entry qualification requirements for one to pursue the said AI course is being in possession of a basic training, Certificate, Diploma or Bachelor's degree level in Animal Health. The admission of new trainees to these institutes is done throughout the year. The said AHITIs receive trainees from all over Kenya and also from the Eastern Africa countries. Each of these AHITIs has a full capacity of about 400 trainees but the study established that these institutes do not have adequate equipment/tools and trainers, due to budgetary allocation/funding constraints.

KVB prescribes the courses offered by these AHITIs and approves them as AI training institutions. Similarly, the trainers must meet requirements for the KVB registration in order for them to be accredited to take part in AI training and other veterinary professional practices (<https://ahitikabete.com/about-us/> ; <https://ndomba.ahiti.go.ke/> ; <https://nyahururu.ahiti.go.ke/> ).

In the study, it was also established that there are AI training institutions, other than the AHITIs, like Mount Kenya University, Egerton University, ADC Livestock Genetics Centre, and University of Nairobi among others - they are regulated by KVB and not DVS. The study, too, revealed that qualified veterinary surgeons are not required to undertake an AI training unlike their veterinary para-professionals counter parts.

## 7. Kenya Animal Genetic Resources Centre (KAGRC)

KAGRC derives its mandate from the Legal Notice No. 110 of 5th September, 2011 (<https://kagrc.go.ke/> ). This parastatal is under the purview of the SDL at the national government level. This mandate provides that KAGRC should: -



DAIRY TRAINING CENTRE

1. establish a national livestock resources gene bank for conservation of livestock tissues, DNA, semen and embryos of all livestock and emerging livestock species for posterity in Kenya
2. conserve for posterity and avail livestock tissues, DNA, semen and embryos of all livestock and emerging livestock species in Kenya for both research and breeding
3. engage in strategic semen production
4. serve as a reference laboratory for certification, testing of semen, embryos and related livestock production materials for purpose of domestic use and export markets
5. either alone or in collaboration with other institutions, develop and produce chemicals and laboratory products for use in the production of semen
6. either alone or in collaboration with other institutions, provide information on the suitability and effectiveness of animal breeding products, and
7. provide training in animal resource conservation procedures, semen, in-vitro embryo production and transfer and related technology transfer

*The KAGRC Strategic Plan (2018-2022) identifies four (4) key strategic objectives which would be pursued during the five years lifecycle ( <https://kagrc.go.ke/> ). These are to: -*

1. increase capacity for germplasm production, preservation and conservation
2. strengthen Institutional Capacity, infrastructure development and legal framework
3. expand market share of KAGRC products and strengthen financial base, and
4. strengthen research, innovation and development in animal genetic resource

The study undertaken showed the services that KAGRC offer. These include the following: -

KAGRIC produces and distributes both bovine semen and Liquid Nitrogen (LN2) as well as AI equipment through its 73 appointed agents spread across the Country. The inseminators procure the semen and liquid nitrogen from these agents. KAGRC produces bovine semen from dairy (Ayrshire, Friesian, Jersey) and beef (Boran, Sahiwal) cattle breeds as well as from some goat breeds (not much breed information was available in this regard) (<https://kagrc.go.ke/>).

The Centre has also established Memorandums of Understanding (MOUs) with over 29 County Governments that purchase bovine semen, Liquid Nitrogen and AI equipment directly from KAGRC. Although the Centre is dealing with bull semen currently, in its strategic plan, semen for other species e.g. goats, pigs, poultry, donkeys, camels and other animals will be availed. The study further revealed that these county governments provide the semen that they procure from KAGRC, mainly, to dairy farmers' cooperative societies who in turn issue the same to their inseminators whereas some county governments issue the semen to their respective county government inseminators.

KAGRC also undertakes testing of Liquid Nitrogen containers for interested clients, upon request, to determine their efficiency. Similarly, the Centre has an extension department which educates



DAIRY TRAINING CENTRE

farmers, students and AI service providers on matters related to animal breeding including breeding technologies. KAGRC stores animal germplasm in Liquid Nitrogen as part of its animal conservation strategy.

The study also established that the concern in Kenya has been what stakeholders', including farmers, need to know in order for them to adequately prepare themselves for a successful artificial insemination. The persistent issue has been how much it will cost a farmer to have his/her cows served. Availability of a good inseminator who is always available when the cows are on heat is also a major concern to many farmers. Then there are more worries on conception rates, repeats, semen quality and so on.



**Figure 4:** L to R, Boran bull, LN<sub>2</sub> Plant building and LN<sub>2</sub> processing unit at KAGRC in Kabete (Source: KAGRC, 2022)

## 8. Agricultural Development Corporation (ADC)

Agricultural Development Corporation (ADC) is a Government Parastatal, which was established in 1965 through an Act of Parliament (Cap 346 Laws of Kenya) and is under the purview of the Ministry of Agriculture, Livestock, Fisheries and Cooperatives. The mandate and core functions of Agricultural Development Corporation are set out under the Act of Parliament, Cap 444, Laws of Kenya ( <https://adc.or.ke/index.php/about-us> ) as follows: -

1. promotion of the production of Kenya's essential agricultural inputs as the Corporation may decide from time to time, such as seeds and *pedigree livestock* including hybrid seed maize, other cereal seeds, potato seed, pasture seed, vegetable seed, *pedigree cattle, sheep, goats, pigs, poultry and bees*
2. undertaking such activities as the Corporation may decide from time to time so as to develop agricultural production in specific fields of production
3. participating in activities of agricultural production which are commercially available participating in agricultural production which are related to primary and secondary functions of the Corporation and which in the view of the Corporation are commercially viable

The strategic objectives of ADC are to: -

1. strengthen the institutional capacity to effectively manage operations
2. optimize production and productivity in all sectors
3. commercialize new enterprises and diversify into new areas



DAIRY TRAINING CENTRE

4. enhance operational efficiency across the corporation

The study found out that some of the main roles of ADC in the agricultural sector include: -

1. being the custodian of the *national livestock studs*. ADC ensures the continued existence of the *livestock breeds* and the availability of quality stock to the Kenyan farmer at affordable prices.
2. the transfer of technology from the research institutions to the Kenyan farmer through farm advisory/consultancy services arm
3. Through linkages with Agricultural institutions, ADC has contributed to be a testing ground for technologies and research. The findings of which are passed on to the farmer. ADC also facilitates the training of farmers through field days and agricultural shows; and the training of students through attachment that provide hands-on experience.
4. ADC being a major producer of agricultural produce, plays a major role in its support to industries processing agricultural goods. Top in the list are seed maize processors, milk processors and millers. Through them, ADC has contributed to support of the industrial sector of the Kenya economy.

#### 9. Agricultural Development Corporation Livestock Genetics Centre (ADC LGC)

The Centre is owned by Agricultural Development Corporation and is located in Kitale, Trans-Nzoia County, along Endebbes-Kitale Road. The Centre was licensed by the Director of Veterinary Services as a semen production and distribution facility on 30th May 2018. It started semen production and distribution on 8th June and 9th July, 2018 respectively. The Centre has had remarkable growth in number of bulls, semen and Liquid Nitrogen sales as well as production of fodder. To date, the Centre has recruited a total of 43 bulls of which 15 are imported from South Africa and 28 are locally recruited from reputable, registered breeders of various breeds across the country ( <https://adc.or.ke/index.php/about-us> ).

The ADC mandate, as provided for by the Act of Parliament (Cap 444, Laws of Kenya), is to produce and disseminate agricultural inputs which includes crop seeds and *livestock semen*. ADC Semen Production Centre aims at producing quality livestock genetics, with particular emphasis on cattle, to complement local supplies and provide diversity, all geared towards increased uptake of AI services, improved dairy and beef productivity in Kenya. In order to realize these objectives, the Centre works closely with breeding institutions, product distributors, county governments and livestock farmers in bull recruitment, marketing and sales, advisory and extension services.

The Centre has a pre-quarantine, main quarantine compound and laboratory that is equipped with state-of-the-art modern equipment for semen collection, evaluation, straw printing, filling and sealing equipment. ADC LGC has an installed capacity to hygienically process 5,000 semen straws per hour.



DAIRY TRAINING CENTRE

The Centre, at the time of conducting the study, had over 250,000 doses of Friesian, Ayrshire, Jersey, Guernsey and Boran cattle breeds in stock. ADC LGC averred that its bulls are recruited from reputable, recording and registering breeders with the needs of smallholder and large-scale



**Figure 5:** ADC Livestock Genetics Centre in Kitale (Source: ADC, 2022)

farmers in mind. The Centre laid emphasis on recruiting bulls that would impact good production, type, functionality, health and longevity traits on their progenies.

It was established, too, that ADC LGC is in the process of appointing agents to distribute these stocks and more to come at affordable cost to AISPs and Farmers. It also has plans to be seeking feedback on the effectiveness and fertility of its bull semen through direct contact with agents, AISPs, County Directors of Veterinary Services and Animal Production staff as well as visiting farmers using its genetics to discuss accessibility and performance (<https://adc.or.ke/index.php/about-us>).

It was established, in the study, that the Centre has a modern liquid nitrogen plant which produces liquid nitrogen for use in ADC LGC laboratory while surplus is for sale to agents at affordable (subsidized) cost. In line with its marketing and extension strategy, the Centre stated that it shall be visiting the various Counties using its products to train AISPs and farmers on efficient, effective service delivery and good husbandry practices. The study established, too, that ADC LGC intended to start stocking quality AI equipment (liquid nitrogen containers, AI guns, socks, forceps, goblets etc.) and livestock extension materials in 3 months' time.

## 10. Nakuru County Government

*County Governments Act, No. 17 of 2012* is Act of Parliament to give effect to Chapter 11 of the Constitution of Kenya; to provide for county governments' powers, functions and responsibilities to deliver services and for connected purposes.

([http://www.parliament.go.ke/sites/default/files/2017-05/CountyGovernmentsAct\\_No17of2012\\_1.pdf](http://www.parliament.go.ke/sites/default/files/2017-05/CountyGovernmentsAct_No17of2012_1.pdf) ; <http://kenyalaw.org:8181/exist/kenyalex/actview.xql?actid=No.%2017%20of%202012> ).



DAIRY TRAINING CENTRE

The authority to discharge the mandate of the county departments of livestock across Kenya, with respect to veterinary services (including breeding) function is vested in the CDVSs. The county governments carry out the formulation, development, implementation, monitoring and review of policies, laws and strategies in the animal health sector – *including those of the breeding sector*.

According to the study's finding, Nakuru County Government does not employ its own inseminators, thus, all the inseminators operating in the county are in private practice – working with agrovets, cooperatives, large-scale farms and the majority are self-employed. Similarly, it was found out that the Nakuru county Government provides subsidized bovine semen to dairy cooperative societies who in turn issue to their inseminators to serve their respective members' cows.

