

# KENYA DAIRY INDUSTRY TRANSFORMATION STRATEGY AND INVESTMENT PLAN 2022-2032

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**TRANSFORMED DAIRY INDUSTRY FOR SHARED PROSPERITY**



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The Director  
African Union - Inter-African Bureau for Animal Resources (AU-IBAR)  
Kenindia Business Park  
Museum Hill, Westlands Road  
P.O. Box 30786  
00100, Nairobi, KENYA  
e-mail to: [ibar.office@au-ibar.org](mailto:ibar.office@au-ibar.org)

# FOREWORD

The Ministry of Agriculture, Livestock, Fisheries and Co-operatives has a Dairy Master Plan 2010 – 2030, developed before the advent of devolution that currently guides the Dairy Industry. It is therefore not aligned with the new constitution of Kenya 2010 which contains the devolved system of government. This informed the need for the review of the Master Plan to incorporate both the constitutional demands of devolution in planning and the emerging issues in the industry. The industry faces a number of challenges that affect productivity that require collaborative interventions that address them by spotting and exploiting existing opportunities along the value chain.

This Strategy and Investment Plan was developed through a consultative co-generation process and multi-sectoral team engagement. The process was supported by Kenya Crops and Dairy Market Systems (KCDMS-RTI) of USAID and AU IBAR who facilitated the engagement of a National Consultant and a Ministry appointed Technical Working Group (TWG). The TWG comprised officers drawn from the various Directorates of the Ministry, and experts and practitioners drawn from public institutions, the Private sector and Non State Actor Organizations. The team took stock of the status of the dairy industry in Kenya and formulated interventions needed for strengthening the weak value chain nodes (gaps) while focusing on transformative actions for the sub-sector. The process involved literature reviews, vision data mining and analysis, participatory and consultative engagement with industry stakeholders. The Strategy provides actions that address issues that affect dairy value chain productivity, efficiency and competitiveness.

The strategy is aligned in principle to the aspirations of Vision 2030 by crafting a middle income growth path for the dairy industry actors. The overarching development goal of Kenya Vision 2030 is to make Kenya a globally competitive prosperous nation with a high quality life by the year 2030 through, strategies aimed at enhancing food security and sustainable economic development. To realize this vision, transformation of the agricultural sector remains a prerequisite condition for achieving food security, economic recovery, economic growth, employment and wealth creation. Within the agriculture sector, the dairy sub-sector remains the single largest and fast-growing segment that requires the necessary focus for its prosperity.

The strategy and investment plan also builds on the specific elements of the Agricultural Transformation and Growth Strategy (ASTGS) by targeting household income growth, positioning of SMEs as industry drivers and fronting the creation of an industry based and sector linked data, information and knowledge management system. The Strategy mirrors the intents of the Livestock Production Strategic Plan 2018-2022 and the Big 4 agenda by focusing actions that will deliver on improved production and productivity, improving market access and trade and formulating a supporting funding and investment portfolio. On the global front, it aligns to the demands of the Sustainable Development Goals (SDGs) by resolving issues that affect Food and Nutrition Security, poverty, climate actions, decent employment and partnerships.

The dairy subsector has the potential for transforming the livelihoods of smallholder dairy farmers and pastoral communities (about 3 million households) from subsistence based farming into high income commercial, competitive, and sustainable dairying building on existing frameworks and development. Kenya

has one of the most developed dairy sub-sector in Sub-Saharan Africa. Dairy remains the single largest contributor to agricultural GDP of Kenya. The contribution of dairy sub-sector is about (KShs 200 Billion) higher than Tea (KShs 46.8 Billion), and Horticulture (KShs 65.2 Billion). The sub sector is a source of food, income, employment, and manure that support soil health management for crop and fodder production.

This Strategy gives the intentions and methods that the Kenya government and dairy industry stakeholders will apply to transform the dairy industry as a way of addressing poverty, hunger and unemployment. The innovative cliché in this strategy is knowledge and technology drive and the application of the enterprise business model as the vehicle for transformation at the unit level also at the macro level. The enterprise has been positioned in this strategy as the means for influencing production and productivity, market access, value addition, and application of smart systems across the value chain.

Finally, I wish to confirm that my ministry will be in the fore front in instituting mechanisms for the effective implementation of the Dairy Industry Transformation Strategy and Investment Plan. I therefore take this opportunity to invite all the relevant stakeholders to read this document and identify the entry points that will guide their involvement and commitment in supporting the implementation of the strategic actions for us to improve the wellbeing of all the citizens.

**Hon. Peter Munya,**

*Cabinet Secretary,*

*Ministry of Agriculture, Livestock, Fisheries and Co-operatives*

# EXECUTIVE SUMMARY

The Kenya Dairy Industry Transformation Strategy and Investment Plan (DITSIP) 2022-2032, is framed with the objective of transitioning some 160,000 dairy dependent households from subsistence based KES 56,000 per annum livelihood systems into commercially based, market oriented middle income livelihood systems with an average annual return of KES 700,000 in gross margin terms. The strategy also aims to drive milk self-sufficiency from domestic production to support the milk dietary component of a food and nutrition secure citizenry. These are aligned to the country's Vision 2030 middle income livelihood aspirations and the 100% food and nutrition security agenda.

In Kenya, dairy is predominantly practiced by smallholders who produce over 80% of the milk. There are approximately 5.1 million animals producing 6.6 billion litres (MOALF&C Livestock Statistics with a current per capita consumption of 110 litres against WHO recommendation of 240 litres. It is projected that consumption will increase to 220 litres per capita by 2030 due better incomes and better marketing. This will translate into an increase from the current annual demand of 5.2 billion litres to 12.76 billion litres of milk. This demand for milk by 2030 cannot be achieved at the current national average productivity levels of 7-8 litres of milk per cow per day with the best counties of Kiambu, Meru, and Nyeri registering the highest production at 12.6, 11.7 and 11.3 litres/day respectively. These low yields means that the number of animals required to meet the 2030 milk demand would be too many.

The strategy has 4 objectives and main intervention areas that drive increased milk output and improved Total Factor Productivity (increased returns on employees, animal, capital investment and management):

- i. Develop and assign skilled and knowledgeable dairy workforce to apply best practices and aptitude needed for the modernization, management and operation of the dairy industry across the milk production and supply chain. The workforce will comprise well-resourced entrepreneurs positioned to drive dairy enterprise development and employable workers with competencies needed to operate the enterprises. These team, christened as the millennial dairy actors will drive modernization, operations and management of dairy enterprises with the benefit of increasing milk output and enhancing the total factor productivity across the value chain;
- ii. Efficient and adaptable dairy animals developed through a well-structured and supported animal breeding and herd upgrading programmes. These will drive the increase in milk output by providing traits needed for efficient feed conversion and milk yields
- iii. Well regulated, structured and organized market influenced by the functions of effective and efficient enterprises. Support to development and enhancement of the organizational governance and operational systems will influence decisions on value addition, product differentiation, quality and standards of milk and milk derived products, marketing and distribution to ensure availability.
- iv. Fit for purpose regulations, policies and support services that include
  - a. Effective and efficient business development support services,
  - b. Effective and efficient animal health services
  - c. Supportive and accessible funding mechanism and resource basket

To modernise and make the Kenyan dairy industry competitive both in the local and external markets, the National and County Governments together with the partners and key stakeholders will focus on five the strategic areas namely:

- i. Building knowledge based and driven dairy industry with actions that target restructuring training at all levels to improve employability and entrepreneurship capacity of the actors. This will aim at building the aptitude, skills and practices of the actors on good agricultural and climate smart practices, financial literacy, firm development, management and marketing and nurturing the entrepreneurial spirit at all levels of the value chain,
- ii. Develop a true to type dairy breed with efficient and adaptable traits with potential to produce at least 6,000 Kg of milk per lactation with actions oriented at breeding a synthetic animals while also progressively upgrading the genomic potential of the existing herd with the eventual aim of weaning off any redundant breeds.
- iii. Support research into improved feed systems development, fodder varieties, TMRs and supply systems
- iv. Support mechanisms that promote start-up, growth and acceleration of enterprises as key instruments for market penetration, capture and retention. The actions aligned to this element will target development of strong enterprises through specific interventions targeting the informal and small traders, restructuring of the cooperative systems and reconstruction of the commercial model of the large corporates in the industry. Well-structured and organised enterprises will through self-regulation and growth models address the industry concerns on milk quality and safety. They will also develop differentiated products through sustainable value addition using advanced and modern technologies. The proposed actions will also foster collective and organised market actions by the enterprises to improve their competitiveness and presence in the global market.
- v. Support establishment of a funding mechanism to ease access to finance by industry actors and provide the finances needed for modernisation and expansion
- vi. Review and formulate fit for purpose regulations and frameworks to incentivize t industry actors and improve their competitiveness within the market place while ensuring availability of good quality and safe milk and milk products

The strategy will require KShs 93 billion over the next ten years for its implementation that is structured to be executed through 18 flagships. The result expected will be increased milk output from 5.11 billion currently to 12 billion by 2030, increased employment with 600,000 jobs and increased incomes to households which at macro level will translate to 600 Billion contribution to the GDP annually.

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# ACRONYMS AND ABBREVIATIONS

ADB	African Development Bank
AGI	Africa Growth Initiative
AI	Artificial Insemination
ASDSP	Agricultural Sector Development Support Programme
ASERECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
CBOs	Community Based Organizations
CFU	Colony Forming Unit
EAAP	East African Agricultural Productivity
EAC	East African Community
EADD	East Africa Dairy Development
EADDP	East Africa Dairy Development Programme
ECAPAPA	Eastern and Central Africa Program for Agricultural Policy Analysis
ERP	Economic Recovery Program
FAO	Food and Agricultural Organization
FBOs	Faith Based Organizations
FGD	Focus Group Discussion
GDP	Gross Domestic Product
GoK	Government of Kenya
HPI	Heifer Project International
ICT	Information and Communication Technology
IFAD	International Fund for Africa Development
ILRI	International Livestock Research Institute
KAGRC	Kenya Animal Genetic Resource Centre
KALRO	Kenya Agricultural and Livestock Research Organization
KAPAP	Kenya Agricultural Productivity Program
KBD	Kenya Dairy Board
KCC	Kenya Cooperative Creameries
KCSAP	Kenya Climate Smart Agriculture Programme
KLBO	Kenya Livestock Breeders Organization
KSB	Kenya Stud Book
MDGs	Millennium Development Goals
MoALFC	Ministry of Agriculture, Livestock, Fisheries and Cooperative Development
MT	Metric Ton
NASEP	National Agricultural Sector Extension Policy
NGOs	Non-Governmental Organizations
SDCP	Small Holder Dairy Commercialization Program
SDLD	State Department of Livestock Development
SHGs	Self Help Groups
SRA	Strategy for Revitalizing Agriculture

UHT Ultra High Temperature  
USAID United States Agency for International Development  
WHH Welt Hunger Hilfe

DRAFT



# I. INTRODUCTION

## 1.1 Background

**The Kenya Dairy Industry Transformation Strategy and Investment Plan (DITSIP) 2022-2032**, is framed with the objective of transitioning some 160,000 dairy dependent households from subsistence based KES 56,000 per annum livelihood systems into commercially based, market oriented middle income livelihood systems with an average annual return of KES 700,000 in gross margin terms. The strategy also aims to drive milk self-sufficiency from domestic production to support the milk dietary component of a food and nutrition secure citizenry. These are aligned to the country's Vision 2030 middle income livelihood aspirations and the 100% food and nutrition security agenda. Successful implementation of the strategy will create positive impacts in terms of **middle income livelihood supporting household earnings, improved work environment, decent employment and increased job opportunities, increased resilience of the milk value chain against climate change associated shocks and societal food and nutrition security**. The impacts on food and nutrition security will be based on the attainment of self-sufficiency of the milk component of a full diet as defined in the country's diet and nutrition guidelines.

**The strategy is people centered with a focus on improving the Livelihoods of dairy sector actors**

The strategy will be implemented over a ten year period with the first 18 flagships prioritized for implementation in the first five years. These will be implemented within the framework of Fourth Medium Term Programme (MTPIV 2022-2027) and the third generation County Integrated Development Plans (CIDPs, 2023-2028). The strategy will be reviewed after five years to assess the continued relevance of the interventions and to examine the progress made towards achieving the planned objectives. The review will provide an opportunity to make modifications to ensure the objectives are achieved within the lifetime of the strategy.

The 18 flagships are formulated around the four main outcomes of this strategy which once achieved will lead to transformation and modernization of the dairy industry. These are:

-  Improved total factor productivity and milk output measured in gross margin and volume terms respectively
-  Improved access to markets and trade for the milk and milk derived products
-  Improved service delivery to support the dairy value chain
-  Supportive framework conditions that include fit for purpose policies, regulations and guidelines, supportive funding mechanisms and a structured and organized market system

The strategy has 4 objectives and main intervention areas that drive **increased milk output** and **improved Total Factor Productivity (increased returns on employees, animal, capital investment and management)**:

- i. Develop and assign skilled and knowledgeable dairy workforce to apply best practices and aptitude needed for the modernization, management and operation of the dairy industry across the milk production and supply chain. The workforce will comprise well-resourced entrepreneurs positioned to drive dairy enterprise development and employable workers with competencies needed to operate the enterprises. These team, christened as the **millennial dairy actors** will drive modernization, operations and management of dairy enterprises with the benefit of increasing milk output and enhancing the total factor productivity across the value chain;
- ii. Efficient and adaptable dairy animals developed through a well-structured and supported animal breeding and herd upgrading programmes. These will drive the increase in milk output by providing traits needed for efficient feed conversion and milk yields
- iii. Well regulated, structured and organized market influenced by the functions of effective and efficient enterprises. Support to development and enhancement of the organizational governance and operational systems will influence decisions on value addition, product differentiation, quality and standards of milk and milk derived products, marketing and distribution to ensure availability.
- iv. viii. Fit for purpose regulations, policies and support services that include
  - a. Effective and efficient business development support services,
  - b. Effective and efficient animal health services
  - c. Supportive and accessible funding mechanism and resource basket
  - d. Supportive and fit for purpose regulatory, policy and legal frameworks

## ***1.2 Global and national context***

A global review of best practices that led to transformation of the dairy industry in some developed dairy industries in some countries especially Israel, Ireland, Germany, Brazil, Netherlands, USA, India China and New Zealand provide some benchmarks that demonstrate what is feasible and scalable within the industry. The important metrics on milk yields, animal herd size and specific trait elements, incomes and livelihoods, markets and market systems, employment and wages, scale and scope of operations from these countries point to an industry that is profitable and that supports decent employment and high income livelihoods under various livestock management systems (extensive, semi-intensive and intensive). A mixture of the right animal traits, scale of operation, organized and structured systems and a knowledgeable and skilled workforce together with supportive regulations and funding mechanism defined most of the developed dairy industries.

***The lessons point to modernized dairy industries that are knowledge and technology driven, supported by well regulated and funded frameworks operating within a well-structured and developed market system. The industry stakeholders rally collectively towards a common vision ascribed by the targeted market.***

The metrics on people (education, skills and numbers), animals (breeds, yield and herd size), business models and framework conditions provided benchmarks upon which the current baseline condition of the Kenyan dairy industry was gauged and reimaged. The reimaging was done during the consultative strategy visioning and formulation process (Table 1). An Excel based decision data tool was applied to derive the vision numbers for the Kenyan Dairy Industry for the period 2022-2032.

### **1.2.1 Skilled and knowledgeable workforce**

The success of dairy industries in developed countries is driven by efficient people and strong systems. The factors that contribute to these are; a large population of skilled and knowledgeable people who create and sustain strong functional systems, organize the industry well while rallying their networks to build a cohesive industry that is trusted by consumers and that benefit all.

The Kenya dairy industry relies on herdsmen and farm hands without basic education. This compromise the standards applied in the management of dairy enterprises leading to low outputs and productivity. In all developed countries farmers control milk collection and primary processing through farmer owned cooperatives that are also managed and led by qualified people with requisite knowledge and skills on safe milk handling , processing, product development and marketing. In Israel for instance, fodder production and Total Mixed Ratio formulation and animal feeding are done by professionally managed firms using technical advances in feeding. The Dutch dairy is a high quality system dependent on circular and precision agriculture practices executed by professionally trained and equipped workforce and management.

The dairy industry in developed countries also offer attractive enumeration to the professionals with wages running as high as \$160,000 (KES 16 Million) per year in New Zealand a figure that compares well with other well-paying professional jobs in the Country. The National Agricultural Workers Survey (NAWS) – a report published by the U.S. Department of Labor– pegged the average total income of farm workers as ranging between \$15,000 to \$17,499 a year for individuals and \$20,000 to \$24,999 for a family. These figures are above the minimum wage level in the USA.

Deployment of skilled and knowledgeable people improves their efficiency and this contributes positively to increased output and productivity. These in turn improves the cash flow of the dairy enterprises making them financially sustainable a factor that contributes to its attractiveness to qualified professionals and practitioners. Globally 150 million households engage in milk production. While in the developing countries most of the milk production takes place in small family farms, their counterparts in developed countries continue to intensify production through large scale industrial establishments.

The world milk production for the year 2018 was at 838 million tons with 81% of the total milk produced by cows, 15% produced by buffalos, 3.4% produced by goats, 1.6% sheep and camel. The 81% of the total milk is produced by over 264 million dairy cows worldwide (FAO stat). India has the greatest number of dairy cows with a population of 43,600,000 which is about 16.5% of the world's dairy cow population. However, this large population of animals produces only around two-thirds of the amount that the highest dairy producer, the USA produces every year. In India the dairy cows include the water buffalo. The US

average dairy cow produces on average 6.5 litres of milk per day. In the recent years the annual quantity of milk produced in the USA increased by 16% from 424.3 Billion to 491.1 Billion litres between 2010 and 2020 and the dairy herd increased by 3% (265,000) while the annual production per cow increased by 12% (2,635 litres). The Kenyan model mirrors that of India with many dairy producers, a large herd of animals kept in small uneconomical herd sizes of 3-5 animals with very low production volumes from the herds of less than 10,000 litres per year.

## 1.2.2 Efficient and adaptable animals

### i. The Cow

The Largest producer of cow milk in the world is USA followed by India. Other key world countries in milk production in the world are China, Brazil, Germany, Russia, France, New Zealand, Turkey and United Kingdom. The key strategic actions guiding established dairy industries included having structured breeding programme with a definite objectives on the kind of traits desired based on the management system, ecology and the skills of the actors. The highest average herd yields of 46L/day and long lactation period for the cow was developed in Israel over a period of 60 years by out crossing local and Damascus cows with Friesian bulls and later with Holstein. The breeding in this hot climate country has created the Israeli Holstein cows that are adapted to the hot climate.

The driving technology has been 100 % artificial insemination exclusively carried out mainly by the “Sion” Co-operative Artificial Insemination company. There are only 747 herds in Israel each with an average of 234 cows cumulatively producing 1.2 billion litres of milk per year. In New Zealand, the dairy industry depends on grass-based diets and a strict requirement for a 365-day calving interval and a breeding goal that drives on-farm profitability and achievement of increased economic efficiency. During the 2021 dairy season, almost half of all dairy cows or 49.6 percent, were Holstein-Friesian/Jersey crossbreeds followed by Holstein-Friesian breeds at 32.5% (DairyNZ, 2020) with an average milk yield of 14L/day.

**Table 1:** Dairy breeds performance criteria for benchmarked countries

Parameter		Israel	Brazil	USA	Netherlands	India	New Zealand	Kenya
Herd Size	Cow	234	30-70	300	101	3	435	5
Yield/day		46	7	28	30	2	14	8
Lactation		10208	2140	9331	6139	1172	3600	2400
System		Intensive	Extensive	Mixed	Mixed	Extensive	Extensive	Mixed
Herd #		747	900,000	34,184			11,175	1.8 M
Cows #		125,000	20M	9.38M	1.56M		4.94 M	5 M
Milk Kg			36B	98 B			2.1 B	
Parameter		Pakistan	Somali	India	Tunisia	Ethiopia		Kenya
Herd Size	Camel	6	17	3	4	5		8
Yield/day		8	5	6.8	4	5		5
Lactation		2920	1825	2482	1460	1825		1600
System		Mixed <sup>1</sup>	Mixed	Mixed	Mixed	Mixed		Nomadic
Parameter		India	Bangladesh	Sudan	Pakistan	France	China	Kenya
Herd Size	Goat	10-15	10-15	20	15	30	40	4
Yield/day		2	3	2	5	5	6	3
Lactation		30.2	27	x	4.9	0.8	194	60
System		Extensive and semi extensive with emerging cases of intensive systems						

<sup>1</sup> Mixed systems consists of nomadic, transhumant and sedentary

New Zealand has 4.921 cows managed in 11,175 herds each with a holding herd size of 440 cows that cumulatively produce 2.1 Billion liters of milk annually. Farmers in New Zealand have been migrating towards crossbred cows in order to benefit from the efficiencies of hybrid vigor and to get the best traits from the two major breeds for dairy farming. The industry in the country depends herd improvement services, with farmers seeking higher performing and more efficient dairy cows through the use of herd testing and artificial breeding.

Across all developed countries, there is an emerging trend of reducing the number of herds (number of farmers) but increasing the herd sizes using breeds with good traits for milk production. In Netherlands for instance, the number of framers reduced from 30,000 in 2000 to 16,000 in 2020. A corresponding review of the trends in USA shows herd numbers reducing form 70,375 in 2003 to 34,184 in 2019 while the herd sizes increased form 129 in 2003 to 300 by 2020. In New Zealand, over a period of one year 2019-2020, the herd numbers reduced by 193 while individual herd sizes increased from 435 to 440 cows in the same period. The lower herd numbers and increased herd sizes fosters economic efficiency and on farm profitability. The commercial herd sizes average at least 200 cows in developed countries.

Globally, the US Department of Agriculture Foreign Agriculture Service (USDA FAS), estimates the number of milk cows in the world as approximately 136 million in 2019 that increased to 137 million in 2020 and more than 138 million by 2021. World over, there are over 800 breeds of cattle. In Europe, where majority of the dairy breeds originated, only of 8 of these are categorized under dairy cattle. They include the White Holstein, Holstein Red, Guernsey, Jersey, Ayrshire, Brown Swiss, Milking Shorthorn and Milking Devon (West)

In developing countries, most of the milk is produced by indigenous or local cattle breeds and crosses which have low production rates. Most of the indigenous breeds found in the tropical regions are the Zebu breeds of the Red Sindhi, Sahiwal, Kankrej, Gir, Tharparkar, Butana and Kenana type. In India, indigenous cattle, which comprise more than 75 percent of the total cattle population, produce on average 1.83 kg milk/day, crossbred cattle produce on average 6.36 kg/day, while buffaloes on average produce 3.83 kg/day (Gandhi and Sharma, 2005; Joshi and Singh, 2005). Higher yields are reported for animals raised under more intensive management systems. In emerging dairy industries like that of Kenya, the local breeds are being outcrossed with exotic breeds mainly of the Friesian, Ayrshire, Jersey and Guernsey type and these crosses produce an average of 8L/day. Like India, higher yields are also reported under intensive management systems in Kenya too.

***Milk yield is a factor of the breed and management system  
Israel intensive management of animals with high milk yielding traits produces 46L/  
day with a lactation production of 12,000kg per cow***

## ii. The camel

Globally, the camel population is more than thirty-four million (single-humped and double-humped), mostly present in drought areas of Africa, the Middle East, central Asia, the Indian subcontinent and some countries of Europe (FAOSTAT, 2017). In past decades, the whole camel population was reared for transportation, meat, and milk purposes however some European countries (Netherland, Italy, Sweden), New Zealand, Australia and the USA are of late focusing on the processing of camel milk and its products. This trend is coercing these countries to endorse and enhance camel farming on a large scale. The camel requires improved management on forage and water to sustain high yields which can increase from the average of 5L/day to a high of 34L/day. The high yields are possible with the Marecha and Barela Dromedaries herds managed under extensive production regimes (Faraz et al., 2021). Marecha is a Pakistani camel breed with an average milk yield of 4179 litres per year with a lactation length of 270 to 540 days and daily yield average of 8 Kg. The lactation milk yield for camels in other countries (India 2482; Somalia 1825; Tunisia and Algeria 1460; Ethiopia 1825) average 2920 litres with daily yields of (India 6.8; Somalia 5; Tunisia and Algeria 4; Ethiopia 5) 5 kg. Camel milk is known to be superior (Table 2) to the milk of other domestic species (Qureshi, 1986). With the modern husbandry practices camel could be the source for future food production especially in arid, semi-arid, mountainous and desert areas.

**Table 2:** Comparison of camel milk composition with other species

Species	Fat%	Protein%	Lactose%	Ash%	Total Solids
Camel	4.9	3.7	5.1	0.70	14.4
Cow	4.5	3.8	4.9	0.72	13.9
Buffalo	7.6	3.8	4.9	0.78	17.0
Ewe	5.3	5.5	4.6	0.90	16.3
Goat	3.5	3.1	4.6	0.79	12.0
Mare	1.6	2.7	6.1	0.51	11.0
Ass	1.2	1.7	6.9	0.45	10.2
Elephant	15.1	4.9	3.4	0.76	26.9
Woman	4.5	1.1	6.8	0.20	12.6

(Source Khan et al., 2003)

The Pakistan camel breeds have the highest milk yields, with a daily output of 4 to 7 litres under ranching conditions. However, they rely on heavy feeder programs and cannot survive the harsh desert conditions and rough terrain witnessed in the North-Eastern counties in Kenya. The Somali camel breeds are the second-highest milk producers, producing about 3–5 litres of milk daily, with a lactation period between 12 and 18 months.

The Rendille and Gabra camels have a milk production yield of between 1 and 3 litres of milk a day and have a lactation period of between 12 and 18 months. The Turkana camel breeds produce less milk than the Somali, Gabbra, and Rendille breeds, with a daily production of between 1 and 1.25 litres of milk. The Turkana breeds have a lactation period of about 12 months. Additionally, the Turkana breeds take a longer period of time before attaining maturity compared to other camel breeds.

Globally, Kenya is the largest camel milk producer in the world, followed by Somalia and Mali (Figure 1) yet the highest exporter of processed camel milk products is the USA followed by New Zealand (Figure 2). Camels unlike other dairy animal species, have a high genetic variability which is due to the lack of selection and the current and historical movements of camels between countries for trade and sometimes war. Breeding therefore remains an important intervention needed to improve the milk yields of existing breeds.

