

Prioritization of climate smart livestock practices and technologies along with beef and dairies value chains



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Workshop report

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LIST OF ACRONYMS

ADID : Association pour le Développement Intégré de Dahra

AIC/CRA: Accelerating Impacts of CGIAR Climate Research for Africa

APESS : Association pour la Promotion de l'élevage au Sahel et en Savane

CCAFS: Climate Change, Agriculture and Food Security

CEP/MEPA : Cellule Études Et Planification/Ministère de l'élevage et des Productions Animales

CIRAD : Centre International en Recherches Agronomiques pour le Développement

CND: Contribution Nationale Déterminée

CSA: Climate-Smart Agriculture

CSS : Compagnie Sucrière Sénégalaise

DAPSA : Direction de l'analyse, de la Prévision et des Statistiques Agricoles

GDP: Gross Domestic Product

GRET : Groupe de Recherche et d'Echanges Technologiques

LDB : Laiterie du Berger

PIL: Plateforme Innovation Lait

PNDE: Plan National de Développement de l'Élevage

PSE: Plan Sénégal Emergent

SPAI: agro-industrial by-products

UNFCCC: United Nations Framework Convention on Climate Change

WRI-CAIT: WORLD RESOURCE INSTITUTE (WRI)-CLIMATE WATCH (CAIT)

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Executive summary

Sustaining animal production through the annual dry season is a challenge in the pastoral pasture-fed areas of Senegal. This is continuously aggravated by climate change, which is affecting livestock productivity in Senegal. Livestock production, especially pastoralism, is a vital part of the Senegalese economy. The government of Senegal through its *Plan Sénégal Emergent* (PSE) is advocating actions for mitigating the effects of climate change and support livelihoods. Climate-smart agriculture (CSA) is an integrative approach to address these interlinked challenges of food security and climate change. Intervention in CSA practices requires prioritization to identify context-specific CSA practices and technologies for the livestock value chains within the various agro-ecological zones of Senegal. The study applied a mixed-method approach, involving participatory prioritization with livestock experts and value chains actors at national scale followed by focus group discussions with men and women farmers in Dahra in September 2022. Criteria were designed on three (3) components, namely climate smartness (productivity, climate adaptation, environmental impact, and mitigation), gender and social inclusion (labour requirements, youth involvement and women friendliness), and achieving one-health (preserving biodiversity, lowering antibiotic residues in animal-source food, lowering antibiotic residues in the environment). Rangeland management (pastoral hydraulics, identifying livestock corridors, pastoral units, vaccination parks), semi-intensive production/stabling (integration/improvement of fodder/forage species and recycling of agro-industrial products –“sous-produits agro-industriels (SPA) in French”), index-based livestock insurance – IBLI – and climate-informed agro-advisories were the prioritized CSA practices in AICCRA intervention for livestock production in the pastoral and agro-pastoral zones of Senegal. The rangeland management includes sustainable use of resources (water ponds, boreholes, pastoral wells etc.). The semi-intensive production involves the sowing of improved varieties of pasture, typically the replacement of native grasses with higher yielding and more digestible forages, perennial fodders, pastures, and legumes. The stakeholders highlighted that the installation of mini-farm for fodder crops, storage warehouses and fodder depots, can help to produce and stock up on fodder to feed livestock in the dry season. In addition, herders need climate informed agro-advisories to guide movement along the corridor, for accessing water ponds, and for more efficient use of feed and pasture. Regarding the collection and processing stages, especially of the dairy value chain, milk collection tools should be improved, including the cold chain to preserve the hygiene and quality of the milk. However, to meet the growing need for electricity and to limit the systematic use of generators, they are turning more towards lower pollution solar energy technologies. The stakeholders perceive that limited access to market and the lack of technical support to be the major constraints for adoption at scale. However, major opportunities for the scaling of the prioritized CSA practices and

technologies are related to the demand for livestock products and private sector organizations such as the Laiterie du Berger, the mini-dairy units owned by women individually and in cooperatives and the Dairy Innovative Platform, that all encourage investment in the sector to increase the livestock production.

1. Background

The livestock sector in Senegal contributed 4.4% to GDP in 2019 and 24.3% to the value add of the primary sector. Livestock plays an essential role in supporting mixed farming-livestock systems (traction, fertilization, sale of animals etc.) (CEP-MEPA, 2021).

The Plan Sénégal Émergent (PSE), the reference framework for Senegal's economic and social policy since 2014, has selected livestock farming as one of the sectors to drive growth. This choice is guided by the significant impact of livestock activities on poverty reduction and wealth and employment creation. Livestock farming is practiced by 29.5% of Senegalese households (Beye et al., 2019). In rural areas, 47% of households practice livestock farming to produce dairy and meat products (DAPSA, 2021). The PSE has thus defined strategic objectives for the sector which, in general, aim to improve the sector's competitiveness in a sustainable manner. In this perspective, an integrated approach favoring the development of value chains has been adopted to boost the productivity of the livestock sectors. The National Plan for Livestock Development (PNDE) of the PSE has the vision of making livestock “a competitive sector, satisfying in a sustainable manner the national demand for animal products and ensuring the socio-economic empowerment of its actors”.

However, climate change and variability adversely affect livestock production through the degradation of natural resources with the risk of reducing productivity. The drivers of land degradation related to climate change are gradual changes of temperature, precipitation, and wind, as well as changes in the distribution and intensity of extreme events (Lin et al.2017). Agro-climatic trends in the Sahel show a significant increase in hot days and heat waves that are harmful to agro pastoral systems (Abberton et al, 2021). Climate change affects livestock production through competition for natural resources, quantity and quality of feeds, water scarcity, livestock diseases, heat stress and biodiversity loss while the demand for livestock products is expected to increase (DAPSA, 2021). In addition, the dry season in Senegal lasts approximately nine (9) months of the year, during which feed for livestock becomes scarce, water more difficult to access and ponds drying up. Therefore, the challenge is to maintain a balance between productivity, household food security, and environmental preservation.