Nakuru County Government Department of Agriculture is committed to facilitating farmers to acquire modern farming equipment, including those of AI value chain, so as to boost food security in the county as well as the nation. Currently, Nakuru is ranked third among the counties with high milk production in the Kenya and has 381,600 head of dairy cattle ([www.nakuru.go.ke](http://www.nakuru.go.ke)).

Nakuru County Government supported the initiative of forming Nakuru County Dairy Cooperative Union to enhance the farmers' capacity to negotiate for better milk prices and affordable semen. Currently, 21 Artificial Insemination kits have been distributed to active dairy farmers' cooperative societies and a county-wide livestock vaccination initiated against the common diseases ([www.nakuru.go.ke](http://www.nakuru.go.ke)). However, Nakuru is not among the 24 counties that have signed a memorandum of understanding with KAGRC. There are 4 KAGRC agents in Nakuru County with at least one inseminator operating in each of the following sub-counties; Molo, Kuresoi South, Njoro and Nakuru Town East ([www.kagrc.go.ke](http://www.kagrc.go.ke)).

Artificial inseminators in Nakuru County do private practice and are neither employed by the county nor national governments. The county DVS is their technical supervisor. The study revealed that the Nakuru County Directorate of Veterinary Services does not have adequate extension staff and the necessary resources to undertake effective supervisory, training and extension services to the inseminators and other stakeholders as it were.

## 11. County Directors of Veterinary Services

During the study, it was established that the CDVSs responsibilities, with respect to breeding aspects included, but not limited, to the following: -

1. *coordinating inspection of private veterinary practices and input outlets in the county in collaboration with Kenya Veterinary Board*
2. liaising with training institutions on training and development of staff, students and interns
3. coordinating veterinary services at ports of entry
4. participating in the formulation, development, implementation, monitoring and review of policies, laws and strategies in the animal health sector



DAIRY TRAINING CENTRE

5. planning and coordinating programmes on the control and eradication of epizootic and zoonotic diseases and pests
6. *compiling and interpreting technical reports – such as breeding activities performance*
7. planning collaborative activities with relevant stakeholders in the animal health sector
8. handling technical, administrative, human resource, budgetary and assets management issues
9. incorporating new initiatives into the department's schemes of work
10. evaluating export/import requests documents in respect to live animals, animal products, by-products and inputs and making appropriate recommendation
11. disseminating information on animal health, products and markets
12. member to the Joint Secretariat Committee of the DVS at the national level (**See Figure 2**)

## 12. Nakuru County Dairy Cooperative Union (NCDCU)

The study revealed that the Nakuru County Government actively participated in the formation of the nascent NCDCU. The cooperative union has 11,000 members drawn from its 15 primary cooperative societies spread across county. Collectively, there are approximately 44,000 cows owned by Union's members giving an average of 4 cows per member/household. According to NCDCU, the dairy cattle breeds reared by its members are Friesian being the majority contributing to approximately 70% of the population, Ayrshire (15%), Jersey (7%), Brown Swiss (5%) and rest 3%. The dairy cattle are mainly found in Kuresoi, Njoro, Molo, Bahati, Rongai and Subukia sub-counties. Some of the cooperative Union members living within the surroundings of Nakuru City also rear dairy cattle (NCDCU, 2022).

The Cooperative Union has its own 20 inseminators spread across the county and it has plans to recruit 40 inseminators in future. It was established in the study that the Union's farmers report to the inseminators the time their cows started showing heat signs. It is the inseminators who determine right time to serve the cows and informs the farmer the time to go to the farm to inseminate the cow(s). It was also revealed that some inseminators go to farms on time, some delay a lot or go too early whereas others do not turn up at all upon being informed by the farmer about their cow(s) being on heat.

Similarly, the inseminators neither make a follow up after insemination nor do they do pregnancy diagnosis on the cows they inseminate. The Cooperative Union considers this a real challenge for their members. Each insemination costs approximately KES.1,500.00 for local bovine semen and KES.3,000.00 and above for exotic/imported semen - majority smallholders, reportedly avoid using the latter due to cost factor. It was also found out that many farmers still use natural insemination as they say it is cheaper and associated with high chances of conception.

Notably, there are challenges including, but not limited, to inseminators' attitudes who treat insemination timeliness casually; this is coupled with knowledge, technical skills and attitudes capacity gaps among the (smallholder) farmers as well. Inevitably, these challenges always lead to





DAIRY TRAINING CENTRE

failure of conception and repeat insemination cases, hence, many inseminations per conception and resultant high costs and losses (See Table 2)

It was established that that inseminators do not offer advice to their clients in most cases but they just inseminate the cows and leave the farms shortly thereafter. It was further said that inseminators did not attach evidence (such as the empty/used semen straws) of inseminations in their reports to the CDVS. Similarly, the Union said that some inseminators do not show the semen straw to the farmers. The study reveals that inseminators, more often than not, are on their own and dairy farmers obtain information about AI services from extension personnel, media, and word of mouth among farmers

**Table 2: Fertility Management KPIs as given by the Cooperative Union Respondents**

S/No.	Fertility Management Key Performance Indicators (KPIs)	Situation at Cooperative Union member farms	Remark
1	Calving interval (CI)	1.5 -2 years	Too long; CI of 1 year is desirable
2	Feeding management	Some cows are too fat, others too thin	Poor feeding management
3	Number of inseminations per conception	2-3 (the Union claimed their farmers kept records)	This is on the higher side. 1-2 is desirable
4	Number of inseminations per inseminator per month	40-50	Too low to sustain a desirable income
5	Age at first insemination (depending on breed & feeding)	14 – 18 months	Reasonable if records are accurate and credible
6	Do farmers keep records of a cows coming on heat before 60 days after calving?	NO	Results in undesirably long calving intervals
7	First insemination after calving (duration between calving and next insemination)	2-6 months	Too long. Around 2 months maximum is desirable



DAIRY TRAINING CENTRE

## 13. Inseminators

### i. The Role of Inseminators

The study established that the prescribed role of the inseminators in the AI value chain included the following: -

1. providing advisory services to the farmers with respect to quality breed bull's semen on the market, bull selection, dairy husbandry, and disease control
2. getting history of the cows on heat from the farmers before inseminating them and keeping good AI records for follow up
3. guiding the farmers on selection of sires with the desired traits which contribute to herd improvement on a given farm before a cow is inseminated
4. carrying out actual artificial inseminations of cows in their respective areas of operation
5. maintaining records and submitting monthly reports of all inseminations carried out to the sub-county veterinary offices – e.g. the numbers of repeat cases, total inseminations, pregnancy diagnosis, reproductive diseases etc.

From the desk studies, it was difficult to know the total number of inseminators, in Nakuru County, or establish the number of those who are registered and/or licensed by KVB. This is because a register of inseminators is not kept and maintained in the county. However, from contacts with stakeholders during the study, it was established that there were about 100 inseminators in the county spread over the 11 sub-counties (**See Table 3**).

### ii. How the AI Process Works in Kenya

From the study, it was established that inseminators determined the time to serve cows on heat once they get information from the farmers. This is regardless of whether the reported timings by the farmers are correct or not. It was also revealed that some inseminators, especially those in private practice go to farms on time, some delay a lot or go too early whereas others do not turn up at all upon being informed by the farmer about their cow(s) being on heat. The situation is more common among the smallholder than the commercial farmers. ***The main challenge is accurate detection, by most farmers, of the time a cow actually started showing heat signs.***

There are factors that farmers consider while deciding to choose an inseminator and bovine semen to use. The factors that influence the farmer's choice of bovine semen to use include cow breed, straw price, whether it is conventional or sexed, and availability. Similarly, the choice of an inseminator by a farmer included the latter's availability, reliability and fee/charges.

Inseminators depend so much on the time the farmer reportedly saw heat signs for the first time with regard to advising on when to inseminate cow(s) and what breed semen in stock while considering the farmer's preferences or objectives. The inseminator also advised the farmer on cow body conformation and other attributes, climate, production system vis-a-vis bull trait qualities. In Nakuru County, like in other parts of Kenya, an inseminator visits a farm to serve one



DAIRY TRAINING CENTRE

or more cows and he/she is not required to be accompanied by another inseminator or supervisor. The insemination processes work as follows: -

- a) The farmer, upon detecting cows on heat, reports the same to the inseminator, who in turn, decides on time to inseminate - usually applying the *morning-afternoon-morning rule* or *AM/PM-PM/AM rule*. *This is a time-tested rule which dictates that a cow observed in standing heat phase in the morning should be bred the afternoon of the same day while that observed in standing heat phase in the afternoon or evening should be bred the following morning. Hitherto, the AM/PM-PM/AM rule has been applied as the industry standard in many countries*
- b) Upon arrival at the farm, the inseminator asks for the breeding and health history of the cow from the farmer.
- c) The cow is then restrained after which the inseminator examines the cow on heat to determine its health and/or pregnancy status. A cow found to be suffering from reproductive disease(s) is not inseminated but treated first. A cow found to be pregnant is not inseminated, too.
- d) If a cow on heat is found to be healthy and not in-calf, the inseminator prepares to inseminate such a cow.
- e) The inseminator discusses and chooses bovine breed semen to be used on the cow having consulted the farmer or not
- f) thawing semen and loading it to the pistolette.
- g) Putting on the arm-length gloves and lubricating them followed by the actual insemination.
- h) recording the information on AI certificate. The information includes the cow breed, sire/dam, date of AI, charges, farm(er) name and location of farm. Three copies are filled in AI certificate are made - one each for the farmer, inseminator and the CDVS for onward transmission to the DVS.
- i) The inseminator gives the empty semen straw to the farmer to keep for future reference.
- j) The inseminator disposes of the used gloves, cleans his/her hands and leaves the farm.

AI processes in Kenya are a formal market with clear legal and regulatory frameworks. However, these laws and policies are not always strictly adhered to by the inseminators and other stakeholders largely due to poor enforcement of the same. Similarly, the inseminators neither make a follow up after insemination nor do they do pregnancy diagnosis on the cows they inseminate regularly. The non-adherence to the regulatory framework is caused by several factors, such as, lack of capital by the inseminators to meet statutory payments, attending courses as well as inadequate coordination and supervision by DVS/CDVS.

For one to be an inseminator in Kenya, they must be basically qualified at the certificate, diploma or bachelor's degree in animal health management from approved institutions. In addition, one must be licensed by KVB to operate in a specified geographical area under the supervision of the



DAIRY TRAINING CENTRE

area SCVO. Similarly, a qualified and licensed inseminator is required to uphold professional code of ethics (*Kenya Gazette Supplement No.163, Legal Notice No.94, The Veterinary Surgeons and Veterinary Para-professionals, No. 29 of 2011; The Veterinary Surgeons and Veterinary Para-professionals (Code of Ethics) regulations, 2015*) while discharging their duties including keeping AI equipment in clean, hygienic, and serviceable conditions at all times.

