Livestock Value Chain Annual Survey Report, October 2020

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Feed the Future Accelerated Value Chain Development (AVCD) Program

Livestock value chain annual survey report, October 2020

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March 2021

Design and layout—ILRI Editorial and Publishing Services, Addis Ababa, Ethiopia.

Cover photo—ILRI/Riccardo Gangale

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Acronyms and abbreviations

ADIS	Africa Dryland Institute of Sustainability
ASALs	Arid and semi-arid lands
AVCD	Accelerated Value Chain Development
BCC	Behavior change communication
CBPP	Contagious bovine pleuropneumonia
CCPP	Contagious caprine pleuropneumonia
CDRs	Community disease reporters
CHEWs	Community health extension workers
CHVs	Community health volunteers
CUG	Closed user group
DVS	Directorate of Veterinary Services
FAO	Food and Agriculture Organization of the United Nations
FtF	Feed the Future
GAM	Global Acute Malnutrition
GDP	Gross domestic product
IYCN	Infant and Young Child Nutrition
J2SR	Journey to Self-Reliance
KLMC	Kenya Livestock Marketing Council
LSD	Lumpy skin disease
LVC	Livestock value chain
MDD-W	Minimum Dietary Diversity for Women
NIA	Neighbors Initiative Alliance
NRT	Northern Rangelands Trust
ODK	Open Data Kit
OIE	World Organization for Animal Health

PPR	Peste des petits ruminants
ToT	Training of Trainers
TIMPs	Technologies, Innovations and Management Practices
PREG	Partnership for Resilience and Economic Growth
PRM	Participatory rangelands management
SOPs	Standard operating procedures
SPSS	Statistical Package for Social Sciences
TLU	Total Livestock Unit
USAID	United States Agency for International Development
USG	United States Government
ZOI	Zone of Influence

Executive summary

This report documents and analyzes the results of the annual survey of the Accelerated Value Chain Development (AVCD) program, Livestock Value Chain (LVC) covering the period August 2019–August 2020. AVCD-LVC is one of the four projects implemented by the International Livestock Research Institute (ILRI), through Feed the Future program of the United States Agency for International Development (USAID). LVC aims to improve pastoralists' livelihoods through improved livestock production and marketing by ensuring sustainable availability of grazing resources, enhanced access to animal health services, promotion of technologies and innovations that support generation and dissemination through mobile-based disease surveillance system ()e-surveillance for informed decisions on disease prevention and control, and targeted disease response by county governments and their development partners. Additionally, LVC supports social behavioral change on feeding practices by pastoralists households and resilience building to climatic shocks and stresses in the five counties of northern Kenya namely, Garissa, Isiolo, Marsabit, Turkana and Wajir

The purpose of the annual survey was to assess the effects and early impacts of the Livestock value chain interventions on the pastoral communities, against targets set for each project performance indicator during current second phase of AVCD.

The survey was carried out between the 15th and 28th September 2020 and entailed the collection of data through face to face interviews from a sample of project participants/stakeholders. During the survey, both quantitative and qualitative techniques were employed to allow data triangulation, and to enrich the information on the subject under investigation.

A structured questionnaire was administered to a sample size of 380 project beneficiaries and the response rate was 100%. The project adopted a similar questionnaire to the one used during the LVC annual survey in 2018 to ensure comparison and consistency in the measurement approach. The quantitative data was analyzed using the Statistical Package for Social Sciences (SPSS) to generate descriptive and cross-tabulation data for reporting. Qualitative data was organized into themes and concepts that were further interpreted to inform the findings captured in this report.

Findings from the survey show that despite the ongoing COVID-19 pandemic which interrupted the pace of activity implementation, project performance against the topline indicators was relatively good. On the "Percentage of female participants of USG nutrition-sensitive agriculture activities consuming a diet of minimum diversity", results showed that 53% of the female respondents interviewed had consumed a diet of minimum diversity over the previous 24 hours, which was over and above the project target of 50%. This indicated that the agri-nutrition messaging conducted by CHVs through the LVC support had a positive effect on nutrition status of women within the reproductive age. However, whereas there was a positive change in consumption of a diet of minimum diversity, the mean number of foods, slightly dropped from 5.15 in 2018 to 4.88 in 2020. The decline could be attributed to the COVID-19 pandemic that impacted negatively both on the demand and supply side of the food system hence affecting the availability and accessibility of various foods across LVC counties. The coronavirus outbreak affected both the availability and affordability of food, and also eroded the purchasing power of households This was further exacerbated by the loss of family income after the closure of various livestock markets.

On the "Value of annual sales of farms and firms receiving United States Government (USG) assistance" the project achieved USD8,305,538 against the set target of USD3,000,000. The value of annual sales was obtained from the sales of live animals, slaughtered animals, and the milk sales from the different livestock species, across the five counties. Similarly, there was an over achievement on the indicator on the "Yield of targeted agricultural commodities among program participants with USG assistance (live animals offtake in kg/annum)"; where cattle achieved the highest yielding of at 9,517, 902 kg followed by goats at 8,419,488 kg, camels at 4,281,488 kg and 3,744,936 kg for sheep. The yield of the live offtake surpassed the target for this indicator.

The over achievements on the two indicators was due to increased panic sales by pastoralists for fear of losing their livestock in case of a prolonged drought period, and the uncertainties surrounding the effect of COVID-19. Besides, the above average rainfall received during the year under review increased both the quantity and quality of pastures, hence better body conditions of the livestock offered for sale, across the five counties. Furthermore, the pastoralists' increased awareness of livestock marketing opportunities created by the improved livestock market infrastructure through USAID investment in the Resilience Zone of Influence (ZOI) region might have contributed to increased sales during the year.

On the "Percentage of female participants in USG-assisted programs designed to increase access to productive economic resources [IM-level]", 29% of the individuals who benefited from LVC interventions designed to increase access to productive economic resources were female, which was 1% less than the 30% set target.   On the indicator on the "Percentage of participants in USG-assisted programs designed to increase access to productive economic resources who are youth (15–29 years)", 43% of the beneficiaries of interventions promoting increased access to economic resources were youth compared to 57% who were individuals of age 30+ years. The interventions that promote access to productive economic resources included implementation of the Participatory Rangelands Management (PRM) toolkit and electronic disease surveillance (e-surveillance) using a Closed User Group (CUG) platform. The inclusion of women and youths in the e-surveillance activities was deliberate to ensure economic inclusivity among different demographic groups are considered throughout the project implementation process.

Despite the outbreak of COVID-19, livestock value chain achievements against the set targets were impressive, and there was indication that the remaining activities would be completed through the inbuilt partnership with county and local communities. Through the same partnership, counties would work with other development partners to allocate more resources to sustain and scale-up the gains to other areas that were outside those covered by the project.

1　Introduction and background

1.1　Lvestock sub-sector and pastoral production in northern Kenya

In most sub-Saharan African countries, the livestock sub-sector is a source of livelihood for a significant proportion of rural households and plays an integral role in reducing food and nutrition insecurity. Further, a considerable number of urban dwellers directly or indirectly derive their livelihoods from livestock through trading in live animals, livestock products or by getting employment in livestock-related agro-processing industries such as dairy, meat, leather and transport. In addition, the livestock sub-sector accounts for about 10% of the Kenya's gross domestic product (GDP) and about 42% of the agricultural GDP (FAO 2019). Kenya's livestock sub-sector contributes close to 90% of the livelihood of pastoralist households and employs about 95% of the local population in the arid and semi-arid lands (ASALs) in northern Kenya.

Despite the important role played by the livestock sub-sector, it remains largely informal, depicting low productivity; grossly underdeveloped and hardly attracting any investments. This is attributed to several factors such as low and erratic precipitation associated with climate change and seasonal variability of fodder, which is a major constrain to sustainable livestock production (FAO 2019). Other underlying factors includes the diminishing rangeland resources and poor land use practices, poor market infrastructure and market systems, weak policies, and unsupportive legislation to support an enabling environment for the sector to thrive. Inadequate public and private financing, and little interest to develop specialized support services and products for nomadic pastoralists who own the bulk of livestock in Kenya. There is also perceived minimal return on investments within pastoralists' livestock value chains and multiple market intermediaries who depress earnings of the livestock keepers.

This is further aggravated by limited access to animal health service delivery, frequent livestock disease outbreaks, and parasites infestation which are major constrains in the development of the livestock sub-sector in northern Kenya. The widespread self-diagnosis and medication, abundance of counterfeit and substandard drugs and minimal targeted vaccination efforts, leading to frequent outbreaks of livestock diseases in northern Kenya further exacerbates the challenges experienced in animal health service delivery. Further, there is reported increase in resistance to the traditional antibiotics and increased cost of veterinary drugs due to reported reduced efficacy of the counterfeit drugs and hence treatment of diseases often requiring repeat doses. In addition, pastoral areas often have low and non-targeted vaccinations coverage due to high vaccine delivery costs associated with the vastness of the region and minimal public funding coupled with close to absent private sector participation in the delivery of animal health services.

The above challenges coupled with low diversification to other income-generating activities, negatively affects the food and nutrition security of people living in the Kenyan ASAL region. According to Wayua (2017), nutrition surveys over the last decade shows that Global Acute Malnutrition (GAM) rates in ASALs exceeds the overall emergency threshold of 15% as defined by the World Health Organization (2006) with over 30% rates in some specific counties. This situation is worsened by poor coverage of health services and other health-related essential infrastructure.

Women of reproductive age especially during pregnancy and lactation period and children in the first 1,000 days of their lives bear the greatest impact of improper and inadequate dietary intake.

Poverty, high illiteracy, negative sociocultural practices, and disparities in household income contribute to under nutrition in women. Consequently, women who consume limited animal-source foods, fruits and vegetables, experience increased risk of micronutrient deficiencies and are at higher risk of dying during childbirth. On the other hand, children with micronutrient deficiencies experience poor cognitive development and reduced learning capacity, with irreversible lifelong consequences. The poor nutrition of women of reproductive age and the loss of cognitive development in children have a profound and lasting impact on quality of human capital in the ASALs of Kenya. This therefore implies that, to break the intergenerational transmission of poverty and malnutrition, children at risk must be reached during their first two years of life.

Despite these challenges, livestock production in the Kenyan ASALs and specifically northern Kenya, though slow, still show potential of alleviating extreme poverty and hunger among pastoralists.

1.2   Project background

The AVCD is one of the four projects under the Feed the Future (FtF) program funded by USAID. The program seeks to sustainably reduce poverty and hunger by widely applying innovations and technologies in selected value chains namely, livestock (extensive), dairy, drought-tolerant crops and root crops. The livestock value chain focuses on the FtF resilience ZOI in the ASALs with an aim of improving pastoralists' livelihoods through improved livestock production and marketing and supporting pastoralists to attain enhanced resilience to climatic shocks and stresses. The project is implemented by ILRI in five northern Kenya counties of Garissa, Isiolo, Marsabit, Turkana and Wajir (Figure 1).

Figure 1: AVCD - LVC project counties.