Meanwhile the agricultural sector contributes on average 37% of the country's total greenhouse gas (GHG) emissions (11.90 megatons carbon dioxide equivalents, according to the latest five (5) years data available from 2015-2019, WRI CAIT). According to national data used to prepare the Third National Communication to the United Nations Framework Convention on Climate Change (UNFCCC), 79% of methane emissions are derived from the agriculture sector, mainly from livestock (51%). In response to these challenges, the government of Senegal recognizes the urgent need to implement adaptation and mitigation measures to increase the resilience of its ecosystems and populations to the impacts of climate change and to reduce greenhouse gas (GHG) emissions by 2030 (CND, 2020). Fortunately, the livestock sector in general offers a wide range of opportunities for enhancing resilience, while mitigating emissions and increasing productivity (Thornton and Herrero. 2015). These opportunities link to several other climate-smart agriculture (CSA) entry points, particularly those revolving around natural resources management, climate risk management and value chains etc. Climate-smart agriculture (CSA) has the potential to deliver "triple wins" by contributing to multiple objectives: (1) sustainably increasing productivity and food security, (2) enhancing farmers' resilience capacity (adaptation), and (3) reducing or removing greenhouse gas emissions (mitigation) where possible (Lipper et al., 2014).

Consistent with the objective of PSE, the Senegal cluster of the Accelerating Impact of CGIAR Climate Research for Africa (AICCRA-Senegal) project aims to helping livestock value chains actors adapt to climate change by expanding access to climate information services and climate-smart agriculture practices and technologies. With the support of AICCRA, livestock keepers can better anticipate climate-related events and take preventative actions, have better access to climate information services and climate smart practices and technologies for livestock systems linked to information on effective response measures. By focusing on CSA initiatives within a country, we are providing this CSA intervention framework of the project that considers the priorities of CSA according to different agro-ecological zones and stakeholders to achieve more effective, efficient, and equitable food systems that respond to environmental, social, and economic challenges in productive landscapes. The integration of CSA requires a critical inventory of current and promising practices for the future as well as the institutional, political, and financial factors that foster its adoption. This overview demonstrates the relevance of the choice of livestock-meat and milk value chains in Senegal in the context of identifying climate-smart practices to cope with climate change. This report provides a snapshot of a developing baseline created to initiate discussion, nationally and locally, about entry points for scaling CSA in the agro-silvo-pastoral areas of Senegal. This approach is based on an inclusive approach of consultations with both experts and value chains actors.

Therefore, this CSA prioritization guides the selection of promising livestock-oriented CSA innovations, practices and technologies for cattle and dairy value chains in the AICCRA Senegal intervention zones. This

represents an opportunity to define CSA technology packages fit for context to a sustainable management system of local natural resources, in the agro-silvo-pastoral zones of Senegal.

2. Methodology

The identification of appropriate and context-specific CSA practices for livestock value chains, in this case, specifically for cattle and cow milk, requires participatory approach with national livestock experts and value chains stakeholders. As an entry point for the implementation strategy of the various components of the AICCRA-Senegal project, with a focus on scaling up CSA, identifying the best bet practices for continuous uptake and implementation within the intervention areas requires a framework for relevant experts and stakeholders to prioritize context-specific CSA options for livestock value chain. The overall approach and methodology were adopted following the CSA prioritization framework of CIAT/CCAFS (e.g. WorldBank and CIAT, 2015; Mwongera et al., 2016, Andrieu et al., 2016). It is consisted in two steps:

- 1st Step: A first identification and initial listing of existing practices and the mapping of livestock value chain within the country through a literature review. The list of practices was discussed and validated regarding their relevance in addressing climate related risks and supporting livestock productivity by in-country experts (mainly veterinary, breeders, scientists in livestock production systems and nutrition, weather information and insurance specialists etc.) during the workshop.
- 2nd Step: Assessment and prioritization of practices: The prioritization criteria consisted in three broad components which include 1) Climate Smartness, 2) Gender and Social Inclusion (GSI) and 3) Contribution to One-Health. The climate smartness is based on the ability of a given CSA practice to contribute to enhancing the productivity, adaptation to climate change and mitigation (where it is possible). The Gender and Social Inclusion (GSI) component expands the criteria on the potential of a practice in terms of accessibility, affordability and labor requirement for women and the youth in the communities. The One-Health component considers the ability for a practice to enhance environment/agro-diversity and animal health, indicators notably: promoting crop-livestock system, preserving biodiversity, lowering antibiotic residues in animal-sourced food, and lowering antibiotic residues in the environment.

For each of identified prioritization criteria, the prioritization was done using a 5-point scale, where 1 = very low importance, 2 = low importance, 3 = medium importance, 4 = high importance and 5 = very high

importance. However, experts and stakeholders decide on the component-level weights (climate smartness, gender and social inclusion and One-Health) based on their importance in prioritizing practices and technologies for livestock sector. The weights were considered in estimating the total average score instead of dividing the total score by the number of criteria linearly.

We conducted two separate workshops, one with experts and the second with value chain stakeholders using a participatory approach followed by focus group discussions (FGDs) with stakeholders in the field for more effective outcomes.

The first workshop was held in Dakar in August 2022 and brought together experts from public as well as private sectors with experience in livestock production system, natural resources management and climate change.



Photo 1: Experts workshop held on 25-26 August, 2022, Dakar. ILRI/AICCRA/Pierre Ndiaye

The experts' workshop was followed by a stakeholders and livestock value chains actors workshop organized in October 2022 with "Plateforme Innovation Lait" (PIL), which operates in the pastoral area. The platform consists of different dairy value chain actors (inputs/services supplier, producer, collector, processors, industry operating in dairy, NGOs etc). The value chain actors' workshop consisted in reviewing, validating and consolidating the experts' based-CSA prioritized lists into CSA package that suits to their needs for

sustainable livestock production. Therefore, the CSA practices were consolidated for different stages of the value chains: inputs/production, collection, and processing stages.