### iii Characteristics of Artificial Inseminators of Nakuru County

During the study, it was established that there were 96 in 9 out of 11 sub-counties (**See Table 3**) of Nakuru County. The majority of the inseminators in Nakuru County are holders of certificate in animal health management while some hold diploma and bachelor's degree in the same field. Qualified inseminators are awarded a certificate in AI upon successfully completing an inseminator's training. In addition to the foregoing, it was also established that veterinary surgeons also inseminate cows but they are not required to undergo AI training after graduating from schools of veterinary medicine with bachelor of veterinary medicine degree.

The basic level of qualification and certification for one to be an inseminator in Kenya is certificate in animal health management from approved AI training institutions in Kenya. However, all inseminators must be registered and licensed by KVB on annual basis regardless of whether one is a qualified holder of certificate, diploma or bachelor's degree in animal health management or veterinary medicine.

Pursuant to the provisions of *Veterinary Surgeons and Veterinary Para-professionals Act, 2011*, all inseminators in Kenya are required to attend Continuous Professional Development (CPD) trainings and attain minimum annual score points under the purview of the KVB. Inseminators also attend other courses offered by bovine semen companies, county governments/CDVSs, agrovets and other stakeholders. However, this knowledge update is rare, unstructured and characterized by duplication by various actors in the chain. Others, too, update their knowledge by sharing experiences with their peers, internet, social and mainstream media.

In Nakuru County, unlike in some other Kenyan dairy counties, there are no inseminators who are employed by either the county government or DVS. All the inseminators in the county work in the private sector with the overwhelming majority being self-employed. A number of them are employed by dairy cooperative societies, agrovets and commercial large-scale dairy farms. The inseminators do not work together in groups but they compete with each other for the clients.

While rendering advisory services to the farmers, the study revealed, inseminators base their recommendations on providing balanced diet - especially minerals - to the cows and good health management so as to maintain desirable heat cycles in the herds. For the majority of the inseminators in the county, smallholder farmers form the bulk of their clientele base whereas the



DAIRY TRAINING CENTRE

commercial large-scale farmers constitute a small part of it. The choice of bovine semen to be used by an inseminator is determined by farmer preference (mainly the large-scale clients), breed of the sire, price of the semen and whether the available bovine semen is conventional, sexed, locally produced or imported. The inseminator's choice of bovine semen, in turn, is influenced by the knowledge level of their clients with respect to breeding generally and AI in particular.

The inseminators think that the knowledge of their clients is mainly on signs of heat for smallholders. With regard to the large-scale farmers, the inseminators think their knowledge include heat signs, breed characteristics (such as, productivity, longevity, body weights etc.), conventional and sexed semen among others. However, in reality, the inseminator's knowledge is varied and limited in scope. The smallholders have the least knowledge on this subject matter whereas their large-scale counterparts are comparatively more knowledgeable. Smallholders acquire knowledge on bovine breed semen from peers, various stakeholders including cooperative societies, field days and other forms of training but these opportunities are few and far apart as it were.

The challenge that cuts across the two groups is the source of information that shape their knowledge in this regard – for example, peers who consider themselves experts purely on the basis of having “lived” with cows for a long time even without undergoing any training. Quacks masquerading in the village and internet as experts and peddling half-truths and outright falsehoods to farmers are quite common. The inseminators offer advice to their clients mainly during their pre-insemination discussion sessions and while treating sick cows. The use of phone calls is also common these days among some farmers and inseminators.

Farmers have some basic knowledge on the cow breeds that are resilient on their local climatic conditions, mature adult size (asserting that small-bodied breeds eat less feeds), tolerance to tick-borne diseases, and productivity among others. From the interactions with inseminators and farmers in Nakuru County, it was clear that some of them consider using imported bovine semen. Some farmers and inseminators actually use Dutch bovine semen.

#### 14. Bovine Semen Distributors in Nakuru County

It was established that the bovine semen distributors in Nakuru County included Menengai Agrovet, Twiga Chemicals, Cooper Kenya Ltd located in various places in Nakuru town, Njoro, Molo and Kuresoi sub-counties ([www.kagrc.go.ke](http://www.kagrc.go.ke)). The role of these local bovine semen distributors included: -

1. procuring and distributing semen from licensed local producers/importers
2. keeping an inventory of all semen received, sold, and submit monthly reports to CDVS
3. ensuring safe storage and distribution of the semen under their custody while ensuring that adequate levels are available in county at all times



DAIRY TRAINING CENTRE

4. procuring and distributing semen from licensed local producers/importers
5. ensuring that the cold chain, liquid nitrogen, supply is maintained
6. dispatch the semen to agents who, in turn, sale to inseminators, other AISPs and even farmers or cooperatives societies

It was also found that some distributors have employed inseminators and veterinary surgeons who provide technical advisory and insemination services to their clients.

**Table 3:** Number and distribution of inseminators in Nakuru County

S/No	Sub-County	No. of Inseminators			Remarks
		Females	Males	Total	
1	Njoro	0	10	10	
2	Nakuru Town East	1	10	11	
3	Gilgil	0	10	10	
4	Kuresoi South	3	12	15	
5	Naivasha	3	7	10	
6	Nakuru Town West	0	5	5	
7	Bahati	3	9	12	
8	Kuresoi North	2	8	10	
9	Rongai	NK	NK	-	No representation in FGD attendance
10	Molo	NK	NK	-	No representation in FGD attendance
11	Subukia	4	9	13	
Total number of inseminators in Nakuru County*		<b>16</b>	<b>80</b>	<b>96</b>	*this does not include the number of inseminators from Rongai and Molo sub-counties

**Legend:** NK – Not known

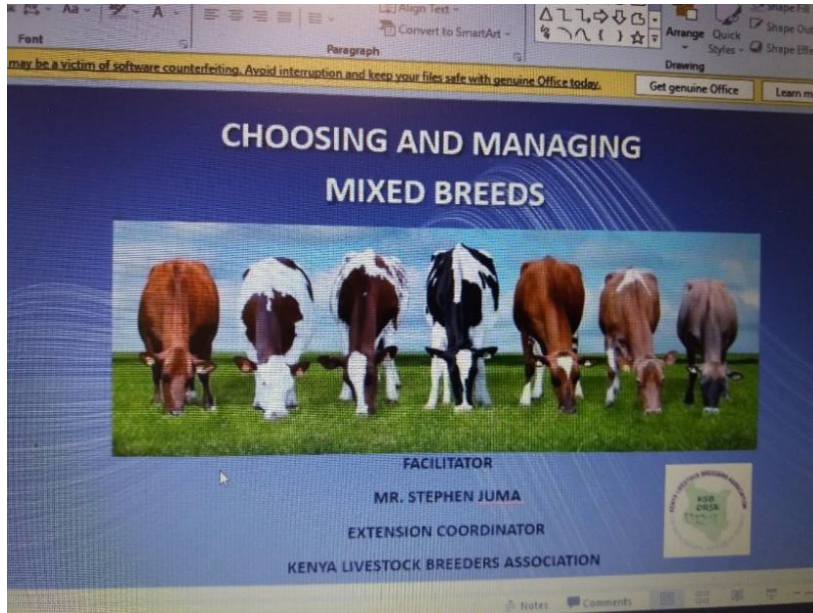


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## 15. Kenya Livestock Breeders Association (KLBA)

KLBA is the national pedigree service for pure-bred and non-purebred livestock in Kenya. KLBA is a private non-profit organization that has been serving the Kenya's livestock industry continuously since its formation in 1920. The various breed associations are also incorporated under the same Act, and any association so incorporated may become a member of **KLBA**. According to the study, there are seven-member societies for which records are being maintained. In addition, KLBA administers, its registration roles in the wider East African region as well. ([https://www.klba.or.ke/index.php?option=com\\_content&view=article&id=30&Itemid=151](https://www.klba.or.ke/index.php?option=com_content&view=article&id=30&Itemid=151))

Upon its formation, the *Stud Book* was mandated to maintain pedigree register for the progeny of the imported livestock; maintain the up-grading scheme for the crosses bred through crossing the indigenous animals and the exotic breeds; and, issue registration certificates for the animals registered.



**Figure 6:** Presentation by one of the KLBA extension staff (Source: KLBA, 2022)

In 1994, farmers out of the realization that registration and performance recording are key prerequisites for any breeding programme, decided to group the services of the two schemes together under one committee, namely, “*Kenya Livestock Breeders Committee*”. From then to date, despite problems occasioned by severe financial constraints, farmers are running a self-sustaining organization financed through income generated from services rendered and very minimal government intervention in form of a small annual grant. Kenya Dairy Board handed over Kenya Milk Records (KMR) function to the Kenya Livestock Breeders Committee which changed its name to Dairy Recording Service of Kenya (DRSK).



DAIRY TRAINING CENTRE

According to the study, KLBA has a data base of approved inspectors who could be contacted by farmers for assistance on Breeding and Inspection of their livestock. Registered breed societies have qualified persons who have been trained as breed inspectors. The KLBA brings together all the livestock keepers in Kenya who have come together to register and improve their breeds. KLBA has a total of 30 breeds currently registered as follows - Cattle (17), Goat (5), Sheep (6), and Pig (2) (See Table 4, 5, 6, & 7).

The KLBA extension and training sections ensure technology transfer to the livestock breeders and entire farming community in livestock sector - cattle, poultry, goat, sheep, deer, rabbit and pig (KLBA, 2022).

**Table 4:** Cattle breeds and breed societies

Breed	Breed Society
Aberdeen Angus	
Ayrshire	Ayrshire Cattle Breeders Society of Kenya
Boran	Boran Cattle Breeders Society of Kenya
Brahman	
Brown Swiss	
Charolais	
Fleckvieh	Fleckvieh Genetics East Africa Ltd
Holstein Friesian	Holstein Friesian Cattle Breeders Society of Kenya
Guernsey	Guernsey Cattle Breeders Society of Kenya
Hereford	
Jersey	Jersey Cattle Breeders Society of Kenya
Limousine	
Piemontese	
Red Poll	
Sahiwal	Sahiwal Cattle Breeders Society of Kenya
Santa Getrudis	
Sahiwal	

**Table 5:** Goat breeds and breed societies

Breed	Breed Society
Boer Goat	
Galla Goat	Galla Goat Breeders Society of Kenya
Kenya Alpine Goat	Dairy Goats Association of Kenya
Saanen	
Toggernburg	



**Table 6:** Sheep breeds and breed societies

Breed	Breed Society
Corriedale	
Dorper	Dorper Sheep Association of Kenya
Hampshire Down	
Merino	
Persian Black Head	
Red Maasai	

**Table 7:** Pig breeds and breed societies

Breed	Breed Society
Large white	
Landrace	

## 16. Breeding Companies Doing Business in Kenya.

The companies considered the following criteria important to be used in engaging inseminators by such firms: -

1. Inseminator loyalty towards the customer
2. The margins the inseminator could make on semen
3. Integrity/honesty of the inseminator – e.g. expecting semen from company A and getting it from company B

Some companies also found it virtually impossible to make a follow up to find out if the semen had been successfully deployed in the smallholder market.