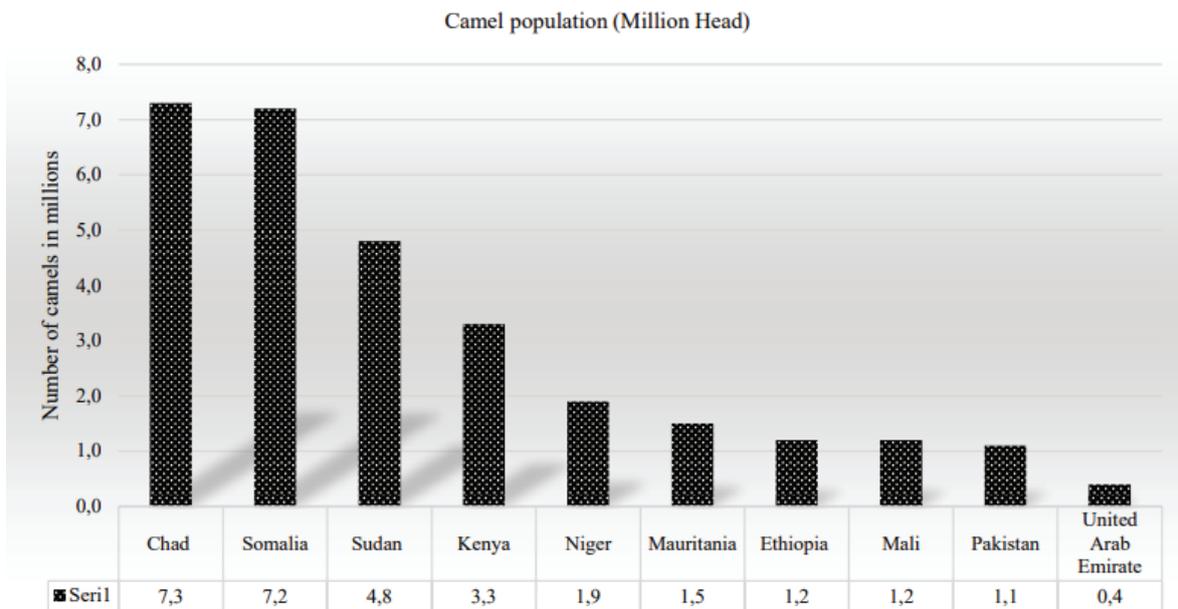


Figure 1: World Camel Population by leading Countries (Source Faraz et al., 2019)



Figure 2: The main camel milk exporting countries

### iii. The dairy goat

The largest number of goats in the world is found in China, followed by India, Pakistan and Bangladesh all of who constitute 45% of the world total. In Africa, the largest concentrations are found in Nigeria, Ethiopia, Sudan and Somalia (Figure 3). The global dairy goat population was estimated to be 218 million in 2017 with the largest number of goats observed in Asia (52%), followed by Africa (39%), Europe (5%), Americas (4%), and Oceania (<1%). The total global goat milk production was estimated at 18.7 million tonnes in 2017.

They are distributed in extremes of climates: from tropical desert, characterized by temperature extremes (0°-53°C) such as in the Thar, Sahel and Negev deserts, with insignificant rainfall and sparse vegetation; to high altitude mountain areas up to 2,500 m such as the Hindu-Kush Himalayan region; to the wet tropics with high temperature, humidity, rainfall (3,000-5,500 mm) and abundant vegetative cover, such as those

in many parts of South-east Asia. But, the preferred environments are the arid and semi-arid regions (Devendra 1999; Aziz, 2010). The Kenyan goat herd is spread across various ecological zones with the highest concentrations found in the semi-arid and arid counties of the North and North Eastern regions.

Total global goat milk production was estimated at 18.7 million tonnes in 2017. It increased by 62% from 1993 to 2013. From 2007 to 2017, production increased by 16%. The dramatic increase in the 1990s corresponds to the growth of the dairy goat population (Figure 2). During the 2007 to 2017 decade, Asia witnessed the largest increase in goat milk production (22%), followed by Africa (13%), and Oceania (9%), Americas (5%), and Europe (4%). Europe however contributes 15% of the total goat milk with only 5% of the population, because of greater specialization and commercialization. Genetic selection of dairy goats in Europe and North America has resulted in increased production and longer lactation. The specialized dairy goat breeds used in high income countries therefore have high genetic potential for milk production. Demand for dairy goat products is rising in both traditional and new markets. Goat milk and products increasingly are preferred for their health and nutritional benefits, including greater digestibility and lipid metabolism, in addition to their taste, compared to cow milk. This best practice is scalable to other regions including Kenya.

### Global Dairy Goat Population by Region 1961 to 2017

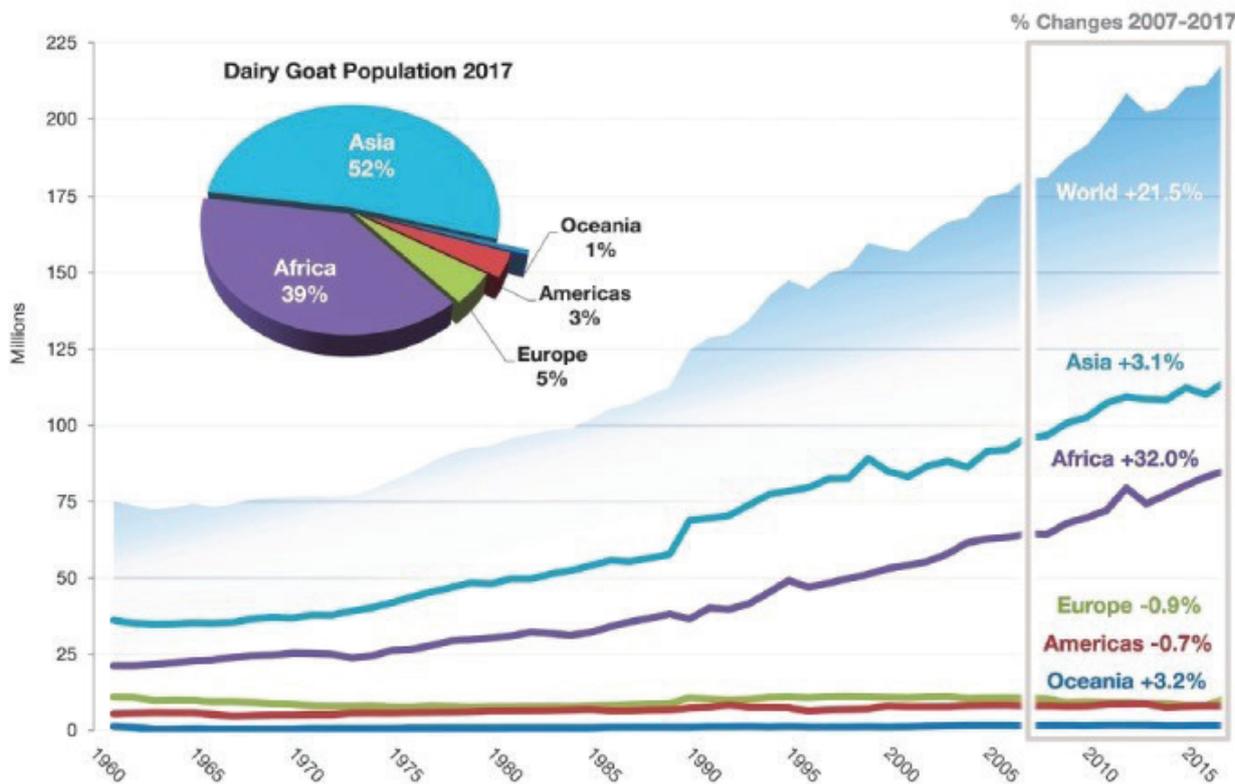


Figure 3: World dairy goat population 1961-2017 (estimated data)

Most small-scale dairy goat producers in developing countries, including Kenya, have no scientific knowledge of genetics and breeding. They apply valuable traditional knowledge regarding breeds and their management. Many indigenous groups or communities have developed their own local breeds, Artificial insemination (AI) is applicable but is used to a lesser but growing extent for breed improvement in goat dairy systems.

The commercial viability of the dairy goat system depends on the on farm breed improvement strategy and the herd density adopted by the producers (Morales et al., 2019). Generally dairy goat producers maintain a herd of 36-190 Doe each producing 3-5L/day over a 270 days lactation period. These are normally drawn from the five main breeds of dairy goats found in the world that are Toggenburg Saanen, Nubian, Alpine, and American La Mancha with Saanen goats being the popular breed around the world because of their high yields and volume of milk,

Demand for dairy goat products is rising in both traditional and new markets. Goat milk and products increasingly are preferred for their health and nutritional benefits, including greater digestibility and lipid metabolism, in addition to their taste, compared to cow milk.

On markets, the most organized market for goat milk is found in Europe, especially in France, but also in Spain, Greece, and the Netherlands. Dairy goat production in the United States began growing in the 1980s, and larger commercial farms are becoming increasingly important, driven by rising demand for goat cheese. Dairy goat numbers in the USA doubled from 1997 to 2012 driven by demand for goat milk derived cheese. The European goat sector is specialized for milk production, mostly for industrial cheese making, while also supporting traditional on-farm manufacturing. Government involvement is significant in sanitary regulation, research, extension, support for local producer organizations, and markets, and ensures safety and quality. The dairy goat sector thrives when producers have access to markets, and the tools and skills to sustainably manage their livestock and natural resources. These are most readily achieved through strong and inclusive producer organizations, access to technical services, and policies that enable the poor and marginalized groups to benefit from increasing demand.

### ***Dairy goat industry success factors***

***Drivers: Skills & knowledge, good breeds and markets***

***Strategy (How?): Breeding programme, technical training services, enterprises, organised producer groups, supportive policies & funding***

#### ***1.2.3 Effective and Efficient Dairy Enterprises***

In most developed countries, dairy farmers control milk collection and primary processing through farmer owned cooperatives. The dairy co-operatives transform milk from their farmers into bulk dairy ingredients or basic dairy products, sold under the co-op's own brand or retailer store brands. The farmer-owned cooperatives in most Western Europe Countries were merged over time into single large regional farmer controlled firms. The mergers were done to improve efficiencies of scale and scope in the collection and processing of farmers' milk in order to compete more effectively in international dairy markets. The strategy aligns its actions to this best practice by proposing actions that will support and promote

federating the many fragmented dairy cooperatives into a few large firms to standardize operations that target growing the industry's export segment. Strong cooperatives with commercial and social functions will create new strategies for innovation, product differentiation, marketing, and growth.

The Israel dairy industry is considered as the most advanced in the world riding on a strong private sector business model. The model is supported by a robust cooperation culture enjoining farmers, the dairies and the government, high level of professional services, shared database, education and Innovation. These define enterprises at the milk production, feed and fodder production, milk collection and processing and associated support services. Milk production is done through two systems;

- i. The Moshavs are some 573 private farms, each with an average herd size of 350 cows producing an average of 15,000 litres of milk per day with a herd average of 46L/day.
- ii. The Kibbutz system that is run on 164 cooperative with a herd average of 12,025kg/year per cow. farms , feed formulation, processing and delivery, a turnkey AI service delivery system, data capture, analysis and information sharing,

The New Zealand production model relies on well-paid professional managers to run the production farms as units or as a group of farms. The New Zealand dairy industry is a high income sector with dairy farm managers earning incomes ranging from \$63,000 to \$160,000 per year; the operations managers in charge of large or multiple dairy farms earn from \$66,000 to \$160,000.

The Chinese enterprise model runs on large-scale farming with the 25 largest farming companies of milk delivering 9.4 billion kg of the country's production or 29% of the 32 billion kg country production. These farming companies had 1.7 million dairy cattle or on average nearly 68 thousand animals each. These companies run a structured system with centralized purchasing of milk from stellar companies, a process that gives them power to stabilize prices and quality of forage and feed and makes them less vulnerable to fluctuations of feed prices. The dairy farms for these stellar companies have dairy herd sizes of 1,000 to 20,000 cows each. The companies have a complete setup of staff with experts in each specific field within the dairy farming operation. This leads to proper and systematic management of the farm personnel, ensures training and teaching of employees, giving each employee opportunity to work in specialized work area where they undertake specific and uniform tasks, leading to high professionalism and productivity by both animals and employees. The Large-scale dairy farms are technology driven adopting state-of-the-art milking facilities and feed management techniques, both of which have increased productivity.

China's dairy farm modernization strategy currently focuses on standardization, mechanization, genetic improvement and farm scale. The future will be the shift to automated milking and feeding, and precision dairy farming. These technologies will further improve efficiency, productivity and animal health. These large-scale dairy farms accounted for nearly 70% of total dairy farms in 2020. In the Netherlands the trend show that the total amount of dairy farms is decreasing, but the size of dairy enterprises is increasing.

The best practices on intensive and extensive production systems from the developed dairy industries informed the transformative the actions in this strategy. It targets supporting the formalisation and

restructuring of some 160,000 dairy industry enterprises, nurturing 26,000 entrepreneurs and enhancing the knowledge aptitude, skills and practices (KAPS) of some 616,000 dairy workforce over the ten year period (Table 4). This is based on vision data analysis done for the sector factoring an expanded milk production and marketing from current 5.11 Billion litres to 14 billion Litres. The enterprises targeted are those on milk production, and innovative firms along the value chain that provide services and supply inputs. The services would range from collective farm or herd management as practiced in New Zealand to services that specialise in herd testing, feed and nutrient management, data collection, analysis and archiving, AI, marketing, trade and cold chain systems etc.

The input supply chain could include enterprises that specialise in production, conservation and supply of fodder and feeds, installation and management of IT, machinery, equipment and robotics. Promotion of the enterprise model will also consider building strong cooperation and vertical and horizontal integration of the enterprises to benefit from scale and scope of operations.

Innovative and professionally managed enterprises and strong producer organizations will improve availability and access to good information, health care, production inputs and technology, improved genetics, transport, and markets across the value chain and thereby contribute to the modernisation of the industry.

**Table 3: The Dairy Industry Enterprise Profile (Source TWG strategy calculations 2022)**

Enterprises		Entrepreneurs Numbers	Employees Numbers	Milk Volumes liters	Value Add in Shillings
Type	Numbers				
<b>Milk Supply Chain Enterprises</b>					
Commercial Farms	155,000	940	155,000	10,462,500,000	345,262,500,000
Commercial Millennial Farms	10,000	10,000	30,000	1,800,000,000	59,400,000,000
Aggregators	26000	47	52000	9,810,000,000	19,620,000,000
Transporters	2800	47	14000	9,810,000,000	4,905,000,000.0
Primary Processors	260	260	780	7,357,500,000	36,787,500,000
Large Processors	5	5	250	2,207,250,000.0	110,362,500,000.0
Traders	17000	94	17000	8,583,750,000.0	17,167,500,000.0
<b>Sub Total</b>	<b>211,065</b>	<b>11,393</b>	<b>269,030</b>		<b>593,505,000,000.0</b>
<b>Hubs</b>	<b>150</b>	<b>150</b>	<b>1500</b>		
ATVETS/ATC/KSA/DTI/AHII	150	47	600		
Incubators	6	12	60		
Agrovets	9000	47	9000		
Artificial Insemination Services	1800	47	1800		
Calf Nurseries	150	150	1500		
Animal Health	2000	2000	8000		
Laboratories	150	12	600		
Bull Schemes	150	6	450		
Business Development Services	3000	12	6000		
Semen Systems	2	2	10		
Cooperatives Services	47	47	940		
MSHG	7000	47	7000		
Feed & Nutrient Management	12	12	120		
Machinery/Tech Services	6	6	60		
Animal Health Insurance	5	5	500		
Fodder Management	10000	940	40000		
<b>Total</b>	<b>455,758</b>	<b>26,328</b>	<b>616,200</b>		<b>593,505,000,000</b>

## 1.2.4 The Enablers

Development of dairy enterprises for the cow, goat and camel milk value chains require investments to integrate inputs, markets, research, and production infrastructure. Government policy and action are critical to ensure establishment and growth of the proposed enterprises, the roll out of targeted breeding and support the reorganisation and modernisation of the cooperative and the cooperate sub sectors and that they benefit can benefit from the benefits of the planned modernisation efforts.

### i. Regulations

The dairy industry in developed countries grew in the backdrop of structured, supportive and fit for purpose government regulations, policies, legal and funding frameworks. Israel regulates its dairy industry through an advanced institutional and regulatory framework. The Israel Dairy Board (IDB) is a body mandated with the responsibility of facilitating and coordinating cooperation among the various market participants. Implementing the government policy for the market, including setting quotas and marketing, managing milk surplus, improving professional standards, promoting the consumption of milk and dairy products and to engage in research on market related issues. Other institutions exist that are responsible for checking and authorising milking parlours and welfare, Veterinarians who specialise in Udder health and laboratory technicians who operate a state of the art, ISO certified laboratory 17025, specializing in the diagnosis of mastitis pathogens and milk quality tests.

The Israel Cattle Breeders Association (ICBA) represents all cow milk producers in Israel and manages the Israeli Herd Book that collects information from about 90% of the dairy cows in the country. Sion is the leading AI & Breeding Company in Israel, responsible for 95% of all inseminations in the country. Hachaklait engages in prevention and control of infectious and production diseases & Herd health, is involved in food safety and animal welfare and carries out clinical field trials.

In New Zealand, the mergers of the dairy cooperatives was enabled by the enactment of the Dairy Industry Restructuring Act, 2001 (DIRA). The Act made the merger possible through legislation leading to the establishment of Fonterra, New Zealand's largest dairy processor in 2001. Fonterra was established through the amalgamation New Zealand Co-operative Dairy Group Limited (NZDG) and Kiwi Co-operative Dairies Limited (Kiwi), alongside the sole statutory exporter, the New Zealand Dairy Board (NZDB). This enabled the merger of the cooperatives by sidestepping the prohibitive demands and regulations set by the Commerce Commission. Fonterra became the largest processor of milk in New Zealand, processing 82 percent of all milk solids as of 2018. The amalgamation improved the value chain efficiency improving the competitiveness of New Zealand's milk products internationally. The country has also standardized its operations and follows a strategy that utilises seasonal production system aligned with feed availability. In winter most processing facilities close while it focuses its product range on exporting transport-friendly dairy ingredients (e.g. milk powder), driven by the need to process the surge in seasonal milk rather, than perishable products.

Europe regulated its milk production by enacting CAP in 1962 (Common Agricultural Policy) that subsidized a guaranteed minimum price for dairy products. This incentivized increased milk production

that in response increased from 1962 levels until the end of 1970 when supply outstretched demand. In response the European Union introduced the milk quota system that was in force until 2015. The European Commission uses number of mechanisms to protect the milk sector during times of increased market disturbance. Market intervention in particular is used to provide a safety net in case of serious market imbalance, in the form of public intervention and aid for private storage. The public intervention for the dairy sector consists of the buying up of butter and skimmed milk powder (SMP) by public authorities, placing it in public storage for as long as needed, until market conditions allow for its release back on to the market. Support can also be channeled. The public aid is also granted for the private storage of butter, SMP and certain types of cheese during periods of glut.

In the United States, the pricing of milk involves a wide variety of pricing regulations based on public policy decisions with the sole objective of ensuring that the public gets the milk it wants, while dairy farmers get the economic returns needed to provide the milk. The milk pricing regulations in the USA stem from pricing reform of 2000 that introduced end-product pricing formulas, by which regulated milk handlers are required to pay producers based on their utilization of the milk. The regulated minimum milk prices reflect the end-product pricing formulas and the farm's share of the revenue sharing pool. Some developed temperate countries (e.g. Canada, Japan) typically produce all the milk they consume and use trade barriers to protect their dairy farmers.

These frameworks and benchmarks provide the entry points for a review process through which fit for purpose and supportive regulations will be formulated to support modernization and growth of the industry. Reference to market interventions and pricing mechanisms applied in the developed economies form a basis for consideration.

## **ii. Funding Support**

Dairy production is European Union's second biggest agricultural sector by value (€59.3 billion in 2019), accounting for around 14 % of agricultural output. This significance is matched with adequate funding provision to support farmers engaged in milk production. Fluctuations in prices affect producers' income and this is addressed through the common agricultural policy (CAP) which provides mechanisms like direct payments, a safety net and exceptional measures to mitigate this risk. Dairy farmers therefore have two main sources of revenue: receipts from the sale of milk, and direct payments from the EU budget. Most direct payments from the EU budget are based on the number of hectares farmed, regardless of production. Fluctuations in the volume of milk produced, or the price paid by dairies, do not affect the amount of direct aid paid to farmers. In addition to direct payments per hectare, dairy farmers may also receive a separate direct payment linked to production, called voluntary coupled support (VCS).

In the United States, the federal government enables the dairy industry by subsidizing the excess production of cow milk. USDA makes payments to dairy farmers impacted by market volatility and disruptions as a result of the COVID-19 pandemic and ensuing Federal policies. It also provides funding to support dairy business innovations.

These lessons buttressed the need for a milk commodity fund to support modernization actions. Secondly, the National Food Strategic Fund (NFSF) milk component should be restructured and remodeled by developing tools and systems that guide the responsive actions needed to address the price and milk volumes volatility as they occur. The NFSF should also develop the incentive structure to support nascent enterprises as they grow in the industry.

### **iii. Organizations**

An important model for influencing markets and government action is through organized producer marketing outfits. Organised dairy industry supports marketing of milk while ensuring good returns to actors within the value chain. The top-5 largest dairy exporters in the world are New-Zealand, the US, Belarus, Germany and the Netherlands.

Globally it is estimated that about (75–85) % of what the consumer spends goes back to the farmers in the co-operative sector. The 15-25% deductions normally cover the value of services rendered and subsidized inputs. The co-operatives procure all the milk brought in by their members to collection centres, Private dairies follow a different approach in milk procurement compared to cooperatives. The private organized players are not obliged to purchase entire quantity of milk from the farmers. The organized private players also hire aggregators at the village level to procure milk and transport it to the processing units.

In India, the creation of the 'Anand pattern' across the country introduced a three-tier cooperative structure at the village society (The DCS for milk collection and payment to farmers), district union (that procures all milk from the DCS, then processes and markets liquid milk and value added products) and state federation (a milk producers' union at a state level responsible for marketing the liquid milk and products of member unions through a common brand name. Some federations also manufacture feed and support other union activities) that promoted collective farmer action and ensured that the farmers got remunerative price for their milk as a stimulus for boosting the country's milk production. This model transformed India from a milk-deficient nation into the world's largest milk producer, surpassing the United States of America in 1998 with about 22.29 percent of global output in 2018. Within 30 years, it doubled the milk available per person in India and made dairy farming India's largest self-sustainable rural employment generator. This model spurred total milk output in the country but it did not translate individual farm units into high income enterprises.

In Netherlands, several dairy farms have organized themselves into cooperatives, through which they sell milk to the milk processing companies owned by the same cooperatives. This ensures supply security and market leverage, and is an investment in the future generations of dairy farmers giving the sector its strong international position (NZO, 2017). Continued collaboration between government, research and education institutes and the dairy industry ensures safety and high quality of products in the Dutch dairy chain. The industry is well organised through a strong and well-resourced membership organization, the ZuivelNL. This enjoins dairy farmer organizations in the primary sector and dairy industry organizations. ZuivelNL, focuses its activities through a number of thematic groups, namely: food safety, animal health, sustainability, research & innovation, labour issues, and export. In addition, ZuivelNL provides services in

the area of market information and general education regarding the dairy sector. The market information activities of ZuivelNL also include managing the secretariat of the national commission that determines, on a weekly basis, the Official Dutch Dairy Quotations. The organisation also formulates critical questions about issues and developments that members are facing and try to correct erroneous laws and regulations.

In Kenya, local examples abound on enterprises that are revolutionizing the milk supply chain through organized collection processing and marketing. In Elgeyo Marakwet and Nandi Counties for instance Metkei Multipurpose Company (MMC) and Kabiyet Dairies variously established processes for central collection point of milk for the dairy farmers for the purpose of bulking, chilling, quality control and marketing. Githunguri Dairies and Meru Dairy Cooperatives collect, process and market milk on behalf of farmers.

The goat and camel milk value chains are not as well organized in the developed countries. The wide diversity of production systems and autochthonous breeds makes the sector very heterogeneous. In order to improve viability, a number of strategies need to be adopted to solve the current problems such as a low profitability, absence of generational change and a little or no recognition of the social and environmental role of the sector.

Organized goat and camel dairy producer groups could emulate the successes with the cow milk sector by driving strategies that could improve the situation of the goat and camel milk sectors through:

- i. Generating market value that will recognize the diversity of the dairy goat and dairy camel sectors (breeds, feeding models, derived products);
- ii. Promoting and raising awareness of the functional attributes of goat and camel milk and derived products so as to increase consumption;
- iii. Assigning an economic value to environmental and social functions;
- iv. improving working conditions through technological innovation to make goat and camel farming more attractive to young people;
- v. Efficient Animal Health and Business Development Services

The Dutch dairy sector is characterised by quality systems ensuring best practices in dairy farming, as well as many initiatives to ensure the sector's sustainability. Their policy efforts are geared towards supporting a circular agriculture through promotion of precision agriculture and farm innovations, creation of more possibilities for experimentation, rewards for sustainable farming practices among others.

The Dutch education system is public and organized in such a way that on most disciplines, like agriculture, students can be educated at all levels. From secondary, diploma, college, university (vocational to academic) education training and curricula are designed according to potential of the students. Extension & training is offered privately, by commercial training institutes, supplying companies and consultancies. R&D is privatized and conducted by contract research organisations,

#### v. **Dairy industry data, information and knowledge management system**

In India, structures are in place to facilitate milk recording and genetic evaluation (Hegde, 2006b; Duclos et al., 2008; NDDDB, 2013). A milk-based selection criteria has been adopted for the selection of breeding bulls using pedigree information as well as progeny testing. Key features comprised the “OVO Triangle” and aligning subsidies or tax arrangements. The OVO triangle was a well-organized knowledge system with intentional interaction between Onderzoek, Voorlichting & Onderwijs (Research, Extension & Education/ Training). From the 1980’s subsidies to the OVO system were reduced and many public organizations were either privatized or their tasks were taken over by private organizations, often financed through the ministry of Economic Affairs. Currently such activities are conducted through Public-Private Partnerships, in which companies and knowledge institutes cooperate in innovative research projects

### 1.3 *The Kenyan Context*

The best practices point to a need for restructuring Kenya’s stocking density of 3-5 cows on some 1.8 million small holder units, 30-50 cows on some 2000 medium scale commercial units, and over 100 cows on large commercial systems (Rademaker et al., 2016). For the goat and camel species, the sectors are very heterogeneous with average herd sizes of 4 Does and 5 camels managed through a diversity of production systems and autochthonous breeds. The goat and camel systems have low profitability without any structured breed improvement system.

The strategy takes cognizance of the best global and national practices reviewed to align a long term national breeding programme for developing a synthetic Kenyan breed that is efficient and adaptable for an intensive dairy production system and a farm based county supported breed improvement programme targeting trait improvement for the existing herds across the counties. The synthetic breeding programme will develop a Kenyan specific efficient and adaptable millennial animal with an average herd yield of 20L/day, 8L/day and 15 L/day for the cow, goat and camel respectively. The second programme will build on existing AI and bull systems to progress the traits of existing crossbreeds and selected indigenous breeds to increase and stabilize average daily milk yields to 15L, 5L and 8L for the cow, goat and camel respectively. The national breeding programme for the millennial animal will be modelled along the Israel Holstein long term system while the AI breed improvement programme will support the existing herd at the county level. The strategy is aligned to the inclusivity clauses of the 2010 Kenyan Constitution and the SDGs principle of not to leaving anyone behind by providing the second process for transitional breed trait improvement. This county supported and farm based process will be supported by a revamped AI and bull services programmes modelled on the New Zealand system. It will be rolled to progress the milk yield traits of existing crosses from average 8L/day to 15L/day for the cow, 4 to 6L/day for the goat and 5 to 10L/day for the camel over the next ten years. Overall the herd numbers for the cow will be reduced to 155,000 from 1-1.8 million with 10,000 of these being the intensive systems millennial cow. The target for camels and goats will be 5000 and 6000 millennial camels and goats respectively and 200,000 and 100,000 improved camels and goats respectively.

An analysis of the profitability margins for the various species undertaken during the strategy formulation process derived stocking densities for the millennial animal of at least 30 milking cows with a herd average

yield of 20L/day, 36 milking Does with an average yield of 8L/day and 30 Camels with an average milk yield of 20L/day (Table 3).