The five-year project has had two phases. Phase I was a three-year project that started in October 2015 and ended September 2018, while Phase II was a two-year project that started in January 2019 and is expected to close by 31 December 2020. In Phase I, the project in collaboration with the Kenya Livestock Marketing Council (KLMC), Northern Rangelands Trust (NRT), Neighbors Initiative Alliance (NIA) and the University of Nairobi's Africa Dryland Institute of Sustainability (ADIS) were able to reach out to 54,024 pastoralists with improved technologies, innovations and management practices through a myriad of interventions namely, animal health service delivery, livestock marketing, sustainable rangeland management and agri-nutrition behavior change communication (BCC) messaging. Phase II's overall goal is to increase income from sales of livestock by 25% by December 2020 and lift an additional 18,000 households out of poverty through strengthened animal health care delivery, natural resources management and improved nutritional status of women within the reproductive age bracket and children in their first 1,000 days. By August 2020, the project had reached 14,270 beneficiaries across all the five counties. The projects specific objectives include to:

• Strengthen counties' institutions to implement policies and enact legislation that enhances natural resource management, livestock marketing and sustainable animal health care service delivery.

• Support establishment of a sustainable disease surveillance and response strategy.

• Advocate for increased investments in nutrition and to enhance county agri-nutrition capacity for improved nutrition especially for women and children.

Under the sustainable rangelands management component, the project has been working with the target counties on the adoption of participatory rangeland management (PRM) toolkit to promote sustainable management and utilization of rangelands and grazing resources. In Phase 2 of the project, 59(49M:10F) county officials were trained on participatory rangelands management across all the five counties, through a Training of Trainees (ToTs) approach. Consequently, the trained counties ToTs have since been building the capacity of local communities on ways to sustainably use rangelands given the uncertainties in rainfall patterns and climate change in the region. A total of 744(594Male:150Female) community members in Isiolo, Marsabit and Wajir were trained. The application of the PRM toolkit by community members has resulted in various changes in management and utilization of rangelands in these areas. For Instance a total of 1,097,400 ha (10,000 ha in Kapua, Turkana County, 79,100 ha in Bute, Wajir County, 218,100 ha in Kinna, Isiolo County and 790,200 ha in Golbo and Kargi, Marsabit County) of land have been zoned under community-led planned grazing. The area under planned grazing can support 679,200 heads of cattle for one year. Effective planned grazing by communities has led to drastic reduction of movements of livestock in search of pasture, in the communities involved.

To institutionalize the PRM toolkit, the project supported Marsabit and Wajir counties to finalize the rangelands management bills, which endeavor to facilitate sustainable and holistic management of rangelands in the respective counties. In Marsabit County, the rangeland management bill (2019), is currently at the technical validation stage after which it will be taken for public participation as required by the Kenyan constitution (2010), while that of Wajir has gone through all the stages of the county legislative process and is currently at the executive level where it is expected to be debated and ratified, before being tabled on the floor of the county assembly for debate and enactment.

Active participation by the private sector in animal health service delivery is perceived as one of the key development strategies to unlock the potential of extensive livestock production in ASALs. To realize this, the project supported the Directorate of Veterinary Services (DVS) to develop and release a circular that clarifies the role of the private sector in animal health service delivery, which was issued in February 2020. The circular provides guidelines on the involvement of the private sector in animal health service delivery including, provision of vaccines and vaccination. In addition, the project supported the DVS and the State Department for Livestock to review and consolidate the existing veterinary laws in accordance with the Kenya Constitution (2010), World Organization for Animal Health (OIE) guidelines on veterinary legislation, OIE Private Veterinary Services (PVS) and gap analysis, OIE Veterinary Legislation Support Program reports and global veterinary best practices. Through project's support, the DVS has consolidated the 10 veterinary laws into three draft bills namely, the Animal Health Bill, the Veterinary Public Health Bill, the Animal Welfare and protection Bill and the Livestock Development Bill, plus the proposed 6 subsidiary legislations namely, Bee Health Regulations, Disease Control Regulations, Grazing Regulations, Livestock Identification and Traceability System (LITS) Regulations and Veterinary Laboratory Regulations. The legislative review provided an important window to integrate private sector involvement in animal health service delivery into the bills, allowing an enhanced enabling environment for building animal health related businesses, including provision of vaccines.

In Phase I, the LVC supported the county CDVSs across the five target counties to establish a mobile based syndromic disease surveillance (e-surveillance) system. The system allows timely flow of disease outbreak information from LVC-trained community disease reporters (CDRs) to the sub-county veterinarians and thereafter the same is relayed to the CDVS. The sub-county vets fill in the information received from the CDRs in mobile-based ODK form and send it to a county-hosted server based at the CDVS's office. The same form is filled at the abattoir and by selected agrovets with an aim of triangulating the surveillance information that allows working out some disease outbreak patterns. To facilitate collection of livestock syndromic data at the household level, the project trained over 30,000 CDRs and producers on livestock disease syndromes using disease manuals developed by the project in Phase I. The trained CDRs and producers helped in collection of livestock symptoms, which were transmitted to the county servers, under the CDVSs. While e-surveillance innovation was well received and was in use across the five counties, the project noted a decline in the number of cases reported due to airtime top-up challenges which prevented making of calls once the CDRs spotted sick animals in their area. To solve this problem, LVC worked with Safaricom Limited and introduced a Closed User Group (CUG) platform, an innovation that allowed members within the CUG to communicate limitless at a cost that is paid for by the county government. The project has continued to work with

Safaricom Limited and county governments to improve the innovation, and also ensure counties can take up the cost of running the CUG on public resources, once the project ends. The CUG platform has improved early warning and response to livestock disease outbreaks and hence will support the component to achieve its objective of enhancing resilience, food security and economic growth in northern Kenya.

Under nutrition, the project developed a nutritional community dialogue card that has different nutritional messages for different age groups in a household as well as information on how to set up kitchen gardens for improved nutritional status. The main target group for the project to be reached by nutritional messaging were children under two years and women of reproductive age. Undernourished women are likely to face reproductive health problems, leading to maternal and infant deaths while poor nutrition for children under two years increases infant and early childhood deaths and some survivors do not develop to their full potential. Lack of knowledge on optimal child nutrition and inadequate support for mothers to practice optimal Infant and Young Child Nutrition (IYCN) are some of the major reasons for poor child nutrition practices. To promote household nutritional status in the target counties, in Phase II, the project trained a total 382 county nutrition officials, community health extension workers (CHEWs) and CHVs on nutritional community messaging using the dialogue card. A total of 32,053 children have benefited from agri-nutrition messaging in the five counties.

In addition, the project worked with the county nutrition staff to develop county-specific nutrition fact sheets. The fact sheets provide a key tool for evidence-based advocacy in engaging county governments' key decision makers to allocate more resources to both nutrition-sensitive and specific interventions. Additionally, plans are under way to disseminate the messages in the fact sheets to members of the community through local FM radio stations. The project anticipates using of the county nutrition fact sheets to advocate for increased funding towards nutrition in the target counties.

The COVID-19 outbreak in March 2020 (when the first case was reported in Kenya), have had devastating impacts on livestock producers. The outbreak forced the Kenya government to put in place strict measures to contain the spread of COVID-19. These measures included cessation movement in and out of Nairobi, Mandera, Kilifi and Mombasa counties, a 7 p.m. to 5 a.m. curfew, donning of face masks for all individuals visiting public spaces, among others. To further curb the spread of the pandemic, the county governments of the LVC target counties imposed specific measures such as closing of primary markets in Isiolo (Oldonyiro livestock market) and Marsabit (Merille livestock market). The Dagahley Market in Wajir County was also closed to limit traders moving livestock from Somalia where the number of COVID-19 cases was rising at an alarming rate. In other counties such as Garissa and Turkana, livestock markets were not closed, but livestock trading went down. Closure of some key markets along the northern corridor had a negative effect on livestock supply chains within the country, given that northern Kenya is a major source of red meat in the country.

In response to the COVID-19 pandemic and as a way of easing the negative impact of these measures, the project, working closely with county governments in all the five LVC counties, developed standard operating procedures (SOPs)/protocols to ensure livestock markets continued operating within the COVID-19 control measures imposed by the government. The developed SOPs borrowed heavily from the guidelines provided by the national government ensuring that interactions within the livestock markets are guided and adhere to the MOH set guidelines. These SOPs are currently being used in markets in all LVC counties.

To assess the effects of LVC interventions described above on the project beneficiaries, a household survey was conducted. Below are 12 indicators that were adopted to monitor performance in the current Phase II:

- EG.3-2: Number of individuals participating in USG food security programs [IM-level].

- EG.3.2-24 Number of individuals in agricultural systems that have applied improved management practices/technologies with USG assistance.

- EG.3.2-29 Number of organizations with increased performance improvement with USG assistance.

- HL.9-2 Number of children under two (0–23 months) reached with community-level nutrition interventions through USG-supported programs.

- EG.3.1d Milestones in improved institutional architecture for food security policy achieved with USG support.

- EG.3.2-29 Number of organizations with increased performance improvement with USG assistance.

- EG.3.2-26 Value of annual sales of farms and firms receiving USG assistance.

- EG.3-10, -11, -12 Yield of targeted agricultural commodities among program participants with USG assistance (live animals offtake in kilograms).

- EG.3.1-14 Value of new USG commitments and private sector investment leveraged by the USG to support food security and nutrition.

- EG.3.3-10 Percentage of female participants of USG nutrition-sensitive agriculture activities consuming a diet of minimum diversity.

- GNDR-2 Percentage of female participants in USG-assisted programs designed to increase access to productive economic resources [IM-level].

- YOUTH-3 Percentage of participants in USG-assisted programs designed to increase access to productive economic resources who are youth (15–29) [IM-level].

Data for the first six indicators is collected through continuous monitoring, while the last six indicators are tracked through conducting an annual survey. The project conducted an annual survey that sought to assess the effect of LVC interventions on the pastoralists' food and nutrition security, as well as the pastoralists' access and use of livestock related Technology, Innovations, Management Practices (TIMPs), inputs, and services with gender lenses.

Specifically, the study sought to answer the following research questions:

- What is the effect of nutrition training on household dietary diversity behavior among target participants?

- What is the relationship between market access, increased income and household-dietary diversity among children under five years?

- What market characteristics enable/constrain household decision-making on dietary diversity?

- To what extent is community-level nutrition education and behavior change affecting dietary and care practices for women and children?

- What is the effect of household access to animal health services and expenditure on disease prevalence?

- What effects do different nutrition pathways have on household nutrition status?

- How are the household access to, and use of, livestock-related Technology, Innovations, Management Practices (TIMPs), inputs, services, and cost?

- What are the yields of sheep, camels, goats, and cattle among program participants with USG assistance (live animals offtake in kilograms)?

2   Study methodology

2.1   Sampling frame

This study adopted a cross-sectional design where data was collected from project participants in five target counties who are households/farmers/pastoralists reached with at least one project intervention. By September 2020, the project had reached over 14,000 pastoralists with improved technologies in sustainable rangeland management, mobile-based electronic syndromic disease surveillance (e-surveillance), and Agri-nutrition messaging. Due to the large population of project beneficiaries and resource limitations, it was not possible to measure progress towards the set targets for every beneficiary. The study team obtained a study sample by randomly selecting two electoral wards from each LVC county. In each of the selected wards, 38 households (including an additional 10% to account for dropout/loss), were randomly selected from a list of all households in each of the selected two wards. This resulted in a final sample of 380 households who participated in the study. During data collection, there was an opportunity for replacement of non-responding households, from the additional 10% sampled lot.

The sample size was calculated to give representative estimates of various indicators for the main domains of interest such as dietary diversity. The number of project beneficiaries to be interviewed for this survey was determined using a formal sample size estimation formula illustrated below:

Equation 1

$$n = 2 * \frac{Z_{\frac{\alpha}{2}} + Z_\beta}{d^2} \sigma^2$$

Where; 2 groups=before and after, n = number of beneficiaries per group; σ2 = expected variation in indicator for each group (expressed as a percent of the mean) d = target impact of the program for the indicator (i.e. change before to after expressed as a percent of the mean).