Photo 2: Value Chain actors' workshop followed by FGD on 25-26 August, 2022, Richard Toll. ILRI/AICCRA/Derek Chan

The two (2) workshops also highlighted the factors that are relevant for the adoption and scaling of the prioritized CSA practices and technologies. Focus group discussions were organized with livestock value chains actors, women (10 participants) and men (10 participants) pastoralists, leading to discussion in deep toward end-user acceptance and ease of usage the enabling adoption's factors of the prioritized CSA. For the prioritized CSA interventions, stakeholders provided insights on what is more important and relevant for scaling to design more effective scaling strategy for the prioritized CSA in pastoral and agro-pastoral area of Senegal.

3. Results and discussion

3.1. Mapping of value chains

The value chain is characterized by the movement of animals and collection of milk from the primary production areas, with pastoral systems in the Ferlo, in the north of Senegal, and livestock farmers in the groundnut basin (Figure 1 & 2). The main constraint on both value chain relates to inputs, including water, fodder and veterinary services. Currently, producers bear these costs. Integration of markets across the

region depends heavily on the maintenance of transhumance corridors within Senegal and with neighbouring countries. These corridors are essential routes for grazing and trading activity (Carabine and Simonet, 2017). Dahra, located in Linguère region serves as a central node of collection of live animals from the aforementioned production areas, collecting animals from neighbouring countries Mauritania and Mali as well (Figure 1).

3.1.1. Beef value chain

A network of weekly markets (called 'louma' in local language) also facilitates the collection, forwarding and sale of animals, with the town Diourbel serving as a primary destination for animals from Dahra town, further forwarding to terminal markets in Dakar, Thiès, Saint-Louis or the Gambia. Operators on the cattle market are wholesale dealers (Dioulas) and the middlemen (Téfankés) between the farmers and wholesale traders. Dioulas collect animals from herders and farmers, and Téfankés are at local markets to facilitate sales. Brokers also work outside markets to connect butchers and chevillards with livestock. Chevillards are large-scale butchers who process meat for retailers, while butchers process meat themselves and sell to the end-consumer. Slaughter facilities run by the state are provided for the use of chevillards and butchers, however our informants estimate that a similar number of livestock are slaughtered outside of these facilities. The large number of actors in the value chain add cost to the price of the meat (Sow et al. 2021), but there are some actors who take multiple roles. For example, 32% of Dioulas don't use transporters, relying instead on producers to transport themselves and customers coming to the market. The study also shows that 37% of Dioulas do not use the services of Téfankés.