**Table 4: Kenya Dairy Industry 2022-2032 TWG calculations**

Species		Yield liters/day	Herd Numbers #	Herd Size #	Annual Profitability KShs
Cow	Synthetic	20	10,000	=>30	700,000
	Improved	15	155,000	155,000	400,000
Goat	Synthetic	8	6,000	50	800,000
	Improved	5	100,000	20	200,000
Camel	Synthetic	15	5,000	34	1,200,000
	Improved	7	200,000	30	120,000

The Kenya Vision 2030 recognizes dairy industry as one of the fundamental avenues for employment creation particularly for the youth (Government of Kenya, 2008). The industry forms the largest agricultural sub-sector after meat, horticulture and vegetable and animal oil and fats (KIPPRA, 2018) with unpacked fresh milk being among the top five foods consumed by most households in Kenya (KIHBS 2015/16). It accounts for more than 4 per cent of Gross Domestic Product (GDP) and 12 per cent of the agricultural GDP (KNBS, 2019a) with an annual milk production of 3.43 billion litres. Further, the sector is a means of livelihood to about 1.7 million Kenyans and growing at a rate of about 5 per cent per year (Ministry of Agriculture, Livestock and Fisheries- MoALF, 2019). A well-structured dairy industry, therefore, has the potential to play a pivotal role in job creation for the youth, thus propelling Kenya to achieve its development goals.

The dairy industry was liberalized in 1992 and since then, the sector has witnessed increased private sector participation particularly in the processing and marketing of milk, thus contributing immensely to creation of employment within the industry. According to FAO (2011a), the dairy industry is estimated to generate 76 jobs for every 1000 litres of milk sold.

Kenyan milk production is 3% of the 18% global production by Sub Saharan Africa. The dairy industry has been growing at an estimated rate of 5 per cent per annum in the last few years. The milk production is estimated at 5.2 billion litres per annum. Milk productivity stands at between 7 and 9 litres per cow per day. The cow that produces the most milk in the world hits 110 litres in a day, but in Kenya the highest is 70 litres. There are more than 1 million smallholder dairy farmers, according to surveys done by the Smallholder Dairy (Research and Development) Project (SDP), contributing more than 70 per cent of gross marketed production from farms.

In Kenya, dairy is predominantly practiced by smallholders who produce over 80% of the milk. There are approximately 5.1 million animals producing 6.6 billion litres (MOALF&C Livestock Statistics with a current per capita consumption of 110 litres against WHO recommendation of 240 litres. It is projected that consumption will increase to 220 litres per capita by 2030 due better incomes and better marketing. This will translate into an increase from the current annual demand of 5.2 billion litres to 12.76 billion litres of milk. This demand for milk by 2030 cannot be achieved at the current national average productivity levels of 7-8 litres of milk per cow per day with the best counties of Kiambu, Meru, and Nyeri registering the highest production at 12.6, 11.7 and 11.3 litres/day respectively. These low yields means that the number of animals

required to meet the 2030 milk demand would be too many. The path to meeting this increased demand in milk consumption is greater increases in animal productivity levels accompanied with some increases in the population of dairy cattle. To meet this demand therefore there is a need to increase the yield per cow per day and the herd sizes.

### **1.3.1 The Evolution of Kenya Dairy Industry 1901-2021**

The Kenyan dairy industry found its roots in the early period of 1900 with the entry of pioneer settlers such as Lord Delamere, H.E. Watts of Lumbwa and the Sandbach-Bakers of Muthaiga. In the early years, the major problems which confronted the settlers included lack of information on the soils and climate, the emerging competition from new cops, disease and pest incidences and frequent incidences of economic depression.

Cattle breed improvement initiatives started almost a century ago when European settlers first introduced dairy cattle breeds in Kenya. To guide and assist the colonial farmers, input services and output market organisations were established. These included: the Veterinary Research Laboratories (in 1910); the Kenya Co-operative Creameries (KCC) (1925); the Animal Husbandry Research Station, Naivasha (1935); the Central Artificial Insemination Station (1946); and, in 1958 the Kenya Dairy Board to regulate dairy marketing. The government established an experimental station at Naivasha in 1903 that evolved into the current day KALRO Naivasha. The station together with other private farms successfully undertook selective breeding of local cattle and importation of pure bred stock such as Friesian, Guernsey and Hereford. The Kenya Stud Book was established to keep animal breeding records in the early 1920s. Since then, major cattle breeding-related activities have been introduced. These include the Livestock Recording Centre, to keep livestock statistics and performance; Dairy Recording Services of Kenya - formerly Kenya Milk Records - to keep milk performance data; Central Artificial Insemination Station (CAIS) to produce semen; and the Kenya National Artificial Insemination Service (KNAIS) to distribute semen. To assist further the adoption of the higher-yielding inputs and enhance dairy productivity, duties were waived on imported semen and embryos. However, the breeding efforts were not well coordinated and they suffered perpetual financial problems that rendered the breeding programs ineffective.

Artificial insemination (AI) services were introduced in the 1940s. The application of artificial insemination was centred initially at Naivasha and later established at Kabete. It was well supported initially resulting over time in the fine modern dairy cattle associated with Kenya. The service used motorized daily runs and frozen semen. Initially the AI program was quite successful, especially amongst smallholders, and the Swedish Government was a major external financier. However, AI services did not escape the general problems of high operational costs and subsequent subsidies; its decline started in 1979, with government inseminations falling from 548,000 a year to around 60,000 by 1997 (Figure 2). This drop was accelerated by the progressive increase in the subsidized price of an insemination from KES 1 (about USD 0.05-10 depending on the year) that had been set in 1971, to an average of KES 2000 for locally produced semen today (some USD 20) post privatization, and double that for imported semen. In order to deal with these problems and as part of a wider agricultural liberalization policy, the government decided to privatize AI service provision in 1991. It also licensed private companies to import genetic material. However, the

private sector did not grow sufficiently to replace the government service and many farmers resorted to bull services of unknown quality. There was a dramatic shift from AI to bull service between 1990 and 2000 by highland dairy farmers. In addition to licensed AI providers, who are mainly vets, a few private large- to middle-scale commercial farms and co-operative societies run their own AI schemes using semen bought from CAIS. Since 1997, however, private provision of AI services has fluctuated, raising concerns regarding the manner of privatization and continued government involvement in AI service delivery. The strong legacy from the colonial era, including AI, recording systems and breed societies, provided the impetus for a strong genetic improvement system. Encouragement from the government, with external support particularly from Sweden, led to widespread uptake of improved cattle among smallholder African farmers. However, the liberalization and privatization process and lack of finance to government-supported institutions have led to significant decline in the ability of support services to sustain genetic improvement and in use of AI by farmers.

In principle, the animal breeding programs have aimed at improving dairy productivity, shortening calving intervals and enhancing herd fertility by minimizing breeding diseases while eliminating the cost of keeping a bull. Exotic breeds of cattle when crossed with local breeds do significantly improve milk yields in a sustainable manner. Finding an appropriate exotic-local breed mix has been, at least nominally if not actually, the principal objective of various dairy-breeding initiatives by the Kenyan Government and other development agents.

In the formative years of dairy development in Kenya, some unfamiliar cattle diseases mostly blackquarter, anthrax, Rift Valley fever, rinderpest, East Coast fever, contagious bovine pleuro-pneumonia, redwater, paratyphoid, haemorrhagic septicaemia, anaplasmosis and enzootic-pneumonia took a huge toll on the dairy cattle. This necessitated the establishment of the Veterinary Department in 1903 that became effective after the establishment of a new Kabete laboratory in 1910. The laboratory was used to investigate cattle diseases, manufacture serum and vaccine for the treatment of diseases leading to a huge progressive prevention and curing of most diseases in the period 1910-1971. Only foot-and-mouth disease remained a challenge. In 1960, Wellcome Research Institute on foot-and-mouth disease was established at Kabete. In order to expand the dairy industry into areas infested with tsetse fly, research on cattle trypanosomiasis was launched and is still actively in place.

Until the early 1950s, indigenous Kenyans were not permitted to engage in commercial agriculture and large-scale white settler farmers dominated dairy production. Following the State of Emergency in the liberation struggle in 1952 and the Swynerton plan of 1954, African farmers were allowed to own land, cultivate cash crops and keep improved dairy cattle. By 1963, when Kenya attained independence, the dairy herd had expanded to about 400,000 exotic cattle and their crosses with the local East African zebu.

After independence in 1963, many foreign settlers who opted to leave the country sold their farms to Africans or to the government. Many of these farms were rapidly sold to African smallholders resulting in a decline of the dairy cattle population in large-scale farms to 250,000 heads by 1965 and a rapidly expanding smallholder herd. To encourage dairy production, the government effected a number of changes in the

provision of livestock production and marketing services. By 1966, free or cheap and efficient livestock services were introduced including clinical and daily runs to provide artificial insemination services. Over time, smallholder farmers gradually came to dominate dairy production, which was partly attributable to the efforts of government (with the support of its development partners and the private sector) to promote dairy production and marketing using a variety of policy instruments and strategies that include:

- Supportive regulatory framework
- Effective breeding and artificial insemination services
- Effective tick control and well-structured and effective veterinary clinical services
- Dedicated investment in research and extension services
- Favourable pricing and taxation policies, Favourable feed prices and quality, good market and trade policy
- Strategic promotion of marketing services, such as through cooperatives and
- Expansion of rural infrastructure (e.g. roads, electrification, water etc).

With the increasing dominance of smallholders, the first veterinary clinical centre was opened in 1974. By 1978, eighteen clinical centres were in operation, expanding to 284 by 1995. Clinical services operated with strong public sector support, including government-employed veterinarians and nominal charges for drugs.

These efforts significantly contributed to the rapid growth of the dairy industry until the early 1980s, when inadequate government budget allocations caused the quality of services to decline. In 1988, the government started to gradually increase the rate of cost recovery as well as encouraging the establishment of private veterinarians. Since the liberalization period of the mid 1990s, public intervention has focused on retaining surveillance and prevention of notifiable diseases, such as anthrax, contagious bovine pleuropneumonia (CBPP), ECF, foot-and-mouth disease, heartwater, lumpy skin disease and rinderpest. Since that time, clinical services were almost entirely to the private sector, with little attempt to support or coordinate the privatization process. As a consequence, privatization of veterinary services was generally slow and patchy, especially in areas with low concentrations of dairy cattle.

One of the primary disease threats to dairy cattle in Kenya, particularly those with exotic genes, is East Coast fever (ECF) - a tick-borne disease which causes significant mortality. The practice of cattle dipping started in 1912 to control ticks and other disease vectors. Among smallholders, communal dips were the main approach in tick control programs after independence; by 1987 there were over 6000 dips in the country. Disease and vector control programs were a major source of success in the dairy industry, although their management was not very efficient. Following the collapse of government-run dip services, dips were handed over to local communities and were run by community management committees on a revolving fund basis. The success of this arrangement has been mixed to poor; some have reverted back to government supervision but with no improvement in service provision and less than half of communal dips were reported to be operational by the end of 1997. Many farmers have opted to use hand-sprayers due to the decline in dipping services.

During the colonial and immediately post-independence era most clinical vet services in Kenya were provided by private practitioners and 'Vet Scouts'. Vet Scouts were local livestock keepers who received informal training from local vet staff, were employed by the County Council and seconded to the government, and lived and provided clinical and other services in the villages. Sessional Paper No I (1965) 'African Socialism' set the scene for a massive increase in government livestock services, to be provided for free throughout the country, and massive investment in the professionalization of the veterinary service. Vet Scouts at village level were gradually phased out and replaced by Vets and Animal Health Technicians (AHTs), based at Divisional and Locational level respectively. The Private Practitioners went out of business.

Sessional Paper No I (1986) 'Economic Management for Renewed Growth' set the stage for structural adjustment within government and the gradual privatization of public services. In 1987, The Intermediate Technology Development Group (ITDG) introduced training of Community Animal Health Workers (CAHWs) to fill the emerging gap. From the outset ITDG intended to test the approach, and if successful, to seek to influence the policy environment so that the approach could be replicated more widely.

After many years in preparation, the KVA Privatisation Scheme was finally launched in 1994. This EC funded scheme provided soft loans to veterinarians wishing to set up in private practice. Originally conceived in 1989 it had taken nearly five years to develop because the KVA, dominated at that time by Government vets, could not find an affordable loan package attractive enough to encourage any government vets to leave the security of a government job. Meanwhile many of the unemployed vets had quietly established private practices without any loan at all. The unemployed AHTs had a harder time however, in 1995, Kenya Association of Livestock Technicians (KALT) was finally registered to regulate the operations of AHTs. Currently Veterinary services are offered by both private and government employed surgeons.

The marketing of milk in Kenya on the other hand evolved centred on two models: the corporate with KCC and Brookside as dominant actors and the informal. The Kenya Co-operative Creameries (KCC) was registered as a company in 1925 and in 1932 became a registered co-operative under the Dairy Industry Act (Cap 336, Laws of Kenya). After its first creamery was opened at Naivasha in the 1920s, KCC rapidly expanded to become the biggest milk processor: by the early 1980s it had 11 milk processing and another 11 milk cooling centres with a combined installed capacity in excess of one million litres per day. A few farmers' dairy co-operative societies (FDCS) also operate their own cooling centres, some established through donor-supported dairy development projects. At this time, KCC had a government-mandated monopoly on all urban milk sales. Of milk supplied to the KCC, 34% came from large-scale producers, 54% from small-scale producers through their co-operatives, and 12% from individual small-scale farmers who supplied KCC directly. The KCC was regarded as the milk buyer of the last resort, although it was not able to accept all the milk offered for sale during 'flush periods' due to plant capacity limitations. Surplus milk was made into skim-milk powder and butter and also ultra-high temperature treated (UHT) milk for distribution to more remote areas and also primary schools under the School Milk Feeding Program. In May 1992, reforms took place in the industry and price controls were abolished to create a competitive self-sustaining dairy industry, characterized by increased private sector participation. The liberalization was interpreted to also imply the lifting of the KCC's urban milk monopoly, although that was never explicitly

decreed. With liberalization, KCC milk intake showed a downward trend that led to closure of most of its processing plants. New private processors, co-operative societies and informal milk traders became major participants in milk marketing.

With the promulgation of the new constitution and advent of devolved units of government, the clinical functions were assigned to County Governments.

### 1.3.2 Camel milk production

Kenya is the leading camel milk producing country in the world with a herd of 3.2 million camels spread in the semi-arid and arid parts of the country. Milk production rose from 328,000 litres in 2006 to 1.12 million litres in 2021 (Table 5). The industry is growing with the entrant of private actors in the processing part of the value chain. The key challenges in the value chain are seasonal availability of forage that affects yields, poor genetic traits and low management skills.

**Table 5: Camel Milk Production by Leading Countries**

Item #	Production %	Production Volume Ltrs				
		2006	2007	2019	2020	2021
1	Global	95.55%	1.81M	2.87M	3.09M	3.15M
2	Kenya	35.70%	328.00K	837.27K	1.13M	1.12M
3	Somalia	30.75%	870.00K	963.04K	966.06K	968.62K
4	Mali	8.60%	152.23K	265.68K	271.00K	271.00K
5	Ethiopia	7.73%	95.79K	282.17K	182.03K	243.43K
6	Saudi Arabia	4.32%	100.00K	133.08K	134.27K	135.93K
7	Niger	3.56%	92.76K	109.15K	110.56K	112.00K
8	Sudan	2%	50.00K	61.00K	62.00K	63.02K
9	United Arab Emirates	1.85%	40.00K	53.33K	56.56K	58.18K
10	Chad	1.04%	16.97K	30.28K	31.44K	32.64K

### 1.3.3 Goat milk production

Dairy goat development in Kenya started in the mid-1950s, with the introduction of exotic dairy goat breeds. Major projects to improve the dairy goat sector were not realized until the late 1970s under United Nations Development Programmes (UNDP) funded and FAO executed projects, which lasted until the mid-1980s. These projects encountered technical, logistical and financial constraints that hindered their quick expansion. However, dairy goats remain an important and quick source of milk for consumption or sale, which has an immense value especially to poor households. According to statistics from the Ministry of Agriculture, the total goat population in the country was 15 million in 2018, of which 400 thousand were dairy goats. An important constraint for the value chain is lack of supportive frameworks with most focus having been attached to the dairy cow. Despite this, goat farming doubled over the last decade following an increased interest in the venture by many farmers in the country. This was spurred by changing consumer tastes and preferences due to the known nutritional and easy to digest qualities of goat milk.

## *1.4 Rationale & Justification*

The current Dairy Master Plan was formulated before the advent of devolved governance systems and therefore is not aligned to the demands of the devolved system. It is also not fully aligned to the demands of Vision 2030 and the sector wide Agricultural Transformation and Growth Strategy both of which are people centred with specific lead on the income levels desired for livestock and pastoral dependant households.

The Strategy focuses on the government of Kenya's aspirations on wealth creation, food and nutrition security and creation of decent employment through transformation of subsistence farming systems into commercially oriented enterprises. This is in line with the aspirations of the government that targets transforming Kenya into a middle income economy and prosperous nation that is globally competitive and that offer its citizens with a high quality of life through enhanced incomes, nutrition and food security and environmental health as envisaged in the vision 2030 and the SDGs.

The national dairy industry transformation strategy and investment provides the framework to inform planning at the national and county levels deriving a clear pathway for the dairy subsector with metrics that will guide formulation of the MTPIV and the third generation CIDPs. The present and new challenges in the country's dairy sub sector require realignment of dairy development programs and strategies with the emerging opportunities and best global practices to resolve, a process addressed by the strategy.

The strategy and investment plan proposes actions that are necessary to drive transformation anchored on four principle drivers; the actor, the animal, the enterprise and the enablers. Its formulation is pragmatic making a departure from traditional need based planning processes to more outward and result based vision process. It also ingrains and mainstreams issues of gender, HIV/AIDS and climate smart agriculture into actionable elements with specific objective of achieving the following:

- i. Provide pathway for formulating programmes, projects and plans as instruments for implementing the strategic actions;
- ii. Drive a knowledge and technology based industry
- iii. Provide a framework to inform county planning and resource mobilisation needed for the development of the sub-sector.
- iv. Create a mechanisms through which private enterprises will be nurtured and public private partnerships supported to leverage private investment in the dairy sector.

## *1.5 Constitutional, Policy & Legal Environment*

There are multiple policies, legislative frameworks and new ones are being developed to address current challenges. The dairy sector strategy will have enabler components to ensure the programs are implemented in suitable environment. The enablers will include policy reviews, enactment of laws and regulation and appropriate regulations. The laws will provide for establishment of new and reforming existing institutions. One of key issues affecting profitability of dairy sector include high cost of farms inputs that are influenced by national fiscal policies touching on taxation regimes and requirements of East African custom union. There legislations in the process of development that will have great impact on dairy industry and competency

of dairy value chain actors such the livestock bill, animal health bill and veterinary public health bill. Animal identification and products traceability will ensure milk product trail can be traced from farm to folk. Food safety coordination bill also provide food traceability. The existing policies, legislations and institutional framework on which this strategy is anchored and aligned are captured in the table below

**Table 6:** Review of policy and legal context

<b>Current Policy Instrument</b>	<b>Relevant Provisions of the Instrument</b>	<b>Alignment of the Dairy Instrument to the Provisions</b>
Vision 2030 (MTP I, II, III, IV)	(I) contribute to 10% growth of GDP and transform Kenya into a newly industrializing, “middle-income country providing a high quality life to all its citizens by the year 2030	Income growth for dry industry actors; having food and nutrition security to assure high quality life for Kenya citizens
Big Four (4) Agenda	Food security, affordable housing, universal health care, manufacturing and Job creation.	dairy industry contribution to nutrition security; provision of raw materials for industrialization; expanded opportunities for employment and incomes for affordable housing
Agriculture Sector Transformation & Growth Strategy (ASTGS)	To transform agriculture sector for Increasing incomes among small farmers, pastoralist and fisher-folk incomes; increase agriculture output and value add; Increase HH food resilience; enablers	Transformation of the dairy industry from need based to income based industry; private sector lead strategy; investment in change agents;
Sessional Paper No. 3 of 2020 on the Livestock Policy	Improve management of livestock feed and rangeland resources; Promote animal Health and food safety; promote investments in marketing, agribusiness value addition and product development; Support dairy research and extension services; promote and collaboration;	Creation of quality control mechanisms for raw material supply systems; investment support;; mechanism for unregulated areas of the dairy industry not under Sessional Paper No. 2 of 2013 on Dairy industry
Sessional Paper No. 2 of 2020 on the Veterinary Policy	Directs for observation and compliance of sanitary measures in production, processing and trade in dairy industry to assure human & animal health and facilitate trade in animals and associated	Control and management reproductive diseases, pests and dairy
Sessional Paper No.4 of 2011 on National Sector Extension Policy	‘To empower the extension clientele through sharing information, imparting knowledge and skills, and changing attitudes so that they can efficiently manage their resources for improved quality of livelihoods’	Creation of quality control mechanisms for raw material supply systems; investment support;; mechanism for unregulated areas of the dairy industry not under Sessional Paper No. 2 of 2013 on Dairy industry
Dairy Industry Policy, 2013	it provides policy directions on how to Improve the productivity and competitiveness of Kenya’s dairy and dairy Products; Positively contribute to the livelihoods of milk producing households; Increase domestic consumption of milk and milk products; Contribute to national food security; Transform the industry into an exporter of dairy animals and products; Maximize dairy exports in the regional and global markets; Re-orient milk processing towards long life dairy products	Will define the industry issues and provide overall policy interventions for development dairy industry

Current Policy Instrument	Relevant Provisions of the Instrument	Alignment of the Dairy Instrument to the Provisions
Dairy Industry Act, CAP 336	Gives the CS powers to make regulations; prescribes for establishment of a regulatory body (Kenya Dairy Board-KDB) and its functions including ; to operationalize this Act; register producers; improve quality of dairy produce; secure reasonable stable prices to producers; promote market research for dairy produce; collaborate with other government agencies to promote efficiency in dairy industry; license private enterprise in in production processing and sale of produce consistent with the efficiency of the producer and interest of the farmer	The Act provides a mechanism for implementation of those policy interventions that require enforcement , regulation and control
Dairy Industry Regulations of 2021	Specifies how each prescription in the Act will be administered in the dairy industry on; dairy produce safety; import & export ; pricing of dairy produce; milk sale contract; produce traceability and recall; compliance officer; return reports estimates and; registration licensing cess and levy	Enforces the dairy industry act and dairy industry dairy industry self-executing policy interventions
Animal Diseases Act, CAP 364	To control notifiable diseases by declaring infected areas, prohibition of importation of infected animals, , slaughter and disposal of infected animals , prescription and control of vaccines and drugs on animals	To improve governance of veterinary services and create disease control framework in the dairy industry
Public health ,Act CAP 362	No person shall sell or expose for sale or import or bring into any market or have in his possession without reasonable excuse any food for man in a tainted, adulterated, diseased or unwholesome state, or which is unfit for use, or any food for any animal which is in an unwholesome state or unfit for their use	equipment used for production, transportation and processing; introduction of other additional substances in the dairy produce and products
Food Drugs and chemical substances Act, CAP	Makes provision for the prevention of adulteration of food , drugs and chemical substance	Marketing of dairy produce; processing additives in dairy products
Prevention of Cruelty to Animals' Act CAP 360	Prescribes measures how to protect the welfare of the animal and reduce stressful situations	Housing of animals; pest infestation and control;
Cattle Cleaning Act, CAP 358	Prescribes how animals will be kept free from ecto-parasites including ticks, mites through various mechanisms; gives powers to inspectors to declare areas where animal are kept as clean or unclean	Management of communal facilities; standardized use of drugs
Veterinary Surgeons and Veterinary Paraprofessionals Act, CAP No. II of 2011	Provides for training , registration and licensing of veterinary surgeons and veterinary para professionals to provide for matters relating to animal health services	dairy industry sanitary professionals; lacks other professional bodies to regulate production, breeding , feeds

<b>Current Policy Instrument</b>	<b>Relevant Provisions of the Instrument</b>	<b>Alignment of the Dairy Instrument to the Provisions</b>
Kenya Agricultural and Livestock Research Organization No.17 of 2013	establishes KALRO to promote , stream line , coordinate and regulate research in crops , livestock , genetic resources and biotechnology; regulate research in crops and livestock diseases and; expedite access to research information resources and biotechnology	Development of improved dairy animals , dairy technologies & innovations for increasing milk yields, improvement of feed quality
Fertilizers and animal Foodstuffs Act , CAP 345	provides for regulation of the importation, manufacture and sale of agricultural fertilizer and animal feedstuff and substances of animal origin intended for the manufacture of such fertilizer	
Environmental Management and Coordination Act, No. 8 of 1999	Establishes NEMA which administers the provision of the Act and other agencies to deal with various aspects of environment.The Act prescribes to lead agencies to enforce environmental provisions	Waste management in intensive dairy production systems and industry processing plants for produce and inputs; and regulations use of
Climate Change Act , No.11 of 2016	Prescribes mechanisms and measures to review levels and trends on greenhouse gas emissions; adaptation to climate change; enhance energy conservation, efficiency and use of renewable energy and; strengthen approaches to climate change research and development training and technology transfer.	Reduction of greenhouse gas emissions from dairy animals (numbers versus production), adaptability of animals to changing climate; circular farming; use of biogas
National Bio-safety Authority Act, No.2 of 2009	to facilitate responsible research into, and minimize the risks that may be posed by, genetically modified organisms; to ensure an adequate level of protection for the safe transfer, handling and use of genetically modified organisms that may have an adverse effect on the health of the people and the environment; to establish a transparent, science-based and predictable process for reviewing and making decisions on the transfer, handling and use of genetically modified organisms and related activities.	organization and creation of use of GMOs for feeds and animals
Standards Act , CAP 496	Establishes Kenya Bureau of standards to promote standardization in the industry and commerce ; to control the use of standardization marks and distinctive marks; to prepare frame , modify or amend specifications and codes of practice	industry inputs and produce quality standards; enforcement of the standards; creation of codes of practice for different actors (service providers, processors, dairy cooperatives and groups , input suppliers- feeds, veterinary drugs, semen )
SACCO societies Act, No. 14 of 2008	Regulations for governance of cooperatives , provision of vertical and horizontal integration of functions and organizations , protection of members	
ICT policy & Act		guide in creating communication strategy, market information collection and sharing,

Current Policy Instrument	Relevant Provisions of the Instrument	Alignment of the Dairy Instrument to the Provisions
Public Finance Management Act , 2013	Governs allocation and a management of public resources for development and creation of funds	allocation of finance for creating an enabling environment (policy & legislations establishment, infrastructure & equipment, establishment of a fund,
Access to information No.3 Of 2016	provides for the right to access information, protection of information; facilitate protection of persons who disclose information; framework to facilitate public education	development of dairy sector communication strategy

## 2. SITUATIONAL ANALYSIS

### 2.1 Current Situation

Kenya has one of the largest dairy industries in sub-Saharan Africa. It has a well-developed production and processing capacity based on over 5 million improved cattle. This is the largest such herd in Africa with more dairy cattle than the rest of the countries in East and Southern Africa combined. In economic terms, the dairy industry is the single largest agricultural sub-sector in Kenya, larger even than tea; it contributes some 14% of agricultural GDP and 3.5% of total GDP. Except during extreme drought years, Kenya is generally self-sufficient in milk and other dairy products. Annual milk production is estimated at about 5.11 billion litres (KDB 2020), although the country has a domestic supply potential of 12 billion litres (About 64% of milk produced is marketed while 36% is consumed at home or fed to calves).

