Food and Agriculture Organization of the United Nations

Planting Material and Storage Inputs Assessment in Somalia

May 2023

Annex 2 Feasibility Study | Appendix 3

For FAO-GCF project ''Climate Resilient Agriculture in Somalia''

Acknowledgment

We would like to acknowledge all the support and guidance rendered by FAO Somalia's Agricultural Sector and other team members. We also acknowledge community level individual respondents who consented to be interviewed during this very important exercise. Special thanks go to all stakeholders including farmers, private seed producing companies, seed/grain traders, and Agro dealer shop owners, who unreservedly shared all the required information during the interview process.

Finally, we also acknowledge Savana Consultancy and Research Services Ltd for field level data collection.

Acronyms and Abbreviation

AVRDC	Asia Vegetables Research and Development Center
CARS	Central Agricultural Research Station
CGIAR	Consultative Group for International Agricultural Research
CIMMYAT	International Maize and Wheat Improvement Center
DANIDA	Danish International Development Agency
DAP	Diammonium Phosphate
FAO-STAT	Food and Agricultural Organization Statistics
FAW	Fall Army Warm
FASNU	Food Security and Nutrition Analyses Unit
FEWS NET	Famine Early Warning System Network
FGD	Focused Group Discussion
FMOAI	Federal Ministry of Agriculture and Irrigation
GAP	Good Agricultural Practices
GEEL	Growth, Enterprise, Employment, and Livelihood
Ha	Hectare
ICRC	International Committee of the Red Cross
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IDPs	Internally Displaced Persons
IDRC	International Development Research Center
IFAD	International Fund for Agricultural Development
IPGRI	International Plant Genetics Research Institute
IRRI	International Rice Research Institute
IITA	International Institute for Tropical Agriculture
IRiS	Inclusive Resilience in Somalia
KALRO	Kenya Agricultural and Livestock Research Organization
MT	Metric Ton
NGOs	Non-governmental Organizations
NPPO	National Plant Protection Organization
OP	Open Pollinated
PIMS	Promoting Inclusive Market System
SARIS	Somalia Agricultural Regulatory and Inspection Services
SATG	Somalia Agricultural Technical Group
SSG	Seed System Group
SSSA	Seed Sector Security Assessment
UN	United Nation
UNDP	United Nations Development Program
USAID	United States Agency for International Development
WB	World Bank

Table of Contents

Acknowledgment i
Table of Contents iii
List of Tables iv
List of Boxes v
List of Diagrams v
Executive summary 7
1 Context 17
1.1. Introduction 17
1.2. Overview of agricultural production in Somalia 18
1.3. Challenges of agricultural development in Somalia 20
1.4. Crop improvement efforts and status of seed Intervention in Somalia 22
1.4.1. Pre-War Crop Improvement and Extension Services 22
1.4.2. Pre-war seed systems 26
1.4.3. Post-war seed interventions 27
1.5. Agricultural input related policies and regulation 28
2 Objectives of the study 30
2.1. General objective 30
2.2. Specific objectives 30
3 Conceptual framework used for the assessment 30
3.1. Definitions and concepts of the seed system 30
3.2. Seed sector security assessment framework 31
3.3. Methods used 33
3.4. Assessment sites selection 34
3.5. Study areas 35
4 Results and discussion 36
4.1. Major crops and their varieties 36
4.1.1. Crop production trend and ranking 36
4.1.2. Vegetable production 43
4.2. Seed production and distribution in Somalia 44
4.2.1. Seed testing, seed production and multiplication 45
4.2.2. Individual and cooperative based seed production and supply practices 52
4.2.3. Seed production by private seed companies 58
4.3. Acute seed security findings 66
4.3.1. Farmers seed sources used in Gu and Deyr 2022 66
4.3.2. Seed security parameters 70
4.3.3. Seed rate determination 73
4.4. Seed supply and demand 82
4.4.1. Crops and vegetable seed supply 86
4.4.2. Crops and vegetable seed price 88
4.5. Chronic seed security findings 90
4.5.1. Improved agricultural practices 90
4.5.2. Fertilizer use practices 90
4.5.3. Improved storage use practices 92
4.6. Seed aid impact on local seed security 95
4.6.1. Emergency seed intervention 96
4.6.2. Developmental seed related projects 96
4.6.3. Suggested programmatic interventions 97
5 Conclusion and recommendations 101
5.1 Conclusion 101
5.2 Recommendations 102
References 105
Research Team 107

List of Tables

Table 1. Central Pillars of seed security assessment 32
Table 2. Investigative tools and methods used during the assessment 33
Table 3. Selected areas of assessment 34
Table 4. Proportion of respondents for Crop ranking by district (location) 36
Table 5. Crop variety ranking by district 38
Table 6. Preferred and other varieties of Maize 39
Table 7. Preferred and other varieties of Sorghum 40
Table 8. Preferred and other varieties of Cowpea 41
Table 9. Preferred and other varieties of Mung bean 42
Table 10. Preferred and other varieties of Sesame 42
Table 11. Vegetable ranking (Proportion) per district 43
Table 12. Priority vegetable types and their varieties 44
Table 13. Crops and varieties tested by SSG/FMOAI 45
Table 14. Yield and agronomic trait of F1 hybrid 46
Table 15. Yield and agronomic traits of FAW hybrids 47
Table 16. List of seed out growers participated in commercial maize seed production 49
Table 17. Profile of individual and Seed Producer Cooperatives 52
Table 18. Crop type and sources of seed used by seed producers 53
Table 19. Quantity of crop seed produced in 2022 and estimate for Gu 2023 54
Table 20. Comparison of the seed volume availability across two Gu season 2022/2023 55
Table 21. Profile of Private seed producing companies 59
Table 22. Quantity of seed produced by private companies in 2022 and estimate for Gu 2023 60
Table 23. Seed production by private companies between two Gu seasons 2022/2023 61
Table 24. Farmer's seed sources used in Gu and Dyer 2022 season (22 Individual) 67
Table 25. Seed sources expected to be used proportionally for Gu 2023 68
Table 26. Farmers evaluation of the performance of Gu 2022 harvest 71
Table 27. Average Price comparison for major crops across the two Gu seasons**.** 73
Table 28.Recommended emergency seed support based on livelihood zones 78
Table 29:Vegetable seed recommendation 79
Table 30: Distinction between Agro dealer shops and Local seed trader in the market 84
Table 31. Trader's observation how Farmers differentiating seed from grain (N=10) 85
Table 32. Seed sale in two seasons (2022) and estimated seed sale for Gu, 2023 season 86
Table 33. Local trader's evaluation of supply trend for major crops 87
Table 34. Seed sold in Gu 2022 and estimated seed for sale for Gu 2023 87
Table 35. Supply estimate for Gu 2023 season at Agro dealer shops (N=8 Agro dealers) 88
Table 36. Price trend for crops and Vegetables across two Gu seasons-2022/23 89
Table 37. Amount of fertilizer used and sources accessed in Gu and Dyer 2022 season 91
Table 38. Recommended fertilizer application for major crops 91
Table 39. Common pests and disease affecting crops during storage period in Somalia 93
Table 40.Estimating improved storage bag need based on livelihoods Zone 94
Table 41: A Simplified Version of a Crop Improvement Program 98
Table 42.Priority crops for crop improvement program in each state 100

List of Figures

Figure 1. Map of Somalia 35
Figure 2. Crop preference ranking 37
Figure 3. Priority vegetables expressed in percentage 43
Figure 4. Partnership on the production of certified commercial seed 50
Figure 5 Comparison of seed volume in MT between two Gu seasons 2022/23 56
Figure 6 Comparison of seeds produced by privat seed companies between two Gu seasons (2022/23) 61
Figure 7.Sources of seed used (% of farmers) in 2022 season 67
Figure 8.Farmers rating on seed quality satisfaction 70
Figure 9 Proportion of Improved and Traditional Storage bag Use by FGD participants 93

List of Boxes

Box 1. The New Modality of Seed Production 46
Box 2. Motives for engaging on seed production business by private companies 54
Box 3. Seed certification process 60
Box 4. Seed saving and seed acquisition by farmers 65
Box 5. Seed quality definitions/ concepts 66
Box 6. Setting a seed package needs to base on an iterative learning process.....77
Box 7. The importance of local market as seed source 78

List of Diagrams

Diagram 1. SIMAN hybrid maize seed variety flow chart.....44
Diagram 2.A simplified version of the certified seed production process.....95

Correct Citation: Moges Bekele and Hussein Haji (2023). Planting Material and Improved Storage Inputs Assessment in Somalia, FAO Somalia

Executive summary

BACKGROUND

Planting material and improved storage input need assessment was carried out across Somalia starting December 2022. The assessment covered 10 districts in 6 states, where 4 states were from the previous South-Central states, which are currently known as South West, Hirshabelle, Jubaland, and Galmudug States, and 2 states from the northern part of the country namely Puntland and Somaliland. The selected districts represented the major livelihoods where people in Somalia depend. These include Riverine, Rainfed and districts where both Riverine and Rainfed based agriculture practiced. The field level data collection involved 30 Focus Group Discussions (FGDs) where Men and Women groups discussed separately and in a total 294 farmers participated. In addition, 22 individual farmer interviews, 10 seed/grain traders' interviews, 8 individual and cooperative seed producers, 6 seed producing private companies, 10 district level government representatives, and a representative from the Somalia Agricultural Regulatory and Inspection Services (SARIS) of the Federal Ministry of Agriculture and Irrigation (FMoAI) were also interviewed. Other stakeholders interviewed includes the CGIAR center and NGOs which includes ICRISAT, Seed System Group, and International Committee of Red Cross (ICRC) who currently support agricultural research and development in Somalia.