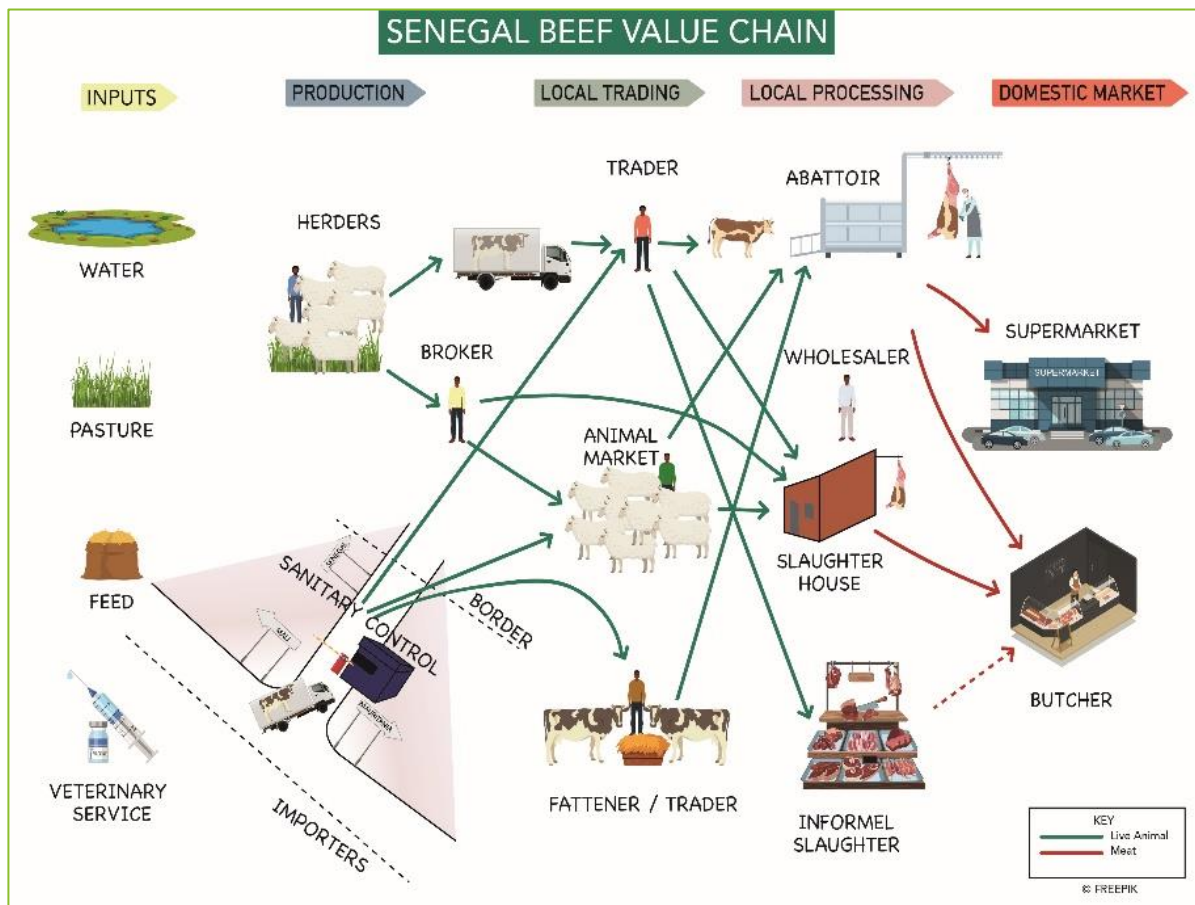


Figure 1: Beef value chain

3.1.2. Dairy value chain

In the dairy value chain, there are two parallel chains in operation (Figure 2). One is the traditional (and mostly informal) chain and the other is more industrialized milk transformation (formal). In the extensive system, milk production is the responsibility primarily of women. They traditionally have an important role in milk production, including collection and selling to dairy industries. They also have an important role in processing and marketing of dairy products through mini-dairy unit, individually or in cooperative to process milk into yoghurt, butter oil, pasteurized milk, milk curd etc. They manage income from trading milk to food items, clothing, and other necessities for the household. Actors in the intensive system face financial and logistical constraints, especially for feeds. In addition, the collection, storage and distribution of milk are a challenge. This has an impact on quality and therefore price. Seasonal fluctuations in production are a major constraint for both chains, affecting supply. Exotic breeds may not be climate-resilient in the long term, even though returns are higher in the short term because of increased productivity.

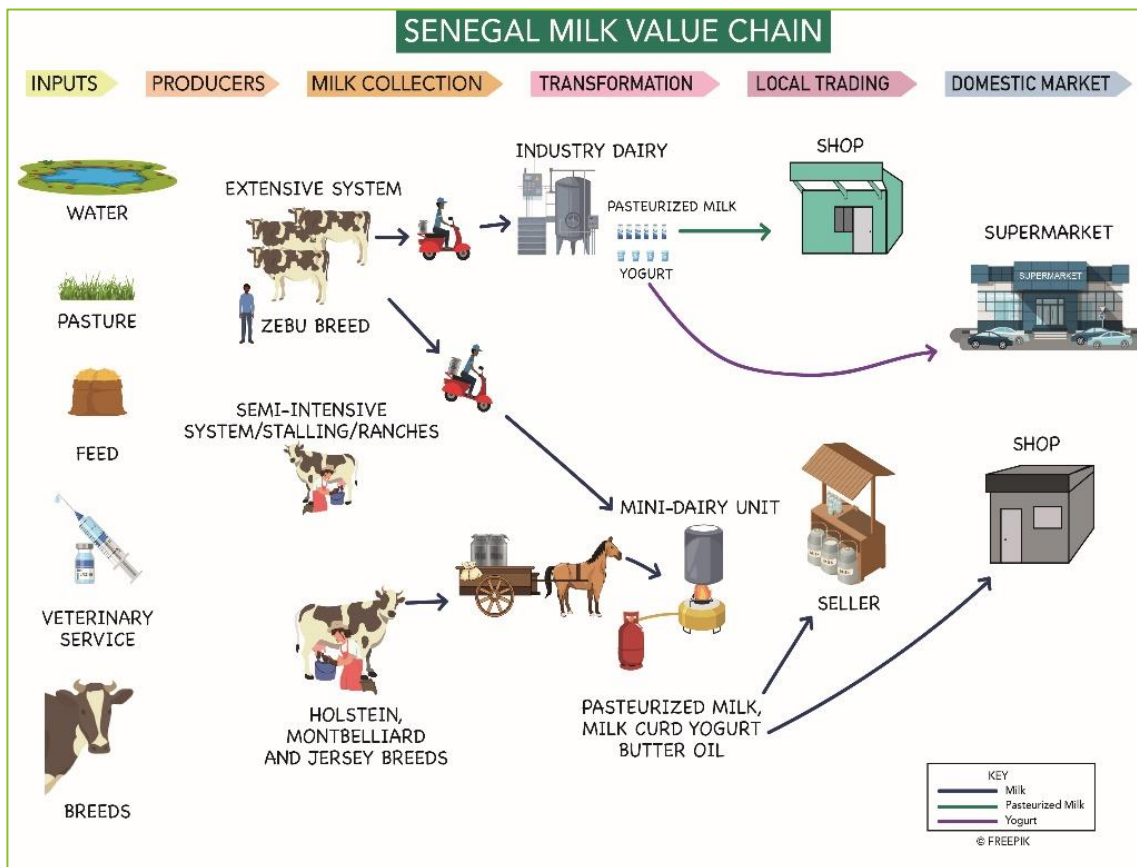


Figure 2: Dairy value chain

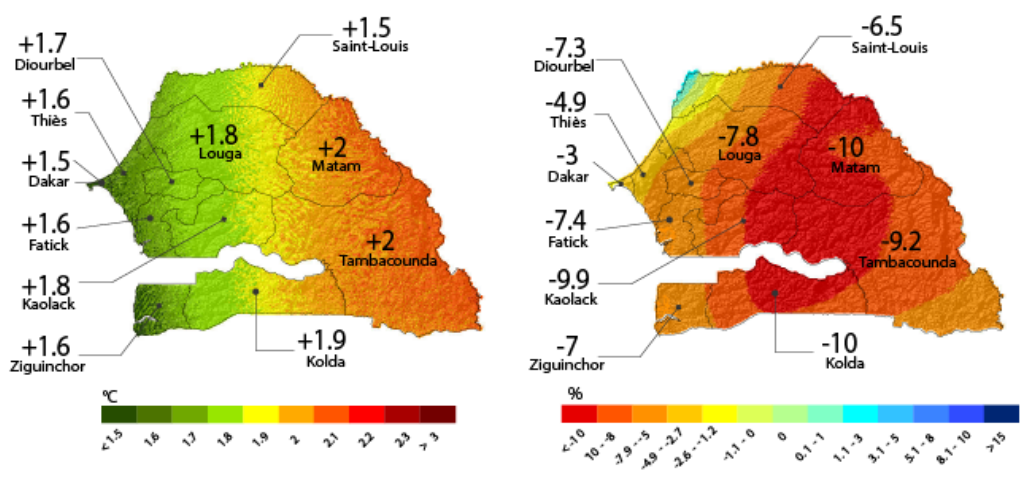
3.2. Understanding the climate risks for livestock production in Senegal