**Table 7:** Kenya Milk Production 2010-2019

Year	Cow milk	Camel milk	Goat milk	Sheep milk	Total production
2019	3,983,250,000	1,165,210,000	273,233,000	107,239,000	<b>5,528,932,000</b>
2018	3,749,000,000	854,669,000	227,797,000	86,427,000	<b>4,917,893,000</b>
2017	3,560,702,000	876,224,000	256,000,000	66,600,000	<b>4,759,526,000</b>
2016	4,115,473,000	848,939,000	221,591,000	89,342,000	<b>5,275,345,000</b>
2015	3,444,214,000	811,634,000	212,131,000	82,579,000	<b>4,550,558,000</b>
2014	3,424,954,000	747,934,000	224,655,000	84,054,000	<b>4,481,597,000</b>
2013	3,686,431,000	870,864,000	268,543,000	62,408,000	<b>4,888,246,000</b>
2012	3,732,960,000	910,846,000	267,904,000	61,564,000	<b>4,973,274,000</b>
2011	3,711,364,000	890,276,000	262,909,000	60,156,000	<b>4,924,705,000</b>
2010	3,638,592,000	892,039,000	260,326,000	58,737,000	<b>4,849,694,000</b>

Small quantities of dairy products are also exported to neighbouring countries. Smallholder dairy farmers, estimated to number over 1.5 million households, account for more than 85% of the annual total milk production and 80% of total marketed milk). Dairy production is concentrated in the highland and high- and medium-potential areas of the country, occupying about 2.8 million hectares (GoK 1991). The ranking of milk production by counties show that Nakuru is the highest milk producing county followed by Kiambu and Nyandarua (SDL, 2020) as presented in Table 8 below. Whereas the Counties in Lower Eastern, Coast, the Northern Region Economic block and the former Nyanza regions are milk deficit areas, they form some of the areas with best potential for animal feed and fodder production.

**Table 8: Milk production by county**

	<b>County</b>	<b>Milk (kg)</b>	<b>dairy cow population</b>	<b>unit price</b>	<b>milk value (ksh)</b>
1.00	Nakuru	381,052,370.00	451,709.00	34.00	12,955,780,580.00
2.00	Kiambu	346,043,587.18	267,700.88	35.00	12,111,525,551.16
3.00	Nyandarua	317,226,292.00	354,393.00	40.00	12,689,051,680.00
4.00	Meru	264,169,779.30	200,680.00	50.00	13,208,488,965.00
5.00	Uasin Gishu	207,868,882.00	342,172.00	30.00	6,236,066,460.00
6.00	Trans Nzoia	187,027,290.26	31,412.00	30.00	5,610,818,707.79
7.00	Kericho	184,700,000.00	265,586.31	40.00	7,388,000,000.00
8.00	Nyeri	178,521,770.00	384,198.00	40.00	7,140,870,800.00
9.00	Nandi	168,490,518.50	228,488.00	32.00	5,391,696,592.00
10.00	Muranga	139,229,823.00	326,802.00	33.00	4,594,584,159.00

### 2.1.1 Knowledgeable and skilled dairy actors

#### i. Milk Production

Besides growing crops for subsistence and commercial purposes, most dairy farmers keep up to three cows with their followers, typically on about one hectare of land in the intensively farmed high-potential areas and 2.5 hectares in the less intensively farmed medium-potential areas (Staal et al. 1998). Dairy production systems largely entail mixed crop-livestock farming which includes other livestock (mostly poultry, sheep and goats), cash crops (coffee, tea and horticulture) and subsistence crops (maize, beans and vegetables)..

The Kenyan dairy industry at production level is mainly a smallholder subsistence based system engaging human labour in the pastoral, ranching and semi intensive production units across the country's agro-ecological zones. The actors are mainly the firm operators (herdsmen, farm labourers) with below primary basic education. This compares dismally with progressive countries like New Zealand, Ireland, and USA that assign dairy management to knowledgeable and skill personnel with at least a certificate level of competence. This contributes to low output and productivity since the actors lack the requisite skills and knowledge needed to institute good agricultural and climate smart practices. The other skills and knowledge gap experience d at this level are those on financial literacy entrepreneurship, agribusiness and agricultural economics.

#### ii. Feed & fodder production and feeding

Modelled scenarios have shown that improving livestock nutrition can on its own double milk production. However Kenya faces a net deficit of 40 percent green fodder, 20 percent dry crop residues and 30 percent concentrate feed ingredients. This deficit in animal nutrition is adversely impacting dairy productivity and production. A great impediment on production and management of animal feed and nutrients is inadequate capacity in terms of existing knowledge, skills, aptitude and practices and required capital resources required to invest in modern technologies for feed production and management. Actions that enhance skills and knowledge on fodder production, conservation, distribution and utilisation and adoption of technologies and practices for exploiting existing potential and resources are proposed. This can be achieved through targeted use of simple feeding technologies, commercialization of seed supply systems, better processing of biomass, and exploitation of new feeding methods, and developing effective feed rations.

As at 2014, the installed capacity for concentrate feed production was 1 million metric tonnes across some 106 registered commercial feed manufacturing companies. Furthermore only 60% of this capacity was utilized with the biggest constraint being inadequate supply of oilseed cake. The country only produced 30% of the 60,000 MT oilseed needed leading to a high dependence on imports with major supplies coming from the EAC partner states.

Secondly, the sector depends on an unstructured fodder production and management system leading to high volatility in supplies in terms of quality, volumes and prices. An analysis of the needs of the industry based on calculations by the TWG point to a demand of 13 million acres of land required for the production of ingredients needed for hay and silage making and formulation of the Total Mix Ration (TMR) for an intensive 3 million dairy herd. A study by USAID – KAVES in 2017 established that Kenya required 2117 million bales of forage annually for both dairy and beef comprising 1387 bales of grass and 584 bales of legume forage. About 15 per cent of this forage is normally silage (KALRO, 2013).

The country produces an estimated 2.5 MMT of silage. Over 80 per cent of the silage is fed to dairy cows while the rest is given to other animal species including beef cattle in feedlots and dairy goats. It is also estimated that Kenya produces 4.3MT of fodder legumes and that demand for quality fodder legumes will rise to 15.7MT by 2030. Silage and fodder legumes production in the country faces a number of challenges among them; Low productivity, climate variability and change, shrinking land sizes, poor handling, storage and transportation, limited mechanization and unstructured and seasonal markets factors that can be resolved through improved technical and management capacity and access to investment capital. There is need therefore for developing smart and precision based intensive fodder production systems and innovating on the TMR mixes to reduce the acreage required to meet this increasing demand. Research on improved feed stocks, appropriate TMRs and fodder production systems is needed together with an emerging entrepreneurial generation to exploit the opportunities.

### **iii. Aggregation, collection, processing and value add**

The total milk processing capacity in Kenya was approximately 3.75 million litres per day; approximately 46% of this capacity was utilized in 2018 of which 1.2 million litres per day was an installed capacity for production of Ultra Heat Treated (UHT) milk. More than half of the installed capacity was investment by the private sector. It is expected that the enhanced use of this capacity will help expand the country's penetration of the rural and regional export markets.

The country had 29 registered dairy processors of which 25 were actively producing a wide range of products including fresh milk, yoghurt, ghee, cheese, and milk powder. Besides the processors, there were 67 registered mini-dairies and 173 cottage industries (KDB, 2019). Between 2007 and 2021, processed milk constituted an average of 10 % of total milk production and about 18 % of marketed milk (KDB, 2019) with the fresh liquid milk being the predominant product sold in the local market.

The milk imported by Kenyan firms is mainly in powder form and is meant to safeguard the processors' market share during the dry season when local supplies are low. However, 98% of the milk imports in 2020

came from Uganda as UHT milk. The largest markets outlets for are individual households who absorb over 80% of total dairy products marketed, Lack of equipment and skills are the greatest impediment that stifle diversification and expansion of the product range. The other challenge is internal and emerging external competition for the market between the dairies. This challenge is the greatest threat to growth of the industry in country. For the dairies to remain competitive in the market, they need to diversify their product through value addition using simple and cost effective methods. This requires investment in competent human capital with innovative capacity to develop new products, penetrate and capture existing markets within and outside the country.

#### iv. **Marketing and trade**

The Kenya Dairy Board, estimates the annual milk production in the country as 5.2 billion litres, half of which is consumed at the farm level while some 2.6 billion litres goes to both the formal and informal markets. About 86% of the total milk is sold in an unpasteurized state with prices ranging from KShs 20 to 40 per litre for the cow milk, KShs 50-60/litre for goat milk and 60-70kShs for camel milk. The prices are seasonal and depend on availability of forage and the weather. Addressing and stabilising feed and fodder availability across seasons is a major strategy intervention that when implemented will stabilise milk production and prices. Per capita consumption stood was estimated at 110 litres/year in 2019 and this occurred without the benefit of a national nutrition and diet guideline nor strong promotional measures to spur milk consumption.

2020	
%	Age Group
38.59%	0-14 Years
58.90%	15-64 Years
2.52%	> 65 Years

The growth of the dairy industry in Kenya is stimulated by high demand of milk and milk products due to the expanding population and improved incomes in the rural-urban trading centres. A key demand driver for fluid milk consumption is Kenya's demographics. More than a third of the national population is under 14 years-of-age, a cohort inclined to consume higher quantities of milk. This is further augmented by the school milk programme that also targets the same age cohort with a structured milk supply regime. The other driver are the dual income households, rapid digitization of commerce (e-platforms), increasing disposable incomes, growing urbanization, changing consumer lifestyles, and other demographic shifts. These are helping to pump up demand for processed, value-added dairy products.

In 2020, Kenya exported \$78.7k in milk, making it the 97th largest exporter of milk in the world. In the same year, milk was the 656th most exported product in Kenya. The main destination of Milk exports from Kenya were: South Sudan (\$25.3k), Uganda (\$20.8k), Democratic Republic of the Congo (\$15.7k), Poland (\$13.8k), and Germany (\$1.15k). The fastest growing export markets for milk of Kenya between 2019 and 2020 were Poland (\$13.8k), Uganda (\$6.54k), and Democratic Republic of the Congo (\$4.33k). (Figure 4)

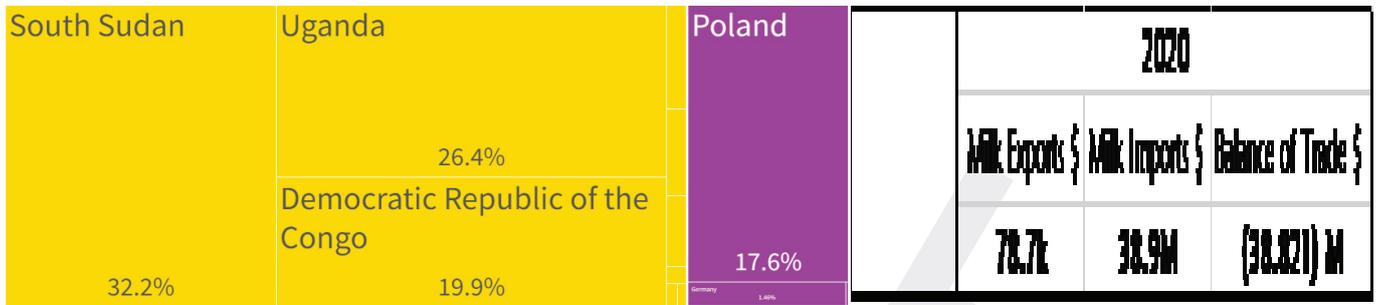


Figure 4: Milk import countries and by share of trade

In the same year, Kenya imported \$38.9M in milk, becoming the 38th largest importer of milk in the world. In the same year, milk was the 99th most imported product in Kenya. Kenya imports milk primarily from: Uganda (\$38.2M) or 98% of the imports, United Arab Emirates (\$323k), Rwanda (\$296k), Denmark (\$76.6k), and Germany (\$37k). The fastest growing import markets in milk for Kenya between 2019 and 2020 were Rwanda (\$282k), Denmark (\$30.4k), and Belgium (\$8.16k). In 2020, Kenya had a negative trade imbalance in favour of Uganda which supplied 98% of the imported milk.

Informal milk marketing, or hawking, occur in rural areas and in ‘zoned’ (urban) areas, even though hawking is considered illegal. The main participants in informal milk markets are dairy co-operatives, milk bars, middlemen/traders and farmers (Figure 5). The high proportion of raw milk sales directly to consumers and through informal traders is an indication not only of many consumers unwillingness to pay the extra costs of processing but also of strong traditional preferences for raw milk, which is generally boiled before consumption.

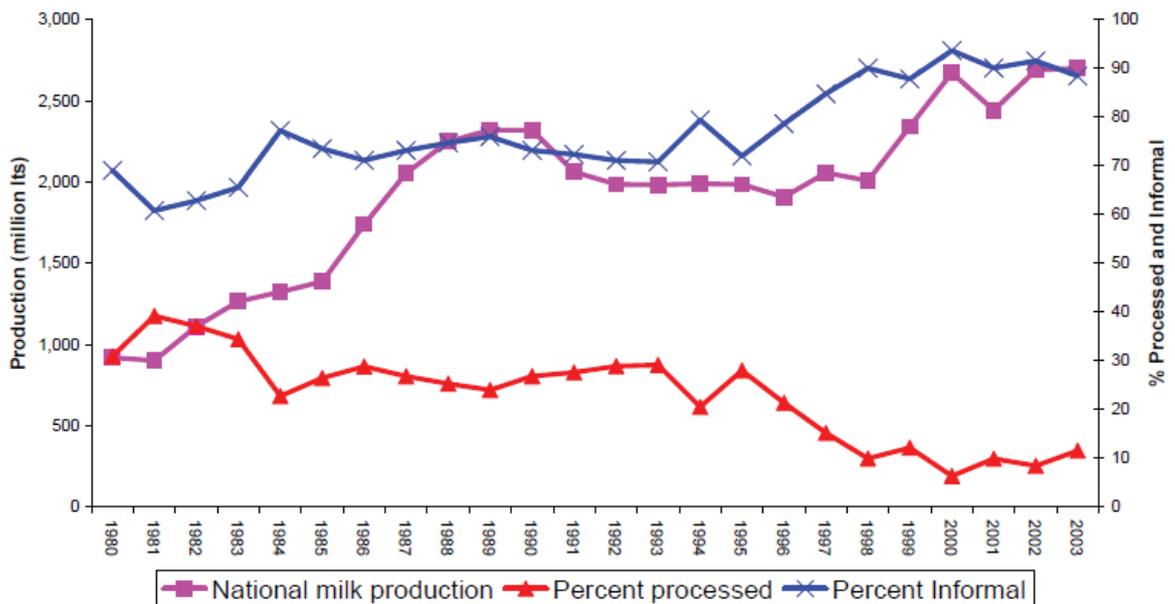


Figure 5: Milk production and processing trends

Kenya’s retail sector is not organized to drive the sales of value added dairy product yet their individualised efforts are spurring sales with 15-20 percent annual growth. Smaller packaged dairy products are being aggressively marketed for the second and third tier markets to deepen a brand’s penetration and increase the volume in the country. The increasing numbers of players in the dairy sector are focusing more on the untapped opportunity for growth in semi-urban and rural regions. Fit for purpose regulations that

reduce competition from informal traders will bolster the growth of the formal smaller and medium enterprises and provide the right framework condition for the growth of the industry. Better organisation and integration, especially in the initial steps of the value chain, would allow for more cost control, and profit maximization. Transport could be managed by the chilling plant, optimizing routes and minimizing costs. Increases in volumes that results from this integration will benefit all those on the chain i.e. producers, transporters, chilling plant owners.

### **2.1.2 Dairy Animals**

Since Kenya gained independence in 1963, significant changes in the dairy industry have occurred with a major shift towards smallholder production and marketing. The livestock population is estimated as over 10 million beef cattle, over 5 million dairy cattle and their crosses, 9 million goats, 7 million sheep and 800,000 camels. In the high potential areas with adequate rainfall and high population densities, exotic breeds of livestock and their crosses are kept for the production of milk, on both smallholder and large-scale commercial farms. Where available land is limited, farmers use zero or semi-zero grazing systems and cultivate fodders for dairy cattle. In these areas, production is market-oriented. In the low potential areas, production is mainly by large commercial ranches, mostly keeping improved livestock breeds. In the arid and semi-arid areas (ASALs), indigenous livestock breeds, such as camels, goats and zebu cattle, are kept under pastoral and semi-pastoral systems

The breeding program currently depends on AI services that need to be revitalized within a liberalized and devolved environment in order to enhance dairy production in the country. The main issues affecting the breeding services revolve around:

- lack of harmonization of breeding organizations and activities
- government policy of not licensing inseminators trained by the private sector (only those with government training are licensed) but high cost of private AI services where these are available
- perceived high failure rates in AI services
- lack of availability or systems to produce stabilized crossbreed semen
- need for proper formulation of effective and viable bull schemes in areas where efficient AI is impossible or uneconomical
- Need for a national breeding policy and implementation programme.

### **2.1.3 Dairy Enterprises**

The Kenya dairy industry is 80% driven by small holder informal producers acting individually through farmer owned cooperatives, private corporates, small and medium sized enterprises or government owned systems

#### **i. Production**

With 80% of the nation's milk production coming from small scale dairy farmers, the dairy industry in Kenya is faced with various challenges: High cost of milk production. High cost of collection per unit of milk. Low quality of raw milk delivered to the milk processor. This has led to dependence on low quality human resource, low investment and application of modern technologies fostering an inefficient, low paying

and unprofitable venture. The sector lacks records that would help track the evolution of the dairy firms' production and growth.

Dairy production systems are based on three common feeding systems for dairy cattle in Kenya: zero-grazing (i.e. stall feeding only), a mix of stall feeding and grazing (referred to as 'semi-zero grazing') and grazing only. Table 9 below indicates distribution of counties into the production systems. The extensive grazing only systems in get yields as low as 1-2 litres per day per cow, much lower than 15-30 litres observed on farms practicing either zero grazing or semi intensive systems. Based on the calculation of this strategy a middle income livelihood oriented specialised dairy enterprises are those with 34 dairy herd size for intensive systems and over 50 dairy herd size for extensive systems.

**Table 9:** The production systems in Kenya by County

Production system	Counties
Intensive system	Garissa, Isiolo, Kiambu, Kirinyaga, Mandera, Masarbit, Meru, Murang'a, Nairobi, Nakuru, Nyeri, Samburu, Tana River, Turkana, Wajir
Semi-intensive system	Bomet, Bungoma, Busia, Embu, Homabay, Kakamega, Kericho, Kisumu, Kisii, Machakos, Makeni, Migori, Mombasa, Nandi, Nyamira, Nyandarua, Siaya, Tharaka Nithi, Trans Nzoia, Uasin Gishu, Vihiga
Extensive system	Baringo, Elgeyo Marakwet, Kajiado, Kilifi, Kitui, Kwale, Laikipia, Lamu, Narok, Taita Taveta, West Pokot

Farmers at production level lack the knowledge or business skills to measure their costs per litre of milk produced. Benefits of additional feed or animal care are rarely examined in the context of increasing yields. Farmers rely on cash flow from the informal channel, cash flow that is not sufficient to allow for investment in production. With limited cash, farmers often depend on open grazing to feed their animals. Feed costs may drop in open grazing, but farmers then become susceptible to the effects of seasonal weather patterns. Strong formal enterprises will transition the small production units into business outfits that attract professional and skilled operators and managers, funding needed for investment and linkages to markets.

## ii. **Aggregation and collection**

Most of the transporters in the informal milk market operate small systems like motor bikes, which carry small volumes of milk. This increases the cost of transportation. When milk is handled in large volumes like 30 tons, irrespective of distance, the unit cost is normally lower in the range of 2-3 KShs/litre. Small transport units can escalate the cost of milk by even KShs 10/litre making the value chain less competitive. The illegality of informal market is a barrier to entry for the establishment of a large transport company. It is also a barrier to entry to other transporters keeping the transportation margins high. The strategy proposes actions that will support development of few but large enough formal transport systems as a cost reduction and profit maximisation measure.

Milk should be cooled within 2-4 hours from the moment it is milked. The main objective of chilling is to preserve the quality of raw milk and reduce spoilage before milk is subjected to further processing. If they are not established by processors, chilling plants are most often owned by producers or individual small scale traders. Milk is either collected by the plant or delivered by producers or brokers. Many chilling plants

do not actively manage transportation, leaving it up to members and other suppliers. To be sustainable a chilling plant needs to be either forward or backward integrated as a cost centre of producers or processors. The chilling plant should manage costs and improve on utilization rates. Promotion of integrated aggregation and transportation systems will improve the efficiency of the value chains, reduce unit costs of handling, reduce losses and thereby improve competitiveness.

### **iii. Processing**

There are some 45 licensed processors handling less than 20% of the total marketed milk, while informal traders account for an estimated 38% of marketed milk: the balance is marketed directly to consumers by producers. Currently, the dairy industry has a processing capacity of 2 million litres per day; KCC has a capacity of 1.2 million litres per day with the balance in the private sector. The major private sector actor is Brookside that handles 45% of the formally traded milk in Kenya. The other key milk market actors and processors are Githunguri Cooperative Society and Meru Cooperative Society. The nature and owners of the processing facilities prescribe their business model.

Milk purchases by processors are driven only by volume and not quality. Processors are not willing to pay the premium for quality, discouraging investment in quality milk production and handling, and investment in cold chain needed to preserve the quality of milk. This creates a market failure to create and capture value through quality differentiation and makes exports impossible for not meeting the quality standards. The processors can influence production of quality milk if they increase the number of products derived from milk. The focus on quality will also increase the value proposition of extending the cold chain.

There has been a strong surge in investments in processing infrastructure and new plants, as new entrants enter the sector, including cooperatives that formerly supplied milk to major processors becoming processors of milk. This surge is a response to the call for value addition and changing consumers' preferences. Firms like Brookside, Sameer Agriculture and Livestock Limited (SALL), New KCC, Uplands Premium Dairies and Bio Food Products and Eldoville have invested in new plants and plant extensions. Highland Creamers and Foods (HCF), a family owned business, started active operations in July 2017 with diary processing in the heart of Kisii highlands, in Nyamira County. In the cooperative sector, following the success of Githunguri Dairy Cooperative, several cooperatives across Kenya have entered the dairy processing arena with the aim of enabling their members to derive maximum returns from their milk. These include, Kinangop Dairy, Wakulima, Ndumberi, Kangema Unity Investment Cooperative and Meru Central Dairy.

A number of county governments have also invested in the dairy value chain, especially in the milk cooling plants to reduce post-harvest losses and improve local milk production. Muranga County scaled this further by setting a milk processing plant in Makuyu on top of the cooling centres it had installed around the county. Other counties that are planning to set up processing facilities include Bungoma and Kakamega. The national government on the other hand bought 180 coolers, each with 3,000 litres capacity, and was on course to import 170 more.

These facilities will benefit from the milk production in Kenya that is estimated to grow to 12 billion litres by 2030 with the intake to the formal processing sector growing to 1 billion litres by 2025. This will ride on a steady rise in demand for processed and packaged milk products in the country, changes in consumer preferences for conveniently packaged and flavourful milk products, rising urbanization and incomes, the emergence of innovatively formulated and packaged dairy products and changes in the retail industry, where malls owners and big retailers are investing to make shopping fun. These factors are creating the best opportunities for the dairy industry to thrive. The sustained demand is also projected to grow as a result of increased demand for quality and safe milk products by consumers, regional integration and cross border trade, diversification in consumption (yoghurt and cheese) and uptake by industrial consumers in baking, confectionary and fast food/cafe sectors.

There are other processors that process goat and camel milk into fresh milk and yoghurt with those in goat milk processing cheese too. Kibiciku Farm, the proprietors of Kibidav Dairies in peri-urban Nairobi, produces Toggs goat milk and cheese. The notable camel milk processors are Kulan Foods Ltd and White Gold Camel Milk. The niche segments include cheese with Raka Cheese, Sirimon Cheese and Brown's Cheese as front runners selling premium cheese products to consumers and quick service restaurants such as KFC, Galitos, and Pizza Hut among others. Other significant players in the sector include Razco, who have a focus on premium yoghurts, and Glaciers Products, which is the leader in the ice cream category in the region.

A number of outstanding issues have been identified that can push the sector forward. More effort is still needed to enable the sector to deal with seasonality of milk production. Due to limited capacity to store excess milk or convert it to powder, which can be reconstituted during droughts when milk production is low, KCC and the other major processors are not able to buy all the milk delivered to them during peak seasons. Although Kenya at times especially during high seasons has surplus milk production, export to the regional market is restricted mainly due to the high cost of production that makes the products uncompetitive.

Strengthened processors will drive innovations that increase the number of high value products as well as open and penetrate markets. Bio Food Products introduced Greek-style yoghurt, lightweight milk bottles for their long life milk, while also signing partnerships with recyclers to help the company get back the used bottles for recycling. New KCC launched the country's first major lactose free products line while Brookside introduced a newer more affordable Delamere fruit yoghurt line that has since grown to be one of the country's leading yoghurt products. Sameer Agriculture and Livestock on the other hand has focused on new, lightweight packaging for its line of white milk, flavoured and fruit yoghurt products with an extended shelf life in the country, which is a first in the region. This points to a positive role in driving value addition and marketing. The strategy recognises this role in driving consumer promotion, product development and marketing and frames supportive mechanisms to enhance their influence.

Strengthened dairy processors will influence value addition and marketing to spur high milk prices returns to farmers and stimulate increased production

#### **iv. Business and Animal Health Service Providers**

The Veterinary Public Health services cover diagnosis, surveillance, epidemiology, control, prevention and elimination of zoonoses; food protection; management of health aspects of 28 laboratory animal facilities and diagnostic laboratories; biomedical research; health education and extension, protection of the environment and production and control of biological products and medical devices. Other VPH concerns include management of domestic and wild animal populations, protection of drinking-water and management of public health emergencies.

The Director of Veterinary Services (DVS) is tasked with carrying out disease surveillance, controlling the spread of diseases, controlling the movement of animals and creating campaigns to contain diseases. This enables Kenya to participate in trade by exporting live animals and animal products outside the country and to also maintain Disease Free-Zones (DFZ). Kenya's dairy sector disease control system is largely dependent on the availability of veterinary services. Veterinary services in the country are provided by both private and public veterinary professionals and paraprofessional. Currently, there are about 6000 Veterinary surgeons and some 10,000 paraprofessionals. This has however not resolved the challenges of service delivery. Animal health services are greatly understaffed and under resourced. The working environment of frontline health officers is not conducive in terms of personal incentives, working procedures and knowledge of the prevailing policy and legislative framework as well as of emerging animal health issues. While more resources should be allocated to public animal health services, local administrations could already establish partnerships with private actors and improve the working environment of animal health officers to make veterinary services more effective. Private sector organizations also play a critical role in supporting the dairy industry in the country by offering key services that include; financial services, training, input supply, commercial milk bulking and offering opportunities for marketing.

There is need to reform and restructure the business models of Animal Health Service delivery, Animal Husbandry Advisory Services and Input Supply (machinery, technology, chemicals, fertilisers etc.) to champion a more robust public private partnerships to improve on diagnostics, surveillance, epidemiology, control, prevention and elimination of zoonoses. Effective and efficient service delivery should be nurtured around models that have been proven globally and which can be adapted to the local context. Reforming and restructuring delivery services around hubs with a scale and scope that foster financial and technical sustainability would also drive production and delivery of safe milk with improved quality. The management of the Herd Book and collection of information from the dairy animals, provision of the insemination services, undertaking clinical field trials, prevention and control of infectious and production diseases & Herd health, monitoring and enforcing milk safety and animal welfare protocols should be remodelled to improve their effectiveness and efficiency.

#### **2.1.4 Industry Organisations**

##### **i. Dairy industry organization structure**

The Kenyan dairy industry is fragmented without a structured and organised market system. Milk marketing was liberalized in 1992 with the ending of the 60 years' dominance of KCC. This decontrolled milk prices and opened milk marketing and processing to both small-scale milk traders and formal private processors.

The effect was a fall of milk marketing in the cooperative societies in the 1990s farmers opting to sale raw milk to small-scale milk traders. This trend has persisted with an estimated 80% of Kenya’s milk traded through some 8 market channels without in built controls to enforce quality and milk safety (Table 10: The Kenya Milk Market Channels).