Desk based review was also carried out on documents relevant to the current assessment. The desk review focused on assessing documents related to the overall operating context including the country's agricultural development opportunities, challenges, past crop improvement endeavors, extension services, and current agricultural related policy and regulations. Major findings of the desk review and the assessment are highlighted below under various sections and sub-sections in this report.

SUMMARY OF KEY FINDINGS

A. Major crops and preferred varieties

1. Maize, Sorghum, Cowpea and Sesame have been identified as major or priority crops cultivated by the majority of the farmers. For the selected priority crops most of the farmers use or depend on locally adapted varieties/landraces. Improved varieties of Maize and Mung bean, which were released back in 1980s are still available and being used by farmers despite decline in varietal purity and productivity over the years.
2. Farmers have identified preferred varieties of major crops such as Maize, Sorghum, Cowpea and Sesame. Varietal preference is usually based on a combination of traits such as local adaptation, better yield, disease and pest resistance, desirable cooking qualities,

pleasant taste and color. Most of the respondent farmers preferred white and red cob local maize varieties, white and red local varieties of Sorghum, red local cowpea variety and black and white local varieties for Sesame crop.

3. Tomato, onion and pepper were identified as the three priority vegetables cultivated in Somalia. Most of the vegetable seeds are imported from abroad and distributed through Agro-dealer shops.

B. Seed testing, production and distribution approaches in Somalia

1. There are various actors that have been involved in seed testing, production and distribution practices in Somalia that include 1) the Seed System Group (SSG) and FMoAI, 2) individual farmers and cooperatives, and 3) private companies. Most of these seed producing actors use local crop landraces as planting materials for seed production. The overall seed production practices in Somalia are characterized as informal seed system, where locally available seeds are continuously being recycled among seed producers and end users (farmers).
2. Seed System Group (SSG) and FMoAI acquired improved Maize, Cowpea and Mung bean varieties from Kenyan Agricultural and Livestock Research Organization (KALRO)and improved sorghum variety from ICRISAT. A varietal adaptation trial for all acquired crops have been conducted across the different agro-ecological zones of Somalia, this was followed by multiplication and distribution of the promising varieties.
3. In 2021 and 2022 years, SSG together with the three private seed producing companies, namely Filsan, CSET and Horn Agro, produced a total of 777 MT of improved seed varieties of maize, sorghum and cowpea and distributed to 24,000 smallholder farmers located in Lower Shabelle, Middle Shabelle and Bay regions.
4. Potential good practice in commercial maize seed production and distribution started to emerge in 2021 in Somalia. Thanks to the unique ***private sector, humanitarian organization, and international agricultural research centers*** partnership which jointly enhance seed production in the country. In Somalia, emergency seed support interventions by various actors have been the dominant channel of crop seed distribution for several years. This emerging good practice of commercial crop seed production and distribution, when scaled up and continued can lead to the sustainability of the good initiative/practice. **This innovative model is currently being adopted by IRiS (Inclusive Resilience in Somalia project) which is supported by USAID, to scale up maize, sorghum and cowpea seed production in Afgoye, Baidoa and Baalad during the Gu 2023 season. Three seed companies registered by SARIS (CSET, Darusalam and Gaalooge) are contracted by IRiS to produce certified seed for the coming Deyr 2023 season.**
5. A range of staple food crop seeds are being multiplied by individuals and cooperatives in Somalia. Major crop seeds multiplied are mainly local varieties/landraces with limited or no improved seed varieties. The collapse of research centers along with their breeding programs

in Somalia forced the active seed producers to depend on poor quality seeds available in grain markets and other unconventional seed sources as parent materials.

6. Sample Individual and cooperative seed producers have produced **117 MT** of maize, sorghum, cowpea, mung bean and sesame seeds during the Gu and Dyer seasons in 2022.
7. During the Gu and Dyer seasons in 2022, 6 private companies produced **2,698 MT** of maize, sorghum, cowpea, mung bean and sesame seeds. Danwadaag Enterprise, a private seed producing company, has also produced a significant amount (**54 MT**) of rice seed in the same reference year.
8. The existing public institutions working on the crop seed system in Somalia lack the capacity to offer services and guidance required by the system. Key services such as crop breeding and variety maintenance programs are missing, and the seed certification service provision was not functional for long time until 2022 when it has just started to operate targeting private seed producing companies. This has encouraged private sector to step in and contribute towards bridging the gap through testing new varieties, distributing the promising ones to smallholder farmers as foundation seeds, and by applying SARIS seed certification requirements, serving as certified seed producers.
9. The year 2021/2022 could be considered as a year marking a milestone in propelling a formal seed production system in Somalia. The key features observed in 2022 include commencement of crop improvement after three decades of latency, and establishment of a public institution (SARIS) that is mandated to oversee requirements for agricultural input use including seed/planting material quality assurance, and responsible for seed certification.

C. Acute seed security findings

1. In year 2022 average seed sources used in Gu and Dyer season has shown that, farmers' own-saved seeds represented the most important source of seeds accounting for 34.5, 37.8, 33.4 and 36.7% of the maize, sorghum, cowpea and sesame seed demands, respectively. Local markets were the second most important sources of seeds addressing a significant portion of the seed demand that ranged from the lowest 27.8% recorded for maize seed to the highest 34.5% for cowpea. Standing at the third place, agro-dealers, addressed 19.9% of the demand for maize seed, 12.4% for sorghum, and 21.4% of sesame seed needs. Social networks also respectively responded to 3.9, 10.4, 4.8 and 1.9% of the market demand for maize, sorghum, cowpea and sesame seeds.
2. Seed aid support within emergency or development setups through different actors during the Gu and Dyer 2022 seasons addressed 13.4% of the demand for maize seed, 4.8% for sorghum, 13.2% for cowpea, and 6.6% of the sesame seed demands.

3. About 63% of the farmers participated in the 10 FGDs expressed their dissatisfaction with the quality of the seeds they used. Seed quality related problems include low yield, susceptibility for pest and diseases as well as poor germination and vigor.
4. The overall farmer level seed availability relates to crop yield recorded during the season. Whenever there is good harvest, farmers will have better capacity to store some produce as seed source for subsequent planting season. In contrary, whenever the crop yield gets low due to various reasons, farmers will look for external support as they face shortages from crop yield. Thus, the low crop yield recorded for the major crops such as maize and sorghum in 2022 has negative implication on seed availability for subsequent seasons. According to the FASNU agricultural assessment report, year 2022 has recorded the third lowest crop yield in Somalia.
5. Farmers save seeds from the previous harvest to use for the upcoming cropping season as own saved seed. Thus, one of the methodologies, used to understand the overall seed availability for Dyer 2022 season, was assessing the crop yield recorded in the Gu 2022 season. On average, 42.2% of the FGD participants have evaluated the Gu 2022 harvest for the four major crops namely Maize, Sorghum, Cowpea, and Sesame and characterized the season as a poor harvest season.
6. Farmers generally access seeds from various sources to meet their needs. It is not common that farmers depend on a single source for a specific crop seed. Depending on the volume of the crop harvest, farmers save some amounts of seed for the following cropping season. The 22 sample respondent farmers reported that own-saved maize seed will cover 26% of their maize demand. They have also indicated that own-saved seeds will cover 30 and 38% of their sorghum and sesame seed needs, respectively for the upcoming Gu 2023 season. Thus, FGD participants (as point 1 section C) and individual interviewed farmers findings disclosed close to similar number of seed has been available as own saved season by farmers.
7. Other seed producers/sources, namely **individual, cooperative and private company seed producers** operating in Southwest and Hirshabelle States of Somalia, forecast increased seed production in the Gu 2023 season.
    i. Interviewed 8 Individual and cooperative seed producers estimated to produce more seed in the Gu 2023 season, therefore, increased seed available to smallholder farmers for the Dyer 2023 cropping season compared with that for the same season of year 2022. These seed producers estimated a combined production of **76 MT** of maize, sorghum, cowpea, and sesame seeds, which is 26% higher compared with that (60 MT) produced during the same season in 2022.
    ii. Interviewed 6 private seed producing companies, on the other hand, projected an even higher production estimated at a combined **2,799 MT** of maize, sorghum, cowpea, mung bean and sesame seeds during the Gu 2023 season. This means that in

Gu 2023 season, there will be a 1,583 MT (130%) increased seed production compared with the 1,216 **MT** of maize, sorghum, cowpea, mung bean and sesame seed production reported in 2022 Gu season.