Equation 2

$$Deff (Design\ effect) = 1 + ICC(K - 1)$$

Where ICC=Intra-cluster correlation, correlation between beneficiaries in the same ward relative to beneficiaries in different wards and K=average cluster size (number of beneficiaries per ward).

Adjusted sample size per group=unadjusted sample size*DEFF.

Equation 3

To calculate the sample size required for the total households sampled, key program impact indicators of dietary diversity and percentage of female participants in USG-assisted programs designed to increase access to productive economic resources was used. Table 1 below is a summary of sample size calculation:

Table 1: Summary of sample size calculation.

Indicator	Summary of sample size calculation					Final sample size (including 10% to account for replacement due to dropout/loss)	
	Target change in indicator (% of mean)	Expected standard deviation (% of mean)	Intra-ward correlation (ICC) (01)	Required number of wards	Required sample size per ward (average)	Sample size per ward (average)	Total sample size per value chain
Percentage of female participants in USG-assisted programs designed to increase access to productive economic resources	30	35	0.10	10	34	38	380
Dietary diversity [0–1]	20	50	0.10		11		

A total of 380 project beneficiaries was used in the study. This was distributed to each county proportionately as follows: 76 in Marsabit, 76 in Isiolo, 76 in Wajir, 76 in Turkana and 76 in Garissa.

2.2   Study area:

The five study counties are situated in the northern part of Kenya, whose inhabitants practice extensive livestock production, as their economic mainstay. The region is hard hit by frequent livestock disease outbreaks, droughts, famine, flash floods, increased predation of livestock, inadequate or near absence of veterinary services, and recently, a devastating locust invasion, which destroyed large tracks of pasture lands.

Most of these challenges have led to increased competition for grazing space and water resources often diminishing pastoralists' resilience to climate shocks, in the face of the overwhelming socioeconomic shock due to COVID-19 pandemic. Figure 2 shows a summary of the LVC target counties.

Figure 2: Presentation of the study area.
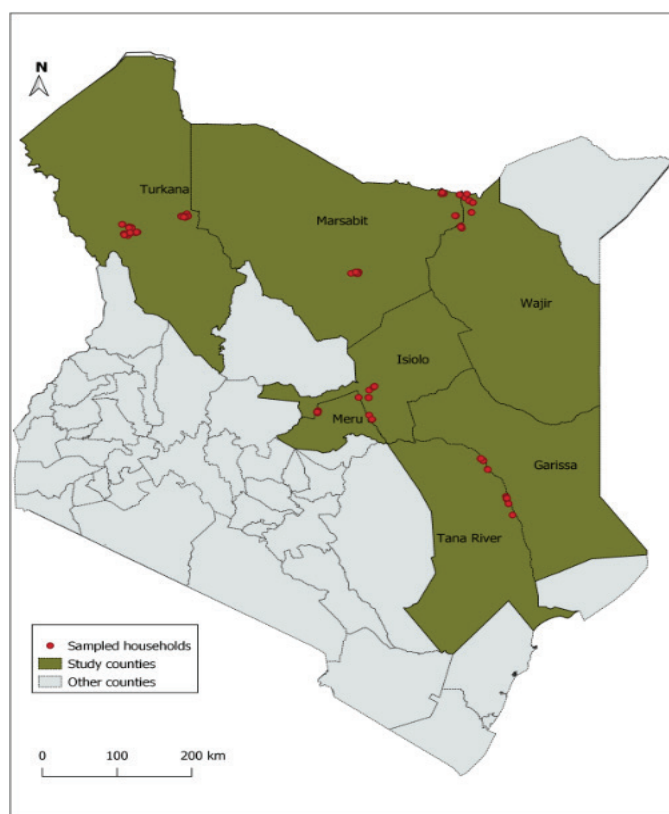
The LVC counties which are characterized as arid lands experience low precipitation, which is quite sporadic from year to year. These counties have vast surface areas with very low population density with the highest being Turkana County at 841,353 within a surface area of 77,000 km^2 and the least being Isiolo County with a population of 268,002 against a surface area of 25,000 km^2. The poverty rates in these counties is way higher compared to the national average of 35.6% in 2015/16 (World Bank Group 2018). These counties usually experience regular drought cycles, which negatively affect food and nutrition security, leading to high incidences of children suffering from chronic malnutrition (stunting and wasting). The five LVC counties are home to millions of livestock with livestock rearing being the main source of livelihoods across all of them. Table 2 shows a summary of selected characteristics across the five counties.

Table 2: Summary of characteristic of LVC counties.

Item	Marsabit	Isiolo	Garissa	Wajir	Turkana	Source
Human population	459,785	268,002	841,353	781,263	926,976	KNBS
Surface area (km²)	70,961.2	25,700	44,174.1	56,685.9	77,000	CIDP
Annual rainfall(mm)	200–1,000	400–650	275–400	200–400	200–400	CIDP
Mean temperature (0C)	20.5	29	36	27.9	30.5.	CIDP
Poverty rate (percent)	42.2	34.2	54.5%	84%	79.4 %	KNBS
% of malnourished children (stunted)	21.1%	13.9%	38.6%	35%	23.3%	SMART SURVEY
% of malnourished children (wasted)	18%	9.2%	8.8%	4.5%	25.6%	SMART SURVEY
Total no of cattle	420,000	253,244	1,104,184	856,638	952,120	CIDP
Total no of sheep	1,851,452	531,355	1,089,870	2,149,812	4,397,148	CIDP
Total no of goats	2,029,490	586,119	1, 947,163	3,121,074	6,219,744	CIDP
Total no of camels	217,360	45,309	486,000	1,176,532	1,018,020	CIDP

2.3   Data management and analysis:

Data collection for the study was conducted between the16 and 27 September 2020. To ensure data quality and consistency, the project focused on retraining most of the data research assistants who had participated in previous baseline studies and other crucial surveys commissioned by LVC. New team members were easily integrated into the old, experienced team. Data was collected simultaneously in all the target counties. The project assembled five survey teams, comprising six persons each (i.e. five enumerators and one supervisor). The tool had several thematic areas that were to be assessed. These included gross margins (current herd size, animal entries and animal exits, animal management costs, application of Improved Technology, Innovations and/or Management Practices (TIMPs), and household food consumption.

Data quality assurance was embedded in the whole process of the study design, analysis, and interpretation to ensure credible results. Further, to ensure quality data, enumerators were thoroughly trained for three days on how to use the Open Data Kit (ODK) software embedded in the tablets for data collection. A pretest was conducted to give the enumerators a feeling of real-time ODK data collection practice to enhance reliability and validity of the results. The study supervisors conducted thorough review of all the data streaming in for completeness, and for any errors before submitting and uploading it to the server. Lastly, the project monitoring and evaluation (M&E) officer and the data analyst consulted daily with the data collection team leaders to ensure a seamless process.

Household primary data was collected using a computer-aided personal interviews in ODK software, and then uploaded to the project servers. Data was downloaded and cleaned using the Statistical Package for Social Sciences (SPSS). Further, data was analyzed using a combination of MS Excel and SPSS packages. Analysis was mainly descriptive (i.e. mean, median, mode, range, standard deviation, and related statistics). In some cases, statistical tests (chi-square and T-test) were also used to support isolation of variable contribution and/or their association/relationship. During data analysis, attempts were made to compare the data collected from the survey with what had been collected during the project baseline to determine the changes in experiences, level of effects/impacts, access to services, and the consumption of diverse diets.

2.4 Ethical considerations:

The enumerators were trained on ethical considerations to be observed throughout the data collection period. The enumerators were expected to read out the informed consent agreement and explain the study objectives to the respondents. They were required to allow the respondents to ask questions before proceeding with the interview or allowing them to decline if they so wished. The enumerators were also expected to communicate to the respondents that their participation was voluntary, and the respondents were free to stop the interview at any time they felt like. The enumerators gave the assurance that the data collected would be treated confidentially and used for only the intended purposes of the study. The interview proceeded only after the respondents had given their consent to continue with the interview. Respondents retained a copy of the signed informed consent agreement, while the enumerator took a photo of the signed form. In addition, the enumerators were also reminded of the importance of using appropriate and respectful language in line with the social norms of the communities being engaged. The enumerators were also asked to be cognizant of the cultural setup and observe dressing code as they visited the study households.

2.5 Limitations

The study areas are vast, and this limited the number of beneficiaries who could be sampled due to time and resource limitations. In addition, the study was conducted during the COVID-19 pandemic and therefore, the study team members were required to operate within the laid-out guidelines by the Kenya Ministry of Health and World Health Organization to curb the spread of coronavirus. For instance, the study teams were to observe social distancing with the respondents and ensured that the discussions were as short as possible, this limited deeper interactions with the respondents. To ensure that both the study team and the respondents were not exposed to the risk of contracting COVID-19, the study used smaller sample sizes to allow minimal interaction with many individuals at a given time.

3   Descriptive analysis of results on selected indicators

This section presents the results of selected key indicators among them, livestock performance measured in terms of productivity for selected livestock species, household incomes, and access to key infrastructure and services such as animal health services. The section further illustrates the consumption patterns, and the results on key Feed the Future (FtF) top line indicators of interest to LVC – notably, agri-nutrition, value of annual sales of farms and firms, and women and youth access to productive resources. This section will conclude with a discussion on women empowerment.

3.1   Household characteristics

3.1.1   Household demographic

Household demographic characteristics in the study area such as, household size, age, educational level, marital status, and main occupation of the household head are highlighted in this section. From the study findings, the average household size for the whole sample was six members. Isiolo County had the lowest household size with five members and Wajir County had the highest with seven members. The overall average age of the household head was 46 years, and this did not differ significantly across the counties. Table 4 shows the variations across the counties for these indicators.

Table 3: Mean household size and age of the household head by county.

County	n	Household size	Age
Isiolo	380	5.16	44.86
Marsabit	380	6.41	49.42
Garissa	380	6.18	47.05
Wajir	380	6.84	45.15
Turkana	380	6.14	45.23
Overall	380	6.28	46.38

Table 4 shows the education level attained by household heads across the five counties. More than half (64%) of the household heads in the survey had no formal education, while about 20% of the heads had attained primary-level education. Only 13% of the household heads had secondary-level education and above. Wajir County had the highest proportion of those with no education (79%) while Isiolo County had the highest proportion of those with secondary school education and above. Only 3% of the households on the survey had attained tertiary/university-level education. Isiolo County had the highest proportion of household heads that had attained tertiary-level education.

As shown in Table 5, majority of the household heads (87%) were married, with the majority proportion of the households being in monogamous marriages at 68.8%. About 9% of the household heads were widowed while only 4% were either single or divorced/separated.

Table 4: Education household of household head by county.

County	Percentage of Households					
	n	No Education	Primary	Secondary	Tertiary/university	Adult education
Isiolo	380	28.4	36.5	27.0	6.8	1.4
Marsabit	380	64.5	25.0	6.6	3.9	0.0
Garissa	380	77.3	15.2	4.5	3.0	0.0
Wajir	380	78.5	10.8	9.2	0.0	1.5
Turkana	380	73.2	11.3	4.2	1.3	0.0
Overall	380	64.4	19.7	10.3	3.0	0.6

Table 5: Marital status of household head by county.