An integrated and structured dairy value chain fosters better performance by facilitating technological innovation, support production processes and quality services. Technological innovations in organised value chains help in collectively giving value chain actors and farmers in particular access to the market using the available resources. Coordinated and collective action normally results in product and market development activities. Organised and structured systems collect, process and share information with value chain actors enabling them to generate higher income through strategic actions like value addition and quality controls of the products. Developed dairy industries coalesce their activities and processes around one or very few organisations to champion marketing, milk safety and quality controls, milk derived products development and export expansion. An organised dairy value chain will resolve the issues that contribute to high costs of production and non-compliance to sanitary and phytosanitary standards imposed in the global market.

**Table 10:** The Kenya Milk Market Channels

<b>Milk Marketing Channels</b>	<b>Number of Intermediaries</b>
Producer-consumer	0
Producer-milk hawker-consumer	1
Producer-processor-consumer	1
Producer-processor-retailer-consumer	2
Producer-dairy co-operative-processor-retailer-consumer	3
Producer-milk transporter-processor-retailer-consumer	3
Producer-milk trader-processor-retailer-consumer	3
Producer-dairy coop-milk transporter-processor retailer- consumer	4

The strategy focuses on promoting better supply chain integration, improved linkages and trustworthy interactions between chain actors to reduce transaction costs and the risks involved in enhancing product quality and safety and reinforcing sustainability and adaptability. Highly integrated value chain will also drive improvements in production, handling and aggregation by improving the gate price and returns to the producers and other actors along the supply chain.

**ii. Data, Information and knowledge system**

Organizations and bodies undertaking animal recording have existed in Kenya since 1963 (Koskey I.S et al., 2011). However there are very many institutions involved without the benefit of integration (Figure 6). There is no integration between the various services that cover pedigree and performance recording with that of AI services, genetic evaluation and selection activities. This creates a serious obstacle for value-added services and feedback to livestock keepers. This has hindered the potential genetic gains that could have

been realized had such integration existed. The perceived benefits from recording by livestock keepers are also few, with little time and resources allocated for acquiring technical skills related to livestock genetic improvement. The effect is a low number of livestock producers registering animals and recording their production, with less than 5 000 animals registered per year from an estimated cattle population of 18.8 million (14.3 million beef cattle and 4.5 million cows), 26.7 million goats, 18.9 million sheep, 3.2 million camels (Kenya Livestock Breeders Organization [KLBO] records).

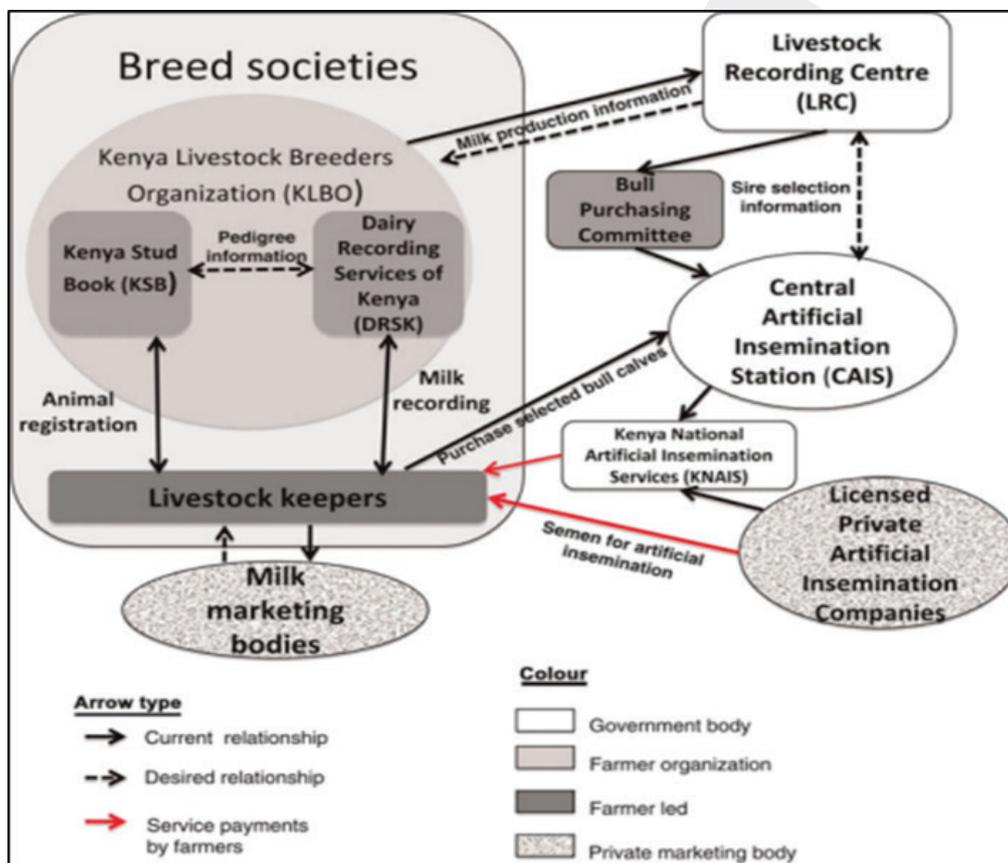


Figure 6: Kenya Livestock Information Structure

There is need for developing a suitable recording procedures for smallholder and pastoral production systems that can generate objective data for use in breed improvement within these systems. A standardized recording system for existing smallholders and pastoralists together with those establishing new dairy enterprises need to be developed, tested and validated by business service providers in collaboration with relevant researchers, Kenya Dairy Board and other national and county government agencies.

This strategy has reviewed successful cases, such as the milk recording systems developed in India for small-scale farmers that were initiated for the genetic improvement of indigenous animals and cross-bred populations, the New Zealand, Israel and Netherland models that are organised around private sector and producer and marketing organisations. Development of a project that will roll out an efficient and sustainable information system to support livestock improvement and infrastructure development and that involves farmers, extension agents, market agents and various service providers is proposed in this strategy.

### **2.1.5 Resource Mobilisation and Funding Mechanisms**

The future of dairy industry in Kenya require resources and skills to weather the new dispensation threats and challenges in order to build strong partnerships between processors farmers, retailers and suppliers of various technologies to the sector. Resources are required to improve systems, modernise farming and processing and to produce high value products competitively. The industry has to counter imports of cheese, butter, cream and milk powder from European countries, and liquid milk from Uganda which because of their lower prices, impacts the viability of the dairy industry in the country.

The dairy industry in Kenya has benefited from a surge in interest from leading private equity funds, venture capital firms and other big players in the international food and dairy industry, attracted by the strong fundamentals of the sector's growth. This has led to direct foreign investment in the sector majorly at the processing and retail level. Brookside Dairies, the country's leading milk processor, saw Danone take a significant 40% stake in the market leader in mid-2014, opening the way for more outside investors to enter the dairy industry in Kenya, after decades of government, cooperatives, and private family-owned enterprises. In 2017, a Dutch family fund, DOB Equity (DOB) invested an undisclosed sum in Countryside Dairy to grant them access to the world-renowned dairy processing technical capabilities in the Netherlands. Bio Foods Products received an investment of an undisclosed amount from TBL Mirror, an equity fund that facilitates and manages combined investment of capital and know-how in promising companies in East Africa and Nigeria. This investment has given Bio Foods the muscle and impetus to be a leader in innovations in the sub-sector leading to the roll out of several innovative brands in the fresh milk and yoghurt categories, including convenient packaging focused on sustainability. Pearl Capital Partners, a private equity firm, bought a minority stake worth KShs 200 million in Eldoville Dairies Limited, a leader in multi-partner initiative that has become a model for inclusive dairy businesses. These initiatives point to an attractive investment environment in the sector that need to be scale out to include investment at the production level. The growth of large farm enterprises will encourage investment from project, equity and venture funds beyond current dependence on loan financing from banks. Most financial institutions have a strong interest in increasing their finance to the dairy sector, but they face a variety of capacity constraints. On the other hand dairy farmers make little use of formal financial institutions for several reasons including the fact that credit financing on commercial terms is not viable for dairy farmers lacking off-farm income sources (Odhong C et al., 2019). This constraint exists although dairy farmers can make financially profitable investments in the sector. Access to formal financial institutions is limited among both dairy farmers and other rural households. However, compared with other rural households, dairy farming is associated with a greater likelihood of saving with a SACCO, microfinance institution and stocks and shares, as well as greater use of credit from SACCOs and goods suppliers. Household income and savings remain the most commonly use source of funds for both investments and operating expenses. This scenario points to a need for a supportive investment mechanism for the dairy sector to support milk production at farm level. For Kenya to drive an industrialised model of dairy production, processing and marketing, increased investment in human capital, technology transfer and adoption, growing enterprises and reforming the governance structures of the cooperatives will have to be made.

Currently the Kenya Government has a commodity fund established under Crops Act, 2013, (amended May 2016), Article 9 (1) to provide sustainable and affordable credit and advances to agricultural sector for: farm improvement; farm inputs; farming operations; agricultural Infrastructure development, support for agricultural value addition initiatives, price stabilization and facilitating capacity building related to credit absorption. However this fund only covers investments in the crop sector with special focus on coffee and sugar value chains.

The available government funding in the dairy sector is that which is normally assigned to KCC for price stabilisation. The fund under the National Strategic Food Reserve is normally applied to purchase milk from producers during periods of glut to romp market prices from falling below production costs. The mechanisms for determining the quantities and pricing to offer to activate the desired stabilisation has however not been framed. Development of specific instruments to aid the fund managers in rolling out the fund will improve the effectiveness and relevance of the fund.

Government supported funding is globally practiced by developed dairy countries like EU, USA, New Zealand and Israel. Dairy production is European Union's second biggest agricultural sector by value (€59.3 billion in 2019), accounting for around 14 % of agricultural output. This significance is matched with adequate funding provision to support farmers engaged in milk production. Fluctuations in prices affect producers' income and this is addressed through the common agricultural policy (CAP) which provides mechanisms like direct payments, a safety net and exceptional measures to mitigate this risk. Dairy farmers therefore have two main sources of revenue: receipts from the sale of milk, and direct payments from the EU budget. Most direct payments from the EU budget are based on the number of hectares farmed, regardless of production. Fluctuations in the volume of milk produced, or the price paid by dairies, do not affect the amount of direct aid paid to farmers. In addition to direct payments per hectare, dairy farmers may also receive a separate direct payment linked to production, called voluntary coupled support (VCS).

In the United States, the federal government enables the dairy industry by subsidizing the excess production of cow milk. USDA makes payments to dairy farmers impacted by market volatility and disruptions as a result of the COVID-19 pandemic and ensuing Federal policies. It also provides funding to support dairy business innovations.

In 2021, The U.S. Department of Agriculture (USDA) provided a \$20.2 million grant funding for the Dairy Business Innovation (DBI) Initiatives in the country. The program supported efforts by farmers to develop higher value uses for dairy products, diversify farmer income through processing and marketing innovation, and encourage the use of regional milk production.

The Kenya dairy sector require direct investments on herd improvement, technology adoption, skills development and to cover operational costs at levels that cannot be met by existing funding sources. A dedicated funding mechanism is required to finance industry transformation. This should augment other direct funding in the sector that is availed through national and county based development programs. The key financial institutions, programs and agencies that support the dairy industry are; World Bank, African

Development Bank, IFAD, FAO National and County Governments, KCB, Equity and Cooperative Bank, Producer organisations and Cooperatives, USAID, Sida, DANIDA. The calculations of this strategy indicate that the industry require investments in the range of KSHs 95 billion to ramp up milk production and the cold chain handling systems in the next 10 years.

## **2.2 Potentialities, Opportunities, Aspirations & Results**

The gains in dairy production and marketing in Kenya can be escalated by reframing existing challenges and constraints into possible opportunities. The sector needs solutions to fix feed and fodder availability and utilisation both in quality and volume terms, provision for efficient delivery of animal health services, addressing declining productivity through improved breeding of efficient and adaptable dairy animals and structuring the milk market. Primary marketing also require infrastructural development and adequate cold chain systems to reduce losses and wastage levels. Strong dairy organisations can advocate and lobby for the cess levied on milk to be used to improved] feeder roads and therefor reduce transport costs that affect farm gate milk prices. The strategy in applying a vision approach reviewed these opportunities to direct the theory of change and strategic modelling.

### **2.2.1 Potentialities**

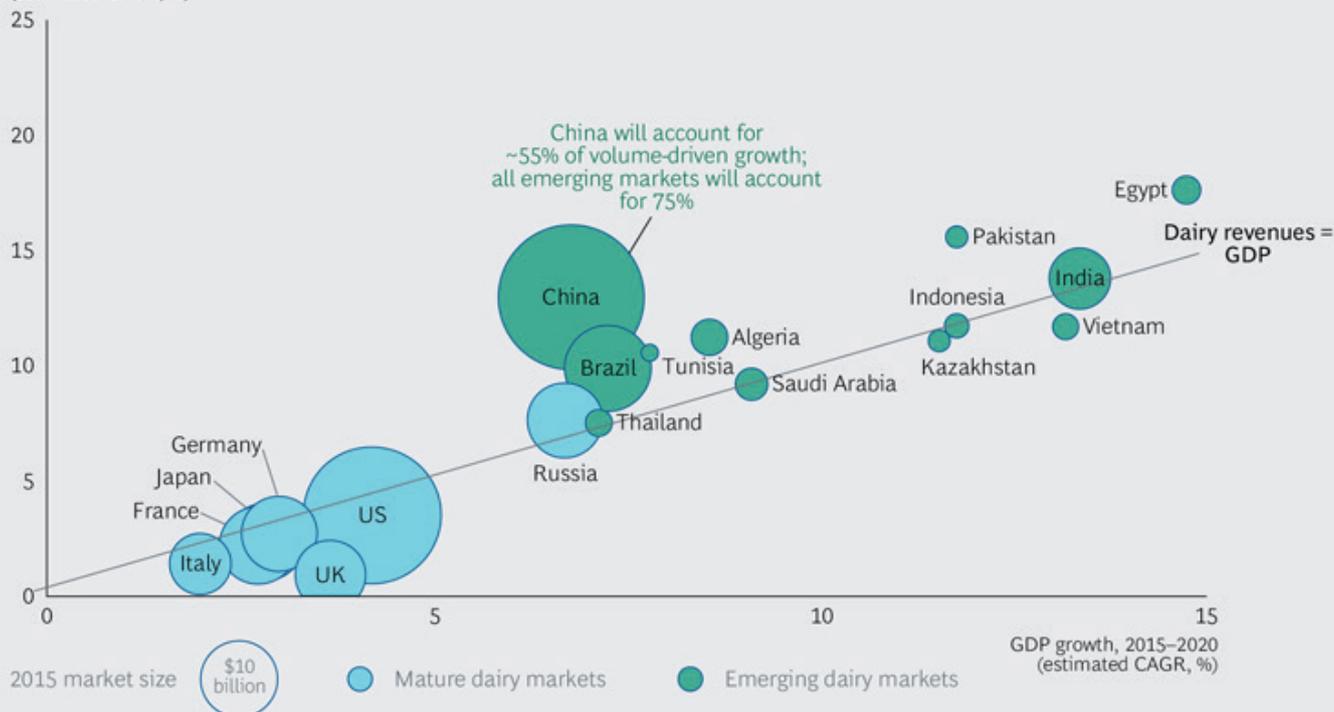
### **2.2.2 Opportunities**

The greatest opportunity for the dairy industry is the increasing demand for milk and milk derived products in Kenya and the emerging global markets (Figure 2) as a result of factors that include;

- A growing consumer population that places an increasing demand for quality and safe milk products
- The regional integration that captures a population of 260 million(Including DRC) people with a structured cross-border trade
- Rising incomes and growth of the middle class within the rising urban population that is projected to account for at least 30% of the total population
- Increasing diversification of consumption, for example there is increasing demand for yoghurt and more cheese is required for hotels and fast food industry
- Re-emergence of school milk program
- Growth in industrial consumers – baking, confectionery, fast foods etc
- Improved modern equipment supply and emerging competencies on their management, operation and maintenance
- The emerging commercialization of camel and goat milk value chains
- Improved systems for fodder and feed production and distribution
- Re-emergence of large scale dairy production (e.g. communal dairy farms, dairy parks and dairy zones)
- Availability of business development services and service providers, training, extension and consultancy services
- Advent of devolution of governance and resources that will support among others a region and county specific development process

## EXHIBIT 2 | In Most Emerging Markets, Dairy Is Growing Faster Than GDP

Dairy market value growth, 2015–2020  
(estimated CAGR, %)



Sources: Economic Intelligence Unit; Euromonitor; BCG analysis.

Note: Growth rate calculated in nominal terms, using local currency for best comparability. Dairy data excludes milk formula, ice cream, and butter.

Figure 7: Stable and emerging global dairy markets

### 2.2.3 Aspirations

The Kenya dairy industry aspirations are guided by the country's Vision 2030, The 2010 Constitution, the Livestock Policy and the ASTGS that when read together demand an industrialising sector that supports middle income and decent livelihood for the citizenry and that contributes to the overall food and nutrition security agenda. The industry aspirations are meant to overcome the challenges and constraints that hinder modernisation and reorientation into an export focused industry. The key elements that define the industry aspirations include:

- A sector that currently derives 70% of its milk from small scale systems transitioning into a formal commercial enterprise model at all value chain links through technology, breed and human capacity upgrade and improved market access
- An industry that is production and domestic market oriented evolving by increasing its milk product range and export share through modernisation of the enterprises to value add, improve milk quality and deliver safe milk and milk products to consumers.
- Emerge into a more organised industry with a strong association that champions collective action in the domestic and global market space and lobbies positive government policies and regulations.
- A high income earning industry that attracts and retains competent and qualified personnel and that offers good workspaces and opportunities for growth and development.
- An industry that generally contributes to the growth of the manufacturing industry by providing opportunities for uptake of locally manufactured equipment, tools and technologies

## 2.2.4 Results

<b>Productivity &amp; Profitability</b>	<b>Increased output</b>	<b>Incomes</b>	<b>Export share</b>
Increased use of technology	Competencies	Employment	Quality milk
Robust dairy enterprises	Improved Breeds	GDP	Safe milk
Strong and relevant Associations	Efficient fodder & Feed system	Higher per capita milk consumption	More value added products

The desired scenarios by 2030 that will emerge with the Implementation of KDITS&IP and the investment plan will include enhanced productivity and profitability of the sector marked by increased unit and total milk and derived milk products outputs, stabilised and competitive prices, increasing incomes, better wages and decent employment opportunities, availability of good quality and safe milk and milk products, improved animal breeds, better managed animal production systems ( animal fodder, feeds and feeding, as well as animal husbandry). These will be realised because of transitioning the sector into a modernised export oriented industry driven by competent actors that champion the growth of a globally competitive milk value chain.

The KDITS&IP and Investment Plan is a people centred strategy that will result in the country attaining self-sufficiency in milk and milk products from domestic production with a desired per capita consumption of 200 litres per year. The industry will also transition smallholder subsistence units into commercial enterprises offering decent workspaces and income to both the owner/operators and employees. The commercial enterprises will improve both feed and feed management and ensure sufficiency in qualitative and quantitative feed and fodder resources for livestock feeding. The KDITS&IP proposes enhanced research to improve feed utilization while the proposed model will result in increased forage production per unit area through encouraging high yielding fodder crops and forages, in an integrated crop- livestock farming systems and promotion of systems that lead feeding dairy animals with quality forages,

It will also lead to restructuring of the cooperative model into a more commercial oriented outfit to improve efficiencies in operations. It will promote vertical and horizontal integration of the value chain to increase chain effectiveness and competitiveness. A major development in the market space will be the delivery of safe and high quality milk and milk products for both the local and export markets.

**Table 11:** Situation, opportunities, aspirations matrix

<b>Situation</b>	<b>Opportunity</b>	<b>Aspirations</b>	<b>Results</b>
Low skilled workforce	Populace with basic education, involved and with interest in dairying and existence of training institutions and programs	Competent practitioners and value chain actors with the right skills, knowledge, aptitude and entrepreneurial spirit,	Good production and management of fodder and feeds  Good animal husbandry practices and technology use
Low entrepreneurial spirit	An emerging millennial and digital generation with entrepreneurial traits, existence of incubation, apprenticeship and coaching programs in the country eg. Jijiri, Enable Youth, Incubation centres, KIE	Good practices and management at all levels of the value chain	Good yields  Increased yields of good and safe milk
Diverse production systems	Established models of production that can be customised per ecological zone, rich biodiversity		
Low genetics, low yields	Existence of breeding stock, breeding institutions and human capital	Commercialise all segments of the value chain to livelihood supporting scale	Increased milk yields, and incomes
Subsistence based units	Emergence of institutions that support enterprise start-up, growth and expansion, existence of small holder units at all value chain links, a quest for commercialisation	Linked value chain segments increasing chain efficiency and effectiveness	Increased volumes marketed, growing incomes and jobs

<b>Situation</b>	<b>Opportunity</b>	<b>Aspirations</b>	<b>Results</b>
Low value chain integration	Existence of partially and fully integrated value chain models, existence of groups, cooperatives and producer organisations, increasing urbanisation that fosters a definite market	Application of modern technologies at all levels, increased efficiency	Increased marketed volumes, better incomes, good information flow
Manual and old technologies	Available expertise, available dealers with equipment and technologies, a technology savvy population, increased expansion of digital systems	Application of modern technologies at all levels, increased efficiency	Increased marketed volumes, better incomes, good information flow
Poorly organised value chain	Existence of producer organisations, existence of apex organisations and associations like KAM, KEPSA to guide federation	Well organised industry at all levels with federated units at county, region and national level, collective market action and policy advocacy	Standardized products that are safe and of good quality, increased sales, incomes, and consumption
Weak organisations	Structures and institutions for training, funding opportunities	Modernised organisations applying latest management systems and technologies that inform product differentiation, marketing, quality and safe standards	Differentiated products, higher domestic and export market share, increased incomes, jobs, better workplaces and higher GDP,  A knowledge based value chain with informed actors  Safe and good quality milk that is competitive

Situation	Opportunity	Aspirations	Results
Unstructured markets	Emerging middle class, existence of regulations and standards  Existence of producer organisations,	A well regulated and structure market accessible to commercial enterprises	
In adequate data, information and knowledge	Available farm records, KRA data, cooperative with information management systems, application of digital weighbridges, existence of digital platforms, development of KAMIS	An effective, efficient and sustainable knowledge management and information system supporting the dairy sector	
Poor quality and unsafe milk	Available laboratories, available technicians and equipment	Quality and safe standards in place, monitoring laboratories and systems functional	

## 3. THEORY OF CHANGE AND STRATEGIC MODELLING

### 3.1 Theory of Change

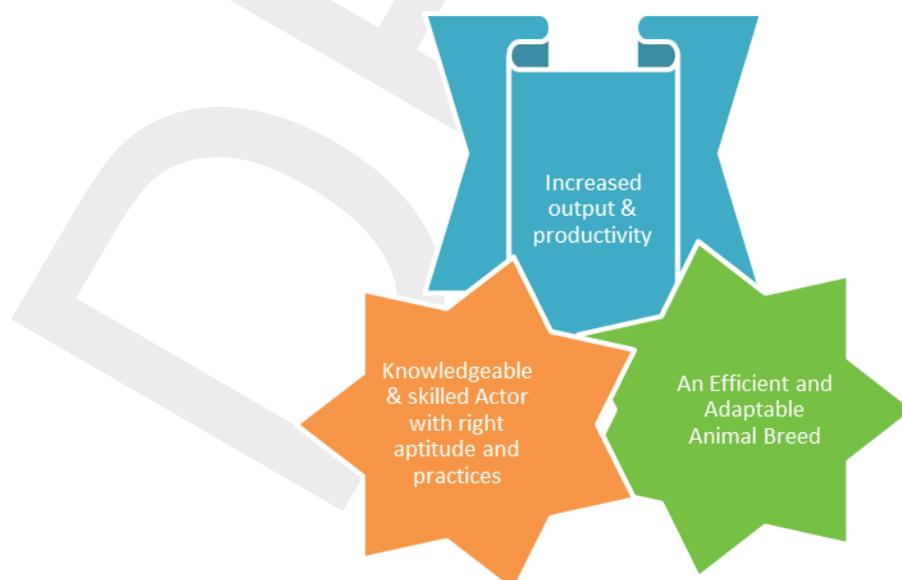
The Kenya Dairy Industry is modelled along two dimensions: structural and functional; the structural element is aligned to those fundamental actions that would streamline and position the dairy industry into a modern and competitive sector. This dimension rides on the attributes of the actors and the trait qualities of the animals as drivers of change. This is supported by a well-structured market system that acts as the anchor for growth and modernisation. The market system is framed on developed and organised small, medium and large corporates which through their internal functional mechanisms regulate and standardise differentiated milk and milk products that have inbuilt market responsive quality and safety standards. The market structure development is facilitated and enabled by fit for purpose legal and regulatory frameworks and supportive funding mechanism to effective transfer of technologies (chillers, weighbridges, cold chain systems, renewable energy systems).

The model mirrors the best global practices contextualised to the Kenyan situation. This aims at positioning the 2030 industry influencers as the key change agents. It is transformative in nature grounded on the theory that the most effective point for influencing change in the sector is by addressing the endemic low management and operational capacity of actors at all levels and by breeding and availing an adaptive and efficient dairy cow to address existing genetic and genomic constraints. The adaptation is tailored to adjust to existing production systems and ecological regions of Kenya.

The dairy actor, the breed, the organisations, fit for purpose regulations and a supportive funding mechanism when addressed in a systemic way would lead to increased milk output, improved total factor productivity with assured good quality and safe milk and milk products for the target local and export markets. Increased milk output will position dairy as key contributor to the national food and nutrition security agenda while increased productivity will increase incomes for actors and players within the industry.

The targeted strategic action to spur this change is twinned around development and positioning of the dairy practitioner as the manager and operator to drive the change. The dairy actor will be equipped with requisite knowledge, skills and aptitude on good agricultural practices, climate smart agricultural practices and technology use, financial literacy, fundamentals of firm management practices and marketing. This knowledge and skill base will stimulate a positive action towards improved dairy management. This action when coupled to a compliant animal that is selectively bred for efficiency and adapted to the various ecological and farming systems of Kenya, will result in increased total factor productivity and milk outputs. Knowledgeable and skilled dairy practitioners through their standardised procedures self-regulate their operations complying with the best practices on animal feed production and feed management on one hand while also observing good animal husbandry practices actions. These two actions are known to conjugate into delivery of quality, safe and increased milk yields.

The structuring of the market system would be attained through development and strengthening of organisations at SME, large corporate and cooperatives levels. The SMEs are premised to be grown from their current informal vendor and small trader outfit into developed and organised entities with formal and regulated actions in the market place. The existing corporates need repositioning for them to adopt an integrated value chain business model with strong vertical linkages across the chain. The cooperative systems will require restructuring from their current business model through restructuring of their business arm to adopt a more commercial orientation while ceding the social functions to a restructured unit of the organisation. The commercial aspects of the organisation strive to maximise profits through a modernisation script.