8. Seed accessibility for most smallholder farmers is still expected to be a challenge. Contributing factors include limited capacity seed producers and distributors to reach out to remote rural areas, poor transportation infrastructure, insecure distribution location/sites, and increasing prices for most crop seeds mainly due to the global economic effects of the war in Ukraine since last year. Prices are anticipated to increase by 54% for sorghum and 50% for maize compared with that of the Gu 2022 cropping season.

D. Seed supply

1. Local markets are one of the important sources of seed for farmers. Based on past 2001 study report, well developed local seed markets have been operating in Southern Somalia, then other part of the country. In Southern Somalia, a network of mostly women small-scale seed and grain traders represented the major source of seed.

2. The supply trend based on the interview of key seed traders (N=10) and Agrodealers (N=8) shows a positive seed availability trend. Most of the seed distributing sources shows positive supply trend for the upcoming Gu 2023 season.

E. Chronic seed security findings

1. Past Seed Security Sector Assessment (SSSA) conducted in 2015 disclosed that 92% of the farming households cultivated a sole crop (either maize or sorghum) at any given time with only 8% practicing intercropping either of the crops with cowpea or mung bean. Later similar seed security assessment conducted in 2020 has disclosed improvements, where out of 1552 respondents, 64.8% (1006HH) reported practicing intercropping, 34.3% (533HH) still practice monocropping farming, the remaining 0.9% (13HH) practice Agro forestry and other practices. The majority of respondent farmers practicing monocropping were observed at Awdal (26%) and Lower Shebelle (18%) regions
2. The emergency agricultural/livelihood support project by FAO started to promote crop diversification even during its response to drought effects. This has happened through supporting farmers to access emergency livelihood package. Either of the primary staple cereal crops (sorghum or maize) along with either of two pulses (cowpea or mung bean) have been constituting the package assisting farmers in the diversification of their crops.
3. Access to new improved crop varieties was observed to be very limited in the target areas assessed. The SSG/FMOAI conducted varietal trials of improved maize, sorghum, cowpea and mung bean varieties, obtained from regional programs, to assess their adaptation to the local conditions and later distributed improved maize, sorghum and cowpea varieties. This is

believed to be the recently observed improved variety distribution to very limited farmers in the area.

4. Some of the seed producing private companies are accessing seeds of improved maize, sorghum and rice varieties from different international research centers namely CIMMYT, ICRISAT and IRRI, started adaptation tests and in some cases, produce and distribute seed of the promising varieties/hybrids to the target farmers.
5. The use of improved agricultural inputs such as inorganic fertilizers was low among the respondent farmers with only 40.4% of them reporting to have used urea at least once for at least one of the crops cultivated in 2022. The use of DAP is reportedly not common as the urea and all kind of inorganic fertilizers are banned by the Government of Somalia. As revealed by the respondent farmers, fertilizer is applied for the cultivation of the two crops maize and sesame, as priority crops for fertilizer application during the 2022 cropping seasons.
6. Past assessment by FAO and SATG on the post production lose conducted in the Bay Region reveals that grain losses associated with the traditional storage systems (underground pits) are significantly higher at estimated 40% loss, which is higher than those or crop losses associated with post-harvest techniques (crop loss occurring during in appropriate harvesting, transportation, and drying process).
7. The use of improved storage bags as good post-harvest grain handling practice was reportedly adopted only by 54% of the 294 FGD participants. Improved storage bags are mainly used for the most prioritized crops namely cowpea and sesame. International NGOs and FAO were the main actor who supported the target farmers with improved storage bags (Hermetic bags). Currently, Agrodealers started to keep Hermetic bags in their shops, to make it accessible to interested farmers.

F. Seed Aid Impacts on local seed security.

1. The developmental seed aid projects which were implemented by various stakeholder have left positive impact and are still supporting the local seed security. The emerging seed companies, improved varieties, germplasm collected, seed multiplication using out growers' model and support offered by various development project started to impact positively the seed systems and it will continue contributing positively for the future seed improvement in Somalia.

CONCLUSION

The informal seed system dominates the seed supply system in Somalia. Generally, Somalia farmers depend on own-saved seed, social networks, local seed markets and seed aid support

and of the seed supplied used, most are local varieties/landraces. Only the transaction of vegetable seeds happens through the formal market channels and almost all vegetable seeds are imported from outside the country. The formal seed sector is just about to emerge as most of the pre-requisites for a formal seed system such as crop improvement, seed out-growers, private seed companies and regulations governing the seed sector are coming to play through the private and public sectors. Good practice on commercial seed production also started and needs to be documented and supported for scaling. As observed from the 2022 Gu and Dyer seasons assessment outcomes, seed security for most target farmers seems to be unstable and is mainly attributed to factors such as low crop yield, and poor seed quality and limited accessibility. For the Gu 2023 production season, Seed supply at local seed markets, and Agro dealers shows positive or close to normal seed supply. However, there is price increment anticipated for majority of major crops namely maize, sorghum, cowpea, and sesame. Seed prices are anticipated to significantly increase in the Gu 2023 cropping season. Prices are anticipated to increase by 54% for sorghum and 50% for maize compared with that of the Gu 2022 cropping season. Mainly due to the inadequate public crop seed support system, smallholder farmers are likely to continue facing chronic seed insecurity related challenges.

RECOMMENDATIONS

A. Emergency seed aid

1. In some areas, for instance Southwest and Hirshabelle states, seed may be readily available, but access is limited particularly for certain segments of the community such as poor and marginalized households, and returnees. In such scenario, input trade fairs and seed voucher system seem to be the most feasible options to increase access to crop seeds. The current seed voucher system is limited to accessing seed only from Agro-dealers. Opening the seed market to all relevant actors has the potential to strengthen the seed market resilience. However, the choice for seed voucher system or seed trade fairs depends on the local security situation.
2. In areas where access and availability of crop seeds are challenging, priority should be given to local seed collection of superior quality from areas having similar agro-ecological conditions where the same crop varieties are grown and distributed to the target farmers. **Apart from Somaliland and the arid zones of Puntland and Galmudug, where annual precipitation is low, most of the southern states have similar agroecological conditions.**
3. New varieties should not be introduced in emergency situations. All new varieties must be tested for adaptation of local condition, farmer and consumer preferences prior to its release to the local farmers. SARIS should take the lead on variety testing and official release to the farming communities.

B. Planting material and improved storage input support

1. Emergency seed aid distribution should follow the need and requirements of the target farmers as well as the recommended seeding rates. This should also take in to account the farmers' own-saved seed available, as result the emergency seed aid distribution only fills the deficit from the required amount. Based on the Gu and Deyr 2022 season average available own saved seed availability at the farmer's side has been recognized, as result the required emergency seed to cover the deficit is **13** kg for maize, and 12 kg for sorghum per HH/ ha under irrigation and rainfed livelihood zones respectively under monocropping practice. In addition, a pulse crop- cowpea of 2 kg and 5 kg for intercropping with cereals under the irrigated and Rainfed livelihood zones respectively. In the case of intercropping the amount of maize and sorghum would be half needed from the above.
2. The FAO improved storage bag distribution should support the storage needs of the preferred crops which include maize, sorghum, cowpea and sesame. The improved storage bag support should contribute to reducing meaningful number of losses associated with in appropriate storage. The improved storage bag support should reduce losses at least by 40% of the average HH harvest per season. This could be possible by taking share or contribution among the beneficiary and FAO support. Depending on the average crop yield record for the season which varies as per the livelihood zones (Rainfed Vs irrigated areas), the average number of improved storage bags for Rainfed and irrigated area HH would be **11** and **13** pieces of bag respectively to be supported each by the FAO and other by direct beneficiary, where each piece of the bag accommodates 50kg of produce.
3. Non-governmental organizations and FAO supported projects are found to be main suppliers of improved storage bags for community. Recently, Agro dealers are becoming one of the actors in supplying improved storage bags (Hermetic bags) to farmers. To assist agro-dealers and ensure sustained supply, attention should be given to promote demand and adoption of the technology by farmers. To adopt a technology, farmers need to understand how to use the technology and have clarity on the benefit of its use. Thus, FAO and partner NGOs should promote the demand through common technology familiarization means, which include: hands-on direct training for farmers, promotion and media campaigns, technology demonstrations.

C. New crop variety introduction

1. With support from FAO and other developmental actors, the FMoAI should develop guidelines for the introduction of new improved varieties, variety testing, crop inspection, foundation seed production, seed multiplication crop production, inspection, and variety release.