County	Single	Monogamously married	Polygamously married	Widowed	Divorced/ separated
Isiolo	4.1	85.1	0.0	6.8	4.1
Marsabit	2.6	53.9	10.5	26.3	6.6
Garissa	0.0	72.7	16.7	7.6	3.0
Wajir	0.0	63.1	35.4	0.0	1.5
Turkana	0.0	69.0	26.8	4.2	0.0
Overall	1.3	68.8	17.9	9.0	3.0

3.1.2 Herd size

Overall, 50% of the households in the study area kept goats while 23% and 19% kept cattle and sheep, respectively. Only 8% of the sampled households' owned camels. The low camel ownership per household across the five counties is associated with the initial capital that is required to purchase camels, which majority of the households in northern Kenya may not afford. Also, pastoralists with camels are more migratory than those with cattle and small ruminants, and therefore they were in hard-to- reach areas during the survey. Among the sampled households, 2% owned cattle in Turkana County, while Marsabit had the highest cattle ownership at 40.6%. Wajir County had the highest number of households who kept camels at 15.4%, with Isiolo County recorded the least at 1.7%. Table 6 gives a summary of the livestock ownership by species across the five counties.

Table 6: Percentage of livestock kept species by county.

County	Cattle	Goats	Sheep	Camels
Isiolo	16.2	47.9	34.2	1.7
Marsabit	40.6	41.5	10.4	7.5
Garissa	29.0	54.0	8.9	8.1
Wajir	28.9	38.9	16.8	15.4
Turkana	2.0	66.7	25.5	5.9
Overall	23.3	49.8	19.1	7.7

The average herd size of livestock (cattle, goats, sheep and camels) owned by a households in the study area was 28. Table 6 shows that goats were the predominant livestock species owned by households in the the study areas at 54, followed by cattle at 27, sheep at 21 and camels at 8.

Table 7: Mean livestock ownership.

County	Cattle	Goats	Sheep	Camels
Isiolo	18	54	39	2
Marsabit	43	44	11	8
Garissa	35	58	9	6
Wajir	35	51	21	20
Turkana	2	63	26	6
Overall average	27	54	21	8

3.1.3 Household income

This section presents the household income levels and identifies various income components in total household income across the five counties. Household income is commonly used as a proxy to household welfare, with households having more income being regarded better off in terms of welfare. This is obtained as a summation of different income components (sources), which in this case include income from sale of livestock and livestock products, and off-farm income which comprises several sources, including wages and salaries, business income, and remittances from relatives working outside the area.

As shown in Table 8, the average annual household income was KES277,526 (USD 2775.26). Isiolo County recorded highest incomes at KES547,907 (USD 5479.07) followed by Garissa County KES428,774 (USD 4287.74), while Wajir recorded the lowest average annual household income at KES79,480 (USD 794.8). Table 8 also shows the proportion of the two major components of annual household income. Off-farm income[1] contributed the largest share to household income (55%), while livestock income contributed approximately 45%. This trend is similar across all counties except Garissa and Wajir. The higher livestock income in the two counties is attributed to high numbers of camels and their highly priced camel milk and live animals. These are traded across the borders in Somalia and Ethiopia and later to international markets in the Middle East.

Table 8: Income by county.

County	Income components		
	Average annual household income (KES)	Livestock income (%)	Off-farm income (%)
Isiolo	547,907	33.6	66.4
Marsabit	199,246	41.7	58.3
Garissa	428,774	74.5	25.5
Wajir	79,480	60.1	39.9
Turkana	132,221	13.3	86.7
Overall Average	277,526	44.6	55.4

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1. Non-agricultural wages, self employed income, remittances, and other income such as capital earnings and pensions.

4 Project achievements in terms of ftf indicators

4.1 EG.3-2: Number of individuals participating in USG food security programs [IM-level]

This indicator assesses the breath of USAID food and nutrition work. The indicator counts the number of direct beneficiaries that have participated in AVCD LVC interventions. This indicator tracks the number of LVC participants who have benefited from the use of PRM Toolkit, Agri-nutrition, and from the electronic syndromic disease surveillance (e-surveillance) interventions. The definition of a participant is a person who has directly benefited from any of the mentioned interventions. Table 9 shows disaggregation of individuals participating in LVC interventions between October 2019 and September 2020. During the year, the project recorded 57% female participants compared to 43% male participants. The female participants were more than their male counterparts because the agri-nutrition intervention heavily targeted women of reproductive age.

Table 9: Number of individual participating in USG food security program by gender.

Intervention	Male	Female	Total
Implementation of Participatory Rangeland Management (PRM) toolkit	551	238	789
Agri-nutrition messaging	1,016	5,054	6,070
Electronic disease surveillance (e-surveillance)	3,626	1,464	5,090
Total	5,193	6,756	11,949
Percent	43%	57%	

In terms of participation per age group category, different age groups are perceived to contribute differently to food security initiatives. Table 10 shows that 43% of the participants were youth compared to 57% who were persons above 30 years of age.

Table 10: Number of individual participating in USG food security program by age group.

Interventions	15–29 years	30+ years	Total
Implementation of PRM toolkit	355	434	789
Agri-nutrition messaging	2,610	3,460	6,070
Electronic syndromic disease surveillance (e-surveillance)	2,189	2,901	5,090
Total	5,154	6,795	11,949
Percent	43%	57%	

As highlighted in Table 10 above, the composition of youth was relatively higher than expected because the interventions entail the use communication technology and gadgets, which seems to attract the youth. The project also encouraged the youth to participate in these interventions because they are more readily available, flexible, and quick to adapt to technical innovations. During the COVID-19 lockdown, LVC used the youths with smart phones to remotely monitor and submit WhatsApp messages/photos of project activities, across the five counties.

4.2 EG.3.3-10 Percentage of female participants of USG nutrition-sensitive agriculture activities consuming a diet of minimum diversity.

The study assessed the effect of agri-nutrition community messaging on female's minimum dietary diversity. Minimum Dietary Diversity for Women (MDD-W) is a population-level indicator of diet diversity, validated for women aged 15–49 years and it is a dichotomous indicator based on 10 food groups namely, dark green leafy vegetables, eggs, legumes,

nuts and seeds, meat and fish, milk and milk products, iron-rich organ meat, fruits and vegetables, other vitamin A-rich fruits and vegetables, and starch staples. According to the MDD-W, women who have consumed at least five of the 10 possible food groups over a 24-hour recall period are classified as having minimally adequate diet diversity.

In each household, data was collected from all women aged 15–49 years of age who consented to participate in the survey. The total number of women of reproductive age who had received nutrition training and accepted to be interviewed was 460. During the interview, respondents were asked to recall all food types they had eaten during the previous day and night (recalling for the last 24 hours), and enumerators determined to which food groups these foods belonged and they recorded the data. The total number of food groups consumed was summed up and all foods were equally weighted. The indicator was calculated based on the following formula:

$$\frac{Total\ women\ 15-49\ years\ of\ age\ who\ consumed\ at\ least\ 5\ food\ groups\ during\ the\ previoys\ day}{Total\ number\ of\ women\ 15-49\ years\ of\ age\ interviewed}X100\%$$

Out of the 460 women of reproductive age who were interviewed, 245 were found to have consumed at least five of the 10 food groups listed above. This finding meant that the percentage of female participants of LVC's USG nutrition-sensitive agriculture activities who had consumed a diet of minimum diversity over the last 24 hours was 53%, which is over and above the project target of 50%. This is an indication that community agri-nutrition messaging by the LVC-trained CHVs has had a positive effect on nutrition status of women of reproductive age. The mean number of food groups consumed by women of reproductive age was found to be 4.88 as illustrated in Figure 3. This was a decrease by 5% of the dietary diversity score in 2018 and 41% increase from the 2016 score. The decline between 2018 and 2020 could be attributed to the COVID-19 pandemic that negatively impacted food availability and accessibility, affecting both the demand and supply side of the food system. The outbreak affected both the availability food at the markets and/or households, as well as eroded the purchasing power of households. From the study, it was found that the proportion of those who sourced fruits and vegetables from mobile vendors sharply dropped from 5.6% to 3.1%, while those who sourced the same foodstuffs from open-air markets dropped from 54.1% to 45.2% during the same period. Hence, the decline in the number of foods consumed.

Figure 3: Trend in women's dietary diversity score.

Trend in women's dietary diversity score
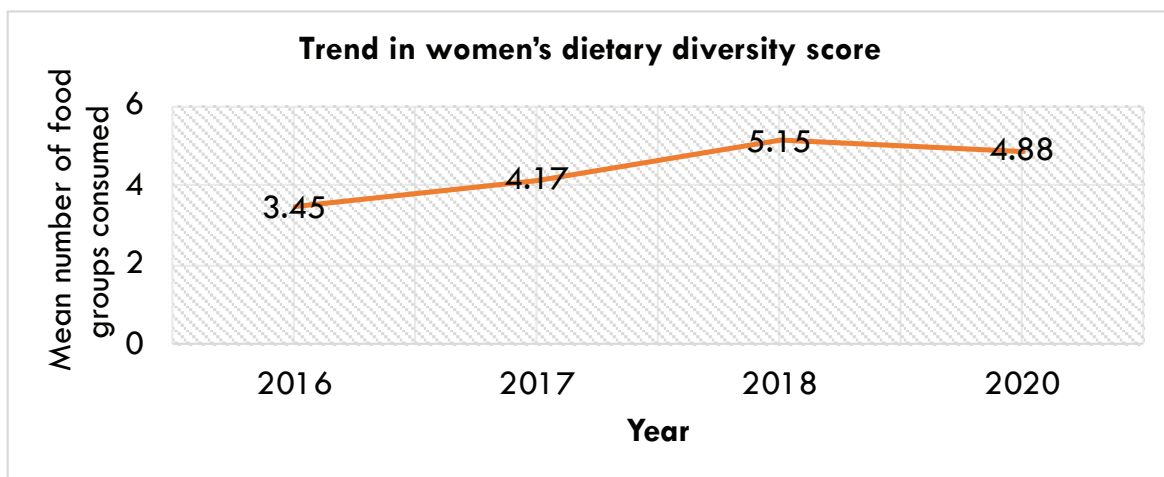
Results further indicates that 77% of females of. reproductive age in female-headed households did not consume the recommended minimum dietary diversity. Similar findings were reported in a study in Ethiopia that assessed nutritional parameters in relation to gender differences. The study found out that dietary intake was disproportionate by household type, and it was demonstrated that the nutrient intake in male-headed households was relatively better than in female-headed households (Haidar and Kogi-Makau 2009). This is attributable to the fact that male-headed households are more likely to diversify their incomes, especially when both partners are involved in income-generating activities. The combined income offers better opportunities to access different food varieties thus increasing the likelihood to diversify their diets.

Figure 4 compares the proportion of women of reproductive age that consumed the 10 essential food groups as collected during the LVC 2018 annual survey and the current 2020 annual study. From the results, there has been a significant increase in the number of women of reproductive age who consumed meat and fish, eggs, dark green leafy vegetables, other fruits and vegetables, and cereals in the last 24 hours. The proportion of women that consumed organ meat and legumes, nuts and seeds reduced slightly in 2020 as compared to 2018. The decrease is attributable to COVID-19 pandemic.