Further, it was found that some distributor staff were certified in several ways to ensure that quality control and complaints handling was done well. According to the study, the most preferred semen by majority of Kenyan breeders or dairy farmers are those of the Holstein Friesian, Fleckvieh and Ayrshire. Demand for Girolando is huge, but its semen is not yet allowed into Kenya by the DVS.

Some companies, too, considered the following as gaps existing in Kenya’s AI sub-sector: -

1. less quality assurance or control of inseminators as some were not licenced or appropriately registered.
2. business companies that supply bovine semen do semen dumping into Kenyan market
3. Unpredictability of AI market due to abrupt change of policies and other institutional frameworks



DAIRY TRAINING CENTRE

It was found in the study that some companies' reflections on what needs to be done to improve the breeding sector in Kenya included registration of animals and services; free market access to all parties; and, farmer knowledge on the actuals of breeding.

It was found that the breeding companies saw opportunities in the breeding sector in Kenya: collective organisation to pave way for formation of one sector coordinating body; registration and evaluation of animals as well as their results; and, focus on cost/price reduction to make Kenya competitive in East Africa.



## CHAPTER 3: KNOWLEDGE CAPACITY AND TRAINING NEEDS OF NAKURU COUNTY INSEMINATORS AND DVS STAFF

This study was envisaged as a first step towards increasing successful inseminations in Nakuru County in particular and Kenya in general. By providing an insight into the breeding sector in Kenya and its issues, it could be a start for providing targeted solutions. It was also envisaged that once the needs had been identified that could result in possible training recommendations. It could, however, also result in other recommendations, for example, financial investment needs or the need for a centralised registration system. The recommendations should be seen as an opportunity to help in addressing these needs. The identification of the capacity gaps and the needs related to knowledge would be the starting points, although the study should not limit itself entirely to these aspects.

The study, therefore, existed out of three parts, that is, 1) the breeding sector in Kenya, 2) the needs of the stakeholders involved; and, 3) the opportunities that would be presented by these needs. When the sector and the needs are understood, one could identify the opportunities to uplift the sector. All in all, uplifting the sector means a higher success of insemination is achieved and a better choice in cow breed could be made to increase the income of the farmer which in turn could lead to more opportunities for the foreign and Kenyan private sectors.

### 1. The Knowledge and Training Needs of Nakuru County Inseminators

Selecting a bull is one of the most important management decisions a dairy farmer makes. Before selecting a bull, every producer needs to establish long-term goals for the herd. Bull catalogues contain sire summaries that provide breeders and inseminators with a wealth of knowledge and an abundance of selection tools.

An explanation of each trait is found in sire summaries. It is important for producers to recognize how traits relate to one another. For example, if one is selecting for high yearling weights, mature size increases. If the goal is to reduce mature size of the cow herd, select bulls with lower yearling weight Expected Progeny Differences (EPDs). There are three main categories of EPD traits, namely, growth (birth weight, weaning weight, weight *at first insemination* etc.), *reproductive* (calving ease, heifer pregnancy etc.), and production (milk productivity etc.) traits.

An example of the terms in a bull catalogue is Total Performance Index (TPI) which is a figure that combines type, management and production traits into one number. The TPI number is a multi-trait index that is very commonly used to rank bulls on overall performance (See Appendix III).

#### i. Knowledge and Training Needs of Nakuru County Inseminators

- a) Inadequate knowledge about the use of bull catalogues
- b) Inadequate knowledge on dairy farm record keeping, analysis and application in making informed fertility management decisions.



DAIRY TRAINING CENTRE

- c) Inadequate knowledge and competence in cattle fertility management
- d) Inadequate knowledge on basic communication skills
- e) Inadequate knowledge and practical skills in basic dairy farm management
- f) Inadequate knowledge and skills on dairy value chain entrepreneurship
- g) Lack of or inadequate exposure to new cattle breeding technologies and techniques
- h) lack of or poor basic knowledge and judging skills on livestock breeds inspection

## ii. Development of Appropriate Inseminators Training

The study revealed training needs (knowledge and skills gaps) of inseminators in Nakuru County. Consequently, a *more practical-oriented training programme aimed at addressing the knowledge and training needs of Nakuru county inseminators should be developed and has to **minimally include** the following:* -

1. bull catalogue interpretation – the catalogues are selection tools that contain sire summaries which provide breeders and inseminators with a wealth of knowledge. Bull catalogues provide sire identity, bull attributes, pedigree, progeny, authoritative conformation traits profile, genomic data, and pictorial presentation of sire and its daughters
2. record keeping and analyses of technical (milk productivity, breeding, health, cow comfort, feeding management etc.) and economic (costs, profitability etc.) key performance indicators (KPIs) of a dairy farm – The county government in conjunction with DVS and other partners should offer capacity building in this respect.
3. fertility management - heat signs detection, pregnancy diagnosis especially in the first trimester
4. basic communication skills for effective AI advisory service provision to the farmers – the inseminators need capacity building in skill sets aspects that will make them effective trainers and /or extensionists when handling their target audiences in their respective areas of work. Communication skills also entail documentation, basic technical writing and reporting of AI activities by the inseminators.
5. basic practical skills and knowledge in basic dairy farm management - technical and economic KPIs (housing, animal nutrition/feeding management, breeding & fertility management etc.)
6. entrepreneurial skills and attitude – the inseminators should perceive and treat dairy farming as a business and not a mere occupation
7. exposure/introduction to new technologies and techniques in AI e.g. Controlled Internal Vaginal Drug Release (CIDR) for synchronization of heat especially among cows in herds which do not show heat signs easily. Synchronization is also used to induce many cows in the herd(s) to come on heat simultaneously so that a farmer may exploit high milk prices in the market during the lean periods of milk production
8. basic livestock breeds inspection and judging skills – this helps in selection of cows/heifers of superior quality genetics



DAIRY TRAINING CENTRE

## 2. The Knowledge and Capacity Needs of DVS Staff

### i. Knowledge and capacity needs of DVS staff

- a) inadequate knowledge in key aspects of dairy cattle breeding
- b) Low capacity in bull catalogue interpretation and use due to inadequate knowledge in this regard
- c) Inadequate knowledge in semen quality assurance systems
- d) Inadequate knowledge and practical skills on dairy farm management
- e) Inadequate knowledge on communication and/or facilitation skills
- f) Inadequate knowledge and skills on technical writing, reporting and record analysis
- g) Inadequate knowledge in competence-based curriculum development and implementation

### ii. Development of Appropriate DVS Staff Training

Similarly, the study revealed knowledge and training needs of the staff of DVS who undertake the capacity building of county supervisors with respect to, but not limited to AI. Consequently, a *more practical-oriented training programme aimed at addressing the knowledge and training needs of DVS staff should be developed and has to **minimally include** the following:* -

1. more training on knowledge in key aspects of animal breeding including formulation of strategic objectives, genetic evaluation, breeding programmes development and planning
2. bull catalogue interpretation -
3. semen quality assurance systems – along the entire value chain (production, storage, transport, application/use etc.) and the embracing of modern technologies.
4. dairy farm management – practical skills and knowledge with more focus on technical and economic key performance indicators on the topical areas of training CVDS ToTs who in train inseminators and farmers as well
5. appropriate communication and facilitation skills – for effective training and extension
6. development of record keeping, technical writing and reporting as well as attendant analytical skills
7. competence-based curriculum design, development and implementation for the relevant target groups (CDVSs staff, inseminators, farmers etc.)

In order to increase successful inseminations in both short- and long-term timelines, the following steps should be instituted and executed (**See Table 8**):-



**Table 8: Short- and Long-Term Steps to be taken for increased successful insemination in Nakuru County and nationally**

S/No.	Target Group	Short Term	Long Term
1	<b>Nakuru County Inseminators</b>	<p>a). Mapping out, mobilizing, sensitizing and facilitating formalization of the qualified inseminators’ professional groups in the county</p> <p>b). organizing and coordinating the breeding stakeholders (county government, dairy union, agrovets, commercial farmers, inseminators and financial institutions) by establishing a forum from where they all harmoniously interact</p> <p>c). strengthening the supervision of the inseminators and their activities in the sub-counties</p> <p>d). enforcement of the relevant institutional frameworks in the breeding sector including the Code of Ethics for inseminators</p>	<p>a). The county government, through legislation, should create a revolving fund from which registered inseminators will get affordable credit – AI equipment, motorbikes, semen, liquid nitrogen, agrovets services/products</p> <p>b). Set up AI hubs (centres) where farmers, inseminators, DVS/CDVSs and other stakeholders would be interacting</p> <p>c). Establishing contractual relationships between inseminators and other AI value chain actors (farmers, cooperatives, bovine semen dealers, agrovets)</p>
2	<b>National DVS Staff</b>	<p>a). enforcement of the relevant institutional frameworks in the breeding sector</p> <p>b). strengthen the information dissemination from the DVS to inseminators and inseminators feedback reports to DVS</p> <p>c). introduction and application of incentive and penalty system for inseminators, DVS and CDVS staff</p> <p>d). capacity building of the DVS staff at both the national and county levels on regular basis</p>	<p>a). provision of adequate funding for effective discharge of their responsibilities including achieving optimal staff numbers, supervision, training, transport and other logistics.</p> <p>b). strengthen the collaboration between the DVS and the county government regarding regulation and supervision of inseminators, reporting and feedback mechanism</p> <p>c). development of an integrated digitized DVS central database for all inseminators, SCVOs, CDVSs, bulls, and reporting effective licensing, supervision, monitoring and evaluation</p>

Source: DTC, 2022



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### 3. Opportunities to Provide the Knowledge and Capacity Needs of DVS Staff and Nakuru County Inseminators

The business opportunities that could be as a result of the provision of this knowledge would be offered to input suppliers, service providers and investors alike. These companies, training institutions and professionals in the dairy value chain could also partner with their public and /or private Kenyan counterparts in this respect. This position is consistent with a Kenyan dairy value chain market potential and assessment conducted by SNV ([Dairy Market Study North Rift, Kenya | Kenia | Agroberichten Buitenland](#) ), which focused on the following thematic areas: -

1. Practical training and education including consultancy/advisory services
2. New technologies, products and services by Dutch companies
3. Feed, fodder, farm machinery and agricultural contracting services
4. Cow barn design, development, and interiors
5. Herd and farm management information systems/software
6. Herd improvement (genetics and young stock management etc.)
7. Milking, milk cooling and processing equipment
8. Financial and fiscal policies



## CHAPTER 4: CONCLUSION

Generally, on the basis of desk studies and contacts with various stakeholders in the AI value chain in Kenya, a lot of information was available. However, it was difficult to obtain relevant data from private firms (e.g. semen distributors and importers) due to protection of their commercial interests as it were. Similarly, it was not easy to get relevant data from some national and county government departments and this is largely attributable to poor or lack of AI service-related record keeping and analysis. Failure by stakeholders, especially from the regulatory bodies, to discharge their mandates effectively, coupled with financial challenges ultimately contribute to low successful inseminations in Kenya.