2. Developmental actors should support the establishment of a public sector managed crop improvement program along in collaboration with CGIAR centers and regional programs. Variety registration and protection services must be established to enhance the breeding program and make new varieties of superior qualities available to the farmers.

D. Link seed producers with other major crop seed value chain actors

1. Seed production, processing and marketing at individual, private and cooperative levels should be supported and encouraged, and all the key actors need to be well linked. Seed processing activities namely mechanized cleaning/conditioning, grading, packaging, and labelling will help end users (farmers) to clearly distinguish seed from grain on the market. This will also help producers sell their products at a premium. Linking seed production with agro-enterprises and value chain actors that FAO Somalia is currently supporting, will help to ensure the sustainability of the crop seed supply.

Sorghum at harvesting stage in Gabiley, Somaliland © FAO

1 Context

1.1. Introduction

While agriculture in general is an important economic activity in Somalia in terms of meeting the population's food needs and source of income through crop sales and agricultural labor opportunities for agro-pastoralists and agriculturalists, it represents the major means of livelihood. Domestic agricultural production is estimated to cover, on average, only 22% of the per capita cereal needs with the remaining being covered through food imports and food aid.

Three decades of conflict have created a protracted and complex emergency, which has eroded livelihoods and led to increased vulnerability contributing to food insecurity, exacerbated by drought and floods spreading across different main cropping seasons. As part of the FAO's Humanitarian and Resilience program response in Somalia, the agriculture sector has been implementing the Emergency Agriculture program since 2011/2012, targeting rural vulnerable farming households with livelihood support (i.e., basic tools, quality seeds, fertilizer, hermetic storage bags, and other on-farm support) and cash ("Cash+") to enable farmers to restore their own food production and income generation. Through the emergency agricultural livelihood support activities, FAO aims to directly impact restoring food stocks while making available nutritious food rapidly within three months in most areas among affected farming rain-fed and irrigated populations.

Generally, Somali farmers rely on farm-saved seeds and maintain their stocks throughout the years by replenishing them with fresh seeds after each harvesting season. In addition to farm-saved seed, other channels through which farmers may access seed include local markets, social networks, agro-input/seed dealers, and relief agencies. Due to the emerging needs of smallholder farmers, there is a need for a review on the ground in relation to the existing structures on how households cope in the event of emergencies and the various channels of the agro-inputs. Carrying out a comprehensive analysis would provide a broader focus on agricultural input needs in Somalia, with a specific focus on seeds and storage bags. Such an analysis would potentially ensure existing seeds and storage bags related interventions are strengthened and offer opportunities to establish new ones for enhanced resilience.

The planting material and improved input assessment aimed at collecting data on planting material and storage inputs utilization. This includes mainly assessing seed sources farmers use, seed accessibility, seed availability and seed quality through Focus Group Discussion (FGD) with target farmers, Key informant interviews with Seed producers, local market seed traders, agro dealers and key informant interviews with other stakeholders such as Federal and State Ministries of Agriculture and irrigation (FMoAI), NGOs, private seed producers, etc. The findings

from the assessment will enable FAO to develop and adopt an effective mechanism for promoting improved agricultural input and improved storage bags interventions.

1.2. Overview of agricultural production in Somalia

Somalia is situated in the Horn of Africa with an estimated population of 17.1 to 17.5 million. The country is rich in natural resources with a coastline of over three thousand kilometers providing a livelihood through fishing to coastal communities. In addition, just over eight million hectares of agricultural land is used by pastoralists resulting in the highest livestock ownership per capita in Africa (World Bank and FAO, 2018). The livestock population (mostly goats and sheep) is estimated at 56 million heads. The country is also endowed with two major rivers (Juba and Shabelle) supporting the production of irrigated crops (maize, rice, sesame, fruits, and vegetables) in southern Somalia.

Somalia has five diverse livelihood systems: pastoralists, agro-pastoralists, fishing and coastal communities, urban population, and internally displaced people. According to the world bank report published in 2018, about 49 percent of the population still lives in rural areas. About 46 percent of employed people work in agriculture, 25 percent in crop cultivation, 9 percent in herding, 4 percent in fishing, and 7 percent in related activities (such as forestry and agro-processing). These figures may have changed drastically in recent years as there has been mass migration of the rural population into urban areas due to recent droughts and declared wars against Al-Shabab. The agricultural zones contributing to the national food requirements, in priority order, include a) Shabelle and Juba Riverine Valleys contributing to rainfed and irrigated maize, fruits and vegetables, and sesame as a cash crop; b) Sorghum Belt in Bay and Bakool regions contributing to rainfed sorghum with livestock production; c) Northwest region producing rainfed maize and sorghum with some livestock herding and, d) coastal Cowpea Belt Zone in Central and Southern Somalia.

Agriculture is the backbone of the Somali economy. In the late 1980's, the country was almost self-sufficient in cereal production (maize and sorghum), and in addition to livestock, fruit crops such as banana, watermelon and grapefruit were exported to Italy and Middle Eastern countries. Crop production peaked in the 1980s, followed by a sharp decline after 1990 when civil war broke out (FAO STAT 2021a). The sector is further weakened by the destruction of agricultural infrastructure, a lack of agricultural inputs, the absence of supporting institutions, including research and extension, impaired access to markets, and high post-harvest and storage losses.

Food imports and food aid have become much larger than domestic production of grains, which cover only about 22 percent of cereal needs on average. In early 2015, 17 percent of the country's population was undernourished and in urgent need of food aid. By the end of October 2017, after

multiple failed rainfall seasons, about half the country's population (some 6.2 million people) was in need of humanitarian assistance, with about 3.1 million severely food insecure (WB and FAO 2018). Since 2020, the food security situation has deteriorated drastically due to failed rains for six consecutive seasons. The increased weather variability resulting from global climate change has created the dual challenge of reduced arable production and pasture availability for rural communities. Between 1982 and 2022, the country experienced nine droughts and severe flooding in 1988 (WB and FAO 2018). In 2021 and 2022, the Shabelle river, which provides irrigation water for over 250,000 ha in the Shabelle valley, dried down entirely for about five months, causing the complete destruction of crops along the river. This has become a major impediment to sustainable crop and livestock production systems in Somalia and has resulted in a mass migration of the population from rural communities to cities and Internally Displaced Persons (IDP) camps. Today, it is estimated that almost one in five Somalis are IDPs. The demographic shift caused by this conflict-driven displacement has led to increasing urbanization and population growth, with consumption largely financed by remittances (FAO 2022).

The significant deficit in local crop production has resulted in an increase over 80% of imported products such as rice, wheat, sugar, maize, and vegetable oil. Food imports in 2015 were valued at USD 1.5 billion (WB and FAO, 2018), and in 2021, food imports have risen to USD 2.5 billion (WB and FAO, 2020). Since 2005, food import and aid have accounted for over 70 percent of the food consumed in Somalia, and the drought in 2021 and 2022 has worsened the situation. In recent years, there has been a shift among the local humanitarian assistance programs away from food aid toward cash payments which support the local business community and provide a rapid response to the food crisis, facilitated by the high penetration of mobile money transfer platforms in Somalia.

In terms of cereals, maize, and sorghum are the most important staple food crops in Somalia. Most of the production occurs in the South West and Hirshabelle States, as these regions enjoy irrigated and rainfed agriculture production systems. For the last five years, annual cereal production averaged only approximately 200,000 MT relative to the production of 650 000 MT in 1988. The annual cereal production in 2021 and 2022 were the lowest, accounting for only 84,000 MT in 2021 and 60,000 MT in 2022 (FAO post-Gu and Deyr assessments 2021). Production is characterized by low yields (1 to 1.50 MT/ha for maize and 0.3 to 0.6 MT/ha for sorghum), especially for small-scale farmers (Gavin et al. 2018). The low yields are mainly due to recurrent drought and flooding, lack of high-quality seeds, endemic pests and diseases, and poor crop management practices. Unlike maize, sorghum occupies more land area and is mainly planted under rainfed conditions with minimum inputs. As result sorghum is considered a more drought-resilient crop and performs better under rainfed agriculture.

Unlike irrigated agriculture, which is generally practiced along the riverine area of Juba and Shabelle, dryland agriculture production is more prone to drought. Soil analysis conducted by

SWALIM and Somali Agriculture Technical Group (SATG) clearly shows that most soils along the Shabelle and Juba rivers have a high pH (7.5 to 8.8) and are low in nitrogen (0.01 to 0.15%) and phosphorus (0.1 to 2.5 ppm) (SATG 2022 and Vargas and Alim 2007). Soil organic matter is also low, ranging between 0.5 to 1.5%. While most of the soil elements remain the same, the phosphorous level in the Vertosols of Somaliland ranges between 2.5 to 35.5, with an average of 8.2 ppm (Vargas and Alim 2007). This value is significantly higher when compared to the phosphorous level recorded along the Juba and Shabelle river. Phosphorous and nitrogen are important elements for root elongation and crop growth. Soil testing should be a routine practice to ensure the right fertilizer/organic manure and amounts are properly administered to enhance productivity while at the same time improving soil health. The poor soil nutrients are attributed to the monocropping system which has been practiced in Somalia for centuries with no additional input to the soil.