Figure 4 : Proportion of women of reproductive age consuming food of dietary diversity.
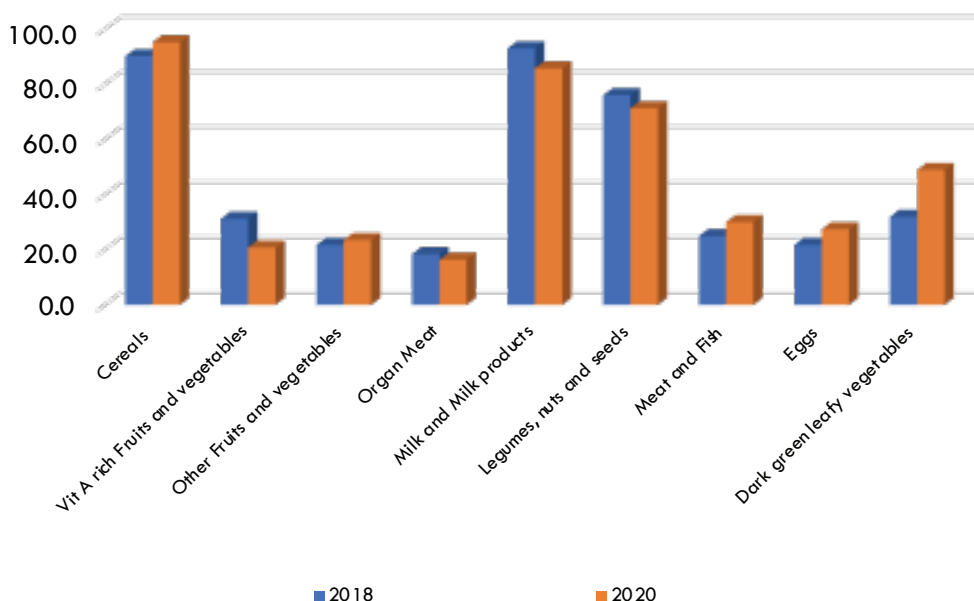
4.3   HL.9-2 Number of children under two (0–23 months) reached with community-level nutrition interventions through USG-supported programs:

In collaboration with the county departments of nutrition and the home-economics, LVC championed community Agri-nutrition messaging through project-trained CHVs and CHWs. During AVCD phase 2, a total of 382 CHEWs and CHVs were trained on community nutritional messaging using the community dialogue cards developed by the project in partnership with USAID Kenya's Partnership for Resilience and Economic Growth (PREG) partners during AVCD Phase 1. Besides reaching women of reproductive age, the project also reached children between 0–23 months. Specifically, the training focused on Infant and Young Child Feeding (IYCF) behaviors. This age group is critical in a child's development cycle, and any nutrition-related complications during this period are often irreversible later in life. Therefore, proper infant and young child feeding practices are pivotal to tackle nutritional problems and prevent irreversible effects among children. During the reporting year 2019/2020, a total of 10,106 children were reached with IYCF messaging in the five LVC counties. The survey collected additional information on children's dietary diversity to further understand the effect of LVC's nutritional messaging for children below two years within the identified community units.

The study also collected information on breastfeeding among mothers with children between 0–23 months. Figure 5 show that the proportion of children breastfed rose by 9% between 2018 and 2020. Continuous breastfeeding ensures that children between 0–23 months obtain all the necessary nutrients which they require for healthy growth and development.

Figure 5: Child between 0–23 months breastfeeding.

Based on the 24-hour recall, only 25% of the children aged between 0–23months received a minimum dietary diversity. These children were reported to be fed on cereals and grains (41%), dark green leafy vegetables (21%), milk and milk products (60%) and fresh meat and fish (18%). All the complementary food samples that were predominantly fed to children were not composed of adequate proteins, fats, carbohydrates, energy, and calcium as recommended for complementary feeding purposes. However, most of the complementary foods had adequate iron and zinc. This is a pointer to the need to deepen the project's engagement in dissemination of nutrition messages in future programming.

Additionally, the study also captured children caregivers' perception on different infant and young children habits. Table 11 shows the caregivers perception on IYCF practices. When asked about exclusive breastfeeding for the first six months, 93% of the caregivers strongly agreed that children should exclusively be breast fed for the first six months. When asked on their perceptions on feeding children (6–23 months) on a variety of foods, 76% agreed that children between 6–23 months should be fed with a variety of food. The findings show that the project social behavior change communication (BCC) on agri-nutrition is playing a key role in changing the social and cultural barriers, hence increasing the uptake of diverse foods among the project participants.

Table 11: Caregivers perception on feeding of IYCF practices.

Perception questions	Perception				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Babies should be given only breast milk for the first 180 days (0–6 Months)	3%	2%	2%	59%	34%
Babies should be given colostrum	4%	3%	7%	56%	30%
Young children (6–23 months) should eat eggs	4%	23%	11%	55%	7%
Young children (6–23 months) should eat fish	7%	20%	10%	54%	8%
Young children (6–23 months) should eat fruits and vegetables	8%	11%	4%	64%	12%
Young children (6–23 months) should eat meat	1%	17%	8%	59%	7%
Young children (6–23 months) should be given cereals, tubers, beans, and yam cooked with vegetables	4%	16%	5%	67%	8%
Young children (6–23 months) should be given variety of foods	1%	12%	11%	64%	12%
Sick children (6–23 months) should be given more food rather than herbal concoctions	3%	26%	11%	55%	5%

Food availability is critical to household nutrition and food security. At the household level, food availability refers to the ability of the household to secure food either from own production or through purchases or gifts/donations.

Figure 6 shows that approximately 95% of the households that were interviewed purchased most of their food items
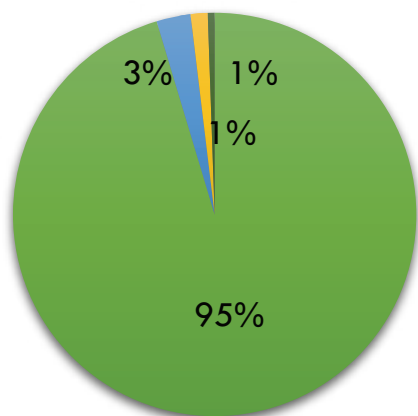
- ■ Purchased ■ Home produced ■ Gifts ■ Donations

with only 3% obtaining it from own production.

Figure 6: Main food sources.

When asked whether the household have a kitchen garden, 17% of the participants indicated to have adopted the use of kitchen garden as a pathway for improved food availability and diversity in terms of cereals, pulses and green leafy vegetables. This is low adoption is attributable to the poor climatic conditions that affected production of most of these food crops.

4.4   EG.3.2-26 Value of annual sales of farms and firms receiving USG assistance:

This indicator measures the value of annual sales as reported by the farmers/pastoralists. The results is obtained through a summation of the value and amount of production from different livestock and livestock products, which in this case include the sale of live and slaughtered animals and the sale of milk from different species that the household owned over the last one year.

Table 12: Value of annual sales by county n=380.

County	Total value of annual sales (livestock and milk)	Value of sales components in (USD)	
		Sale of live and slaughtered livestock	Sale of milk
Isiolo	35,032	7,582	27,450
Marsabit	5,222	2,605	2,617
Garissa	166,269	26,707	139,562
Wajir	13,104	13,081	23
Turkana	1,543	1,358	185
Overall	221,171	51,333	169,838

As shown in Table 12, the value of annual sales for the 380 households that were interviewed averaged USD221,171. Garissa County recorded the highest value followed by Isiolo County, while Turkana recorded the lowest values. The table also shows that the sale of milk contributed the highest proportion in the value of annual sales for both Isiolo and Garissa. At the time of the study, the project had reached 14,270 individuals with various interventions on improved management practices/technologies – notably, PRM toolkit, animal health services/e-surveillance and agri-nutrition. As

noted earlier, the current data is based on a randomly selected sample of 380 households. Table 12 provides an esti-mated/extrapolated value of annuals sales for the 14,270 households reached by the LVC in Phase 2.

Table 13: Value of annual sales n=14,270.

County	Total value of annual sales (Livestock and Milk)	Value of sales components in (USD)	
		Sale of live and slaughtered livestock	Sale of milk
Isiolo	1,315,544	284,724	1,030,820
Marsabit	196,092	97,825	98,268
Garissa	6,243,839	1,002,918	5,240,920
Wajir	492,105	491,226	879
Turkana	57,959	50,996	6,962
Overall	8,305,538	1,927,689	6,377,849

LVC had set a target committed to increase the value of annual sales of farms and firms receiving USG assistance by USD3,000,000. Based on Table 13, the value of annual sales rose to USD8,305,538 surpassing the project's target. This could be explained by the fact that besides LVC, other partners (both USAID and non-USAID funded), could have contributed to the huge increase.

Figure 7 shows the desegregation of the value of sales by gender. The value of sales for males is considerably higher than that of their female counterparts. This can be attributed to the fact that among the pastoralists' households, men own most of the livestock and make most decisions on the sale of livestock compared to women. Majorly, women own and make decisions in the poultry value chain. Therefore, there is need to promote interventions that would develop the indigenous poultry value chain to increase the number of women owning at least this portion of livestock. This would empower women, hence make decisions regarding the sale of poultry, and, bridging the existing gender asset gap across the five AVCD LVC counties.

Figure 7: Value of sales by gender.
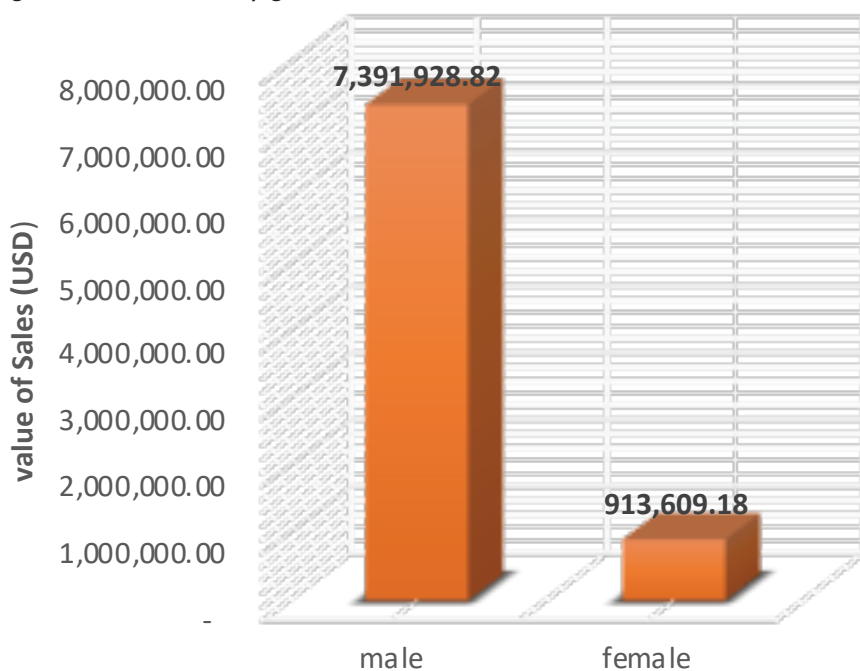
Youths play a key role in enhancing food and nutrition security not only at the national level but also at the household level. To fully exploit the potential of the youth in agriculture and specifically in livestock production, it is necessary for them to have access to incomes from livestock keeping. Figure 8 shows the value of annual sales compared between the youth and non-youth (adults). The value of sales for youth is USD3,571,381 compared to USD4,734,156 among

the non-youth or adults. There is a relatively small margin of USD1,162,775.32 between the two groups, which implies that the youth are gradually engaging in livestock-keeping and trading as a source of livelihood.