The climate related risks reported by livestock value chain actors include drought, erratic rainfall and rising temperatures. Drought remains the most common challenge to livestock producers in the pastoral areas, with adverse effect for animal feed and water scarcity. According to the stakeholders, the rural areas experience irregular rainfall patterns during the rainy season, erratic start of the rainy season, and long dry spell length that affect crop and livestock production. Similarly, stakeholders reveal that the drought affect the productivity of animals, with low levels of milk production that limit the access to markets. Although there has been a steady increase in livestock and crop production in Senegal in recent years (Chengat Prakashbabu et al. 2020), farmers in Senegal are facing increased climate variability (Thornton 2022) with the level of rainfall more unpredictable and a shorter rainy season, increased heat stress both for agricultural workers and their livestock, and increased competition for diminishing water resources. The dairy value chain's stakeholders perceive severe impacts from drought, which affects the different stages of the value chain (harvesting, storage and processing stage etc). Drought and temperature raise also contributes to milk spoilage and increases operational costs in the collection and bulking of milk (Mwongera et al., 2019).

Further, climate change is projected to lead to rising temperatures, increased drought and decreased rainfall in Senegal, which is likely to have considerable impacts on livestock production in the coming decades. Climate projections (Figure 3) indicate that (Ramírez-Villegas J and Jarvis A. 2008; Collins et al., 2013; Ramírez-Villegas J and Thornton P.K. 2015):

- Temperatures continue to increase by 1.1 to 1.8 °C by 2035, and up to 3 °C by the 2060s.
- Warming is faster in the interior of the country than the coastal areas,
- Extreme events are expected, including prolonged droughts and more frequent flooding.

Higher temperatures and changing rainfall patterns in the regions of Louga, Matam, Tambacounda etc. may impact the spread and severity of existing vector-borne diseases and macro-parasites, accompanied by the emergence and circulation of new diseases. These changes will include a substantial reduction in the quantity and quality of forage available as well as water resources in these regions and heat stress in animals, particularly in the pastoral areas. Indeed, in the silvopastoral zone and northern River Valley, livestock producers are also at risk. Although livestock breeds in Senegal are well adapted to high temperatures, the impact of climate change on the production of biomass and water resources may affect the health of the animals and the traditional movement patterns of pastoralists and aggravate conflicts over limited resources (Tetra Tech ARD; CSE; ISRA. 2014). Livestock-dependent households will be the most vulnerable to climate change as a reduction in precipitation may affect the quantity of pasture available, leading to competition over the limited resources. These farmers also tend to have fewer resources than “mixed”-system farmers (Tetra Tech ARD; CSE; ISRA. 2014).



Changes in annual mean temperature (°C)

Changes in total precipitation (%)

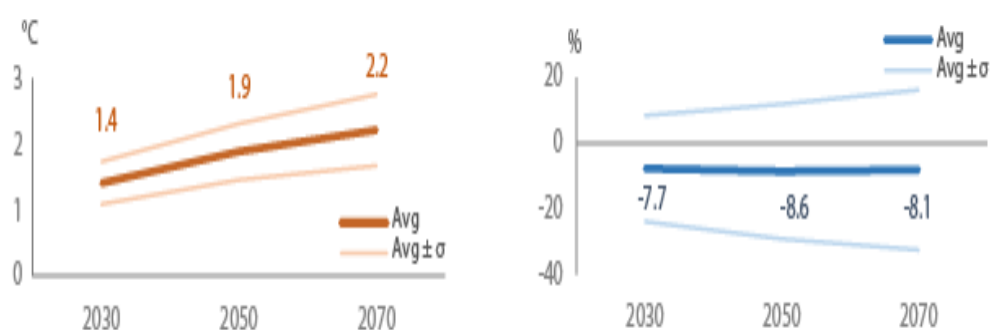


Figure 3: Projected changes in temperature and precipitation in Senegal by 2050 (Source: Ramírez-Villegas J and Jarvis A. 2008; Collins et al., 2013; Ramírez-Villegas J and Thornton P.K. 2015)

3.3. Outcome of CSA practices prioritization

3.3.1. Experts' inventory and prioritization

Results of the inventory's exercise with experts building on existing and past climate change intervention for livestock value chains in the different regions and agro-ecological zones of Senegal reveal 14 CSA practices and technologies. These practices and technologies are compiled from various interventions by national and international institutions in the various regions of Senegal which include the pastoral and agro-pastoral zones. Based on the experience of experts in the past years on the potential of each practice to contribute to the different targeted components (climate smartness, gender and social inclusion, one health), the qualitative evaluations led to prioritize the identified practices (Figure 4). The identified and prioritized CSA technologies and practices present opportunities for addressing climate change challenges, as well as for sustainable livestock production in Senegal. A high score indicates the level of relevance of or to what extent a given practice can enhance the adaption capacity and contribute to build the resilience of pastoralists in the pastoral and agro-pastoral zones of Senegal.