1.3. Challenges of agricultural development in Somalia

There are several challenges in the Somalia agricultural sector that are hindering the whole food value chain (crop and livestock production, processing, and marketing). The major ones are highlighted below.

- **In Security:** The majority of the agriculture production area is insecure as these areas are controlled by Al-Shabaab. Al-Shabaab imposed heavy taxation on all agriculture production to the point that there is no incentive in farming. Farming has become unsustainable, and most of farmers have abandoned crop production and moved to IDP's camps near Mogadishu and other major cities. This has severely impacted both irrigated and dryland crop production in the agricultural heartland of the Southern regions. Consequently, Somalia has a chronic food crop deficiency, with domestic cereal production meeting less than 40 percent of per capita cereal needs even in the best agricultural seasons.

- **Drought and flooding:** Recurrent climate-related shocks, including droughts and flooding, combined with protracted conflict has weakened household resilience, leading to vast cohorts of the population in need of humanitarian assistance – approximately 6.5 million people in 2021/2022 (FSNAU & FEWS NET, 2022 and a large number of Internally Displaced People (IDPs) that are heavily dependent on humanitarian aid. IDPs comprise about 18 percent of the population. The humanitarian crisis in Somalia has become one of the most acute crises in the world. It has had a particularly devastating impact on women, given the high levels of sexual and gender-based violence, displacement, and lack of economic opportunities, aggravating vulnerabilities, and protection risks.

- **Low yield and rising agricultural Imports:** The country's two important cereal crops, maize, and sorghum have low yields (1 to 1.5MT/ha for maize and 0.3 to 0.5MT/ha for sorghum) that have remained the same for the last 30 years, while planted acreage has declined by about one-third. Maize is typically grown under irrigation, while sorghum is grown under dryland conditions. Agricultural imports account for 70–80 percent of domestic food consumption and have risen 18-fold since the late 1980s. The combination of increased domestic food demand (largely supported by remittances and driven by rapid population growth and urbanization) and the collapse of domestic crop production has led to a massive increase in food imports.

- **Lack of Skilled Labour:** A serious skills gap exists in the agriculture and livestock sectors. While universities are the main centers of education and training for agriculture and livestock skills development, most graduates lack the technical understanding and know-how to address and effectively implement technical activities. There are serious skills gaps in all aspects of science-based programs. Most universities lack the capacity to design strong curricula. They only engage in limited use of high-end technologies, mainly due to a lack of research capacity, shortages of adequately trained instructors and poor retention of skilled labour, inadequate laboratory facilities, and lack of innovative approaches to teaching.

- **Poor Agriculture infrastructure:** The agriculture sector is weakened by the destruction of agricultural infrastructure, including a lack of agricultural inputs, the absence of supporting institutions, including research and extension, impaired access to markets, and high post-harvest and storage losses. Over the years of civil unrest, irrigation canals, flood control measures, water reservoirs, and road infrastructure deteriorated significantly.

- **Agriculture Policy and Regulations:** Agricultural policies and regulations are essential to meeting the increasing demand for quality seed and inputs and pesticide products that do not harm humans, animals, and the environment. These are important in providing guidelines and directions to be followed in improving domestic agricultural production and thus reducing poverty and malnutrition. They also assist farmers in getting access to improved seed varieties, which contributes to improvements in the commercial value of their products.

- **Consumption pattern:** In recent years, there appears to be a shift in food consumption pattern. Consumers in major cities and rural areas tend to prefer readily available cereal food products from the market such as wheat, rice and spaghetti rather than maize and

sorghum which require labour intensive processing prior to consumption. Grain milling companies are just emerging to reverse the trend.

- **Agriculture technologies:** Most of the small and medium-scale farmers continue to practice traditional farming system despite the change in weather pattern. It is important to consider practicing climate smart agriculture technologies including drought tolerant varieties and application of conservation agriculture as well as IT platforms to increase the efficiency of the seed and crop production systems.

- **Land degradation:** Land degradation is a prominent environmental issue in the country, driven by drought, desertification, and poor agricultural and pastoral practices.

1.4. Crop improvement efforts and status of seed Intervention in Somalia

1.4.1. Pre-War Crop Improvement and Extension Services

Before the civil unrest particularly between 1960 and 1990, the seed system in Somalia was not much different from those in many African countries. In these reference years, the priorities in the agricultural sector, for most African countries, were to set up strong research and extension services tasked with developing innovative technologies as well as improved varieties of various crop species. In countries where large commercial farms are commonly practiced, including South Africa, Zimbabwe, and Kenya, a commercial seed industry has well developed to serve the needs of these farmers, and in the post-independence period, these companies have largely been privatized and have expanded their markets to include smallholder farmers. However, the range of crops targeted by these companies has primarily been limited to hybrids – maize in particular – although late in those reference years, this has begun to change as output markets driven by increased urbanization and export demand have incentivized expansion into seed production of other crops.

Agricultural research in Somalia dates back to the late 1960's when the Central Agriculture Research Station (CARS) was first established. The main research center was based in Afgoye about 30 km west of Mogadishu, and had three substations to extend its research activities: a) Alexandria, based near Jilib (Middle Jubba); b) Boonkaay, located near the city of Baidoa (Bay Region) and c) Aburein located near Hargeisa (North West Region). The Alexandria substation was focused mainly on irrigated crops, whereas Boonkaay and Aburein were mainly engaged in research activities related to dryland agriculture. Before 1980, most of the agriculture research activities were conducted at CARS. However, after the arrival of the Wyoming team in Baidoa with financial support from USAID, the Boonkaay dryland agriculture research station became the center for testing dryland crops and technologies such as new varieties, intercropping, and

conservation agriculture. While maize was the major research commodity at CARS, sorghum was the main crop at Boonkaay, with over 80% of the research activities being focused on these two crops. Very limited research activities were carried out in the other substations (Alexandria and Aburein). In most cases, the substations were poorly equipped and understaffed.

The Central Agriculture Research Station (CARS) was the major employer of agricultural professionals in Somalia, yet its crop improvement program lacked qualified researchers and technicians to conduct a full-fledged plant breeding program with the goal of producing improved varieties/hybrids adapted to the local conditions. (H. Haji personal communication)

It is important to note that developing and releasing a new variety (using the breeding methods for self- or cross-pollinated species) generally requires 8 to 10 years of intensive screening and evaluation for yield and agronomic traits in both on-station and off-station environments. It was only in the 1980's that breeding programs were started at both stations (CARS and Boonkaay) with fresh graduates from the Somali National University and overseas. In most cases, the local team was supported by expatriate plant breeders funded by FAO, IDRC, or USAID.

Despite the cyclic nature of the research and lack of advanced technical skills, both CARS and BDARS were able to test new varieties of seeds introduced from centers belonging to the CGIAR and regional programs. Over the years, thousands of early-generation materials and advanced breeding lines were introduced from CIMMYT (maize and wheat), ICRISAT (sorghum, millet, and pigeon pea), IITA (cowpea), IRRI (rice), AVRDC (mung beans), ACSAD (sorghum). These materials were first tested in preliminary trials. The promising lines were tested in advanced trials and off-station nurseries. The best performing varieties were then tested in advance trials and off-station nurseries to identify varieties with superior yield, better agronomic performance, and adaptation to the local conditions.

At CARS, the breeding work on the variety improvement of maize through germplasm introduction and evaluation, as well as a new genetic combination using conventional breeding techniques, started in 1971. During the early years of the program, several yellow maize varieties were identified. The maize improvement work resulted in the identification of Tuxpeno, a maize variety having good adaptation and desirable agronomic qualities, the introduction of the Godey variety of maize from a neighboring country, and the release of the first composite variety Afgoi Composite. In 1979 a new variety, "Somtux," was produced and released to the farmers (Smith *et al.*, 1976), which was followed by the release of Isoma in 1983. The use of Somtux and Isoma varieties markedly increased crop yield along with other superior agronomic performance compared with that of local varieties.

Among the success story in the crop improvement program at the Boonkaay dryland research station was the identification and release of Filsan, a mung bean variety, in 1988. Filsan is a superior variety of mung bean which is characterized by high yield potential, larger seed size,

early maturity, and better cooking qualities. The Filsan variety was released based on an evaluation of introduced mung bean varieties from AVRDC.