The study, nonetheless, revealed that the value of Kenya's AI business is USD.11 million at the current rate of breeding heifers and cows in the country's dairy herds. AI use in these herds has a potential to generate over USD.37.6 million at the current 60% of dairy cattle insemination rate. The organization of the AI value chain is in place with institutional instruments that provide for the governing of the roles of the various stakeholders.

From the study, it was established that although investment at semen production level could be considered, initial investment by bull stud companies should first be at the warehousing and distribution levels, with supply done through product importation, targeted at establishing distribution channels and demand stimulation before investing in production facilities is done. In this regard, however, consideration should be given to the inherent potential risks that would arise from subsidized or free products that could be supplied by the government and/or donor agencies' programmes. The potential foreign investors should consider forging strategic partnerships with their Kenyan counterparts, who have insightful commensurate understanding about the local market dynamics, in carrying out these activities. There are clear indications that the potential investors have interest in the Kenyan AI value chain, thus, they could exploit the opportunities therein.



## CHAPTER 5: RECOMMENDATIONS

Below, are conclusions and recommendations to some specific AI stakeholders with regard to how to increase successful inseminations in Nakuru County and their respect roles therein.

### 1. Directorate of Veterinary Services (DVS)

#### i. Conclusion

The study established that the DVS has capacity gaps including, but not limited to, inadequate human resource (under staffing), under funding, and non-enactment by Parliament of the policies that it has formulated/developed. This adversely affects DVS' role in capacity building of county supervisors of inseminators and facilitators.

#### ii. Recommendations

#### The Kenya Animal Bio-surveillance System (KABS)

To improve early detection of emerging infectious diseases in sub-Saharan Africa (SSA), many of them zoonotic, numerous electronic animal disease-reporting systems have been piloted but not implemented because of cost, lack of user friendliness, and data insecurity. In Kenya, an open-source mobile phone-based domestic and wild animal disease reporting system has been developed, rolled out and collected data over two years to investigate its robustness and ability to track disease trends (Njenga MK, et al, 2021).

KABS application (App) built on the *Java®platform*, freely downloadable for android compatible mobile phones, and supported by web-based account management, for editing and data monitoring, has been tried in the Kenya, the study revealed. The application was integrated into the surveillance systems of Kenya's domestic and wild animal sectors by adopting their existing data collection tools, and targeting disease syndromes prioritized by national, regional and international animal and human health agencies. Smartphone-owning government and private domestic and wild animal health officers were recruited and trained on the application, and reports received and analyzed by Kenya DVS. The KABS App performed automatic basic analyses (frequencies, spatial distribution), which were immediately relayed to reporting officers as feedback (Njenga MK, et al, 2021).

According to the research (Njenga MK, 2021), 662 (95%) of 697 trained domestic animal officers downloaded the application, and more than 72% of them started reporting using the application within three months. Introduction of the application resulted in 2- to 14-fold increase in number of disease reports when compared to the previous year, and reports were more widely distributed. Among domestic animals, food animals (cattle, sheep, goats, camels, and chicken) accounted for over 90% of the reports, with respiratory, gastrointestinal and skin diseases constituting more than 85% of the reports. Herbivore wildlife (zebra, buffalo, elephant, giraffe, antelopes) accounted for over 60% of the wildlife disease reports, followed by carnivores (lions, cheetah, hyenas, jackals,



DAIRY TRAINING CENTRE

and wild dogs). Deaths, traumatic injuries, and skin diseases were most reported in wildlife. It was concluded that this open-source system was user friendly and secure, ideal for rolling out in other SSA countries to improve disease reporting and enhance preparedness for epidemics of zoonotic diseases. (<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0244119>).

KABS, already in use in 35 out of 47 counties across Kenya including Nakuru, is a much-improved tool that supports the electronic syndromic disease reporting for data analysis and documentation to help in decision making. This is simply a mobile application, that gives an idea of diseases available in the country besides capturing the exact location where the data is originating from. In the process of implementing the system, the first batch of selected veterinary officers (VOs) from each of the participating counties are trained on the KABS App usage after which they are tasked to train others, including all inseminators, so as to boost their data management skills which is a challenge to many. *It is imperative to state that these county batches of VOs involve only a few individuals in some selected counties – who, themselves, have not been adequately trained other than being poorly resourced to discharge their logistical and technical requirements in this respect.*

From the study, it was evident that some few of the inseminators were already using the KABS App (**See Annex 2**) to capture disease data which they submitted to DVS for analysis, reporting and decision making on actions to be taken. The majority of the inseminators do not interact with the CDVSS in their respective counties and this forms the weak link between DVS staff and inseminators regarding capacity building.

The DVS should: -

1. harmonize data collection through developing and integrating digital recording platforms that incorporates a feedback mechanism to which all the breeding stakeholders (county governments/CDVSSs, AHITs, semen agents/distributors/importers, inseminators, farmers, consultants etc.) could be plugged in for ease of access to and retrieval of shared data and information. Currently, DVS has the KABS App, which captures diseases data at ground level in real-time, hosted at its offices in Kabete; *this App should integrate a feature (module) for AI data capture, analysis and reporting. The online App should be capable of gathering all information of each bull, inseminator, farmer and insemination activity to guarantee useful data for good decision making regarding national breeding activities – e.g. using it as a tool to positively reward good inseminators or disqualify non-registered and/or unethical inseminators.* DVS should develop such a system in conjunction with key breeding sector stakeholders including SDL, KVB, County DVSSs, and private service providers with commercial interest in Kenya's AI value chain.
2. consider, in collaboration with KVB, deploying its staff at the county level so as to strengthen their respective roles; capacity building and supervision by DVS and registration, licensing and regulating by KVB



DAIRY TRAINING CENTRE

3. in collaboration with the stakeholders, seek ways of providing incentives to herd recording and contributing to genetic improvement programmes.
4. create an enabling environment for production of milk, dairy stock, and provision of market linkages to breeders
5. actively encourage cooperation with companies dealing in bovine semen, AI value chain products, and service providers with a view to exchange knowledge and information. DVS could do this by exploiting the existing bilateral agreements between The Netherlands and Kenya e.g. in the bovine semen supply.
6. develop/review and implement its strategic plan for the breeding sector in Kenya

## 2. County Government of Nakuru (CGN)

### i. Conclusion

While Nakuru County is willing and trying improve the breeding sector through supporting in extension service provision and investment in several packages like liquid nitrogen and vats for inseminators, it constrained financially.

Regarding the role of the CDVS, there is a capacity gap in the supervision and coordination of the AI value chain service providers as well as data documentation and reporting.

The inseminators require training in fertility management, breeding programmes, farm economics and analysis, entrepreneurial skills and training of trainers' skills among others.

### ii. Recommendations

The Nakuru county government /CDVS should: -

1. in collaboration with KVB, keep and maintain an accurate up-to-date register of all the qualified, and licensed inseminators so as to edge out quacks while enhancing efficiency, responsibility as well as effectiveness in AI service delivery in the county. CDVS should, in collaboration with KVB, upscale their effort in supervisory and regulatory roles of the AI value chain respectively - as well reporting.
2. introduce incentives and penalty system for the inseminators in the county so as to instill a strong sense of discipline and responsibility among the inseminators.
3. provide attractive packages like bonus, through financial regulations, for licensed inseminators regarding enhancing their motivation in offering adequate on-farm advisory services to the farmers on breeding management issues
4. organize the inseminators into formal professional groups that could be easily coordinated, supervised and trained. Such groups could easily benefit from financial credit available in the market for formal groups; this will enable licensed inseminators to access finances for acquiring AI kits, motorbikes/transport and semen



DAIRY TRAINING CENTRE

5. in collaboration with AI training institutions and other AI value chain stakeholders, develop simple customized AI training materials for inseminators and farmers' handbooks. These would strengthen the capacity of the farmer groups as well. It should, thus, develop and execute capacity building programmes and increase the number of quality extensionists in breeding and fertility management countywide
6. come up with a workable resource mobilization plan targeted at promoting and strengthening AI value chain service provision in the county sustainably.

### 3. Other AI Stakeholders

#### a. AI training institutions

- i. All AI training institutions in the public and private sectors should develop or review their training curricula to make them competence-based while incorporating practical dairy farm management components. The curricula should be harmonized and moderated by the relevant technical and regulatory agents at both levels of Kenyan government and private sector stakeholders.
- ii. The training institutions should appropriately upgrade their training facilities and trainers so that they could effectively carry out capacity building to their respective trainees while ensuring compliance with the provisions of the relevant institutional frameworks in force.
- iii. The AI training institutions should seek partnerships and/or cooperation with other institutions that offer similar courses from The Netherlands so as to benefit from their expertise as well as rich experiences. Exchange programmes for both trainees and trainers between The Netherlands and Kenya.