Figure 8: Value of annual sales by age group.
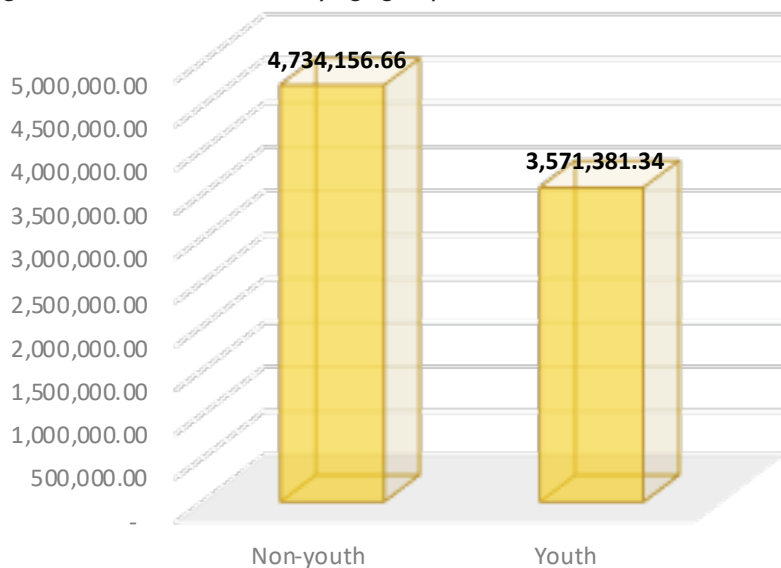
4.5 EG.3.2-24 Number of individuals in agricultural systems that have applied improved management practices/technologies with USG assistance.

The adoption of agricultural practices and technologies enhance resilience, food and nutrition security through improved productivity. Over the last five years, AVCD livestock value chain has been supporting communities to adopt improved technologies to enhance livestock productivity. In Phase 1, the project trained 32,161 pastoralists, as CDRs, on syndromic disease recognition and reporting, through the electronic disease surveillance (e-surveillance) system. Further, the project trained 1,011 producers on fodder production, harvesting and storage, and 1,900 on better rangeland management practices. In Phase 2, 5,894 individuals have been trained on improved technologies namely, management and utilization of rangeland and rangeland resources (834 individuals) and syndromic disease surveillance/e-surveillance (5,894 individuals). Further, the project worked with Safaricom Ltd and supported the integration of a CUG platform into e-surveillance systems across the five counties after the realization that the flow of disease outbreaks information from the CDRs to the county headquarters was declining as a result of lack of provision for airtime for the CDRs to make phone calls. As a result, over 800 CDRs, county government officials, public health officials and strategic agro-vets have been enrolled in the CUG membership across the five counties. The innovative CUG platform initiative has drastically increased the number of reported disease outbreaks by the CDRs and other CUG participants. The e-surveillance/CUG reporting platform has also improved the turnaround time for veterinary officers to respond to, and treatment of, livestock diseases in the target region. Additionally, the Turkana veterinary authorities have used the collated information to inform pre-positioning of veterinary inputs, including projecting future vaccines requirements.

In addition, the project, through its policy and legislation work supported the Director of Veterinary Services (DVS) to issue a circular that clarifies the role of the private sector players in animal health service delivery, specifically vaccination. The issuance of the circular is expected to unlock enormous opportunities for the private sector to engage in animal health service delivery, including regions where the venture has previously been perceived as unprofitable. Further, the project supported the adoption of technologies such vaccination/spraying, curative treatment, use of commercial feed and livestock minerals, water harvesting, hay/fodder, and steer fattening.

This indicator (EG.3.2-24 Number of individuals in agricultural systems that have applied improved management practices/technologies with USG assistance) calculates the total number of agriculture system actors participating in

the USG-funded activity who have applied improved management practices and/or technologies supported by the USG within the food and agriculture system during the reporting year. In this case, the study paid key attention to the number of individuals who are implementing the PRM toolkit through development of grazing plans and the number of individuals who are using the e-surveillance/CUG platform in reporting disease outbreaks in the target counties. These individuals were disaggregated by gender and age to assess the magnitude of impact on these groups. Table 14 shows that 71% of the participants that have applied innovations on agricultural system are male compared by 29% of their female counterparts. When disaggregated by age, 43% of participants who applied improved technology under LVC support were aged between 15–29 years with 57% above 30 years.

Table 14: Number of participants in agricultural systems that have applied improved management practices/technologies disaggregated by gender.

Intervention	Male	Female	Total
Implementation of PRM toolkit	551	238	789
Electronic syndromic disease surveillance (e-surveillance) system/CUG platform	3626	1,464	5,090
Total	4,177	1,702	5,879
Percent	71%	29%	

The 2020 annual survey sought to understand the application of different technologies that have been promoted by LVC over the 2 years. The study results indicate that 91% of the total households interviewed applied at least one of the improved technologies/innovations promoted by LVC. There is a drastic increase in technology application from 68% in 2018 and 31% in 2016, hence demonstrating a gradual increase in the number of project participants (Figure 9). This could be attributed to pastoralist-to-pastoralist learning, as well as buy-in and promotion of the technologies by the county governments and PREG partners, contributing to the entrenching of the Journey to Self-Reliance (J2SR, among project beneficiaries. Figure 9 illustrate a 5-year trend of farmers/pastoralists applying at least one improved livestock technology.

Figure 9: Percentage of farmers/pastoralists applying improved technology.
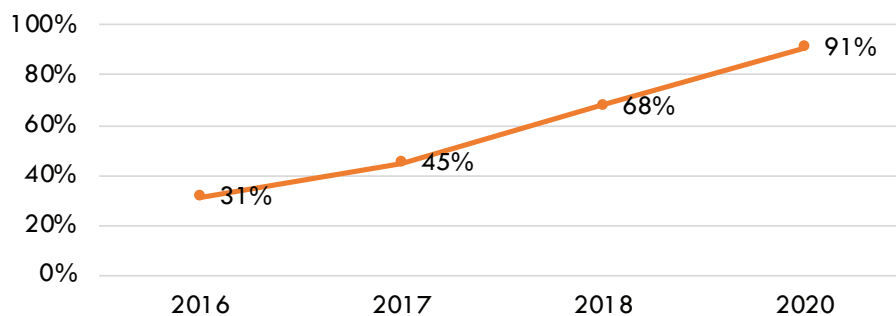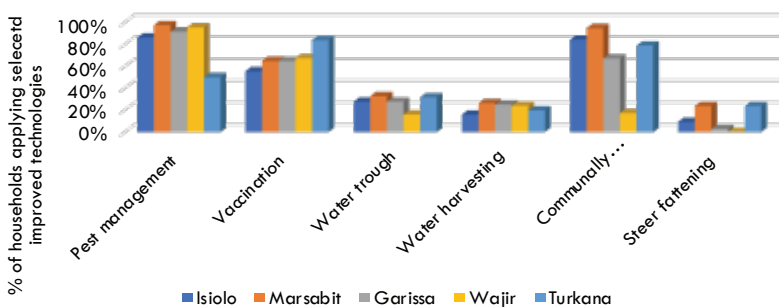

Figure 10 shows the trend in percentage of the number of households that have applied selected improved technology across the five target counties.

Figure 10: Improved technology applied during the reporting period.

Whereas LVC work supported technologies and interventions that support better animal health and rangeland management practices, the study sought to find out whether the beneficiaries had access to other innovations such as water harvesting and steer-fattening, which usually complement project intervention in improvement of livestock production. Livestock keepers applied various techniques to ensure healthy animals for maximum outputs. From the survey findings, majority of the pastoralists in the five counties (more than 50% of the respondents in each county) applied pest management practices such spraying, deworming, and dipping one year prior to the interview period. As shown in Figure 10, while vaccination coverage and adoption in the target counties have been low, LVC project participants recorded significantly high levels of vaccinations. For instance, 84% of the interviewed households in Turkana County had their livestock vaccinated, while Marsabit, Garissa, and Wajir recorded about 65% of livestock vaccinations. Isiolo County was the least with 55%. The relatively high level of vaccination rates across the five target counties is indirectly attributable to the project's support to counties to establish a sustainable real-time e-surveillance system that allowed pre-positioning of veterinary inputs and demand for services by the beneficiaries. The surveillance info/data generated has also enabled the respective veterinary authorities to respond timely to outbreaks, and to lobby for additional public financing of the animal disease surveillance infrastructure.

Frequent droughts and poor utilization of rangelands and rangeland resources pose a major challenge to livestock production in northern Kenya. Therefore, sustainable utilization of rangeland resources is central to a revitalized livestock production and productivity, as it provides a solution to the diminishing rangeland resources such as fodder and water. The project in Phase I developed a PRM toolkit that promotes partnership among the different community players and inclusivity in use of rangeland resources. The toolkit considers the interests, positions and needs of all rangeland users in pastoral areas and offers opportunities for negotiations between different stakeholders to agree on an appropriate grazing plan. It also provides a process that legitimizes the communal land and resource tenure which is aligned to the priorities of the pastoralists and the government. Findings from this study shows that on average, 68% of the project participants within LVC PRM toolkit adoption sites practiced communal planned grazing. This proportion was highest in Marsabit County at 95% and lowest in Wajir at 17%. Rainwater harvesting technology adoption was noted as low across the five counties. This is because the amount of rainfall received in these counties in most cases is less than 200mm per year. This, coupled with high evapotranspiration rates, makes conventional water harvesting and storage practices unfit for households in the northern Kenya region.

Besides drought and dwindling grazing resources, livestock diseases are also a major constraint that limits pastoralist productivity and development of the livestock industry in the region. Livestock diseases impact negatively on both social and economic well-being of pastoralists, immensely eroding their resilience. On average, 67% of the households that were interviewed reported that at least one of their livestock species fell sick one year prior to the study. Garissa recorded the highest (84%) and Wajir County the lowest proportion (40%). Table 15 shows that that sheep and goats (shoats) were the most affected livestock species by diseases (76%) and camels were the least (3.2%). Contagious bovine pleuropneumonia (CBPP) was reported as the disease that most cattle suffered from (41%) followed by foot-and-mouth disease (FMD) at 34%, and abortion in livestock was the least (3%). Most goats were affected by contagious caprine pleuropneumonia (CCPP) (43%) followed by Peste des Petits Ruminants (PPR) (28%) in sheep and goats, while hemorrhagic septicemia was the most common disease in camels.

Figure 11 shows that over 70% of the sick livestock were treated. Majority of the households (60%) used self-prescribed drugs to treat their animals, with traditional animal health workers covering about 15% of the households. This further shows that there is a challenge on the numbers and spread of trained animal health service practitioners in the region. This reinforces the expected enhanced role that private animal health service providers will play once the 2019 DVS[2]circular is fully implemented.

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2. DVS Circular on the Participation of private Veterinary Surgeons and private Veterinary Paraprofessionals in vaccination of animals, 2nd Sept 2019.

Table 15: Livestock disease by species.

Cattle diseases		Shoats diseases		Camel diseases	
Disease	% of households that reported the disease	Disease	% of households that reported the disease	Disease	% of households that reported the disease
Foot-and-mouth disease	34.2%	Peste des petits ruminants (PPR)	28.1%	Trypanosomiasis	35.7%
Contagious bovine pleuropneumonia	41.4%	Contagious caprine pleuropneumonia (CCPP)	43.3%	Hemorrhagic septicemia	64.3%
Tryps	8.8%	Trypanosomosis	6.2%		
Difficult calving	2.9%	Worms	20.5%		
Worms	8.8%	Hemorrhagic septicemia	1.4%		
Lumpy skin disease	5.9%	Foot rot	0.0%		
		Blood urine	0.5%		

Figure 11: Individuals who treated sick animals.