The crop improvement program at CARS and Bonkaay had only three varieties (2 maize and 1 mung bean) recommended for release since their establishment. At the time of the variety's recommendation, there was no official legislation guiding the researchers on the registration and release of new seed varieties. The breeder/foundation seed of these varieties disappeared after the collapse of the government system in 1990. In 2002, SATG became involved in identifying the Filsan seed pedigree and tracing it back to its origin. SATG obtained a small quantity of Filsan foundation seed from the Asian World Vegetable Centre (AVRDC), which was then increased at an experimental station in Minnesota, USA. The seed was sent to the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in Nairobi, Kenya, for further seed multiplication. In August 2005, 110 Kg of Filsan seed was distributed to several farmers in the Middle and Lower Shebelle regions. More than 1 ton of seed was produced and distributed to many more farmers in subsequent seasons who still continued to grow the crop. Unlike Filsan, which is self-pollinated, 'Somtux breeders' seed loss is more complicated as maize is cross-pollinated and seed is contaminated unless strict isolation is observed during seed production. The currently available Somtux no longer resembles the original Somtux variety released in 1984.

Other related activities important to the crop improvement work were the collection, documentation, and evaluation of the local germplasm. IPGRI/CRISAT conducted the first sorghum germplasm collection of the local landraces in 1979 (Damania and Rao 1980). A total of 69 local sorghum landraces were collected, mainly from the Bay and Bakaol regions. In Gu of 1981, the local sorghum accessions were evaluated at BDARS in a non -replicated observation nursery (Annual Report, 1981). Agronomic data were recorded on days to 50% flowering, days to maturity, plant height, grain color, and yield. The range in days to 50% flowering was from 50 to 77 days, and for maturity, 92 to 126 days. The plant height ranged from 129 to 239 cm, and the yield was from 258 to 1440 kg ha^{-1}. The yield was high for accessions No. 16, 19, 21, 23, 25, 44, 60, 63, and 68.

In 1987, the national sorghum improvement program supported by IDRC in collaboration with ICRISAT undertook the second round of local sorghum germplasm collection throughout the southern regions of Somalia (Prasada Rao et al. 1987). A total of 253 different sorghum landraces were collected from Bay, Bakool, Gedo, Lower Shabelle, Middle Shabelle, and Hiran. Evaluation trials for agronomic traits of the local landraces were conducted in the Deyr season of 1987 at BDARS. 27 accessions were selected based on their yield potential and good agronomic traits. The yield varied from 1237 kg ha^{-1} to 1734 kg ha^{-1} for SS-170 and SS-242, respectively. The plant height ranged from 150 to 190 cm. For the days to 50% flowering, the variation was relatively small (52-57 days). The seed materials of these lines should be available at the ICRISAT gene bank and can form the basis for future sorghum intervention strategies. A detailed account of the plant

genetic resources, including the establishment of research facilities and all varieties tested, from different crop species, prior to the civil unrest, was thoroughly discussed by Dr. Hussein Haji in a research paper "Improvement and Sustainable use of Plant Genetic Resources in Somalia" submitted to ICRISAT/FAO in 2007 (H. Haji 2007)

The staff from the extension department has been working closely with the research team at CARS and BDARS, but apart from Somtux and Filsan, there were no other recommendations on seed varieties. Instead, the extension recommendation was based mainly on applying Good Agriculture Practices (GAP) such as timely sowing, timely irrigation, proper weeding, and control of pests and diseases. Demonstration plots were generally conducted throughout the agricultural production areas, using locally grown maize and sorghum, to showcase the positive impact of GAP on yield and agronomic traits.

With the collapse of the Somali state in 1990 and the civil war that followed, agriculture research and support services ceased to function. Numerous research findings that offered hope for appropriate and meaningful crop intervention strategies were lost.

1.4.2. Pre-war seed systems

There were no private seed companies in Somalia before the civil unrest. Most of the agricultural interventions, including research, extension, seed production, as well as commercial crop production and marketing (Banana, sugarcane, rice, and cotton), were vertically integrated and implemented by the Ministry of Agriculture complemented by agricultural projects supported by various donor agencies. While the agriculture research and extension establishments date back to the early 1960's, the public seed sector in Somalia only began in 1976, with the 'Seed Production and Certification Project', jointly funded by UNDP and the Freedom from Hunger Campaign/Action for Development Trust Fund. FAO and the Ministry of Agriculture implemented the project. This project was extended in 1978 with funding from DANIDA. A follow-up project, 'Seed Production and Improvement' (Phase I), was implemented from 1981 until 1986, with a second phase lasting from 1987 to the end of 1990. Both phases of this project were also funded by DANIDA and implemented by FAO and the Ministry of Agriculture (Longley, 2001).

These seed projects were structured to produce high-quality seeds of maize, sorghum, cowpeas, mung beans, rice, groundnuts, and sesame in quantities sufficient to provide basic (foundation) seed for the production of certified seed by contract farmers to meet the needs of users in the Shabelle and Jubba Regions. The seed center was established at Afgoye (an old cotton experimentation farm) to serve as a model seed farm, train the national staff, and organize seed production through contract farmers. The center was equipped with field and seed processing equipment and facilities to ensure the production, harvesting, processing, storage, and handling of 150-200 tonnes of basic seed per season. Due to technical difficulties, only small quantities of certified seed were produced.

It wasn't until 1986 that an acceptable system was found by working with farmers from a single village, Dar-es-Salaam, located about 45 km from the seed farm. An out-growers model for maize seed production was used to engage the best farmers to produce 60 tonnes of certified maize seed. Involvement with contract seed growers was expanded to other villages and private growers in the Lower Shabelle Region, a state farm, and private growers in the Lower Jubba and Middle Shabelle Regions, but with limited success.

Despite the sizable investment that was made in the establishment of a formal seed system, the results in terms of quantities produced were relatively modest. Only 3,715 MT of certified maize seed was produced over the period of 9 years (1984–1989) when the estimated annual maize seed requirement was 5,000 MT. Apart from maize seed, the only other crop that was multiplied in any quantity was sesame, but only 13.7 MT of foundation seed was produced from 1984–90, and there are no records of this being advanced further to certified seed. Only 30% of certified seed was marketed through the private sector, with the remaining 70% being sold to the Commercial and Saving Bank of Somalia. It was not until 1988 that a cost recovery policy was

introduced. Major challenges encountered during the early establishment of the seed system included the following:

a) The loss of seed viability during storage. This was due to high temperatures, high humidity, insects, and diseases that occur in the 6-8 months between the main maize growing seasons (Gu). To avoid the long storage period and cost of monthly fumigation required to keep the seed viable, it was proposed that the maize seed could be produced in the Deyr season for the following Gu season planting. While this could result in better seed quality, maize production during the Deyr season is very costly due to irrigation costs and losses due to wild pigs and birds.
b) Lack of breeder seed supply from Central Agriculture Research Station, as no new seed varieties were coming from the crop improvement program, and the few that existed were not maintained due to lack of cold storage facilities, which was therefore obliged to multiply seed every year (Ekin, 1990).
c) The seed certification stages of basic and certified seed were something of a misnomer since the varieties of the crops produced by the seed company were neither stable nor prescribed.
d) Seed quality remained a problem, as did seed marketing, despite the use of radio and newspaper advertising to promote maize seeds. The project report stated that most Somali farmers do not clearly distinguish seed from grain, and historically, there have been insufficient extension efforts to promote seed awareness. This was compounded by a weak rural trading infrastructure, an overall lack of organized input supply with low penetration by private sector suppliers, and varieties with low, competitive performance.

1.4.3. Post-war seed interventions

In response to the complex emergency situation resulting from the civil unrest in 1991 and the collapse of the seed system infrastructure, most of the seed interventions in Somalia in the post-war period have been short-term, emergency projects. The aim was to provide seed to farmers who were assumed to have lost their own seed stocks due to population displacement, drought, or flooding. The emphasis was to ensure that farmers had seeds to plant in the coming season, and little attention was paid to the appropriateness of the varieties provided or the quality of the seed itself.

The seed distribution to the farmers generally consisted of cereals (maize and sorghum), legumes (cowpeas), and oil crops (sesame) in addition to assorted vegetable crops such as tomatoes, onions, peppers, carrots, cabbages, lettuce, watermelon, and swiss chard. While the cereals, legumes, and oil crops are procured from local traders, most of the vegetable crops are sourced from outside the country - predominantly from Italy, Yemen, and Kenya by input traders located

in Mogadishu (Bakara market), Bossaso, and Hargeisa. Except for the newly emerging hybrids, most of the vegetable varieties are open-pollinated and are known by the farmers as these have been in the market for over 30 years.

While FAO is the main organization distributing seed, there are many others INGO's who are also distributing seed to farmers in Somalia, including CEFA, ICRC, ADESO, World Vision, and Qatar foundation.

1.5. Agricultural input related policies and regulation

Agricultural policies and regulations are essential to meeting the increasing demand for safe and sustainable use of agriculture products. These are important in providing guidelines and directions to be followed in improving domestic agricultural production and thus reducing poverty and malnutrition. While ensuring safe use of pesticides, they also assist farmers in getting access to improved seed varieties which contributes to improvements in the commercial value of their products. The high demand for domestically produced food in Somalia presents significant opportunities for agriculture, therefore, government policies and regulations must address challenges such as low agricultural production and productivity while enhancing environmental sustainability, including reducing greenhouse gas emissions, and improving adaptation and resilience in the face of climate change and other unforeseen shocks. When agricultural operations are sustainably managed, both the environment as well as the humans and animals consuming the agriculture products can be protected from the harmful impacts of adopting poor agricultural technologies.