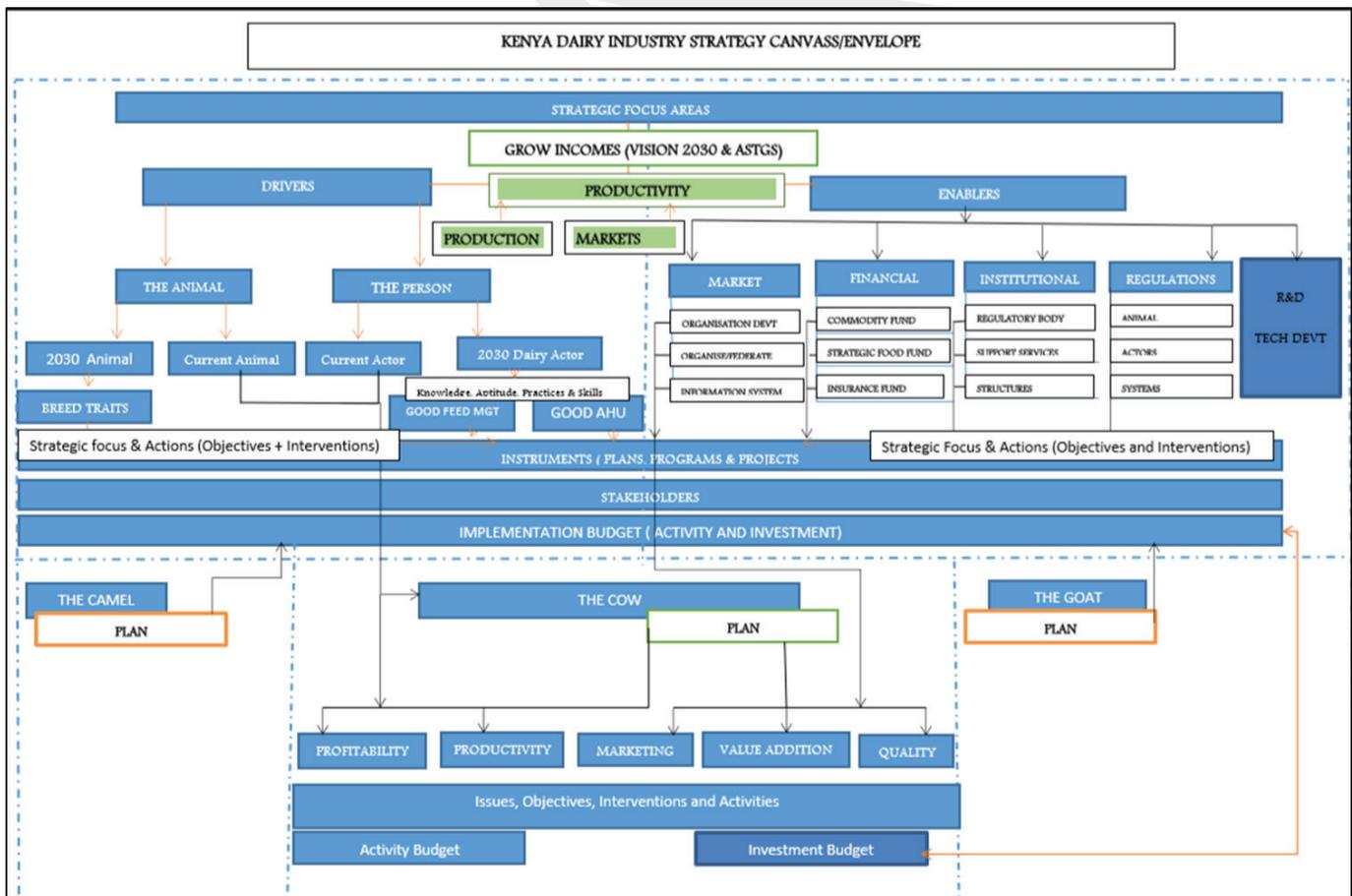
**Figure 8:** Modulated Theory of Change Framework

This theoretical model premises strengthened and modernised organisations as the pillars for realising greater market activity. The strategic actions will focus on modernising operations and organisational structures to improve efficiency, develop and differentiate products, penetrate, capture and retain markets through production of competitively priced milk and milk products, that are both safe and of high quality. The actions aligned to this change aim at restructuring the enterprises to reposition their product development both in range and quality so as to respond to local and global consumer preferences and existing legal and regulatory frameworks. As the industry advance into a modernised and export oriented sector, the demand for federating and associating for collective action in the markets will emerge and be acted on. The structural model is vision focused deriving its aspiration from the Country's 2030 economic growth blue print, in which Kenya envisions an industrialising nation with middle income livelihood for the citizenry.

The functional dimension takes cognisance of the latency that exists in the industry and mirrors the demands and voices of the current industry players. It works on what is feasible from current practice drawing the actions from the standardised practices allowing for continuity without depriving the desired change. It advances the theory that the current system only requires streamlining the planning to reflect the operative action of industry actors to generate interests and action that will lead to increased profitability and productivity. This planning approach is limited to the dairy cow value chain within this framework with provisions made to allow for progression of the planning actions to include the camel and goat milk value chains. The functional model is need based providing a strategic planning framework to increase production to satisfy the 220 litre/capita food and nutrition milk requirements for the country's citizenry by the year 2030.

Measure	Theory of change model				
Impact	Improved livelihood with better incomes, decent jobs and increased resilience				Improved food and nutrition security in terms of the milk component in the diet
Outcome	Improved productivity & output measured in gross margin and volume terms		Improved access to markets demonstrated by influence of enterprises to value add and market quality and safe milk and milk derived products		Improved access, availability and utilization of milk and milk derived products
Output	616,000 dairy actors trained and have employable skills needed in the dairy industry, absorbed and working in the dairy value chain enterprises	26,000 dairy entrepreneurs nurtured and starting and growing enterprises	600,000 (300,000 cows, 100,000 goats and 200,000 camels) number of dairy animals with efficient and adaptable traits created through synthetic breeding and producing milk under intensive systems  4.56 million cows, 400,000 dairy goats and 800,000 camels with improved traits after breed upgrading and producing milk under various production systems	456,000 number of smart dairy enterprises ( production to trade) established and operating  47 number cooperatives restructured and strengthened to offer and offering distinct social and commercial functions to members  5 number of large corporates and 456,000 enterprises integrated supports effectiveness and efficiency of the milk value chain	Increased number of socially oriented milk marketing channels (School milk programmes),  Developed national nutritional guidelines for milk rich diet  Increased awareness and use of recommended dietary component of milk by the populace
Activities	i. Task capacity development team and ATVET secretariat to develop restructuring and capacity building program for the Dairy industry courses ii. Carry out restructuring of 150 ATVET institutions	i. Constitute and task a dairy industry incubation team to review and develop an industry aligned incubation programme ii. Build capacity of 6 regional dairy industry incubation hubs	i. Constitute a TWG to review initiate and develop a national synthetic breeding programme to nurture Kenyan specific dairy animals ii. Roll out a long term national dairy breeding programme to nurture an efficient and adaptable dairy cow, goat and camel	i. Constitute the task force to review and develop a programme to promote development of new and strengthening existing SMEs and corporates	i. Constitute a task force to review the milk rich diet and to develop a program for promoting increased milk consumption ii. Institute a task force to develop the nutrition guideline iii. Roll out the programme for promoting milk consumption iv. Monitor, evaluate and learn

	<p>iii. Roll out employability skills training of 30,000 number of dairy workers across 150 ATVET institutions  iv. Review the extension models for various ecological and dairy management systems  v. Develop responsive extension support system to support the 616,000 actors  vi. Monitor evaluate and learn</p>	<p>iii. Roll out the incubation of 26,000 dairy industry millennial entrepreneurs  iv. Monitor, evaluate and learn</p>	<p>iii. Roll out county specific dairy breed improvement programme to progress and stabilize the good dairy traits of the existing cow, goats and camel herds.  iv. Monitor, evaluate and learn</p>	<p>ii. Roll out the dairy enterprise development support programme to facilitate the start-up, growth and expansion of dairy enterprises  iii. Roll out programme for reforming and restructuring the cooperatives to embrace dual social and commercial roles but under distinct frameworks  iv. Promote the restructuring and remodeling of the corporates to foster value chain integration  v. Monitor, evaluate and learn</p>	
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#### Legend

The framework provides for the crafting of smart strategic thrusts to guide the development of the dairy industry in Kenya with specific provisions allowing for the planning and development of execution instruments for the camel, cow and goat milk sun industries.

This cow milk being the largest contributor of the milk in Kenya, if fronted further and its instrument to guide industry implementation is developed alongside the main strategic focus areas. The main strategic focus areas of the strategy are.

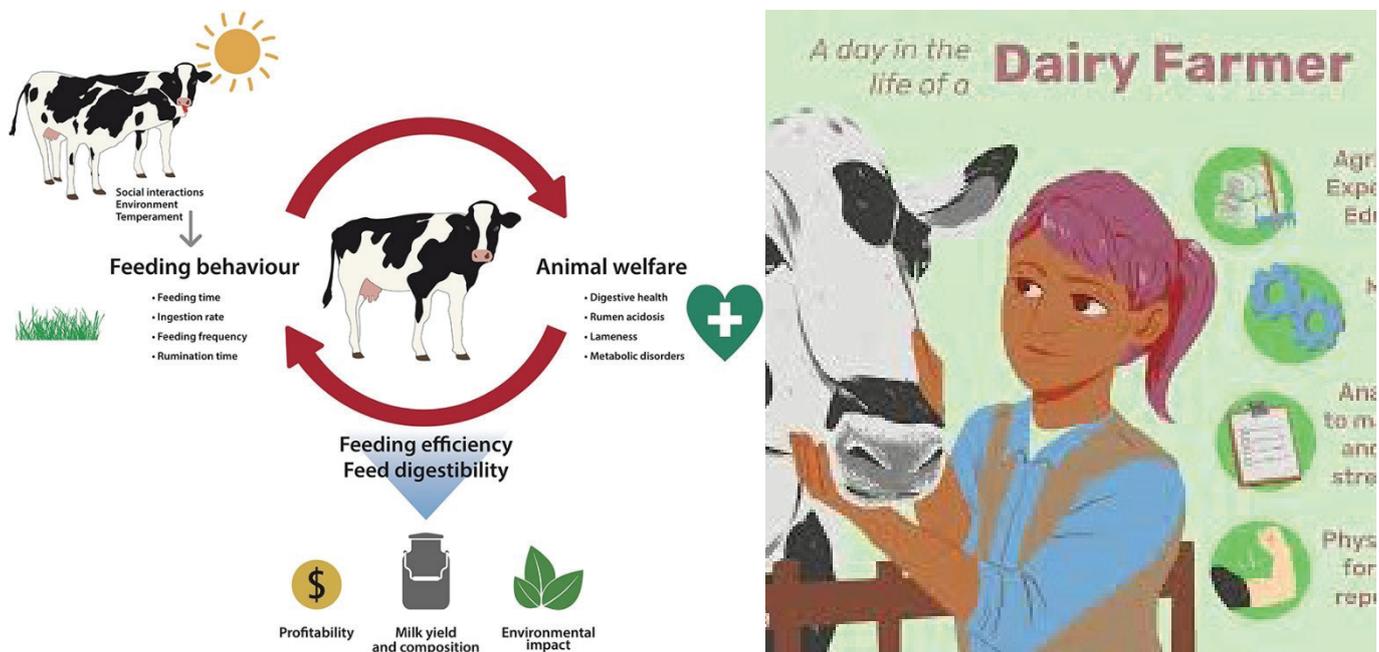
1. The development of Kenyan Dairy Animal  
This is to be realised through
  - a. Breeding adaptable and efficient dairy animals
  - b. Supporting upgrading of part of existing herd and sustaining genotype of some of the current herd
2. Building the knowledge, aptitude, practices and the skills of the actors across the nodes to position them as drivers of better animal husbandry management. The knowledge base will be enhanced at the feed production and animal husbandry levels. The focus actions will target
  - a. Development of a 2030 dairy actor with requisite knowledge, aptitude, practices and skills at both entrepreneur and employee level to position them to manage the 2030 cow
  - b. Support roll out of extension and other training modalities to support current dairy actors to improve their skills sets in managing the current dairy herd
3. Development of the support systems that include
  - a. Market systems development through
    - i. Organisational development of critical units that produce and market milk including cooperatives, corporate (MSME) and welfare units (CIGS, SHG, CBOs)
    - ii. Support the organisation of groups, federation of cooperatives and formation of business associations to champion collective action at the market space and to influence policy, regulations and budgeting
    - iii. Support establishment of a harmonised, efficient and effective information and knowledge management system
  - b. Financial Systems through establishment of various funding systems including a commodity fund, strategic food reserve fund, insurance fund etc
  - c. Institutional framework
  - d. Formulation of fit for purpose regulations
4. The actions the cow and the person managing both the feeds and the cow at strategic level will be executed to increased productivity and profitability. The market systems when well-structured would be executed through marketing, value addition and ensuring product quality action that will be executed at the cow milk level. The cow milk last mile actions will be established by anchoring them on five pillars
  - a. Profitability
  - b. Productivity
  - c. Marketing
  - d. Value Addition
  - e. Quality

## 3.2 Strategic Modelling

### 3.2.1 Increasing production and productivity

Increasing production and productivity will be achieved through focused actions that will improve workforce capabilities and working areas, improve the genetic makeup of the animals while supporting mechanisms that will restructure the dairy market while attracting increased investment in the sector. Improving the capabilities of the workforce through education, training and mentorship to drive a knowledge based animal nutrition and herd management, modernising the workplace through increased investment in enterprise development and technology adoption and use, increasing unit yields by improving animal genetics through synthetic breeding and selective upgrading, and organising the actors through processes that aim at strengthening and transforming the cooperative and group formations into commercially oriented enterprises.

ACTORS	ANIMAL	WORKPLACE	ENTERPRISES	MARKET STRUCTURE	PROCESSING
160,000	3.6 Million	665,000	160,000	Federated enterprises cooperatives and large corporates	45



**Figure 9:** Factors that affect milk yield in pictures

The dairy industry strategy focuses on six anchor actions that will realise increased production to 14 Billion litres through increased unit yields 20-25L/day and increase total factor productivity through better market structure and management of the milk and milk products. These anchor actions will lead to;

Increased milk production and output to address the country's nutritional need of 220 litres of milk per capita. The key constraints to improving output of milk are common across the counties and concern (i) feed availability and management (ii) shortage of improved stock, and (iii) dependence on low skilled actors with insufficient knowledge on good agricultural practices, climate smart agriculture and technology applications. This will be achieved through actions that target;

- improving the capability of the workforce to better manage the herd through better animal nutrition, environmental control and general herd care
- improving the workplace through investment and use of modern technologies at all levels to improve operational efficiency and effectiveness
- improve the animal genetics and strengthen systems for stabilising and sustaining animal breed selection, upgrading and synthetic breeding

Increased total factor productivity through development, growth and strengthening of commercial systems that increase enterprise profitability, improve the dairy industry actor's incomes and that will contribute to the growth of the country's GDP. The main constraints that affect productivity and profitability of milk value chain hinge on low levels of financial literacy among value chain actors that limits their access to affordable credit and poor understanding of the marketing system. Raising productivity and profitability needs initiatives that facilitate growth of entrepreneurial knowledge, business linkages, and know-how to ensure competitiveness. This will be achieved through actions that target:

- Modernisation of dairy enterprises through increased investment in state of the art technologies and systems to improve operational efficiency and effectiveness. A modern dairy sector will invest in technologies that improve milk production, handling, aggregation and storage, value add and processing and marketing

- b. Transform and reform the social–commercial enterprises into commercial-export oriented industry. The action will realise strengthened enterprise that responds to market forces through improved market intelligence, improved operations and management practices
- c. Restructure and strengthen value chain organisations at local and national level to better influence and structure the local and export markets for the Kenya milk and milk products. Stronger market and producer organisations at all levels will improve collective action to improve and stabilise prices, volumes, milk quality and safety

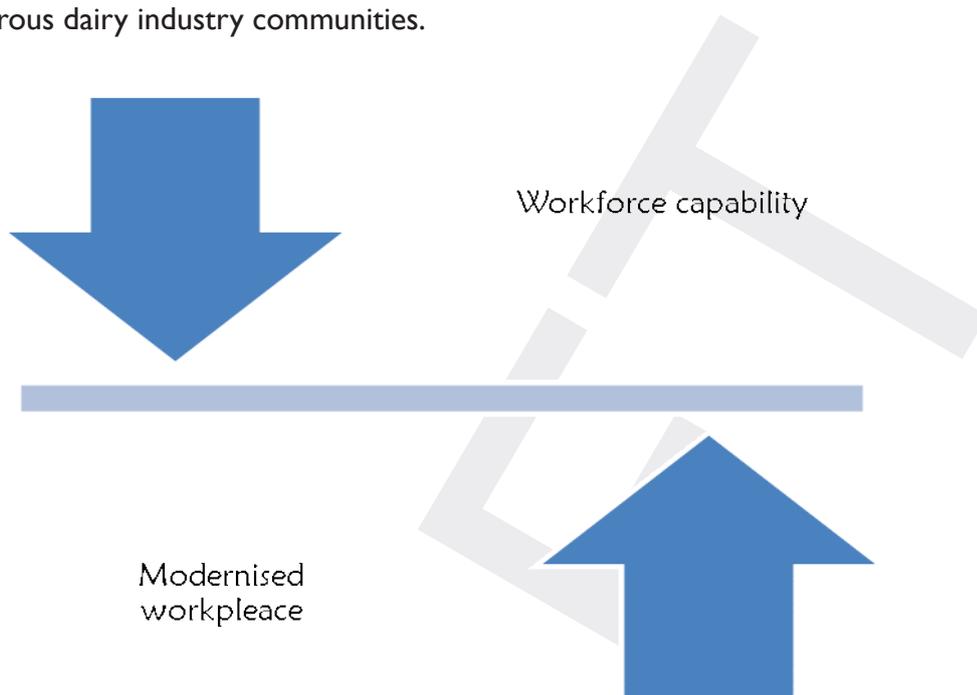
**a. Competent Dairy Actors**

The dairy industry strategy is committed to ensuring the future long-term success of dairy farming in the country through actions that focus on building the capability of the dairy actors and ensuring that a world-class workforce is attracted and retained within the industry. Improved workforce entrepreneurial and technical capabilities will address the low skills and knowledge level amongst most value chain actors and the inherent low level of commercialization especially by small scale producers who do not take dairy as their core business.

A knowledgeable and skilled workforce is being positioned to be the drivers of structural changes that are needed at the macro and micro levels in order to modernise the industry and expand its export market reach. The structural changes will be evidenced through shifting trends in farm sizes, realignment of the dairy market structure, responding to changing consumption patterns and trends, making domestic and dairy product trade policies smart as well as increasing participation of the private sector. Other changes that need knowledgeable and skilled actors are the actions that will be put in place to respond to challenges associated with credit market failures, emerging variation and coordination problems in investment and reallocation of resources from the dairy industry to crops and other manufacturing sectors. A modern and export market oriented dairy industry may also witness transformation in farming system marked by a decreasing number of farms, increasing herd sizes and growing milk yields. Such transformation will put a higher demand and dependence on hired (nonfamily) labour which must be skilled and knowledgeable enough to drive the change. Beyond technical skills in good agricultural practices, technology adoption and use, the sector requires to drive increased productivity by deploying a workforce with capabilities in business, human and natural resources management.

A workforce with positive aptitude and the right entrepreneurial and technical skills will actualise improvements in dairy herd nutrition, apply good herd management as well as effecting genetic selection for sustained increased milk production and improved unit yields. A knowledge driven dairy industry will realise increased factor productivity and milk output through informed and calculated investment into technologies and practices that buttress the industry against the changing climate ( eg. temperature regulating fans and humidifiers, irrigated pasture production) while increasing adoption of technologies (e.g., automated calf feeders, cow activity monitors, and automated milking systems) that improve value chain efficiency and effectiveness.

The strategic focus for this action will aim at building human capabilities and establishing great workplaces through modernisation so as to make the Kenyan dairy industry the most attractive sector for the country's most talented workforce. This will drive increased productivity, profitability and incomes and help grow vibrant and prosperous dairy industry communities.



Capabilities that reinforce entrepreneurship will create a genre of actors who will start, grow and expand dairy enterprises across the milk and milk products supply chain. The growth and expansion of dairy enterprises will increase the need and demand for a workforce with employable knowledge skills and aptitudes. Increased investment into and development of boot camps, incubation centres, mentorship programs and training institutes will provide a platform for nurturing the next generation industry workforce. In the interim, an upgraded extension process will facilitate the current workforce most of who will be weaned off through natural attrition in the next 30 years.

Among the competencies required are those that will address animal feeds and fodder production and supply, on farm animal husbandry and milk production, milk processing and value add, and milk marketing and provision of effective business support services across the entire value chain. Availability of quality feeds and forages for feeding dairy animals will require development of an efficient, effective and sustainable animal feed and fodder production and supply chain system. Knowledge driven and well-funded feed and fodder production and supply enterprises will increase forage production per unit area through encouraging high yielding fodder crops and forages and application of efficient farming systems. The entrepreneurs will model systems that will utilize available crop residues, agro industrial by products and non-conventional feed resources while addressing proper harvesting and harvesting at the right time, processing and storage, besides, conservation and judicious usage. Other skills and competencies required will be those that address nutritional deficiencies by reviewing and developing complete rations for effective utilization of feed resources. Investment in technologies like compressed feed blocks and use of expander-extruder processing to produce complete feeds develop a package of practices that provide strategic supplementation of specific deficit nutrients in feeds.

The skill and knowledge development process will also target increasing competencies on good animal husbandry practices addressing various farming systems and proper feeding. The feeding system will include emerging feeding processes like feeding by-pass proteins and by-pass fats in the rations of high yielding cross bred animals, use of bio- technological products, like pro-biotic, pre- biotics in dairy animals can dramatically enhance the on farm milk production. These strategic actions have potential to ensure sustainable availability of feed and fodder resources as well as their effective utilization for enhanced milk production on long term economic basis.

**b. Modernise the industry**

The strategy considers developing a framework that supports education and training of potential new milk processors on the business climate locally and globally and to promote expanded dairy processing capacity. This will be realised by positioning existing and new actors to establish sustainable milk production and processing, through policy development, industry support, and advocacy and promotion of Kenya’s dairy industry. A modernised industry with products that are demanded by consumers will secure and expand international market positions not only through exports, but also through investments in brand presence in the target export countries. At the local front investment in technologies that improve efficiency and expand the value add range to meet consumer preferences will better position the industry to compete at the food retail outlets. Inclusion of the food retail sector in joint activities of quality management, product development and marketing will help achieve higher added value per product unit of milk and increase market penetration of the milk products locally and globally.

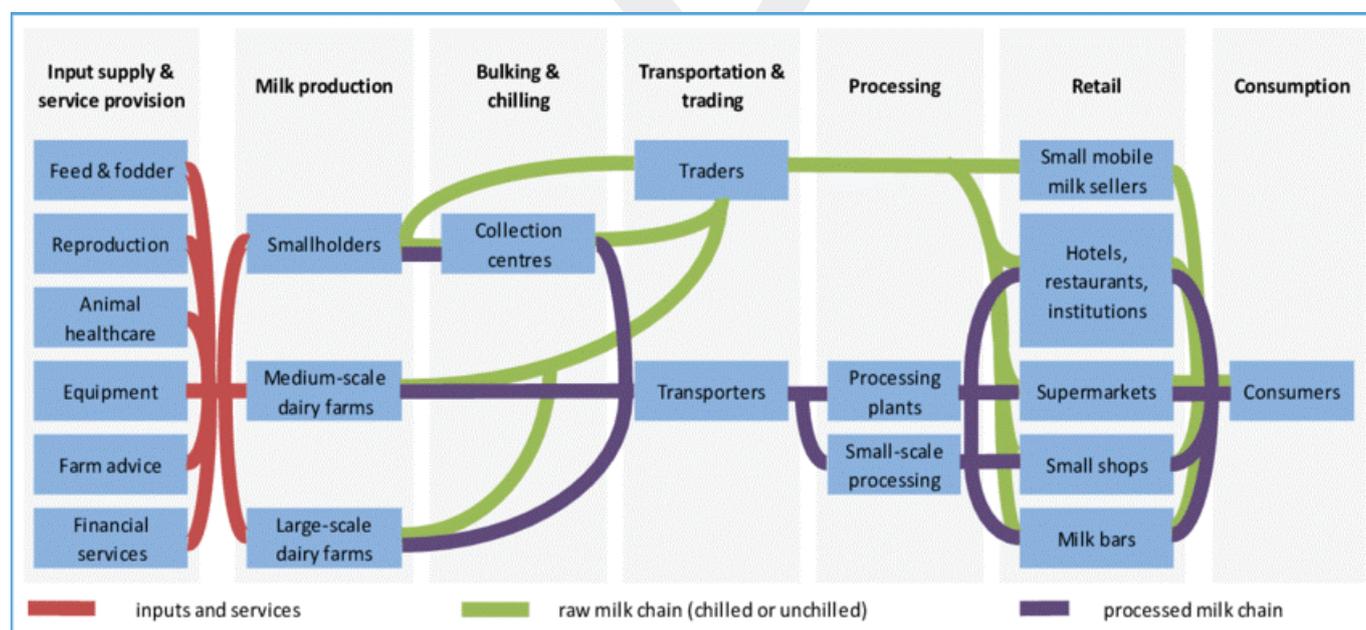
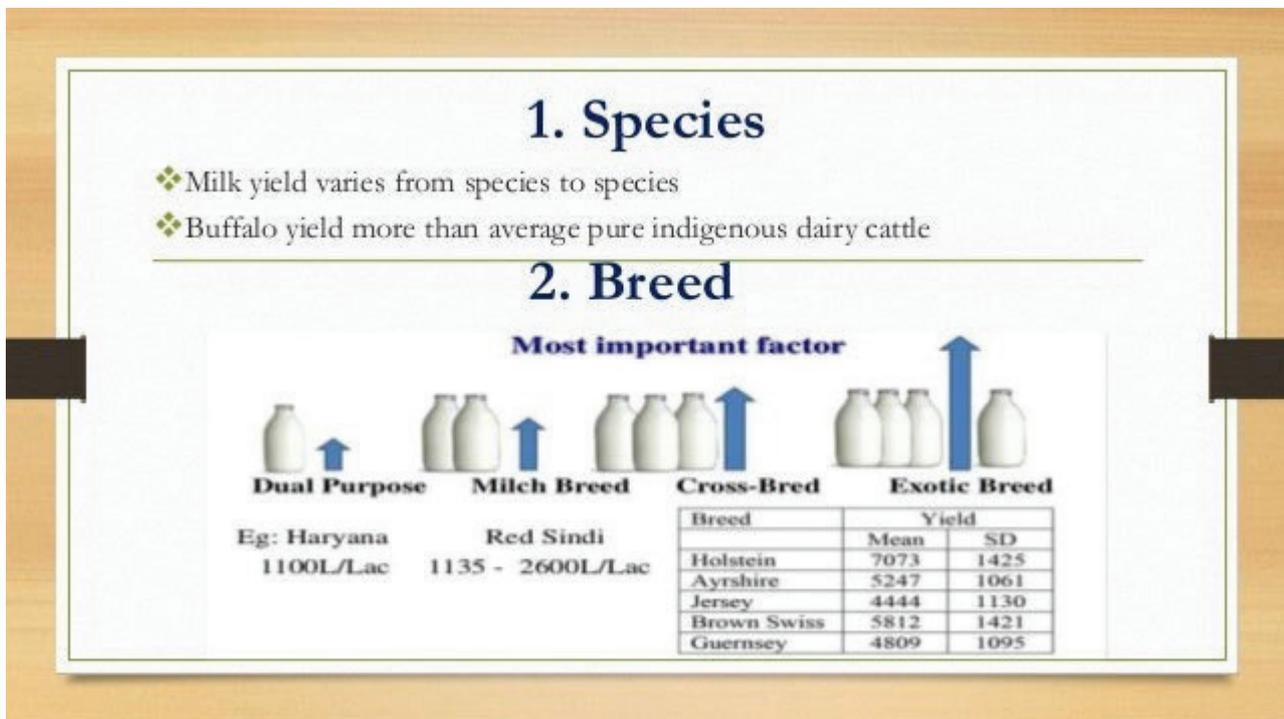


Figure 10: The processed milk supply chain

**c. Efficient and Adaptable Dairy Animal**

The average age for first calving for dairy cows in Kenya was 36 months in 2021 while the daily yield was 6 litres. The yields recorded for goats and camels was 2 litres and 5 litres respectively. The yield is therefore specific to the species and for each species, to the breed (Figure 6). Addressing the genetic material of each species of animal will contribute to improved breeds that when adapted to the ecological and production system will lead to increased milk outputs.