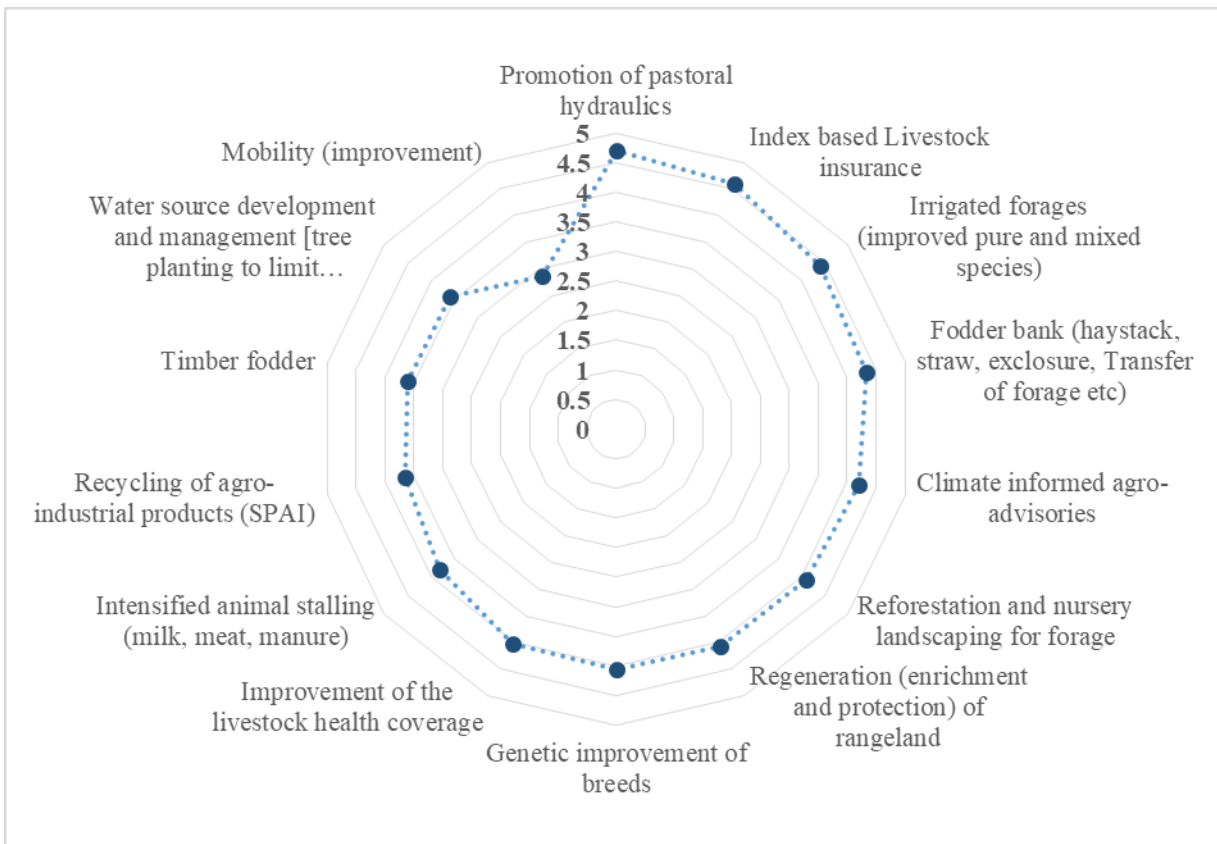


Figure 4: Prioritized CSA practices and technologies

3.3.2 Value chains actors' prioritization

The major challenges in livestock systems face by herders for production are lack of pasture and quality feed, and scarcity of water resources.

INPUTS-PRODUCTION

CSA practices	Agro-ecological zones And adoption rate (%) <30 30-60 60<	Predominant farm scale S: small scale M: medium scale L: large scale	Climate smartness	Gender and social inclusion	One health	TOTAL
Rangeland management (pastoral hydraulics, corridor, pastoral unit, vaccination park)	Pastoral and agro-pastoral zones >60%	L	2.8	0.84	0.9	4.54
Semi-intensive production/stalling (integration/improvement of fodder/forage species, mini-firm and Recycling of agro-industrial products (SPA1),	Pastoral and agro-pastoral zones <30%	S	2.54	0.78	0.87	4.19
Index based Livestock insurance (IBLI)	Pastoral and agro-pastoral zones <30%	S	1.8	0.74	0.4	2.94
Climate informed agro-advisories	Pastoral and agro-pastoral zones <30%	S	2.2	0.78	0.87	3.85

COLLECTION

CSA practices	Agro-ecological zones And adoption rate (%)	Predominant farm scale S: small scale M: medium scale L: large scale	Climate smartness	Gender and social inclusion	One health	TOTAL
Improved collection tools (Refrigeration chain)	Pastoral and agro-pastoral zones <30%	S	1.2	1.26	1.5	3.96

PROCESSING

CSA practices	Zone agro-ecological	Predominant farm scale S: small scale M: medium scale L: large scale	Climate smartness	Gender and social inclusion	One health	TOTAL
Improved storage (Refrigeration chain) for processed dairy products	Pastoral and agro-pastoral zones <30%	S	2.1	0.62	0.12	2.84
Solar power	Pastoral and agro-pastoral zones <30%	S	2.57	0.64	0.12	3.32
Diversification of dairy products (cheese, butter oil etc.)	Pastoral and agro-pastoral zones <30%	S	1.63	0.64	0.1	2.37

Figure 5: CSA prioritized for cattle and dairy value chains in Senegal

Regarding these challenges for livestock production, the value chains actors' prioritization exercise building on the experts' work led to consolidated CSA practices in the pastoral and agro-pastoral zones around:

- (1) Rangeland management (rehabilitation activities, pastoral hydraulics, corridor, pastoral unit, vaccination park)
- (2) Semi-intensive production/stabling (integration/improvement of fodder/forage species and Recycling of agro-industrial products (SPAI, french acronym),
- (3) Index-based livestock insurance (IBLI) and
- (4) Climate informed agro-advisories.
- (5) The following graphic (Figure 5) present the CSA practices along the key value chain stages with scores according to stakeholders' evaluations given their contribution to climate smartness, women and youth inclusion and one health

Regarding the contribution to the different component, the results show that each of the prioritized CSA has more potential for climate smartness, on average 2 points than gender and inclusion and one health, which record less than 1 point. The rangeland management and semi-intensive production/stabling were prioritized among the stakeholders for improving productivity, and income from animals' products and adaptation to climate change. The total average scores are 4.54 and 4.19 (from a total of 5) respectively for the CSA packages such as rangeland management (pastoral hydraulics, pastoral unit) and semi-intensive production through fodder/forage species production). According to stakeholders, the climate informed agro-advisories and Index-based livestock insurance (IBLI) are important for decision making and the transfer of risk even though most of them don't trust in the climate information and payout promised by insurance companies. These CSA practices were scored 3.85 and 2.94 respectively for their potential for climate risk management.