The Somali Agricultural Regulatory and Inspection Services ("SARIS") was established after the Somali Federal Parliament passed SARIS laws and governing structures on November 15, 2020. It is a regulatory agency primarily working with the Federal Ministry of Agriculture and Irrigation (FMAI) and responsible for monitoring agricultural activities in Somalia, including, but not limited to, plant protection and implementation of control measures by setting up quarantine regulations, seed inspection and certification, fertilizer quality inspection and certification, pest control product inspection and certification, and the introduction of related subsidiary instruments. SARIS also serve to enact regulatory standards governing the sale, production, storage, and distribution of seeds. It is the responsibility of the SARIS to produce policies, rules, and regulations governing the importation, supply, use, and quality of seeds/seedlings and other inputs such as pesticides and fertilizers imported for crop production purposes. Weak or limited agriculture policies make the sector more vulnerable to environmental and man-made disasters, thus negatively affecting the sector’s long- term ability to effectively contribute to the food security of the most at-risk groups of the population

At present, SARIS is hosted by the FMAI and is overseen by the Director of the Department of Plant Protection. The Ministry is also home to SARIS's laboratory facilities and is currently providing services on field seed inspection, seed testing for germination, purity and moisture content, in collaboration with Federal Member State Ministries of Agriculture and Irrigation. Ultimately, the aim is to establish an independent SARIS authority with its own board of directors, offices, laboratory services and executive members who will run the day-to-day activities of the authority.

When SARIS becomes fully functional, it will have the mandate to facilitate international trade as a National Plant Protection Organisation (NPPO). The institution's tasks include the implementation of the Somali Agrochemical Policy; the Seeds and Varieties Act; the Plant Protection and Quarantine Law; the National Fertilizer Policy; and the National Pesticide Policy. Other laws of importance include agriculture land use and irrigation policies. The agricultural land use policy addresses the economic, political, legal, physical, and planning aspects of agricultural land use, while the irrigation policy regulates the use of water for agriculture. The Standards and Quality Control Act Law No. 27 establishes the Somali Bureau of Standards, whose mandate is to control the quality of goods and services across the economic sectors.

The recently passed agricultural laws provide a legal framework for regulating agricultural development in the country, including the quality control of farming inputs and products. The government has put these frameworks in place to facilitate trade and investment in the agricultural sector, which is a significant pillar in the National Development Plan.

In addition to SARIS, the Foreign Investment Law of 2015 promotes and protects foreign investments. It aims to offer favourable incentives to foreign investors, such as tax advantages, and guarantees against expropriations. It also guarantees that an investor can settle any dispute through international arbitration.

2 Objectives of the study

2.1. General objective

To inform future agriculture emergency and development program design through understanding the major challenges and identifying the different planting and storage materials utilized and required across the livelihood zones of Somalia.

2.2. Specific objectives

The specific objectives of the assessment include:

- Documentation of the different planting and storage materials utilized across the different livelihood zones in Somalia.
- Understanding and identifying the various channels through which farmers source agricultural inputs, planting materials, and storage materials (pre and post-calamity such as drought floods and desert locust upsurge.
- Capturing the best practices among farmers working with and harnessing the synergies of different stakeholders (private sector, government, farmers, UN, NGOs, etc.) within the planting and storage input market supply system.
- Identifying the major challenges smallholder farmers face in accessing planting and storage materials and services under different scenarios and to define appropriate programmatic responses relevant to their needs and preferences.

3 Conceptual framework used for the assessment

3.1. Definitions and concepts of the seed system

The seed system refers to the various ways smallholder farmers obtain seeds from different sources. Seed sources can be grouped into "informal" and "formal" sector sources. The formal seed sector provides farmers with improved/modern varieties resulting from a series of activities, starting with plant breeding and ending with commercial seed on the market through seed companies, input dealers, government channels, and international aid agencies. The informal sector consists of all the other ways farmers obtain seed: from their harvest, from friends, relatives, and neighbors either through barter, gift or sale, or through local informal markets.

The informal and formal seed sources are part of one overall seed system, the various aspects interacting with each other to determine the relative importance of different seed channels to a particular farmer. For any given farmer, seed sources may vary according to crop type, and it is not unusual for farmers to meet seed requirements for one crop from a range of sources. In situations of stress, it is often essential for farmers to have the opportunity to switch between

sources so that if one source dries up, another source can be tapped to compensate (FAO SSSA Guideline, 2015).

Somalia has gone through a prolonged period of political and economic instability coupled with wars and poor climatic conditions. The relative importance or role of informal and formal seed systems in Somalia has been affected due to the prolonged conflict and different actors supporting agricultural production, particularly stakeholders supporting planting materials for the target groups. The crisis in Somalia has attracted the international community's attention, with donors through different local and international NGOs coming to rescue the hungry, food insecure, and malnourished. A higher percentage of the aid beneficiaries receive is always food, farm machinery, small farm tools, fertilizer, and seeds. Of great importance is a seed aid intervention being conducted by both local and international NGOs for improved agricultural productivity, improved nutrition, and food security (FAO SSS Assessment 2015/2016).

The same study - FAO Seed Security assessment 2015/16- mentioned that Somalia's seed system is largely underdeveloped and characterized as predominantly informal. Most farmers save their own seed or obtain seed from nearby farmers or villages (social networks), and the rate of varietal development and adoption of new seeds is low and contributes to sustained seed insecurity.

Seed security exists when men and women within the household have sufficient access to quantities of available good quality seed and planting materials of preferred crop varieties in both good and bad cropping seasons.

The concepts of seed security and insecurity are defined and classified by duration, i.e., whether the problem is acute or chronic. Acute seed insecurity results from short-duration events that often affect much of the population. This could be triggered by failure to plant, loss of a harvest, or high pest infestation of seed in storage. Normally this varies widely among households, but during an acute event such as a flood or civil disturbance, all households in a particular region may be significantly affected.

Chronic seed insecurity exists independently of a disaster or acute stress, although they may make it worse. Chronic insecurity is often found among people marginalized in one of the following three ways: i. economically by poverty, lack of land or labor, ii. Ecologically in areas with a high prevalence of drought or degraded land iii. Politically insecure areas

Seed security assessment assists in recommending an appropriate response that can be put in place to address both acute and chronic seed insecurities based on a complete understanding of the local/area's seed security system.

3.2. Seed sector security assessment framework

The FAO Somalia planting material and Improved agricultural input assessment focusing on seed and storage input has used the FAO Seed Sector Assessment framework as a guiding methodology for designing the assessment tools and further investigating the issues as explained

(Table 1). The FAO Seed sector assessment framework is anchored on understanding the key Five (5) central pillars of the seed security assessment. These pillars include- Seed Availability, Seed Access, Seed Suitability, Seed quality and resilience. A shift in any of these fundamental pillars is likely to destabilize the existing seed security system in the area or a precursor to seed system.

Table 1. Central Pillars of seed security assessment	
Availability	Sufficient quantities available from all sources in quantities and quality and at the appropriate time for sowing
Accessibility	The farmers have adequate resources to afford the prices of seeds and in adequate quantities
Quality	Physical, physiological, and sanitary aspects of the seed
Suitability	Adaptability to the local agroecological conditions and preference of the seeds by the farmers
Resilience	The ability of the households to resist the impact of a major shock or stress that can destabilize existing seed security

Source: *Remington et al. (2002) and FAO Seed Security Practitioner Guide (2016)*

Availability refers to the existence of an adequate quantity of seed of target crops within reasonable proximity during critical sowing periods. Seed availability is independent of the socioeconomic status of farmers.

Accessibility refers to the ability and willingness to acquire seed by cash purchase, exchange, loan, barter, or use of power in social networks. Access to seeds is a parameter that is mainly dependent on the resource base of the farmer or the household.

Suitability: preferred characteristics, taste, aroma, appearance, culinary quality, resistance to diseases and pests, and adaptability to local conditions.

Seed quality refers to:

Purity: seed cleaned, free from an inert material such as chaff, stones, broken seed, and dirt (damaged by insect attack and free from dead or live insects), relatively uniform, and does not contain immature grains.

The moisture content: the amount of water contained in the seed sample. Moisture content is important in maintaining seed quality and is closely related to other aspects of **Physiological seed** quality, such as seed maturity, the storage life of the seed, and susceptibility to insect or disease infestation.

Germination: the ability of the seed to produce a normal seedling. To determine the germination rate, a germination test is required and in the case of field test, waiting until the seed is planted. The germination rate can be affected by high temperatures and

relative humidity during seed storage though the impact of adverse temperature and humidity varies by crop.