Proportions of individuals who treated the sick livestock
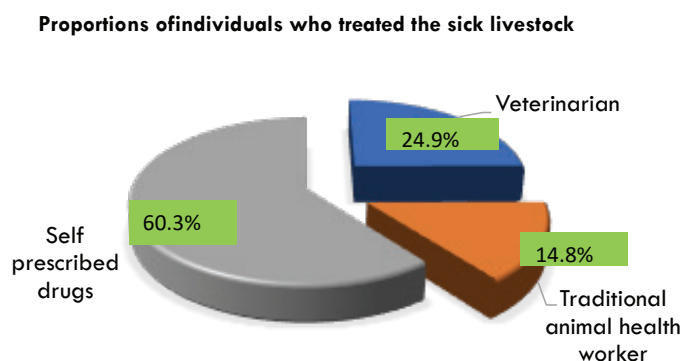
Notably, livestock that were treated through self-prescribed drugs (mean death rate 5 animals) and traditional animal health workers (mean death rate 4 animals) had a higher probability of dying after treatment compared to the ones treated by trained veterinarians (mean death rate 2 animals).

4.6   EG.3-10, -11, -12 Yield of targeted agricultural commodities among program participants with USG assistance (Live animals off-take in Kg/annum)

Of the 380 people interviewed, 21% indicated they owned cattle, 42% goats, 16% sheep, 7% camels, 5% donkeys and 9% chickens. Figure 12 shows the herd size disaggregated by county. It shows that goats are the predominant livestock species kept by the project beneficiaries. In summary, the Tropical Livestock Unit (TLU)[3] for cattle is 713, TLU for goats is 438, TLU for sheep is 99.8 and 304.3 for camels.

According to the FtF handbook, yield is a measure of the total output of production of agricultural commodity (live animal offtake in the AVCD-LVC case) divided by the total number of units in production (total number of animals in the herd in the AVCD-LVC case) during the reporting year as a result of USG assistance. Therefore, the formula for calculating yield is:

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3. Tropical Livestock Units are livestock numbers converted to a common unit.

Figure 12: Herd size by county.
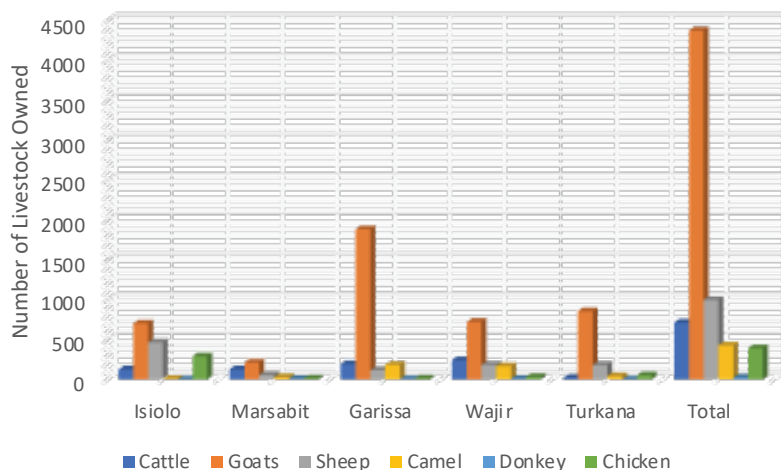
$$\text{Yield} = \frac{\text{Total live animal offtake}}{\text{Total number of animals in a herd}}$$

Since there is no defined production cycle in extensive livestock systems in the reporting year, all the data points for total production (TP) and units of production (UP) will be counted (and summed) each time live animals offtake is done and animal products are produced. The total sum of TP divided by the sum of UP will provide an estimate of the average yield across the year. In this case the total production will be offtake quantity including the entire weight of all animals that were sold, slaughtered, gifted, or exchanged, including those for home consumption (all livestock that exited the household). In this case the following calculation will be used:

$$\text{Yield} = \frac{\text{Total production (TP)}}{\text{Units of production (UP)}}$$

Therefore, this study adopted the following definitions:

1. Total production is the total amount of animal offtake (sales, given away, slaughtered for sale, and own consumption and including loses of animals through death, predation, theft, given away as dowry and lost animals.

2. Total units of production (UP) is the total number of animals in the herd for the reporting year, which can be calculated by collecting the number of animals in the herd at the beginning of the reporting year plus any additional animals including from births, purchases or those acquired by any other means during the reporting year.

For the calculation of yield, the study assumed an average weight for the livestock is 300 kg for camels, 277 kg for cattle, 25 kg for sheep and goats (Mwangi et al. 2020). The adopted animal weights are also consistent with the information provided by livestock markets sales data monitors. Table 16 shows the total production (total livestock offtake) that include live animals sold, slaughtered animals for sale, slaughtered animals for own consumption and animals given away as dowry and gifts.

Table 16: Total production (in kg) by county from livestock offtake.

Animal species	Total production (kg)					
	Isiolo	Marsabit	Garissa	Wajir	Turkana	Total
Cattle	3,601	2,770	6,371	5,817	1,385	19,944
Sheep	2,375	1,385	3,878	554	1,385	33,517
Camels	0	0	1,108	2,493	0	3,601
Goats	3,700	3,878	113,847	27,977	19,667	206,365

Table 17 shows livestock losses across the reporting year. The losses captured were deaths of animals, animals lost, animals stolen, and animals predated. The table also shows goats were the main animals hit by high losses emanating from death, theft, predation, and loss.

Table 17: Livestock losses by county.

Animal species	Total loses (kg)					
	Isiolo	Marsabit	Garissa	Wajir	Turkana	Total
Cattle	554	14,127	11,357	3,878	554	30,470
Sheep	950	1,150	425	200	275	3,000
Camel	1,800	4,200	6,000	1,200	6,000	19,200
Goat	1,150	2,775	1,950	650	825	7,350

Table 18 outlines the total units of production which have been calculated by summing up the total production from animal offtakes and that of animal loses in kg for the 380 interviewed households.

Table 18: Total production in kg.

Animal Species	Isiolo	Marsabit	Garissa	Wajir	Turkana	Total
Cattle	4,155	16,897	17,728	9,695	1,939	50,414
Sheep	3,325	2,535	4,303	754	1,660	36,517
Camel	1,800	4,200	7,108	3,693	6,000	22,801
Goat	4,850	6,653	115,797	28,627	20,492	213,715

Table 19 shows the yield of livestock species disaggregated by county. Cattle had the highest yield at 71.1 followed by camels at 53.5, sheep at 23.3 and goats at 11.7.

Table 19: Yield per animal.

Animal Species	Isiolo	Marsabit	Garissa	Wajir	Turkana	Total
Cattle	33	131	93	45	28	71
Sheep	3	70	62	41	2	23
Camel	225	162	39	22	143	54
Goat	3	39	9	24	1	12

Table 20 shows the yield of live offtake per species disaggregated by county. From the results, cattle were the high yielding species at 9,517,902 followed by goats at 8,419,488 then by camels at 4,281,488 and sheep at 3,744,936 among the project beneficiaries. The yield of the live offtake surpassed the target for year 2020. The surpassing of the yield of livestock serves as a proxy pointer that the project interventions which promoted farmers' access to animal health services and availability of pasture through better management of rangeland resources enabled producers to have better animals. This in turn enabled farmers to sell the animals at higher prices, thereby contributing to increased household income and poverty reduction.

Table 20: Yield of live animal offtake by county.

Animal species	Yield (kg) of live animal offtake by county						
	Isiolo	Marsabit	Garissa	Wajir	Turkana	Total	Target
Cattle	780,156	3,172,634	3,380,676	2,080,416	104,021	9,517,902	3,411,474
Sheep	239,398	736,032	1,328,049	1,389,823	51,635	3,744,936	1,074,009
Camel	337,974	788,605	1,334,621	693,409	1,126,579	4,281,188	1,209,499
Goat	337,974	1,561,251	3,070,679	3,294,680	154,905	8,419,488	1,895,000

Figure 13 shows the distribution of yield of agricultural commodities by gender, in this case yield of livestock production. In all the livestock species, the yield for men is considerably higher than that of women. This can be attributed to the fact that men own most of the livestock species and make decision on the sale of these livestock species.

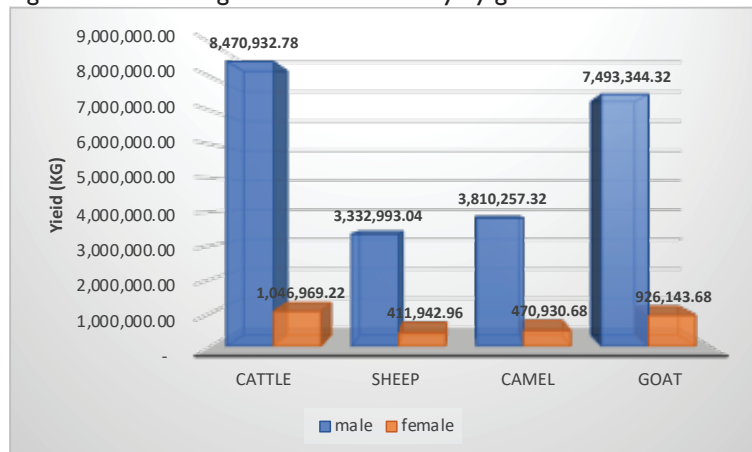Figure 13: Yield of agricultural commodity by gender.

Figure 14 shows the yield of agricultural commodities by age group. The figure shows the youth have contributed substantially to the total yield of our target beneficiaries. This has been contributed by the deliberate engagement of the youth by the project in all its interventions.

Figure 14: Yield of agricultural commodity by age group.
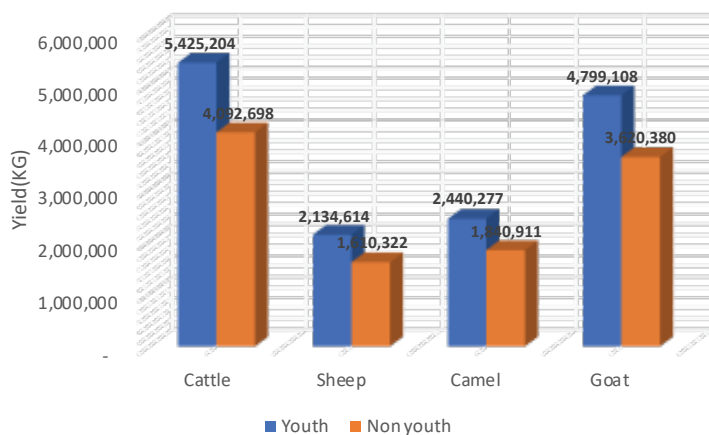
4.7 GNDR-2 Percentage of female participants in USG-assisted programs designed to increase access to productive economic resources [IM-level]