**Figure 11:** Factors that determine milk yields

The actions aligned to address this need are two fold

- i. Breeding a synthetic breed that is adaptable to the different ecological zones of Kenya and efficient enough with an average daily yield of 20 litres
- ii. Upgrading the existing herd to improve the genetic potential to a 15 litre /day cow

#### **d. Market Structuring**

The strategy advances the need for collaborative action by value chain actors to structure the flow of milk from production to retail outlets. Market position of dairy producers remain weak and inadequate due to lack of regulated market. The current structure and model transfers market risks and price concessions to dairy producers through mechanisms that encourage milk-processors and retailers to dictate prices to producers. This favours the processors and retailers who earn money, while the dairy milk producers only break even and/or constantly make losses. An organised marketing system that allows for collective action by all chain actors would mitigate low pricing and milk uptake risks and contribute to equitable sharing of the gains of milk trade. The strategy proposes to strength producer organisations through restructuring their operations and aligning them more to commercial action as well as federating them at county, regional and national level to improve their effectiveness in collective actions in the market space.

Secondly, the Kenya dairy industry depends mainly on liquid milk as its main product. This offers no significant competition for raw milk leading to few marketing alternatives and higher added value from sale proceeds. Expansion and modernisation of the processing systems to increase the product range, quality and safety would resolve this constraint. The strategy will focus increased investment in enterprise technology upgrade, and improving human capacity in product development and marketing. A modernised workspace and requisite human capital will action increased value addition, market penetration and retention.

The third action will target establishment of market risk management framework to support the industry. This will entail establishment of early warning systems to guide levels of production, increase value add products and establishing framework for a determining volumes targeted for the strategic food reserve basket as well as establishing and enforcing predictable contract production and processing. This model will best fit cooperatives and corporates that vertically integrates market players in the dairy value chain, and in situations where there is heavy interdependence across the links.

**e. *An efficient and sustainable market information system***

A robust, efficient and sustainable knowledge management and market information system is an important enabler in the growth and sustenance of any value chain. The space for digital technology is expanding and revolutionising data collection and use, communications and consumer connectivity. The strategy proposes a modulated development of a Kenya Dairy Knowledge and Information System with modules and functions at different levels of the value chain and government structures. This action will be delivered through a project action anchored on a Private-Public Partnership.

### **3.2.2 *Improving framework conditions***

The strategy focuses on five enablers that need to be aligned for the industry to be modernised and contribute to shared prosperity. The enablers are categorised as internal and external. The internal conditions include regulatory frameworks that are industry centred and that regulate the industry directly. They also include internal resources (funds, infrastructure, human, institutions and systems) that are already assigned to the sector. The external enablers are those that are outside the direct influence of the industry. These include fiscal policies, trade agreements, infrastructure development (roads, water and electricity, basic training and school enrolment) and the general business environment.

**a. *Improved regulatory frameworks***

A review of the policy, legal and constitutional framework on which this strategy is anchored is captured and articulated in section 1.3 of this strategy. There will be need to review the Dairy regulations to make facilitative especially in the area of market access for formalised enterprises, to guide contracting and contract agreements, and to support development of a vertically integrated value chain. The regulations should also foster the growth of a producer organisation federations at county, regional and national level while facilitating the restructuring of the cooperative systems to embed effective and efficient commercialisation structures in their systems.

**b. *Supportive resources and funding mechanism***

The most widely adopted cooperative model, incorporate elements such as input services, loans, animal insurance schemes, milk collection systems, remunerative pricing, and weekly or monthly milk payments to reduce risks for dairy operators. The enterprise model that aims at integrating large processors and small holder producers also provides some support that include training, loans and inputs. This is the primary and most sustainable resource basket for the dairy industry that depends on cash flows generated internally from trade and costed services.

However, the investment needed to create small, medium and large dairy enterprise across all links is beyond the capacity of most poor rural households. The national strategy and county based programs will therefore incorporate innovative financing packages, including livestock insurance to mitigate risk and establish a milk commodity fund resourced by both the national and county governments, committed development partners and venture capital venture funders. This kitty will target facilitating funding of start-up, growing and expanding dairy enterprises across all links. The action when augmented with fit for purpose regulations will lead to increased transition of informal traders into the formalised market.

The government has an established National Food Strategic Fund that aims at stabilising prices and volumes of six strategic food items that include milk. This fund, however, has not engaged dairy industry stakeholders in formulating pricing mechanism needed for supporting milk pricing and volume stabilisation across seasons. A framework to facilitate proactive and continuous engagement with the fund administrators will provide the needed consultation.

In order to safeguard long-term agricultural value chain funding, the strategy proposes that a link be established between specific services that the value chain actors provide to society in the form of climate action and conservation measures to levies and funds that address conservation and climate action. Secondly, the social benefits of livestock businesses that secure a great many jobs should be particularly rewarded when calculating agricultural funding at the national and county level and in the design of the fiscal policy.

### **c. Research and innovation**

The Kenya dairy industry needs new products and new ingredients built with consumers and end users in mind. There is a growing investment in research and development by some of the large dairy processors but there is need to expand the product range to cover new dairy formulation for food. The adverse effect of climate change also is putting strain on the productive capacity on the water and land systems compromising availability of fodder and feeds. These can be addressed through research to formulate and test new production systems and develop alternative TMR rations. The breeding of the adaptable and efficient cow requires a targeted research program, while breed multiplication centres and county based breed upgrading processes that employ AI and embryo transfer require new advances for semen storage, management and insemination. Innovations are also required on advanced equipment and technologies to support production, processing and transport.

To meet the aspirations of Kenya Dairy 2030, the key strategic actions will focus on the breeding of the synthetic adaptable and efficient breed at national level and the roll out of robust breed upgrading program across all the implementing counties and regions. The national and county budgets will be allocated to directly support KALRO and other research centres at the Universities across the nation to supplement commitments from other industry players and stakeholder's. These research and development centres are knowledge generators and job builders, since research that expands the product range, improves quality and safety will grow the dairy industry.

#### **d. Animal Health and Delivery Services**

The lacuna created by low capacities at the county government level and the few number of qualified animal health technicians requires corrective action. The strategy will implement actions that address the technical and entrepreneurial capacity of the animal health technicians and address the financing inhibitions that constraint on one hand producers from accessing animal health services and on the other health service providers from establishing commercially viable animal health support services. Proposals are made for the establishment of a contributory animal health insurance fund to address this vacuum. This will augment animal insurance modalities that are already designed and functional.

The current animal health delivery services will also be remodelled to allow for expansion of support infrastructure like laboratories and development and establishment of county cross border disease surveillance and response systems,

### **3.3 Strategic Focus and Actions**

To modernise and make the Kenyan dairy industry competitive both in the local and external markets, the National and County Governments together with the partners and key stakeholders will focus on five the strategic areas namely:

- i. Building knowledge based and driven dairy industry with actions that target restructuring training at all levels to improve employability and entrepreneurship capacity of the actors. This will aim at building the aptitude, skills and practices of the actors on good agricultural and climate smart practices, financial literacy, firm development, management and marketing and nurturing the entrepreneurial spirit at all levels of the value chain,
- ii. Develop a true to type dairy breed with efficient and adaptable traits with potential to produce at least 6,000 Kg of milk per lactation with actions oriented at breeding a synthetic animals while also progressively upgrading the genomic potential of the existing herd with the eventual aim of weaning off any redundant breeds.
- iii. Support research into improved feed systems development, fodder varieties, TMRs and supply systems
- iv. Support mechanisms that promote start-up, growth and acceleration of enterprises as key instruments for market penetration, capture and retention. The actions aligned to this element will target development of strong enterprises through specific interventions targeting the informal and small traders, restructuring of the cooperative systems and reconstruction of the commercial model of the large corporates in the industry. Well-structured and organised enterprises will through self-regulation and growth models address the industry concerns on milk quality and safety. They will also develop differentiated products through sustainable value addition using advanced and modern technologies. The proposed actions will also foster collective and organised market actions by the enterprises to improve their competitiveness and presence in the global market.
- v. Support establishment of a funding mechanism to ease access to finance by industry actors and provide the finances needed for modernisation and expansion
- vi. Review and formulate fit for purpose regulations and frameworks to incentivize t industry actors and improve their competitiveness within the market place while ensuring availability of good quality and safe milk and milk products

### 3.4 The Strategic Interventions and Flagships

The KDITS&IPIP's main innovation is the positioning of the private sector as the key influencer in the modernization process. This is targeted to occur through the actions of MSMEs, Cooperatives, and the corporate entities along the milk value chain. The dairy enterprises as structured at the farm level, through aggregation, collection, distribution, processing and value add, marketing and trade functions ride on the strengthen and effectiveness of the dairy enterprises.

The strategy positions dairy enterprises as the vehicles of influence of the milk supply chain. They are the point of convergence for the dairy breed and the actor anchor drivers (actors and breeds) riding the enterprise as the vehicle that influences production, milk handling and marketing. The four enablers that focus on reviewing and developing fit for purpose regulations, address funding support and nurturing development and roll out of business development services.

#### 3.4.1 The Model framework

The 17 flagships will be implemented through an array of instruments that include programmes, plans (national and CIDPs), projects, regulations, budgets, direct investment and funding. The strategy provides a framework for guiding the actions of the national and county governments, development partners, the private sector, non-state actors and the milk production and supply chain actors and stakeholders. It is aligned to the national and county government planning frameworks with clear investment propositions for engaging the private sector. It is programme based to find a footing in the MTPIV and the third generation CIDP.

#### 3.4.2 The Flagships

Differentiated actions (National and County Governments)

#### 3.4.3 Drivers

##### a. Skilled, Knowledgeable and Professional Dairy Actors

The strategic actions targeting improving actor capacity actor will be rolled through two flagships;

- i. Upgrading and restructuring skill and knowledge training (curriculum, plans) and support development of a workforce with good agricultural practices and demonstrated positive aptitude on use of climate smart agricultural practices and technologies and use of innovation and smart technologies ( National institutions National and County Govt, ATVET County based with capacity support from National government). 30,000 skilled workforce produced
- ii. Development and roll out of dairy enterprises incubation programme to nurture dairy entrepreneurs who with financial and regulated support will start and grow dairy enterprises at all levels of the milk value chain. The actions should lead to creation of 10,000 dairy entrepreneurs. (National and county)

##### b. Efficient and adaptable dairy animal

The three flagships that will deliver this strategic element will be rolled out in parallel one at the national level and the other at the county level.

- i. The national action will target development of a synthetic dairy breed that is adaptable to the Kenyan

ecological landscape and that efficiently converts the available feed and energy into milk. A breeding programme will be developed and supported to enable KALRO to deliver on this action. The desired outcome will be dairy animals with improved yields, cow (20litres/day) goats (5 litres/day) and camel (8litres/day)

- ii. The counties based action will focus on upgrading and stabilizing the genetic milk yield and disease resistance traits of the existing herd (cow, goat and camel). Programming at this level will focus on creating systems that manage semen generation, storage, distribution and utilization, breed selection and reproduction,

**c. Modernized dairy enterprises**

The strategy positions the dairy enterprises as the key influencers of the industry with established internal operational and governance structures that function and control milk product differentiation (value addition), quality and standards (milk quality), marketing and markets. Well-structured and governed enterprises will influence the structuring of the milk and milk product markets, differentiate products through strategic value addition and observe milk quality standards in line with existing regulations. Three flagships will action this development outlined as;

- i. Transitioning of informal systems into MSME through support to entrepreneurs at all levels to create 10,000 milk mega enterprises and 446,000 MSMEs.
- ii. The current cooperative model is transitioning from the social enterprise service based system into a hybrid system that separates the social functions from the commercial functions. This transitioning requires restructuring of the cooperative model to fit the functions and roles of producer marketing cooperatives into the modified commercial units. This restructuring will demand review of the training programmes at all levels, review laws and regulations to embrace and facilitate commercialization of cooperative governance and operations. ( County government at county and regional (block) level and national government with county governments at national level
- iii. The current corporate model in the country requires restructuring to foster an integrated model system. This flagship will action processes that will lead to foster greater vertical and horizontal integration of value chains to improve efficiencies and competitiveness and reduce redundancies for shared benefit across the value chain.

**3.4.4 Enablers**

**a. Organizing for collective action and advocacy**

Well-structured enterprises require to be organized at all levels to facilitate and support collective actions in the markets and to ensure the voice of the actors is reflected in regulations, laws and policies and budgetary considerations. The flagships to action these include

- i. Organizing for markets locally and for export
- ii. Organizing to develop systems for service delivery ( input supplies, training etc)
- iii. Funding mechanisms

The KDITS&IP anchors funding support, fit for purpose regulations and smart service provision as the key enablers that will support the roll out of the flagships that are actioned as drivers and influencers. These

enablers will be actioned through the following flagships

**b. Establish dairy commodity fund**

Develop a funding framework to support investments in the dairy industry along all the value chain nodes

**c. Restructure the National Food Strategic Fund**

Develop instruments for establishing trigger points and mechanisms for stabilizing milk prices and volumes

**d. Establish Animal Health Insurance Fund ( Animal Health Insurance Fund, Animal Insurance, Dairy Enterprise Insurance)**

Under this flagship, it is recommended that a contributory animal health insurance fund be established to address the need for a health insurance. This will cover the costs of treating the animals. This will augment the animal insurance facilities that are already designed and functional but which focus on risks associated with production losses.

**e. Fit for purpose regulations, policies and laws**

**f. Fit for purpose regulations and policies**

The sector is currently characterized as predominantly small holder subsistence based pastoral and agro-pastoral system with a large animal herd engaging a large number of actors. These large numbers however do not produce enough milk needed to meet the milk based dietary needs of the population. The sector has also degenerated into a low profit sector that does not attract and sustain profitable enterprises. The majority of the actors in the sector especially at the production node operate at subsistence level without skills needed to drive output. Regulations should drive the need for professionalism, and support growth of large but fewer enterprise, the review should guide formulation of regulations that advance production, marketing, and services delivery.

**g. Animal Health and Livestock Management Services**

**h. Animal Health Services**

The lacuna created by low capacities at the county government level and the few number of qualified animal health technicians requires corrective action. A capacity needs assessment of the animal health technicians will be done to map the technical and entrepreneurial capacity needs that when addressed will lead to the establishment of commercially viable animal health support services. The current animal health delivery services will also be remodeled to allow for expansion of support infrastructure like laboratories and development and establishment of county cross border disease surveillance and response systems,

**i. Business Development Services (Extension, information)**

This will address restructuring the county based extension services to support the actors on transition and who may not benefit from the ATVET training. Development of a professional advisory service will also be considered as a private sector initiative to bridge the extension gap. The strategy proposes change

of technical advisory services from the traditional government/county extension model to management advisory service modelled around the New Zealand system

**j. Kenya Dairy Knowledge and Information System (KDKIS)**

The need for verifiable data and information is critical for decision making and planning. The flagship focuses on formulation of a project to review and consider development of an appropriate knowledge management system for the dairy sector

**Table 12: Strategic model and matrix**

Strategy Outcomes	Intervention level outcomes	Flagships			Indicative Outputs
		Cow	Goat	Camel	
Increased productivity and output	Improved Knowledge Aptitude Practices Skills and employability of dairy actors  Strengthened training institutions	i. Support training of 30,000 actors to acquire employable skills on good agricultural practices, climate smart agriculture, technologies and technology adoption for dairy development, economics and management of dairy enterprises, soft and people skills for dairy enterprise development  ii. Support restructuring and capacity building of 6 national training institutions, (1 DTI, 3 KSA and 2 AHITI) and at least one county ATVET to offer dairy industry employable skills emphasizing on integrating climate smart agriculture, good agricultural practices, technologies and technology adoption, innovation, soft people skills, financial literacy and economics and dairy system management.  iii. Support restructuring and strengthening of extension and business development support systems to offer extension and advisory services to 155,000 dairy actors across the milk value chain			Number of National Training institutions restructured  Number of county based ATVETs restructured  Number of dairy actors trained with employable competencies  The number and type of extension service systems in place
	Strengthened dairy incubation systems  Improved entrepreneurial capacity among dairy actors	i. Support establishment and strengthening of onsite and offsite dairy incubation centers and systems  ii. Promote incubation of 10,000 incubates with dairy entrepreneurial skills and aptitude addressing business concerns on animal feed and fodder production, animal health services management, animal husbandry practices, animal business development services among others			Strengthen 6 national and at least one county based dairy industry incubator  10,000 millennial dairy entrepreneurs nurtured over 10 years with capacity to start, grow and expand dairy industry enterprises
	Improved animal breeds (millennial animal) with adaptable and efficient traits that are ecological area and production system specific  Improved breeds with stable traits for each ecological zone and production system	i. Promote breeding of adaptable and efficient dairy animals addressing feed conversion and ecological resilience that will give desired yield for each species ( Cow 20 liters per day, goat 6liters/day and camel 10liters/day)  ii. Support and promote upgrading of existing herd to stabilize their resilience and milk production traits to desired levels for each dairy species (cow 15liters/day, goat 4 liters/day and camel 7liters/day)  iii. Support investment in technologies (breeds, fodder production) by dairy entrepreneurs			For the dairy cow, a 300,000 millennial herd with herd yield average of 20 liters/day (6000 liters per lactation) established  For the cow, 3 million dairy herd with stable traits that give an average herd yield of 15 liters per day suited for each ecological zone and production system established

Outcomes	Intervention level Outcomes	Flagships [Cow Goat and Camel Milk]	Indicative Outputs
Improved access to markets locally and globally	Modernized and effective dairy enterprises at firm, cooperative and corporate levels to influence value addition and marketing of safe & good quality milk	i. Support and promote enterprise development and modernization that is technology and knowledge driven to increase total factor productivity, safe milk handling and improve the dairy value chain efficiency across the nodes	160,000 dairy SMEs at all levels (input, BDS, production, collection, export, trade, aggregation, and processing) engaged in various business especially feed and fodder production, milk production, value add and trade
		ii. Support and promote restructuring of the dairy Cooperatives to realign and separate the social and commercial functions, integrate knowledge and technology driven processes and to restructure and strengthen governance systems to make them deliver effectively on their dual social and commercial mandates	160 Dairy cooperatives restructured and strengthened to deliver BDS and other support services and collect and market milk ( processing option)
		iii. Promote vertical and horizontal integration of the dairy value chain targeting the actions of large Corporates to increase chain efficiency and effectiveness	3 vertically and horizontally integrated dairy value chain systems
	Organized and structured markets	<p>i. Support restructuring and strengthening of existing producer and marketing organizations, private actor associations and business platforms into tiered system aligned to existing devolved governance, economic blocks and national units to champion collective action on milk quality, value addition and marketing at the local and export levels and advocate for supportive policies, regulations and budgetary to the industry</p> <p>ii. Support the establishment of the dairy industry data, information and knowledge management module as a component of the Kenya Agricultural Information Management System</p>	<p>1 National dairy cooperative union and 1 dairy association strengthened and supporting member associations and cooperatives collectively on marketing and advocacy</p> <p>An integrated data, information and knowledge management system in place</p>
Improved framework conditions	Funding mechanisms	i. Develop a dairy commodity fund to mobilize, consolidate and allocate resources needed for the modernization of the dairy industry. This fund will support nurturing of millennial dairy actor, breeding of the millennial animal, grow dairy enterprises	A dairy commodity fund in place aligned to the financial needs for modernizing the industry
		i. Develop the framework to support the National Strategic Food Reserve Trust Fund to competently intervene the milk market with purpose of stabilizing volume flow and prices of milk in the Kenya market that benefits the consumer and the producer as part of the government's incentive program in the industry	Tools and systems in place to support triggering of market intervention to stabilize milk prices and volumes in the market
	Fit for purpose policies and regulations	i. Review and formulate regulations to support professionalism, ease market access for formal actors and support mechanisms to support export oriented milk value chain system in the Country	Supportive regulations and policies at national and county level that nurture the enterprise model, knowledge and technology driven systems and the export component of the industry

Outcomes	Intervention level Outcomes	Flagships [Cow Goat and Camel Milk]	Indicative Outputs
Improved service delivery	Effective and efficient animal health services	i. Modernize and reform animal health services for it to be effective in undertaking disease surveillance, control and treatment. The modernization action will entail capacity building through training equipping and establishment of a contributory animal health insurance to cover treatment costs of the dairy animals. The reforms will require a review of the training structure to make it conform with emerging technological advancement in the sector	Restructured animal health services system in place  Animal health laboratories

## 4. IMPLEMENTATION FRAMEWORK

### 4.1 Target Beneficiaries

The KDITS&IP is a people centred strategy designed with the explicit objective of improving the livelihood supporting incomes of participating communities and realising self-sufficiency in milk needed to address the national food and nutrition security. The strategy focuses on modernisation of the dairy industry through interventions that target enhancing the knowledge and skills of actors, improving the genetics and genomes of the dairy animals for them to be adaptable and efficient. Restructuring and reorganising dairy enterprise as vehicles for increased productivity and output, market restructuring, product differentiation and delivery of quality and safe milk.

Potential direct beneficiaries include some 900,000 smallholder families, or nearly 3.6 million people. Women and youth dairy operators play a leading role in the sector in nearly all counties of Kenya. However, when scaling-up occurs and returns increase, men often take over and women are often left behind. Within the target group, special emphasis will be placed on the empowerment of women and youth by ensuring they have equal opportunities under all the strategy pillars, but especially under strategic pillar 1 and 3. Efforts will be put in place to ensure that at least 60 percent of the actors targeted for knowledge and skill development and those involved in dairy enterprise development within KDITS&IP at the national and county level are women and youth.

Special emphasis will be laid by targeting private entrepreneurs in dairy value chains by focusing mainly on: milk producers, collectors and aggregators, processors, service providers, finance and micro-finance institutions, regulatory institutions, industry associations and organisations. The strategy is focussed on small, medium and large milk producers, urban and rural consumers and specifically export markets that require safer and high quality dairy products that must be offered at competitive prices.

The strategy also targets policy makers and legislators, national and county dairy institutions and all the actors along the value chain, including larger scale milk producers and processors. The private sector is expressly targeted, partly because it was not sufficiently captured in earlier development efforts, but also for its crucial role in providing productivity-enhancing goods and services and market access and being the key anchors for vertical integration of the value chain.

KDITS&IP will drive an enterprise led and knowledge based dairy industry that provides opportunities for integrating profitable delivery of goods and services with milk collection, processing and transmission across the value chain links while imbedding information collection and diffusion as well self-regulation. This should deliver competitively priced quality and safe milk and milk products to consumers locally and globally. The strategy will lay emphasis on engaging adequately positioned knowledge generation and transfer institutions for effective information and knowledge management and to guide research and innovation to make this possible.

Target	Baseline numbers	Expected
Millennial adaptable and efficient animals	TBD in baseline	Goats, 60,000 Camels 120,00 Cows: 200,000
2030 Dairy entrepreneurs: Milk enterprises	TBD in baseline	Goat Milk, 10,000 Camel Milk, 10,000 Cow Milk: 160,000
2030 Feed and Fodder Enterprises	TBD in baseline	50,000 fodder & feed enterprises
Health service providers	2000	10,000
National Dairy Association/Federation	1	One
Restructured cooperatives	2	20
Restructured large dairy corporates	0	5
Modernised dairy processing units	3	20
Modernised dairy hub systems	0	47
Institutional structures	1	47
Policies	-	TBD after review
Regulations	-	TBD after review

## 4.2 Stakeholder Analysis and resource envelope

The following stakeholders were enjoined during the formulation of this strategy and committed to support its implementation in part or fully during the 10 year cycle. Other partners with interest will be enjoined and assigned responsibilities within the program, investment or activity windows elaborated in the investment plan. Table 4 is an indicative list of the partners.

**Table 13: Strategy and Industry Stakeholders**

Item	Institution/ Organisation	Strategic role/responsibility	Indicative budget	Period
1	MoALFC	TBD	TBD	TBD
2	CoG	TBD	TBD	TBD
3	County Governments??	TBD	TBD	TBD
4	USAID	TBD	TBD	TBD
5	AU-IBAR	TBD	TBD	TBD
6	KALRO (TBD)	i) Adaptable and efficient animal ii) Knowledgeable actors iii) KDMMIS		
7	KDB	TBD	TBD	TBD

The framework is progressive and informs future engagement and further commitments by current and any future or new stakeholder.

### 4.3 Value Proposition

#### 4.3.1 Proposition design criteria

The main challenge for the KDITS&IP is to formulate an attractive value proposition and investment plan that when implemented will benefit the dairy value chain's actual and potential operators and the consumers they supply; and to action the strategy at both the national and county specific situations. The strategy provides a framework that focuses on immediate activities based on already known commitments by stakeholders while giving room for the generation of a detailed investment program to be finalised towards the end of 2022 based on the interests of individual county governments as penned in the third generation CIDPs and the appeal of the strategy to investors from the private sector, regional and sub-regional organisations such as EAC, AU-IBAR and the International Financing Institutions (IFIs), Regional Financing Institutions (RFIs) and International Agencies.

The foundation of the indicative Investment and Implementation Plan is based on the KDITS&IP actions and the adjoined dairy cow investment plan. A ten year timeframe is adopted, spanning 2022 to 2032, with some activities starting in 2022. KDITS&IP has investments targeting livestock and dairy value chain infrastructure that will be developed by both the private and public sectors. It will take time to achieve the desired critical mass, especially for actions that target creation of the 2030 millennial dairy actor and animal. It will require time to breed the adaptable and efficient animal as well as build the desired build the desired enterprises.

The indicative investment plan for the strategy is divided into a national program to inform the MTPIV and regionalised county level sub-programs to inform the components of the county specific third generation CIDPs and the ten year county sector plans. The indicative investment plan has an element that is specifically focused on the dairy cow, which will be implemented as a component plan of this strategy for optimum impact. A dual track approach will be used, with immediate and longer-term interventions.

This strategy and the indicative investment plan was formulated by sector Technical Working Group and reviewed and adopted by the Kenya Dairy Industry workshop delegates held in three regions of Kenya, the industry experts convened as a caucus at Manzoni Resort, the county government's Agriculture sector CECM caucus. It will inform the development of proposed investments into detailed, fully costed project proposals at national and county levels in collaboration with potential investment partners. An immediate action plan for 2022-2023 covering this process with an overall value proposition for strategy implementation and dairy cow investment plan value is set out in section 4.8. This meant to make the KDITS&IP SDD and the dairy cow investment plan practical, bankable and actionable; and a roadmap to enable county based, targeted and tailored investment approaches.

### 4.3.2 Investment and activity proposition and timeframe

The value proposition for this strategy is summarised in the table presented below. The element that covers the dairy cow is outlined in more detail under section 5. The proposed institutional oversight and the monitoring evaluation and learning (ME&L) arrangements are also set out in section 4.8. The oversight will be delivered by an inclusive KDITS&IP Task Force supported and facilitated by the State Department of Livestock, Industry actors and strategic partners that include private sector and development partners. The Taskforce will guide the implementation of KDITS&IP Members of the Task Force will be drawn from the national and county governments and will represent the broad constituency of public, private, Non State Actors and the dairy industry stakeholders.