#### b. Nakuru County Dairy Cooperative Union

The Union is in its formative stages having been formed a few years ago with the assistance of the Department of Agriculture, Livestock, Fisheries, and Cooperatives. It is recommended that the Union should: -

- i. put in place robust governance structure so as to discharge its mandate effectively including with respect to AI service delivery.
- ii. seek partnership with Dutch and Kenyan AI training institutions with practical dairy management components.
- iii. seek to enter partnership/contracts with local and Dutch bovine semen producers, distributors, or importers so that they could enjoy negotiated predictable semen supply for their members.
- iv. develop and implement its breeding programme in collaboration with CGN, DVS, AI training institutions like AHITs, CoE, and other stakeholders.
- v. seek partnership with Kenyan development financial institutions so as to access financial credit



DAIRY TRAINING CENTRE

**c. Local Bovine Semen Producers and Semen Distributors**

- i. These stakeholders should employ qualified staff, uphold professional ethics, and procure good quality semen from reputable producers at all times
- ii. They should, too, seek partnership and contracts with dairy cooperatives, agents, inseminators and agrovets to avoid market price distortions
- iii. They should also be involved in or co-contribute to training and extension services



**Directorate of Veterinary Services (DVS) - the facilitators of capacity building and the regulator of national breeding services**

**Goal and objectives**

*The goal of this research is: to better understand the breeding sector in Kenya and assess the knowledge and training needs of the inseminators of Kenya so as to ultimately increase successful inseminations in the country.*

**What does the breeding sector look like in Kenya?**

**A). Basic Information on Kenya’s Breeding Sector**

1) What are the roles of the following stakeholders in the breeding sector in Kenya?

a) Dairy farmers

.....  
.....

b) Kenya Livestock Breeders Association - Kenya Stud Book (registration) and milk records (performance)

.....  
.....

c) Directorate of Veterinary Services

.....  
.....

d) Inseminators

.....  
.....

e) County Directors of Veterinary Services - Inspectors /supervisors of inseminators

.....  
.....

f) County governments

.....  
.....

g) Bovine semen distributors

.....  
.....

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<sup>1</sup> This questionnaire was designed for the DVS headquarters respondents. However, the same questionnaire was modified to suit each of the various breeding stakeholders’ respondents interviews - like inseminators, Nakuru County Government, AHITs, KAGRC amongst others.



h) Kenyan bovine semen producers like Kenya Animal Genetics Resources Centre and Agricultural Development Corporation-----  
-----  
-----

i) Foreign bovine semen producers  
-----  
-----  
-----

2. Please, provide the following information about Kenya's breeding sector: -

a) what is the population of dairy cows in Kenya?  
.....  
.....

b) which types and breeds are there?  
.....  
.....

c) Where are most of the dairy cattle located in Kenya?  
.....  
.....

d) how many artificial insemination (AI) clients are there in the country?  
.....  
.....

e) where are the AI clients (dairy farmers) mostly located in the country?  
.....  
.....

f) What is the percentage of farmers using AI services as compared to those who are not using?  
Using.....% Not Using..... %

g) What are the reasons provided by farmers not using AI services?.....  
.....  
.....

h) How do dairy farmers obtain information about AI services?  
.....  
.....  
.....

3. How does the insemination process work in Kenya?



.....  
.....  
.....

4. What factors influence a client’s decision to artificially inseminate his/her cows?

.....  
.....  
.....

5. How does a client choose an inseminator and the bovine breed semen to be used?

.....  
.....  
.....

6. How does the inseminator advise or assist /help a client decide cow breed semen and timing to be inseminated?

.....  
.....  
.....

7. Does DVS monitor and evaluate the insemination performance of individual artificial inseminators? **Yes/No** (delete as appropriate) If yes, briefly explain the process.....

.....  
.....

8. Does DVS reward the well performing and apply sanctions to poorly performing inseminators?

.....  
.....  
.....

9. Which bovine semen is most preferred by majority of Kenyan breeders or dairy farmers, between exotic and Kenyan cattle breeds?

.....  
.....

10. What factors influence the choice between exotic and local bovine semen by: -

a) farmers

.....  
.....  
.....

b) inseminators?

.....  
.....  
.....





11. Does an inseminator go to a farm to attend to one cow or he/she needs more cows to be on heat concurrently in a given farm? What considerations come into play regarding this aspect?

.....  
.....  
.....

12. How does the insemination processes work in Kenya with respect to date, hygiene, location, health status, after-service care among others?

.....  
.....  
.....

13. What are the rules and regulations regarding artificial insemination in Kenya? Give examples.

.....  
.....  
.....

14. What are the legal obligations (provide examples of relevant laws) as regards insemination? Does one inseminator go alone or also with an inspector to a farm in Kenya?

.....  
.....  
.....

15. What are the respective percentages the Kenyan breeding sector's formal and informal market AI segments?

- a) Formal.....%
- b) Informal.....%

16. Are the regulatory processes and procedures adhered to by the actors (inspectors, inseminators, semen distributors, farmers etc.)? **Yes/No** (delete as appropriate) If not, is this on purpose?

.....  
.....  
.....

Give examples of these processes and procedures.

.....  
.....  
.....

17. Is there a feedback mechanism through which farmers, county inseminators inspectors and semen distributors use to communicate their issues to the DVS head office? **Yes/No** (delete as appropriate). If yes, how effective and /or efficient is it currently?



.....  
.....  
.....

18. What is the current situation on breeding and its future plans in Kenya, e.g. how do the inseminators in counties advise the dairy farmers at the following levels: -

a) strategic (long-term) level e.g. breeding goals and objectives, vision and mission

.....  
.....

b) Tactical /management (medium-term) level e.g. observing and adhering to technical and economic Key Performance Indicators (KPIs) on the farms

.....  
.....

c) Operational (short-term) level e.g. daily hygiene improvement, heat detection, insemination timing etc. on dairy farms

.....  
.....

19. What are, in your opinion, the good/strong points in Kenya’s Artificial Insemination if you looked at it regarding the following stakeholders: -

a) Farmers

.....  
.....  
.....

b) Inseminators

.....  
.....  
.....

c) Companies dealing with bovine semen business

.....  
.....  
.....

d) County directors of veterinary services

.....  
.....  
.....

e) DVS

.....  
.....  
.....



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f) Kenya Livestock Breeders' Association

.....  
.....  
.....

g) Bovine semen producers (local and foreign)

.....  
.....  
.....

20. What are, in your opinion, the gaps, mistakes, missing points, or challenges in artificial insemination if you looked in terms of the following stakeholders:

a) Farmers

.....  
.....  
.....

b) Inseminators

.....  
.....  
.....

c) Companies that supply bovine semen business

.....  
.....  
.....

d) DVS

.....  
.....  
.....

e) County directors of veterinary services

.....  
.....  
.....

f) Kenya Livestock breeders' Association

.....  
.....  
.....

g) County directors of veterinary services

.....



.....  
.....

21. In your opinion, are there adequate breeding plans in Kenya? **Yes/No** (delete as appropriate). If yes, give examples

.....  
.....  
.....

22. In your opinion, what needs to be done to improve the breeding sector in Kenya? Give examples of interventions.

.....  
.....  
.....

23. What threats, in your opinion, are there in the Kenya's breeding sector operating environment? Give examples of mitigation measures.

.....  
.....  
.....

24. What are, in your opinion, the opportunities in Kenya's breeding sector if you looked at them in the following aspects: -

a) Farmers

.....  
.....  
.....

b) Inseminators

.....  
.....  
.....

c) Companies that supply bovine semen business

.....  
.....  
.....

d) DVS

.....  
.....  
.....

e) Kenya Livestock breeders' Association

.....



.....  
.....  
f) County directors of veterinary services

.....  
.....  
.....

**B). Characteristics of the inseminators of in Kenya**

25. How many trained inseminators are there in Kenya?

.....

26. What is the required minimum level of knowledge for someone to join an insemination professional course?

.....

27. Which institutions, in Kenya, can someone attend for AI education and training?

.....  
.....

28. Is there a certification scheme for the artificial inseminators in Kenya? If yes, please briefly elaborate.

.....  
.....  
.....

29. What is the basic level of qualification and certification needed for one to be allowed to be an inseminator?

.....  
.....

30. Is an inseminator required to be certified or accredited in Kenya? **Yes/No** (delete as appropriate). If yes, by whom?

.....  
.....  
.....

31. How do inseminators keep their professional knowledge, skills, tools and attitudes up to date during the course of their work life in Kenya?

.....  
.....  
.....  
.....

32. Do artificial inseminators work in both the public and private sector in Kenya? **Yes/No** (delete as appropriate). If yes, give their respective percentages: -

a) in Public.....%



b) in private sector..... %

33. Do inseminators work together or they are in competition?

.....  
.....

34. What is the basis for offering their artificial insemination services; what do inseminators base their recommendation(s) on?

.....  
.....  
.....

35. In Kenya’s dairy counties, who are mostly the clients of artificial inseminators; smallholder- or medium- and/or large-scale farmers?

.....

In what respective percentages?

- a) Smallholder clients .....%
- b) Medium-scale clients.....%
- c) Large-scale clients.....%

36. What informs the choice of bovine semen in Kenya by: -

a) farmers

.....  
.....  
.....

b) inseminators

.....  
.....  
.....

37. What do you, as the regulator of artificial insemination services in Kenya, think are the knowledge and skills level of their clients regarding successful insemination in the country’s dairy cattle farms?

.....  
.....  
.....

38. What is the actual knowledge level of the inseminators’ clients in the country?

.....  
.....  
.....

39. What is: -



(a) The knowledge and skills level of inseminators' clients on bovine semen breeds?

.....  
.....

(b) Do inseminators have different relevant information materials that they use to advise their clients on different breeds and their respective advantages?

-----  
-----  
-----

(c) how do the inseminators acquire their knowledge and/or skills?

.....  
.....  
.....

40. What is the Knowledge or skills and requests of dairy farmers with regard to adoption of more resilient and higher yielding dairy cow breeds in the county?

.....  
.....  
.....

41. Does the DVS consider using Dutch bovine semen in in Kenya? **Yes/No** (delete as appropriate) If yes, how would DVS like this to be done successfully?

.....  
.....  
.....

42. How do inseminators give advice to their clients in the country?

.....  
.....  
.....

43. Do the Kenya inseminators or farmers consider using Dutch bovine semen?

.....  
.....  
.....

**C). The Needs of the Inseminators in Kenya**

44. What are the educational needs (knowledge and skills gaps) of the country's Inseminators in your view?

.....  
.....  
.....

45. What are the educational and capacity needs of DVS staff with regard to artificial insemination in Kenya including: -



a) the DVS officers supervising the artificial insemination service providers training in all the dairy counties in the country?

.....  
.....  
.....

b) facilitators from the DVS office as the regulators of Kenya breeding services?

.....  
.....  
.....

46. Where are the gaps, among these stakeholders, that serve as hinderances to increased successful insemination in the country?

.....  
.....  
.....

47. What could be done in the short-term and the long-term to increase successful insemination in the country?

.....  
.....  
.....

48. If a training were developed for these two target groups what should it minimally include, in terms of appropriate: -

a). knowledge gain (give examples relevant thematic areas in this regard)?

.....  
.....  
.....

b). skills acquisition (give relevant examples)

.....  
.....  
.....

a) attitudinal change (give relevant examples)

.....  
.....  
.....

b) Other thematic area (s) e.g. budgetary allocations at both DVS and county levels, organisational issues, infrastructure, tools, materials etc.





.....  
.....  
.....