Rangeland management

The rangeland management includes the improvement of rangeland productivity through rehabilitation activities (enrichment with nutritive species and protection). The so-called "hydraulique pastorale" refers to the policy implemented since the 1950s in Francophone Sahelian Western Africa as a way to develop extensive traditional herding through a better access to water supply and use (Baroin, 2003). The pastoral unit refers to a geographical space centered on a borehole where pastoralists live exploiting the same resources and using the same water points (ponds, pastoral wells or boreholes etc.).



Pastoral units, which are dedicated to improving pastoralist livelihoods, bring together the herders for sustainable management of pasture and animal health. They set rules for grazing, mainly during the dry season, where there is a lot of competition in the use of resources for animals. The pastoral unit has the mandate to sensitize, to solve the conflicts between farmers and herders, and monitor the respect of corridor on their territory.

Photo 3: Visit of pastoral unit, water pond in the village of Thiargny, 17 September 2022, ILRI/Prosper Houessionon

For instance, for the best coordination of resources in the pastoral unit's territory, an area of 500 meters is defined around the water pond, where animals cannot graze.

A major concern in the silvopastoral zone is transhumance. Pastoralism and especially nomadic transhumance are a common adaptation strategy practiced in the Sahel to cope with the climatic stresses and limited resources in the region (Diouf et al., 2014). Pastoralists move with their cattle from north to south across the region of Louga, as pasture dries up, before returning north again with the summer rains. They turn to the Dolly Ranch, a domain of 87000 hectares for pasture. The transhumance corridors connect seasonal grazing lands, for resource-use flexibility because of the spatio-temporal variation in resource availability within the country. The established livestock keepers association must therefore agree on the passageways, sensitize the Fulani herders' migrants and equip these transhumance routes for the respect of the established corridor for a sustainable use of the resources.

According to value chain actors, for a climate smart perspective; opportunities for research for development include the support of the rangeland management council and the livestock keepers association established

in the pastoral unit. This consists in activities to improve the local level planning processes including those involving multi-stakeholders and in strengthening local governance structures. In this regard, some entry points are: 1) village council, 2) grazing committee, and 3) village land use planning/joint village land use planning.

The semi-intensive production/stabling

The value actors stipulate that the shortage and high cost of feed are the major constraints for the practice of semi-intensive production. Indeed, the semi-intensive production for a climate smart production consists in promoting fodder/forage species production, and the use of recycling of agro-industrial products (SPAI). It includes activities on the silage production technology to farmers. The integration of forage legumes offers a potential for increasing forage and consequently, livestock production. The legume forage has been shown to improve both the quantity and quality of fodder and crop residues leading to better system efficiency (Ayarza, 2007).



Photo 4: Field visit on 22 September, 2022. Cowpea forage demonstration site. Meouane. ILRI/AICCRA Senegal/Prosper Houessionon



Photo 5 : Field visit on 05 May, 2022. Richard Toll. ILRI/AICCRA Senegal/Prosper Houessionon

The stakeholders highlight that the installation of mini-farms, storage warehouses and fodder depots, can help to produce and store fodder to feed livestock in the dry season. For livestock farmers, actions are needed to support the herders for feed processing and ensure the availability of improved fodder varieties with better digestibility that will definitely contribute to increased productivity regardless of seasonality. Improvements in feed digestibility can be achieved through the processing of locally available crop residues, and better feed digestibility leads to better animal and herd performance (Getahun, 2019). According to stakeholders, the capacity building of herders, and specific training on the production of cowpea fodder through availability of fodder seeds, the processing of local available crop residues and by supplementation

of diets with better quality green fodder such as multipurpose leguminous fodder trees, where available can help them to substitute the high cost of feeds. This will in turn guide for a better planning and sustainability of the livestock production during the dry season and improve the productivity of livestock.

Milk collection tools should be improved, including cold chains to preserve the hygiene and quality of the milk. However, to meet the growing need for electricity and to limit the systematic use of generators, they are turning more towards lower green energy source such like solar energy technologies.

The lack of technical support, and lack of dairy related technologies are the major constraints related to milk production whereas problems related to milk marketing include lack of quality control of milk, lack of cooling and storage facilities at milk vending sites, poor quality of milk supplied from rural areas, sale of raw milk, inappropriate milk handling and storage vessels, and spoilage of milk due to lack of preservation and processing facilities.

Climate informed agro-advisories and Index-based livestock insurance

The main constraint for the use of climate informed agro-advisories is the interpretation of the information for decision making for herders. According to stakeholders, the climate informed agro-advisories can be useful if based on the rainfall and can provide accurate information on the duration of pasture and water ponds during the dry season to guide the movements of herders. The National Agricultural Insurance Company of Senegal (CNAAS, its French acronym) is in charge of livestock insurance and is working with a number of partners to distribute insurance products to smallholder farmers. According to the stakeholders present, herders are distrustful of the payout procedure which requires autopsy and vaccination records before payouts are made and leading to long delays. Thus, the stakeholders felt that climate index insurance for livestock can better protect them from risks associated with drought or variable precipitation. The index-based livestock insurance ([IBLI](#)) program that has been implemented by ILRI in other countries such as Ethiopia and Kenya can be an entry point for reducing the impact of climate risks faced by herders.

Capacity enhancement and facilitation of intervention which augments not sustainable use of pasture and forage production to reducing the impact of climate change on livestock production can be supplemented with assistance tot herder in decision making and risks transferring.