Livestock is considered as a productive asset with high expected returns through sales, consumption of livestock and offspring. Poultry k is considered an asset for women in ASALs, which they can own more easily and poultry ownership by women has the potential to bridge the gender asset gap within households (Kristjanson et al. 2010). To ensure that women participate in programs designed to increase access to productive economic resources, the LVC deliberately made effort to ensure women play a greater part in the implementation of rangeland management interventions, through adoption of the PRM toolkit. The project has been cognizant on the role of women in sustainable rangeland management in that the PRM toolkit calls for all-inclusive participation which involves all community groups so as to ensure that different (and at times conflicting) interests, which represent the governance structure of the community rangeland unit are well addressed. The PRM toolkit recognizes women as change champions who hold significant social power, knowledge and skills related to rangeland management. This is because women are the ones who go out to grazing fields and harvest fodder to feed the weak and lactating animals and the yearlings at home and have knowledge of the access to, and the trend of, forage availability and accessibility within the grazing home range outreach. The PRM toolkit therefore calls for the involvement of both men and women, and indeed youth, in order to achieve sustainable rangeland resources management. Using the participatory data, the mentioned indicator was calculated as:

$$\frac{Number\ of\ female\ program\ participants}{Total\ number\ of\ male\ and\ female\ participants\ in\ the\ program} * 100$$

Out of the 834 participants trained on the PRM toolkit, 238 were females (29%). This is 1% less than the project target taking part in programs that promote access to economic resources, a commendable achievement, given the gender disparity inherent in the pastoralist production system. The ownership of livestock within the household has a great bearing on who makes decisions to sell animals and who make decisions on how the money from the livestock sales will be used. Women ownership of livestock plays a key role in households food and nutrition security. In this case ownership of livestock was treated as the productive economic resource. Table 21 shows that majorly, women own relatively more poultry (at an average of 12) as compared to their ownership of large and small ruminants, as opposed to their men counterparts whose avarege ownerhip of poultry is 1. On small ruminants such as goats and sheep, women owned an average 6 goats compared to 48 goats owned by their men counterparts and an average of 2 sheep compared to 19 sheeps owned by their men counterparts. As a rule of thumb, women do not own larger ruminants, although differ from one household to another. Even when widowed, hence a female household head, she often has to seek permission and/or cioncurrency from senior males in the larger family, and/or her elder son, before selling her livestock for whatever reason.

Table 21: Livestock mean- ownership by sex.

County	Ownership of livestock by gender									
	Cattle		Goats		Sheep		Camels		Poultry	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Isiolo	18	0	50	4	35	4	2	0	5	32
Marsabit	27	16	29	15	10	1	8	0	0	4
Garissa	33	2	51	7	8	1	6	0	0	2
Wajir	34	1	48	3	18	3	18	2	5	5
Turkana	2	0	60	3	25	1	6	0	25	15
Overall average	23	4	48	6	19	2	8	0	1	12

Figure 15 shows the percentage distribution of livestock species ownership disaggregated by gender. In total, women owned 11% of the livestock owned compared to men, who owned 89% of all the livestock species. This therefore implies that 11% of the female participants own livestock and therefore have resources and authority necessary to mobilize their livestock assets so as to improve their household livelihoods and nutrition status.

Figure 15: Distribution of livestock ownership by gender.
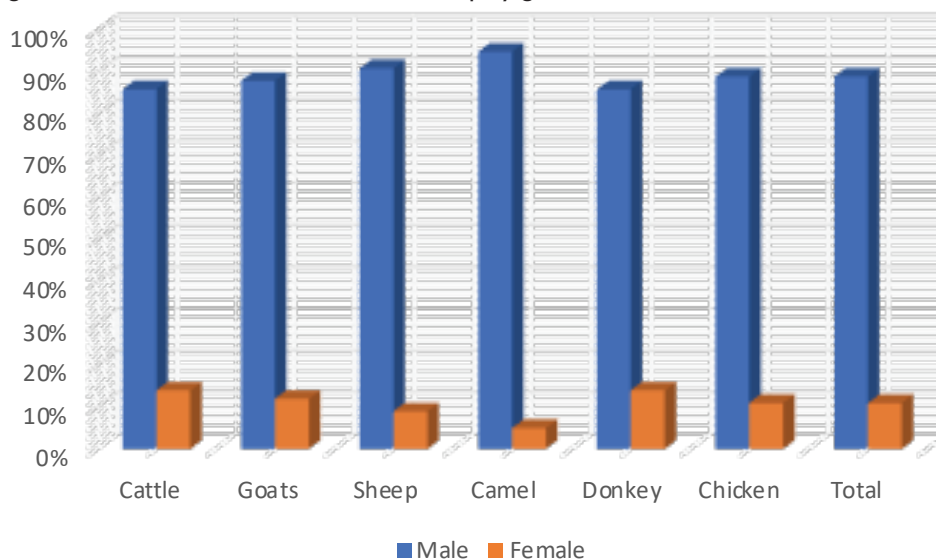
4.8 YOUTH-3 Percentage of participants in USG-assisted programs designed to increase access to productive economic resources who are youth (15–29)

According to the Kenya Population Report (KNBS 2019), the youth accounts for 75% of the national population, with one million entering the labor market annually (Kaane 2014). Youth offer a dynamic workforce that is innovative; have a high uptake of technological know-how and the has the ability to take on significant levels of risk. In the ASALs of Kenya, livestock production presents a huge opportunity for the creation of employment to absorb the youth and ensure achievement of food security for future generations. To guarantee that the youth innovation potential is realized, the project deliberately involved youth in two separate interventions namely, electronic syndromic disease surveillance (e-surveillance) and participatory rangeland management. In the e-surveillance, community disease reporters are engaged to report disease symptoms and other pertinent information on livestock diseases threats and have been empowered to promptly report outbreaks to the relevant veterinary office through the e-surveillance system/CUG platform. The reporting CUG structure entails CDRs reports disease incidences to the sub-county veterinarians. Most of these CDRs are youth and have advance knowledge in smartphone technology and its use which has enabled real time disease reporting with unprecedented success in the LVC counties. In addition, together with LMS AA2, LVC has worked with the youth to monitor the adoption of the PRM toolkit, thus deliberately enlisting the youth in enhancing governance structures in the management of rangeland resources. Since the youths are the community resource persons in providing leadership in the use of the ward adaptation planning committees, the two sister projects are also using the youth's WhatsApp groups to PRM toolkit implementation progress, and challenges. The county technical staff are also able to advice the grazing committees through the same WhatsApp platform.

Therefore, this indicator (YOUTH-3 Percentage of participants in USG-assisted programs designed to increase access to productive economic resources who are youth (15–29), helps to measure whether the project interventions have played a role in harnessing the potential and creativity of youths in reducing poverty, hunger and malnutrition in the target LVC counties. The indicator is calculated as follows:

Out of the 500 members in the e-surveillance/CUG initiative, a platform that supports effective communication in disease reporting, 214 members are youth. Under the implementation of PRM, of the 834 participants engaged, 355 are youth. Overall, out of the 1,334 participants engaged in electronic disease surveillance and participatory management, 569 of them are youth. This translate to 43% of youth involved in interventions that allow them to have access to productive economic resources.

$$\frac{Number\ of\ youth\ program\ participants}{Total\ number\ of\ all\ participants\ in\ the\ program} * 100$$

5   Conclusion and recommendations

Overall, the objectives of the survey have been achieved. The aim was to assess how project interventions had impacted on the project beneficiaries during the last two year of implementation. The interventions are mainly: enhancing participatory rangeland management (PRM) to strengthen the resilience of pastoralist to shocks and stresses due to climate change; promoting improved animal health management through electronic syndromic disease surveillance; supporting county governments to develop policies and enact legislations that are conducive for a robust livestock production and livelihoods of the pastoral communities; and lastly, support to Livestock Market Associations (LMAs) to collect, collate and disseminate livestock sales data for informed sale of livestock, especially at the house level; and promoting better nutrition through community Agri-nutrition training and outreach. Generally, the project has performed relatively well, both qualitatively and quantitatively based the survey data collected and analyzed and the observations made during the survey and subsequently reported herein. Quantitative measurement of performance was pegged on the annual targets set for the project topline indicators, while qualitative assessments were based on observation of the sampled beneficiaries during the field data collection.

Data from the survey showed an overall improvement in performance on most topline indicators compared to last year, and the trend is even much higher when compared with the AVCD LVC baseline values collected in 2016. There was great improvement in terms of yield of various animal species which more than tripled the baseline figures. The project also performed well on nutrition outcomes where the study found that majority women within the reproductive age bracket were consuming diet of minimum diversity. Similar achievements were also registered where the numbers of children reached through Agri-nutrition training of their mothers and/or caregivers greatly improved. Important to mention too, is that the proportion of youth embracing project interventions such as e-surveillance using the CUG platform , and PRM mobilization of pastoralists jointly with LMS AA2 (a PREG partner) increased tremendously, indicating enhanced opportunities for upscaling the PRM toolkit for better rangeland management beyond the initial project sites.

Qualitative observations are noted that project beneficiaries were sensitized and keen to adopting the Technologies, Innovations, And Management Practices (TIMPs) promoted by the project to boost their livestock production and wellbeing. Notably, too, community-based extension system including Ward Adaptation Planning Committees (WAPC), Locational Grazing Committees, and the Village Committees at the county level, played a critical role in cascading the project TIMPs and innovation to community members. The systems/structures built and strengthened at the community level by AVCD and partners are expected to be instrumental in upscaling and sustaining the project's outcomes achieved not only during the two-years of project implementation, but also those development gains achieved in AVCD phase 1.

Nevertheless, due to COVID-19 pandemic, the project was not able to accomplish some of the planned activities particularly related to policy reforms involving both national and county governments. Some of the livestock bills could not be presented to county assemblies, or secure public participation as most gathering had been suspended to comply with the MOH COVID-19 prevention measures. However, most of these legislations were at different stages, and counties are expected to revisit the bills, as the pandemic easiest out.

In view of the findings described earlier and the conclusion drawn, the survey team suggests the following recommendations to enhance the sustainability of the project gains:

- All county governments are encouraged to increase public investments in upscaling the project gains beyond the areas reached by the project. This can also be done by engaging other development partners working in the counties to support the scale-up activities.

- Noting the strong partnership, the project has established with county governments and other local institutions, in initiating appropriate livestock policy and legislative reforms, county governments are encouraged to increase effort to have the different legislations passed by relevant county assembly authorities. County governments are also advised to solicit for cooperation with the national government as legislations are processes that entails domestication of national level policies in and legislation to country context, hence calling sobriety in this endeavor.

- The national level legislation that include Animal Health Bill, Veterinary Public Health Bill, Animal Welfare and Protection Bill, Livestock Development Bill, needs to be supported also, since some of the critical bottlenecks to a robust pastoralist livestock value chain development at the counties, is largely due to non-supportive policy and legislative framework at the national level.

- County government in AVCD LVC project area should undertake necessary policy reforms to institutionalize community agri-nutrition messaging using CHVs and allocate resources to pay stipends for the CHVs to continue their good work at community level. This would strengthen and expand community Agri-nutrition outreach to other parts of the counties and would fast-track the achievement of nutrition outcomes of the target counties.

- From the 2019 LVC annual survey, it is sufficient to concluded that adoption of the PRM toolkit enabled communities to embrace sustainable management of rangeland resources through strengthened community customary governance structures. This entails the protection and management of pastures, water, and other livestock related natural resources by establishing and strengthening community customary grazing patterns; promoting inter-community access to rangelands resources; and establishing and protecting seasonal rangeland reserves among other measures. There is need for County governments to continue expanding the training to other Ward Adaptation Planning Committees (WAPC) to deepen the application of the PRM toolkit.

- Implementation of LVC's phase 2, has not only generated significant and rewarding results, but has also helped project management to learn a variety of lessons. It is important that these lessons are documented to inform current and future similar interventions. These can be shared with county governments, USAID, and other development partners working in the target counties.

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