49. On a scale of 1-5, how would you rate the performance of the following breeding sector stakeholders in the execution of their respective roles: -

- a) DVS HQs (national level) .....
- b) County directors of veterinary services (DVSs)?.....
- c) Dairy county government Departments of Agriculture, Livestock & Fisheries.....
- d) Inseminators in counties.....
- e) Kenya Livestock Breeders' Association.....
- f) Dairy Farmers' Cooperative Societies.....
- g) Farmers.....
- h) Bovine semen distributors.....
- i) Bovine semen producers.....

50. What is the relation between National and County governments when it comes to Artificial insemination service provision?

-----  
-----  
-----

51. In the DVS-county governments collaborative framework, what is working and what is not working?

.....  
.....  
.....

52. What is the DVS doing to increase the rate of successful artificial insemination in Kenya?.....

.....  
.....

53. In your view, what need to be done in order to make the Kenyan breeding sector's value chain vibrant and sustainably successful?

-----  
-----  
-----

54. DVS has an app that captures diseases at the ground level in real time and whose server is hosted at the DVS offices in Kabete. Could this app be used to capture real-time breeding data across Kenya? **Yes/No** (delete as appropriate). If **yes**,



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a) what are the capacity needs of the would-be users of the said app in the Kenya's breeding sector?

.....  
.....  
.....

b) What are the budgetary implications if the app would be used for this purpose in a sustainable manner?

.....  
.....  
.....

c) What extra technological infrastructure would be required to use the app to effectively and efficiently capture breeding data?.....

.....  
.....

55. Please, give any more comments or inputs that DVS considers important in increasing the rate of successful insemination in Kenya-----

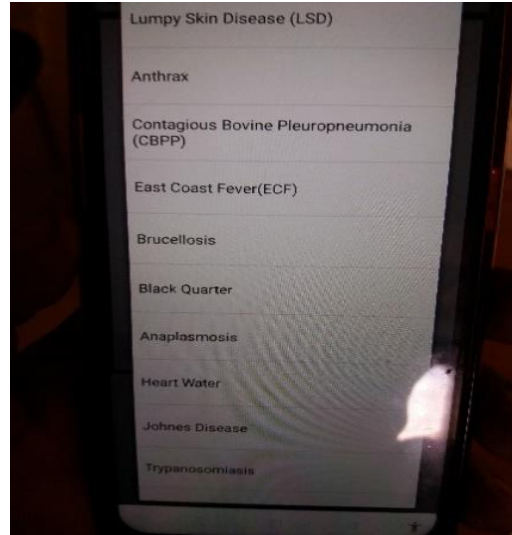
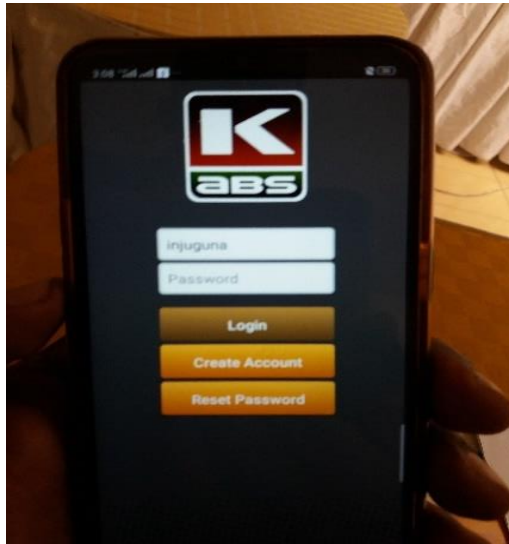
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**-END - THANK YOU-**



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Annex 1: DVS App that captures diseases, real- time, on mobile smartphone (L & R)



Annex 2: Inside one of the bovine semen agent's premises in Nakuru City





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**Annex 3:** First photo - Mr Han Tellegen (DTC), Mr. Johnstone Sang (Nakuru Dairy Union Chairperson), Mr. Joe Marema (Secretary, Dairy Union) and Mr. Eric Kimalit (DTC/PDTC Kenya); Second photo – KVB poster on its CPD



**Annex 4:** Left – A Focus Group Discussion session with Nakuru Artificial Inseminators conducted by Mr. Han Tellegen and Mr. Eric Kimalit in Nakuru City. Right – Dr. John (Nairobi Veterinary Centre, a bovine semen supplier, Nakuru) after an interview by DTC team





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Annex 5: Left – KLBA signage at its headquarters, Nakuru City; Right – Mr. Han Tellegen (DTC), Mr. Leonard Muganda (KLBA CEO), and Mr. Eric Kimalit (DTC/PDTC Kenya)



## APPENDIX I: Dairy Sector News in Nakuru County

### Boost for Dairy Farmers in Nakuru as County Purchases Equipment Worth Sh 10.5 Million

KNA August 25, 2019 Agriculture, Nakuru

Dairy Farmers in Nakuru have been challenged to embrace mechanisation in order to boost milk production.

County Executive Committee Member for Agriculture Dr. Immaculate Njuthe Maina said the devolved unit was committed to facilitating farmers to acquire modern farming equipment to boost food security in the Country.

Currently, Nakuru is ranked third among Counties with high milk production in the Country and with 381,600 dairy cattle.



In 2018, the devolved unit netted Sh 10.5 billion from the sale of 293 million litres of milk. Speaking when she handed over equipment valued at Sh10.5 million purchased by the County to dairy farmers in Gilgil Sub-County to be used in harvesting and baling of hay, Dr Njuthe observed that mechanised agriculture has been identified as one of the ways to attain sustainable growth in the agriculture sector.



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<p>“We are working on the Nakuru County Mechanization Policy which is vital for agricultural transformation that will help in realizing food security. The policy will guide use of farm machinery to boost income for farmers.</p>
<p>The purchase of the equipment is the beginning of a program aimed at encouraging farmers across the County to adopt mechanization to increase productivity” said the CEC.</p>
<p>The equipment which included a trailer, bailer and tractor was handed to Inua Hustlers Farmers’ Cooperative on Friday at Elementaita ward in Gilgil Sub County. In 2018, President Uhuru Kenyatta announced that the government had waived import taxes on agricultural machinery and equipment in a move meant to support farmers to acquire the equipment at affordable prices.</p>
<p>Dr Maina further urged farmers to join cooperatives. She said the County Government supports the initiative of forming Nakuru County Dairy Cooperative Union that will enhance the farmers’ capacity to negotiate for better milk prices.</p>
<p>Currently, 21 Artificial Insemination kits have been distributed to active Dairy Cooperatives and a county-wide livestock vaccination initiated against the common diseases.</p>
<p>Also present was Livestock Chief Officer Dr Enos Amuyunzu, area MCA Moses Ndung’u, Chief of Staff Gichuhi Njoroge and other County officials.</p>
<p><u>Chief of Staff Gichuhi Njoroge County Executive Committee Member for Agriculture Dr. Immaculate Njuthe Maina</u> <u>Livestock Chief Officer Dr Enos Amuyunzu, MCA Moses Ndung’u</u></p>

On the picture include Dr. Immaculate Njuthe Maina, CECM (Nakuru County ALF) and Dr Daniel Mutai and Mr. W. Rop (RVIST), partner of DTC in Nakuru.



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## APPENDIX II: News on Nakuru County Government Funding to Dairy Sub-sector

Kenya News Agency: Nakuru Farmers Want More Funds Injected into Dairy Sector
<b>20 SEPTEMBER 2020</b>
<i>By Francis Mureithi</i>
Dairy farmers in Nakuru will reap maximum benefits if Governor Lee Kinyanjui's administration sets aside more funding for agriculture to ensure full implementation of the ambitious Nakuru County Dairy Strategic Plan 2019-2024.
According to the 2020/2021 budget, the critical Agriculture docket has been allocated Sh1 billion.
However, more than half of the money, which translates to Sh552.5 million, will go to recurrent expenditure while Sh453.8 million will go to development in the three departments of Livestock,
Fisheries and Agriculture.
Dairy farmers in the county have observed that an additional budgetary allocation will assure them of ready markets and better prices, ultimately translating to more jobs along the milk value chain and increasing wealth in the county.
According to the chairman of the Nakuru Dairy Value Chain Stakeholders' Platform Waweru Nyangi, dairy farmers will gain if they double their milk production from the present seven litres per cow per day to 15 litres.
The average production per lactation in the region is 2,100 litres.
Global productivity
This is low compared to the leading global productivity per cow of 42 litres per day and 12,000 litres per lactation.
The average annual milk produced in the county in the last financial year was 290 million litres worth Sh9.6 billion.
"Nakuru dairy farmers have shown keen interest to improve their milk production through better animal husbandry practices and as they improve on their dairy herd management. The county government should assure them of ready markets for their milk and other value addition milk products like yoghurt," said Mr Nyangi.
To make Nakuru a leading milk producer, the dairy farmers have called for the establishment of guaranteed minimum returns and implementation of a quality-based payment system.
"This payment system will attract our youth to dairy farming and replace the ageing dairy farmers who are exiting the stage due to natural attrition," added Mr Nyangi.
The farmers also want the county to declare hay and other fodder as a cash crops, establish strategic reserves and develop infrastructures to promote the farming.
They also want the county to establish storage, processing plants and increase investment in machinery.
The county has established a machine and equipment unit at the Agriculture Training Centre in Soilo where farmers can hire various equipment at competitive rates.





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Mr Nyangi said the dairy farmers have formed a strong cooperative union which brings together 15 societies with the aim of establishing a milk processing plant in the county.
"To increase the uptake of milk and milk products, we are looking towards the establishment of a county school milk programme by once school reopens fully next year," said Mr Nyangi.
At the moment, the farmers sell their milk to established processors such as Brookeside Dairy, New Kenya Cooperative Creameries (NKCC), Daima Dairies and upcoming processors in the region such as Bahati Agro-Processor among others.
The dairy cooperative union was formed in 2019 with the sole aim of addressing the challenges faced by dairy farmers in the region.
Some of the challenges the farmers are facing include poor quality feeds, inadequate and inefficient breeding services, ineffective disease control and veterinary services, lack of credit and low adoption of technology among others.
The platform has revolutionised the dairy sector and is a key player in the development of the county's strategic plan which was launched on September 14 at Pokea farm in Njoro Sub-County.
The platform has also facilitated the registration of Nakuru Dairy Cooperative Union, the development of Nakuru County Food Safety Bill and has also participated in the development of the new milk regulations.