### 4.3.3 Economic value of the strategy

The strategy will result in an increase in annual milk production from current 5, 11 Billion liters to projected 14 Billion Liters valued at 594 Billion shillings (TWG calculations) by 2032. This will be a 208% increase coupled with 616,000 jobs supported during the period. The enterprise model framed in this strategy will lead to creation of new enterprises and strengthening of existing ones. At the processing node, 70% of the milk produced will be handled through bulking, chilling, pasteurizing, standardizing and processing. This will increase the value of milk from 345 Billion on raw milk to 593 Billion. This should inspire investment targeting to adopt technologies for safe handling of milk and for value addition. Other investment opportunities and their return on investment are summarized in Table 5 below. Overall the strategy require 93.2 Billion shillings for its implementation spread over the next ten years. The economic value of modernizing the dairy industry will increased jobs opportunities, increased incomes with a 642.8 Billion contribution to the GDP annually and self-sufficiency in milk from domestic production.

**Table 14:** Value proposition for the Dairy Industry Strategy

Enterprises		Entrepreneurs Numbers	Employees Numbers	Milk Volumes liters	Value Add in KSHs	Investment Needs KSHs *Billions
Type	Numbers					
<b>Milk Supply Chain Enterprises</b>						
Commercial Farms	155,000	940	155,000	10,462,500,000	345,262,500,000	15
Commercial Millennial Farms	10,000	10,000	30,000	1,800,000,000	59,400,000,000	10
Aggregators	26000	47	52000	9,810,000,000	19,620,000,000	9
Transporters	2800	47	14000	9,810,000,000	4,905,000,000.0	5
Primary Processors	260	260	780	7,357,500,000	36,787,500,000	
Large Processors	5	5	250	2,207,250,000.0	110,362,500,000.0	
Traders	17000	94	17000	8,583,750,000.0	17,167,500,000.0	1
Sub Total	211,065	11,393	269,030		593,505,000,000.0	40
<b>In Billions</b>						<b>Billions</b>
Hubs	150	150	1500		2	0.8
ATVETS/ATC/KSA/DI/AHII	150	47	600		3	4
Incubators	6	12	60		0.3	3.2
Agrovets	9000	47	9000		3.6	0.2
Artificial Insemination Services	1800	47	1800		0.2	1
Calf Nurseries	150	150	1500			21
Animal Health	2000	2000	8000		12	1
Laboratories	150	12	600		0.02	0.6
Bull Schemes	150	6	450		0.004	0.1
Business Development Services	3000	12	6000		19	0.3
Semen Systems	2	2	10		7	0.3
Cooperatives Services	47	47	940		1	2
MSHG	7000	47	7000		0.01	
Feed & Nutrient Management	12	12	120		0.9	1.5
Machinery/Tech Services	6	6	60		0.04	1
Animal Health Insurance	5	5	500		0.003	1
Fodder Management	10000	940	40000		0.2	1.2
Breeding animals					0.001	10
Research on feed and fodder					0.03	4
<b>Total</b>	<b>455,758</b>	<b>26,328</b>	<b>616,200</b>		<b>642,813,000,000</b>	<b>93,200,000,000</b>

The enterprises of that will be established include those on feed and nutrient management, fodder production and management, Milk production farms/firms, transport, aggregation centers and business hubs, processing facilities, animal health and business development centers among others.

An economic analysis of these business showed that when operated to scale, they would generate profits with gross margins averaging 20%.

#### 4.3.4 Resource Requirements

Implementation of the strategy will require a total of KES 93.2 billion during the 10-year period. A summary of resource requirements per strategic focus areas presented in the Table 15 below

**Table 15:** Summary of financial resource requirements

<b>DRIVERS</b>	<b>Billion KSHs</b>
Skills development	4
Entrepreneurial Development	3.2
Enterprise Development	69.7
Organizing and integration of value chain	0.1
Animal Health Services	1
Business Development Services	0.2
Animal Breeding	10
AI Services	1
Feed and Fodder Research	4
<b>TOTAL</b>	<b>93.2</b>

#### 4.3.5 Resource Mobilization

The funding to implement the strategy is expected to come from the Government through the Exchequer, development partners and partnerships with the private sector. Efforts will be made to mobilize funding from development partners to support some of the outputs. In addition, the Department of Agriculture, Livestock and Fisheries will continue to embrace Public Private Partnership (PPP's) in the sector to ensure the identified priorities are fully implemented. Further, the Department will endeavor to ensure prudent utilization of funds during the Strategy implementation period.

#### 4.3.6 Summarized implementation matrix and timeframe

The 18 flagships will be rolled out in the first five years after which a review will be done to evaluate progress and define the next course of actions.

**Table 16:** Strategy summary actions and timeframe

Outcome	Strategic Focus	Strategic Actions	Responsible	Indicative Budget KES	Timeframe
<b>Increased Output and Productivity</b>	Nurture skilled, competent knowledgeable and entrepreneurial actors to drive management and operations of milk VC & to start and grow enterprises	Support a skills, knowledge and entrepreneurship development program at both levels to nurture entrepreneurs with competencies to start, grow and expand i. animal feed and fodder production enterprises and ii. Dairy milk production enterprises	MoALFC & CG KDTI, KDB, KEPSA, ATVET-CDAAC, CUE, KALRO, Universities	7 Billion	Ten years 2022-2032
	Breed adaptable and efficient dairy animals localised to production and ecological systems of Kenya	i. Support a synthetic breeding program at national levels ii. Support upgrading program at both levels	KALRO, ILRI, MoALFC & CG , Producers , Producer & Business organisations and association,	14 Billion	Ten years 2022-2032
	Provide funding support to entrepreneurs to start, grow and expand animal feeds and fodder production and supply enterprises and dairy milk production enterprises	Provide a funding framework to support dairy entrepreneurs to produce and supply feeds, feed rations and fodder and milk and milk derived products	MoALFC & CG, KALRO, ILRI	5 Billion	
<b>Improved market access</b>	Strengthen producer organisations and federate associations to influence policy environment and to structure markets	i. Develop mechanisms for federating existing organisations into a national umbrella association overseeing milk and milk products standardisation, certification, branding and exports ii. Support strengthening of producer organisations	MoALFC, CG, KEPSA, KDB, KEPROBA,	150 Million	Five Years 2022-2027

Outcome	Strategic Focus	Strategic Actions	Responsible	Indicative Budget KES	Timeframe
	Modernise, strengthen and restructure small, medium and large milk VC enterprises to produce and market quality safe and differentiated milk and milk products for both the local and global markets	<p>i. Restructure and strengthen the commercial arm and model of milk cooperatives to improve their competitiveness locally and globally</p> <p>ii. Transition the informal milk marketing systems into formal small and medium enterprises</p> <p>iii. Promote vertical integrated VC model across all links especially with the large processors and marketing outlets</p> <p>iv. Promote modernisation of the industry through technology transfer to produce and market safe, quality and differentiated milk and milk products for local and export markets</p>	MoALFC & CG, KALRO, Incubators (KIE, ENABLE Youth, ATCs), KAMIS, KNBS, ICT Authority, AFA, NCPB, KRA, Ministry of Trade, KAM, KEPSA	10 Billion	Ten Years 2022-2032
		i. Frame an efficient and sustainable Kenya Dairy knowledge management and market information system	MoALFC & CG, KALRO, Incubators (KIE, ENABLE Youth, ATCs), KAMIS, KNBS, ICT Authority, AFA, NCPB, KRA, Ministry of Trade, KAM, KEPSA, Processors	400 million	Five Years 2022-2027
	Fit for purpose regulations	i. Review policy frameworks and make them facilitative and less prohibitive	MoALFC & CG	KES 40 million	Ten years 2022-2032
		ii. Domesticating strategy into county sector plans and 3rd and 4th generation CIDPs	MoALFC & CG	KES 80 Million	2 Years, 2022 and 2027

Outcome	Strategic Focus	Strategic Actions	Responsible	Indicative Budget KES	Timeframe
		i. Mainstream KDITS&IP into MTPIV and MTPV frameworks	MoALFC & CG	KES 5 million	2 Years 2022, 2027
Improved access to financial resources	Initiate and sustain a supportive funding mechanism and investment framework for the dairy industry	i. Formulate a milk commodity fund to support industry growth	MoALFC & CG	KES 7, Million	1 Year, 2022-2023
		ii. Support the National Food Strategic Fund to develop and roll out a strategic milk pricing framework	MoALFC & CG. NCPB	KES 7, million	1 year 2022

#### 4.4 Monitoring Evaluation and Learning

Implementation of the KDITS&IP will initially be guided and monitored by Kenya Dairy Industry Task Force, facilitated by the National Government, CoG and other stakeholders committed to this course and willing to be enlisted in the team. Later, it shall be taken over by the proposed Kenya Dairy Knowledge Management and Market Information System unit. The Task Force members will be drawn from dairy industry incorporating public, private, producer organisations, cooperatives and Non State Actors who signify their willingness and commitment to participate. The implementation framework is presented below

#### 4.5 Implementation Matrix and Indicative Investment Plan

STRATEGIC	Strategic Issues	Strategic objectives	Specific Objectives	Strategic interventions	Activity	Targets	Indicators	Budget (KSh.)	Output	Responsible
An efficient and adaptable animal	Low genetic potential of dairy animal	To Create a mechanism for developing a high yielding and adaptive dairy animal	To select and upgrade Sahiwal cattle to increase daily milk production from 5.2kg to 15kgs	Develop national breeding program for Sahiwal cattle for increased milk production	Organize an inception meeting for the technical working group	1 inception workshop	Inception report	1,720,000.00	3 National Dairy Breeding Programs (National Dairy Cattle Breeding Program, National Dairy Goat Breeding Program and National Dairy Camel Breeding Programs)	KALRO, IRI, MoALFC, Universities, KDS, KUBS, Treasury, County Governments, NFR
					Stakeholder sensitization workshops	6 regional and 1 national stakeholders workshops	No. of national & regional stakeholder workshops reports	30,100,000.00		
					Undertake situational analysis of socio-economic and biophysical parameters	Information on socio-economic and biophysical parameters	Number of regional reports	10,000,000.00		
					Undertake characterization dairy cattle breeds	Characterize Sahiwal cattle breeds	Number of regional reports	10,000,000.00		
			Define breeding goal, objectives and identify traits of economic importance	Breeding goal, breeding objectives and traits of Economic importance	Technical report (breeding goal, objectives, and traits)	1,720,000.00				
			Design pure breeding schemes	Pure breeding schemes	Technical report (breeding scheme)	1,720,000.00				
			Design selection and mating criteria	Selection and mating criteria	Technical report (selection and mating criteria)	1,720,000.00				
			To select and upgrade exotic dairy cattle for increased daily milk production from 8kg to 15kgs	Develop national breeding program for Exotic cattle for increased milk production	Stakeholder sensitization/awareness workshops	6 regional and 1 national stakeholders workshops	Number of national and regional stakeholder workshops reports	30,100,000.00		
					Undertake characterization dairy cattle breeds	Characterize 4 dairy cattle breeds	Number of regional reports	10,000,000.00		
					Define breeding goal, objectives and identify traits of economic importance	Breeding goal, breeding objectives and traits of Economic importance	Technical report (breeding goal, objectives, and traits)	1,720,000.00		
					Design pure breeding schemes	4 pure breeding schemes	Technical report (breeding scheme)	1,720,000.00		
			Design selection and mating criteria	Selection and mating criteria	Technical report (selection and mating criteria)	1,720,000.00				
To develop an adaptive intermediate cow producing 20kgs daily	Develop national breeding program for 3 way crosses (Friesian (NF1) x Ayrshire x Sahiwal) for increased milk production for medium to low rainfall potential	Stakeholder sensitization/awareness workshops	6 regional and 1 national stakeholders workshops	Number of national and regional stakeholder workshops reports	30,100,000.00					
		Define breeding goal, objectives and identify traits of economic importance	Breeding goal, breeding objectives and traits of Economic importance	Technical report (breeding goal, objectives, and traits)	1,720,000.00					
		Design cross-breeding schemes	Cross-breeding scheme	Technical report (breeding scheme)	1,720,000.00					
		Design selection and mating criteria	Selection and mating criteria	Technical report (selection and mating criteria)	1,720,000.00					
To develop national breeding program for 4 way crosses (Friesian x Sahiwal, Jersey x Bharan) for increased milk production for medium to high rainfall potential	Develop national breeding program for 4 way crosses (Friesian x Sahiwal, Jersey x Bharan) for increased milk production for medium to high rainfall potential	Stakeholder sensitization/awareness workshops	6 regional and 1 national stakeholders workshops	Number of national and regional stakeholder workshops reports	30,100,000.00					
		Define breeding goal, objectives and identify traits of economic importance	Breeding goal, breeding objectives and traits of Economic importance	Technical report (breeding goal, objectives, and traits)	1,720,000.00					
		Design cross-breeding schemes	2 Cross-breeding schemes	Technical report (breeding scheme)	1,720,000.00					
		Design selection and mating criteria	Selection and mating criteria	Technical report (selection and mating criteria)	1,720,000.00					
To establish 1 national delivery, monitoring, evaluation and learning system for a breeding program	Develop a monitoring and Evaluation framework for breeding program	Design Monitoring and evaluation framework for breeding program	Monitoring and evaluation framework	Technical report (M&E)	860,000.00					
		Design and operationalize a digital M&E system	Functional digital M&E system	Digital M&E System	860,000.00					
		Follow-up and technical backstopping schedules	4 quarterly backstopping	Number of schedules	860,000.00					
		Implementation review meetings	4 quarterly reviews	Progress reports	17,200,000.00					
Reviewer and provide animal data capture cards	Animal data capture cards	Number of cards	1,360,000.00							
<b>Sub Total</b>								<b>283,900,000.00</b>		

Strategic issues	Strategic objectives	Specific Objectives	Strategic interventions	Activity	Targets	Indicators	Budget (Ksh.)	Output	Responsible						
Weak institutional infrastructure capacity for delivering genetic gain systems	To strengthen institutional capacity for delivering dairy genetic gain systems	To increase centers of excellence for reproduction and conservation of quality germplasm from 2 to 6	Establish a stakeholder coordination unit for cattle breeding programs	Define stakeholder institutional roles and responsibilities	Stakeholder roles and responsibilities	Quarterly Progress reports	860,000.00	Strengthened Breeding Institution	KALRO, ILRI, MoAL, SAC, Universities, KDS, K.LBO, Treasury, County Governments, NRC						
				Coordinate breeding programs coordinating unit	Breeding program coordinating unit	Functional coordinating unit	860,000.00								
Prepare annual workplans and budgets for implementation of breeding programs	Annual workplan and budget			Annual workplan and budget	860,000.00										
Prepare and disseminate communication material	Manuals, Brochures, pamphlets, policy briefs			Number of communication material distributed	1,350,000.00										
To upgrade 6 satellite semen and embryo production and distribution centers	Infrastructure capacity needs assessment for production and distribution of semen and embryos		Infrastructure capacity needs report	Number of reports produced and disseminated	2,580,000.00										
	Procure, install and commission state-of-the-art semen and embryo equipment		6 Functional state-of-the-art equipment (semen and embryo)	Number of equipment purchased, installed and commissioned	200,000,000.00										
	Refresh and operationalize 6 satellite centers		6 functional state-of-the-art satellite semen and embryo distribution and production centers	Number of satellite centers refreshed and operationalized	60,000,000.00										
	Awareness creation to relevant stakeholders		Sensitize 1000 regional and national stakeholders	Number of stakeholders sensitized	2,580,000.00										
To establish 1 national gene bank for Conservation of genetic material	Stock satellite centers with quality genetic material		2,000,000 show of high quality semen annually 500 Embryos annually	Number of shows produced Number of embryos harvested	10,000,000.00										
	Upgrade semen center to a gene bank		Gene bank	Functional gene bank	100,000,000.00										
	Procure, install and commission state-of-the-art equipment	Functional state-of-the-art equipment for gene bank	Number of equipment purchased, installed and commissioned	200,000,000.00											
	Develop standard operating procedures and material transfer agreements for the gene bank	Draft SOPs and MIAs	Number of SOPs	860,000.00											
	Develop MOUs for the counties	Final Memoranda of Understanding	MOU	4,300,000.00											
	Validate MOUs, SOPs and MIAs	Validated SOPs and MIAs, MOUs	SOPs, MOUs, MIAs	4,300,000.00											
	Awareness creation to relevant stakeholders	Sensitize 500 regional and national stakeholders	Number of stakeholders sensitized	5,160,000.00											
	Develop bio-banking database	Bio-banking database	Functional bio-banking database	5,000,000.00											
	Install bio security system	Bio security system	Functional Biosecurity system	10,000,000.00											
	To build capacity of 100 animal breeders	Capacity needs assessment on animal breeding and genomics	Infrastructure capacity needs on animal breeding and genomics report	Number of reports produced and disseminated	1,440,000.00										
Advocate for Curriculum review for animal breeding and genomics		A competence-based curriculum for animal breeding and genomics	Reviewed curriculum	1,440,000.00											
Undertake training for animal breeders on genomics		Train 100 animal breeders on genomics	Number of animal breeders trained	7,560,000.00											
Certification and accreditation of animal breeders		Certify and accredit 100 animal breeders	Number of accredited animal breeders	50,000.00											
To establish 1 national identification system for dairy animals		Design identification system for dairy cattle	National animal identification system	Functional animal identification system	5,160,000.00										
		Pilot identification system for dairy cattle	pilot identification system in 6 counties	Number of counties National animal identification system piloted	5,160,000.00										
		Validate and roll out identification system	2.4 Million animals identified by 2030	Number of animals identified	5,160,000.00										
		To establish genomic evaluation and information feedback	Design genetic evaluation and feedback system	Genetic and evaluation feedback system	Functional genetic and evaluation feedback system	5,160,000.00									
			Pilot genetic evaluation and feedback system	pilot genetic and evaluation feedback system in 6 counties	Number of counties genetic and evaluation feedback system piloted	5,160,000.00									
			Validate and roll out genetic evaluation and feedback system	1.2 million dairy animals genetically evaluated by 2030	Number of dairy animals genetically evaluated by 2030	5,160,000.00									
Establish genomic laboratory	Genomic laboratory		Function genomic laboratory	500,000,000.00											
To establish a performance and pedigree system	Design pedigree registration and performance recording system	Pedigree registration and performance recording system	Functional Pedigree registration and performance recording system	5,160,000.00											
	Pilot pedigree registration and performance recording system	Pilot Pedigree registration and performance recording system in 6 counties	Number of counties pedigree registration and performance recording system piloted	5,160,000.00											
	Validate and roll out pedigree and performance recording system	1.2 million dairy animals pedigreed by 2030	Number of dairy animals pedigreed by 2030	5,160,000.00											
	<b>Sub Total</b>							<b>1,165,650,000.00</b>							
Inadequate knowledgeable, skilled, innovative, and practicing dairy actors	To strengthen capacity building programs for the development of the millennial dairy actor	To train 300 dairy farm workers, 100 farm managers and 20 investors	To upgrade dairy farmer training centers	Capacity needs assessment on dairy cattle husbandry and management	Human capacity needs on dairy cattle husbandry and management report	Number of reports produced and disseminated	1,440,000.00	Skilled and entrepreneurial dairy actor	ATETA MoAL, SAC, Universities, Extension Centre KIE						
				Refresh and renovate existing animal genetic conservation farms as demonstration and training centers	47 functional demonstration and training centers	Number of demonstration and training centers refreshed and operationalized	60,000,000.00								
				Redesign tailor made short courses to a competence-based approach	2 competence-based short courses	Number of competence-based short courses	1,440,000.00								
				Undertake training for farm workers, managers and investors	1000 dairy actors trained	Number of trained dairy actors	7,560,000.00								
				Certification and accreditation of farm workers, managers and investors	Certify and accredit 100 animal breeders	Number of accredited animal breeders	10,000.00								
				Awareness creation and advocacy	Sensitize 500 regional and national stakeholders	Number of stakeholders sensitized	1,000,000.00								
				<b>Sub Total</b>							<b>71,450,000.00</b>				
				Weak FFR for purpose regulations to support dairy animal breeding	To review the regulations and strengthen mechanisms for enforcement of appropriate regulations and policies for dairy animal breeding	To formulate 1 breeding regulation for livestock	Develop breeding regulatory instruments			Establish a task force for review of existing breeding regulations	1 taskforce group	A functional taskforce	1,720,000.00	Supportive regulations, laws and policies	MoAL, SAC, County Attorneys, Cooperative, KEPRA
										Organize three technical write shops for drafting the breeding regulation	03 technical write shops	1 draft breeding regulation	5,160,000.00		
										Organize regional stakeholder consultative forums	Inputs and recommendations from stakeholders	Number of regional technical reports	30,100,000.00		
Organize National stakeholder validation meetings	Validated breeding regulation	breeding regulation submitted to AG	4,300,000.00												
To formulate a regulatory framework to guide training and positioning of the dairy actor	Develop supportive regulatory framework to guide training and positioning of the dairy actor	Establish a task force for regulatory framework to guide training and positioning of the dairy actor	1 taskforce			A functional taskforce	1,720,000.00								
		Organize three technical write shops for drafting	03 technical write shops			1 draft regulatory framework to guide training and positioning of the dairy actor	5,160,000.00								
		Organize regional stakeholder consultative forums	Inputs and recommendations from stakeholders			Number of regional technical reports	30,100,000.00								
		Organize National stakeholder validation meetings	Validated regulatory framework to guide training and positioning of the dairy actor			Regulatory framework to guide training and positioning of the dairy actors submitted to AG	4,300,000.00								
		<b>Sub Total</b>							<b>67,200,000.00</b>						
		Poor funding and investment mechanism for research and development to support dairy cattle breeding interventions	To develop a funding and investment mechanism for research and development support dairy cattle breeding interventions			To facilitate access to credit and insurance services	Establish financing and insurance programs	Identify potential financing and insurance providers	20 financing and 5 insurance providers	Number of financing and insurance providers	4,300,000.00	Funding and investment portfolio	Treasury, MoAL, SAC, KEPRA, County Governments, Development Partners, Cooperative, Private Sector, Venture funds		
Organize a expo and investment forums for relevant actors/stakeholders	10 expo and investment forums			Number of expo and investment forums	5,000,000.00										
Establish a networking platform with relevant actors	Networking platform			Functional networking platform	4,300,000.00										
Identify potential research and development partners	20 research and development partners			Number of research and development partners	4,300,000.00										
To create a National research and development fund for Animal Breeding	Establish strategic partnership alliances to promote investment			Organize a symposium for showcasing strategic dairy research and innovation	5 symposiums for showcasing dairy research and innovation	Number of symposiums for showcasing	5,000,000.00								
				Establish a networking platform with relevant actors	Networking platform	Functional networking platform	4,300,000.00								
				Establish a task force	1 taskforce	A functional taskforce	860,000.00								
				Engage a treasury to establish a Research and development fund	Research and development fund	Authorization by National Treasury									
Strengthen Research-Extension-Farmer-Linkages Systems (REFLS) for technology uptake and transfer	Establish REFLS platform			Convene a meeting for profiling development partners and key research interests	10 bankable proposals	Number of development partners number of bankable proposals	860,000.00								
				Annual symposium for dissemination of technologies, innovations and management practices in animal breeding	5 technologies disseminated annually	Number of technologies disseminated	9,500,000.00								
<b>Sub Total</b>							<b>30,420,000.00</b>								
<b>Grand Total</b>							<b>1,551,980,000.00</b>								

# ANNEXES

## Annex I: Dairy development indicators (TWG calculations)

DAIRY DEVELOPMENT INDICATORS	Targets for 2030	jobs created 2030
total number of dairy farmers (million)	155,713	155,713
number of extension officers/DFA	3,114	3,114
number of county extension officers	900	900
number of AGRICULTURE TRAINING INSTITUTIONS	47	940
Total animal feed processing Capacity	117	23,357
Number of Mineral salt processors	10	1,999
Number of Agrovet	1,802	9,008
Number of artificial insemination providers	1,802	1,802
Number of embryo transfers/month	129,760	649
Number of bull stations	3	150
Number of commercial dairy farms	1,081	10,809
Number of commercial calf Nurseries	2,131	21,313
Number of Veterinary surgeons	1,802	1,802
Number of Animal health technicians	7,206	7,206
Number of veterinary laboratories	30	300
Number of satellite and support veterinary Laboratories	180	9,000
Number of Veterinary Services Information Systems (VSIS)	1	150
number of cottage business	7,679	38,395
Number of coolers in the location	5,375	26,876
total capacity of coolers(in L / day)	26,876,407	
Number of pasturizers	269	538
Volume of milk processed (in L / day)	26,876,407	349,393
number of processors	134	26,876
Total number of dairy products marketed	30	20,157
number of milk traders	17,064	17,064
Volume of milk sold to cooperatives(in L / day)	23,463,530	
Number of shops retailing processed milk	34,939	34,939
average volume of milk sold per retail shop(in L / day)	769	
Number of milk ATM	384	384
volume of milk sold through ATM	383,949	
Number of dairy cooperative	1,920	38,395
Average volume of milk per cooperative(in L / day)	20,000	
number of dairy Self help group	7,679	7,679
volume of milk sold to processors	26,876,407	
<b>total</b>		<b>808,608</b>

## Annex 2: Projected gross margin for millennial dairy farmer (TWG calculations)

	PARAMETERS	QTY	PRICE(KSH)	NUMBER OF COWS	PERIOD	VOLUME OF MILK	AMOUNT IN KSH
<b>INCOME</b>							
	SALE OF MILK(KG)	20	35	15	300	90,000.00	3,150,000.00
	SALE OF MANURE(BAGS)	15	1	23	365	246.58	126,688.81
	SALE OF BULL CALF	1	3000	8	1		24,468.75
	SALE OF HEIFERS	1	100,000.00	3	1		342,187.50
<b>GROSS INCOME</b>	<b>TOTAL REVENUE</b>						<b>3,643,345.06</b>
<b>EXPENDITURE</b>							
	LABOUR(PERSONS)	2	10000		12		243,333.33
	DAIRY MEAL(KG)(70 KG BAGS)	5	30	15	365		821,250.00
	MINERAL SALTS(KG)	0.150	90	23	365		114,019.93
	HAY(14KG BALES) 400 bales/acre	0.10	150	23	365		126,688.81
	SILAGE(KG) 30% DM 25000 kg/acre	25	4	23	365		844,592.08
	Protein legumes(KG) in 18 kg/bale	0	20	23	365		-
	AI(2 insemination/conception)	1	3000	15	1		45,000.00
	VETERINARY COST	1	500	23	12		140,765.35
	Vaccination	1	500	23	1		11,569.75
	Insurance	100000	0.04	23	1		92,558.04
	SUNDRIES	1	10	23	365		84,459.21
	WATER	60	0	23	365		25,337.76
	VECTOR CONTROL	1	30	23	52		36,196.80
	ELECTRICITY	100	15	1	12		18,250.00
	DEWORMING	1	200	23	4		22,522.46
	calf rearing	3	35	7	120		95,812.50
	TRANSPORT	1	2	1	300		180,000.00
	DEPRECIATION	0		1	1		-
	MGT	1	1,000.00	1	12		12,166.67
	<b>TOTAL EXPENDITURE</b>						<b>2,926,689.35</b>
	<b>PROFIT/LOSS</b>						<b>716,655.71</b>
	<b>MONTHLY PROFIT/LOSS</b>						<b>59,721.31</b>
	<b>COST PER LITRE</b>						<b>32.52</b>



African Union – Interafrican Bureau for Animal Resources  
(AU-IBAR)

Kenindia Business Park  
Museum Hill, Westlands Road  
PO Box 30786  
00100 Nairobi

Kenya

Tel: +254 (20) 3674 000

Fax: +254 (20) 3674 341 / 3674 342

Email: [ibar.office@au-ibar.org](mailto:ibar.office@au-ibar.org)

Website: [www.au-ibar.org](http://www.au-ibar.org)