3.4. Enabling factors for adoption at scale

Small farmers in the pastoral and agro-pastoral areas of Senegal make their livelihood mostly from livestock products. However, stakeholders perceive that high cost of technologies, limited access to market, lack of technical support as major constraints for adoption at scale. The stakeholders need a profitable market for

marketing their products in a timely manner, as milk is a perishable product. Therefore, access to quality stock feed and real-time market knowledge are necessary, from the stakeholders' point of view. In addition, stakeholders perceive improving market access, as a way of implementing various contract farming and building of open markets. Private dairy companies can promote a market for dairy in the pastoral zone by:

- (i) developing a livestock cooperative,
- (ii) creating a service company,
- (iii) developing dairy centres,
- (iv) reducing the cost of collection,
- (v) setting up mini-farms,
- (vi) settling the dairy core of pastoralists and set up local services
- (vii) contracting with farmers.

Additionally, the capacity development on dairy product safety can help farmers by enhancing compliance to safety standards and promote self-regulation through adoption of best practices for milk collection and processing.

3.5. Opportunities for scaling up: Private sectors, gender engagement and institutions

The livestock sector plays an important role in the economy and food security of stakeholders, mainly the dairy sector in the pastoral and agro-pastoral areas of Senegal. Small and large livestock can make a huge difference to women and men's incomes while strengthening household food and nutrition security and building resilience. The major opportunities for the development of the sector in Senegal include high demand for livestock products, the presence of enabling policy that encourages investment in the sector, the absence of competitors, and easy access to transportation systems.

The Laiterie du Berger (LDB) is a private company created in 2004 in Richard-Toll, in the North of Senegal, one of the largest suppliers of dairy products in Senegal at competitive price. The increased demand for industrial and packaged dairy products is a major driver, the consequence of a growing urban population and a new middle class that values standardized and hygienic food. Their dairy products are much appreciated and marketed under the Dolima brand, with a wide range of products including yoghurts, fresh milk, and other products, with LDB being one of the main suppliers of dairy products in Senegal. It contributes to strengthening the food security and socioeconomic resources of Senegalese Sahelian pastoral households. They collect and add value to milk from local herders and help to meet the increasing

demand for milk products in the country. However, on their own, they struggle to get required quantity of local milk to meet the demand of dairy products in Senegal. This gets worse during the dry season where the milk production decrease significantly because of drought and the inability of most of herders to buy high-cost feed for their animals. Therefore, the local milk available represents only on average only 20% of the total raw milk required for LDB to meet dairy products demand in Senegal, with the rest being supplied by imports of powdered milk.

In addition, some stakeholders process raw milk and supply dairy products at local level. The Dairy Innovation Platform is a group of stakeholders in Dagana, northern Senegal comprising more than 1,500 milk producers made up of traditional breeders, more than 65 mini-farms, 14 collectors of milk, small- and medium scale processors and distributors, plus other stakeholders including research institutes, rural communities, and government offices working agricultural development. The dairy cooperatives and mini-dairy units owned by individual woman and women's groups operate in the pastoral area, mainly in Dahra, Linguère, and process raw milk into yoghurt, butter oil, pasteurized milk, and milk curd.

AICCRA Senegal can support, train and capacitate the small farmers on feed production and management of pasture through climate informed agro-advisories to sustainably increase their production. Moreover, AICCRA can strengthen the capacity of the Dairy Innovation Platform for better coordination and scaling strategies designed and applied to support the stakeholders.

Conclusion and policy implications

The prioritization process represents a major step towards the successful implementation of the AICCRA-Senegal cluster. It provides evidence that the rangeland management (pastoral unit, pastoral hydraulics), semi-intensive production (production/stalling - integration/improvement of fodder/forage species), climate informed agro-advisories and index-based livestock insurance can help cope with climate risks and sustain livestock production. Furthermore, the process highlights the importance of gender and social inclusion especially in terms of women and youth involvement in the uptake and use of the prioritized CSA practices. Thus, interesting opportunities for designing an effective index-based livestock insurance and the dissemination of climate information for the actors of the selected VCs can be a source of potential success. The important role of the Dairy Innovation Platform to bring together the different players was emphasized by GRET, LDB, CSS, APESS. The Compagnie Sucrière du Sénégal offers the possibility for the production of 50 ha of forage with the Dairy Innovation Platform to support the stakeholders during the dry season. Therefore, AICCRA-Senegal can extend its intervention zone to the pastoral area for livestock component to build its interventions and scaling on the existing frame of Laiterie du Berger (LDB) and Dairy Innovative

Platform (PIL) through capacity development and specific training for stakeholders and technicians. A collaboration between ILRI/CIRAD/LDB was praised as a first step towards supporting livestock value chains in the pastoral and agro-pastoral zones of Senegal.

This study identifies key policy implications:

1. Strengthen the livestock (dairy and beef) value chains, through the private sector engagement by stimulating investment in cowpea fodder and forage production to promote stabling and guarantee the milk collection for dairy industry. This could be possible through strong partnership with community via community-oriented information, training on milk collection and awareness-raising campaigns that will enable pastoralists to be more business-oriented.
2. Public sector (National research institutes, Ministry of livestock etc) contribution to strengthening the value chains should focus in supporting and establish fodder seed system to promote youth entrepreneurship in the production and access to cowpea fodder seeds at scale.
3. As an adaptation strategy for dry spells and droughts, there are opportunities for the private sectors to invest in index-based livestock insurance and dissemination of climate informed agro-advisories programs.

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AICCRA
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About AICCRA

Accelerating Impacts of CGIAR Climate Research for Africa (AICCRA) is a project that helps deliver a climate-smart African future driven by science and innovation in agriculture.

It is led by the Alliance of Bioversity International and CIAT and supported by a grant from the International Development Association (IDA) of the World Bank.

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