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## APPENDIX III: Description of Genetic Terms used in Bull Catalogues

1. **REGNAME** -The herdbook name of the bull
2. **CODE #** - The special number which the AI companies use to identify sires
3. **MILK** - The average milk production of a bull's daughters in a 305-day lactation (expressed in pounds: 1 kg = 2.2 pounds)
4. **FAT** - The average fat production of a bull's daughters in a 305-day lactation (expressed in pounds).
5. **FAT %** - The average fat% of a bull's daughters.
6. **PRO** - The average protein production of a bull's daughters in a 305-day lactation (expressed in pounds).
7. **PRO %** - The average protein % of a bull's daughters.
8. **# DTRS** - The number of milking daughters this sire has in his proof.
9. **# HERDS** - The number of herds where this bull's daughters are milking.
10. **PTAM** - Predicted ability of sire to transmit genetics for milk production. The pounds of milk produced by a bull's daughters above contemporaries.
11. **PTA %F, PTAF** - As for PTAM, this is the amount of fat a bull's daughters are expected to produce above contemporaries.
12. **PTA %P, PTAP** - As for PTAM, this is the amount of TRUE protein a bull's daughters are expected to produce above contemporaries.
13. **REL** - Production reliability
14. **PTAT** - Type or confirmation improvement expected from a bull's daughters compared to contemporaries
15. **TPI (Total Performance Index)** -This is a figure which combines type, management and production traits into one number. Very commonly used to rank bulls, TPI is the USA Holstein Association's multi trait index that ranks bulls on overall performance. The traits included in the TPI formula, and their respective percentages in the formula are:
  - a) Fat: 16%
  - b) Protein: 27%
  - c) Feed Efficiency (FE): 3%
  - d) Productive Life (PL): 7%
  - e) Somatic Cell Score (SCS): 5%
  - f) Fertility Index (FI): 13%
  - g) Daughter Calving Ease(DCE): -2%
  - h) Daughter Still Birth (DSB): -1%
  - i) PTA Type: 8%

*Source: World Wide Sires Ltd*



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More information on bull catalogues may be obtained from the websites of bovine semen producing companies globally, for example, the following: -

CRV Bull Catalogue: [http://www.ckl.africa/wp-content/uploads/2018/02/CRV-Catalogue\\_2016\\_Final.pdf](http://www.ckl.africa/wp-content/uploads/2018/02/CRV-Catalogue_2016_Final.pdf)

WWS Bull Catalogue: <https://wswiresea.co.ke/category/catalogue/2022-catalogue/>

KAGRC Bull Catalogue: <https://kagrc.go.ke/wp-content/uploads/KAGRC-BULL-CATALOGUE-2020-2021.pdf>



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## APPENDIX IV: Milk production in Nakuru County

<b>Celebration as Dairy Farmers in Nakuru Rake in Billions from Milk Sales</b>
<b>By Heal (self-media writer)   1 year ago</b>
It has now emerged that dairy farmers in <a href="#">Nakuru</a> have now earned a whopping Ksh.11.7 billion from the sale of 300 million litres of milk last year.
According to Governor Lee <a href="#">Kinyanjui</a> , Nakuru is the third leading devolved unit in milk production in the country with 381,600 dairy cattle after Kiambu and Murang'a counties.
Kinyanjui stated that his administration had brought together 13 milk farmer groups under the umbrella Nakuru County Union of Dairy cooperatives which were jointly yielding 40,000 litres of milk per day.
The County boss said his administration had also allocated Ksh.7 million to seven dairy farmer cooperatives to modernize their operations.
Kinyanjui noted that the county had spent Ksh.40 million on a free livestock immunization program in 11 sub-counties and had distributed Artificial Insemination kits to Dairy Cooperatives as a way of improving dairy animal breeds
The governor observed that dairy animals within the devolved yielded an average of 5 litres per animal.
"This production is far below the global average of 24.5 litres per cow per day. We are working on new strategies to be adopted by farmers to increase milk production per animal to at least 15 litres which will translate to Sh25 billion earnings annually," he explained.
Kinyanjui affirmed that towards improving access to markets for dairy farmers, the County Government was focused on rehabilitating and developing infrastructure in rural and farming areas.
The governor noted that his administration had recently commissioned the Sh8.9 million <a href="#">Biashara Wakulima</a> Dairy Cooperative Society's collection and storage centre within Naivasha Sub-County in a move aimed at boosting milk production and sale.
The newly commissioned facility which is within Biashara Ward has a capacity to handle 10,000 litres of milk per day.
Kinyanjui noted that <a href="#">Naivasha Sub County</a> has the potential to produce 20 million litres of milk per year.
He affirmed that the County Government was supporting various initiatives of promoting the umbrella <a href="#">Dairy Cooperatives Union</a> that would enhance the farmers' capacity to negotiate for better milk prices.
He urged the youth to embrace modern agriculture in order to create wealth and jobs. "With the youth making up 70 per cent of the Kenyan population, it is only right that they help feed their country," he noted.
"Their innovativeness, creativity, skills and energy should be used to turn the 80 per cent of Kenya's land mass that is arid and semi-arid into productive pieces of land," said the county boss.



APPENDIX V: Programme for the Kenya Mission; 24-28 January 2022 By Han Tellegen & Eric Kimalit, DTC Netherlands/PDTC Kenya

Day	Date	Time	Place	Activity	Responsibility	Organization's Contact person	Appointment Status / Remark
1	24.1.2022 Sunday	Evening hours	Nakuru	1. Han arrives in Nakuru and checks in at hotel	Han/Eric	-	Confirmed
2	24.1.2022 Monday	08.00 – 11.00 hrs.	Nakuru-Nairobi Hwy	Travelling	Eric/Han	-	
		14.00 - 15.00 hrs	EKN, Nairobi	Entry meeting with the Embassy staff	Eric/Liz	Ms. Elizabeth (Liz) +254 735 333003	Confirmed
3	25.1.2022 Tuesday	09.00 – 10.00 hrs	DVS HQs, Nairobi	Meeting/interview with the representative(s) of DVS (Breeding Section)	Eric/Han	Dr. Marigi, Breeding Section +254 721 403914	Confirmed
		10.00 - 13.00 hrs	Nairobi-Nakuru Hwy	Travelling	Eric/Han	-	
		14.00- 15.00 hrs	Nakuru	1. Courtesy call/Meeting the CECM, ALF, Nakuru & Dr. Alice Wanjema (Contact person) <b>2. Have a session with CDVS afterwards</b>	Eric/Han	Dr. Maina. Immaculate N. +254 738 396939 +254 716 702047 Contact Person: Dr. Alice Wanjema +254 722 431778	Confirmed



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		15.30 – 16.30 hrs	Nakuru	Meeting/interviewing KLBA under which there are sections, i.e. KSB (registration) & milk recording (performance).	Eric/Han	Mr. Leonard Muganda (CEO), +254 722 907686	Confirmed
4	26.1.2022 Wednesday	09.00 - 11.00 hrs	RVIST	Meeting with Principal and Board – MoU, CoE, Way forward	Eric/Sammy /Han		
		12.00-13.00 hrs	Njoro Sub-County	Meeting/interviewing Nakuru Bovine semen county agent	Eric/Han	Ms. Moraa +254 724 961943	Confirmed
		14.00-15.00 hrs	Elburgon, Molo Sub-County	Meeting/interviewing Chairman, Nakuru County Dairy Cooperative Union (Membership: 15 primary DFCs)	Eric/Han	Mr. Johnstone Sang +254 723173658	Confirmed
		16.00-17.00 hrs	Nakuru Town	Meeting /interviewing Nairobi Vet Centre (Nakuru) representative; Bovine semen supplier	Eric/Han	Dr. John Bore +254 711 346844	Confirmed
		17.30-18.30 hrs	Nakuru Town	Meeting/interviewing CKL (CRV agent in Kenya) representative	Eric/Han	Ms. Jackline Kiprono +254 712 761889	Confirmed
5	27.1.2022 Thursday	10.00 – 11.00 hr	Nakuru Town	Menengai Agrovet enterprises	Eric/Han	Joseph Waweru +254 722 455979	Confirmed
		11.15-13.15	Nakuru - Bahati	Njiku Model Farm, Bahati	Eric/Han	Dr. Steve Muthui +254 722 808701	Confirmed



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			Nakuru - Bahati	Farmspy Farm (Smallholder), Bahati	Eric/Han	Mwangi +254 726 026892	Confirmed
			Nakuru-Lanet	Acacia Farm, Lanet	Eric/Han	Mr. Joseph Wachira +254 728 159511	Confirmed
		14.00-17.00	Nakuru – Town	Meeting /interviewing Artificial Inseminators from various sub-counties (Plenary meeting)	Eric/Han/CD VS	Dr. Wanjema +254 722 431778	confirmed
6	28.1.2022 Friday	7.00 - 10.00 hrs	Nakuru-Nairobi	Travelling	Eric/Han		Confirmed
		10.00-10.30 hrs	Nairobi	Taking PCR test - Han	Eric/Han	Ms. Jamila +254 722 271667	Confirmed
		19.00 hrs	Nairobi	Han preparing/going to airport	Eric/Han		



DAIRY TRAINING CENTRE

**APPENDIX VI:** List of Artificial Inseminators interviewed in the afternoon of Wednesday, 26.1.2022 in Nakuru

S/No.	Name	Sub-County	Organization	Designation	Phone	E-mail
1	Hannah M. Kimani	Kuresoi North	Private	Inseminator	0733716450	<a href="mailto:ann.muthoni@gmail.com">ann.muthoni@gmail.com</a>
2	Peter Mwangi	Bahati	Private	Inseminator	0726026892	<a href="mailto:spymwas@gmail.com">spymwas@gmail.com</a>
3	James Kuto	Nakuru Town West	Private	Inseminator	0725029029	<a href="mailto:kuto.jm@gmail.com">kuto.jm@gmail.com</a>
4	Ibrahim K. Njuguna	Naivasha	Private	Inseminator	0721874247	<a href="mailto:kiharaibrahim52@gmail.com">kiharaibrahim52@gmail.com</a>
5	Davis korir	Kuresoi South	Private	Inseminator	0722808230	<a href="mailto:daviskorir22@yahoo.com">daviskorir22@yahoo.com</a>
6	Andrew Saisi	Gilgil	Private		0726790218	<a href="mailto:andrewosaisi@gmail.com">andrewosaisi@gmail.com</a>
7	Benjamin T. Wainaina	Nakuru Town East	Private	Inseminator	0721890438	<a href="mailto:btangira@gmail.com">btangira@gmail.com</a>
8	Paul W. Gachuru	Njoro	Private	Inseminator	0722939435	<a href="mailto:paulgachuru@gmail.com">paulgachuru@gmail.com</a>
9	Haron N. Wandaka	Subukia	Private	Inseminator	0723770073	<a href="mailto:harunwandaka@gmail.com">harunwandaka@gmail.com</a>
10	No rep. present	Molo				
11	No rep. present	Rongai				





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