Resilience refers to the ability of the household or farmer to resist the impact of a major shock or stress so that pre-existent levels of seed security are either maintained or quickly returned back. It measures the extent to which seed security is adversely affected by a particular shock or series of shocks—for example, different abilities to switch between seed sources. Resilience is the ability to maintain or increase its level of seed security as defined by the four elements. In this sense, "resilience" is a quality that cuts across the four elements.

The degree of resilience is measured by the extent to which seed security is adversely affected by a particular shock or series of shocks. When faced with the same shock (such as drought) two farmers in the same village may exhibit different degrees of resilience to the shock in terms of their seed security. Thus, one farmer may become seed insecure as a result of the drought (not resilient), whilst another remains seed secure (resilient). Some households may be susceptible to very small shocks, in which case we can say that they are highly prone to seed insecurity (very low resilience), FAO, 2016[1]

The FAO Seed Security Assessment process entails collecting and analyzing data to understand the parameters of seed security and how best to intervene to support seed security. Seed sector Assessment characteristics can be carried out in an emergency context shortly after a shock. It can also be executed in the context of a protracted crisis, such as the context of Somalia, or as a baseline exercise when there is no crisis to shape the agricultural interventions.

3.3. Methods used

The themes and methods used in the assessment are outlined in the below (**Table 2**). They include a range of qualitative and quantitative methods and draw on the insights of multiple stakeholders. Twenty-two individual farmer interviews, 30 focus group discussions (FGDs), Key informant interviews with seed/grain trader, seed producers, Agro dealers, etc. Details of the different field instruments will be annexed in the final version of the report

Table 2. Investigative tools and methods used during the assessment

Types of investigation	Commentary
Background information Collection	Desk review report to understand. • Prewar crop improvement and extension services • Prewar seed system • Agricultural practices potential, challenges, etc.
Focus group discussions	Men and Women separate groups according to the local custom

[1] https://www.fao.org/3/i5548e/i5548e.pdf, Seed Security Assessment A PRACTITIONER'S GUIDE, FAO 2016.

N = 30 (20 men group + 10 women group). In total, 294 farmers participated in the FGD.	• Agricultural and crop variety use trend, constraints, etc. • Seed source strategies per crop • Improved agricultural input –Fertilizer, storage bag, etc. use practices
Individual farmers interview N= 22 (11 men + 11 women)	Assessment of: • Seed sources, crop patterns, input utilization, • Farm size available for crop + vegetables
Key informants Interview Seed Producers N= 8 Seed /grain traders N= 10 Private seed producing companies N= 6 International Research, INGOs N= 3 Government interviews = 10	Assessment of: • Crop and variety supplies in the market • Crop and variety seed produced • Crop and variety stocked, quantity produced, traded, estimate supply • Crop and variety price trend • Crop and variety produced by private seed producers • Crop Improvement approaches supported by research actors • Government policy, regulation, etc.

3.4. Assessment sites selection

The planting material and improved agricultural input assessment targeted and collected information from selected regions in Somalia, in sampled districts where interventions have been implemented previously and in districts with potential for future planting and storage inputs interventions. The table below (Table 3) provides details of the states from which a sample of ten districts was derived for the assessment.

Table 3. Selected areas of assessment

State	Regions	Districts	Livelihood
South West, Hirshabelle, Galmudug, and Jubaland	Gedo	Bardhere	Riverine and Rainfed
	Lower Juba	Kismayu	Riverine and Rainfed
	Lower Shabelle	Afgoye	Riverine and Rainfed
	Bay	Baidoa	Rainfed
	Hiiran	Belet Weyn	Riverine and Rainfed
	Middle Shabelle	Jowhar	Riverine and Rainfed
Puntland	Bari	Iskushban	Rainfed
Somaliland	Togdheer	Burao	Rainfed
	Woqooyi Galbeed	Hargeisa	Rainfed
	Awdal	Borama	Rainfed

3.5. Study areas

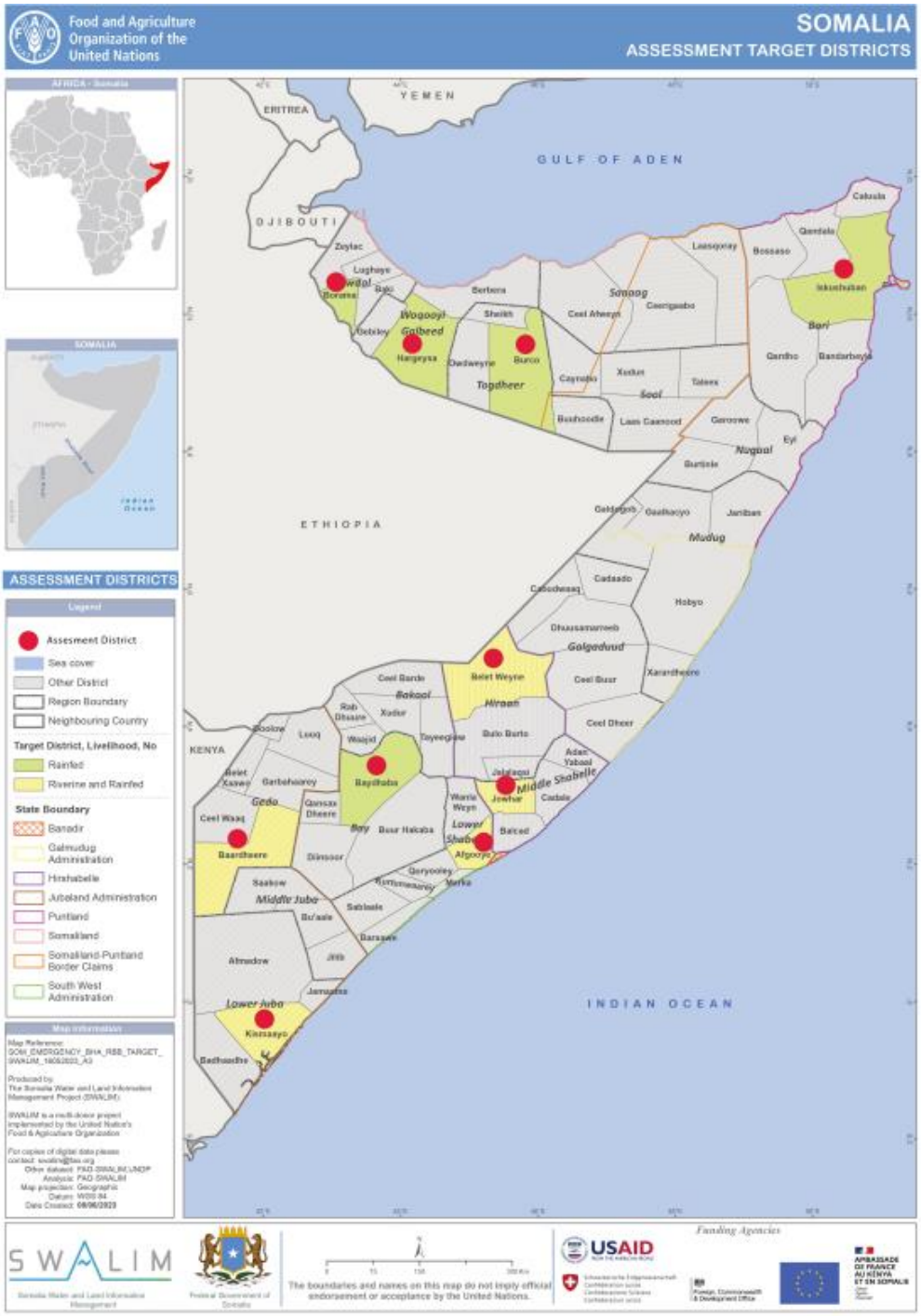


Figure 1. Map of Somalia

4 Results and discussion

The major findings of the current assessment are highlighted in separate sub-headings under the results and discussion section. Under this section, the results discuss findings on the major crops and their varieties, seed production practices where details on the approaches in seed production used, crop types and quantities of seed being produced by different actors discussed, seed supply and demands results. The other results sub-headings include results under the acute seed security findings, chronic seed related challenges in relation to improved input utilization and final sub section on the impact of seed aid on the local seed security. Under each of the sub-headings a brief introduction, then followed by the results discussion has been made.

4.1. Major crops and their varieties

Agricultural production which includes livestock and crop sector remains the main source of livelihood for the people of Somalia. Farmers produce a number of crops that they consider important to their households. The choice of crops is based on multiple factors that includes food, fodder, income at the household level, and also nutrition for family needs.

Crop production contribution to attaining food security is high among areas where farmers practice farming in Somalia. Due to failed rains for the last five consecutive seasons, crop yield for major cereals, pulses and other crops has declined significantly. As result, the food security situation in Somalia has deteriorated drastically since 2020. The long-term climate effect has created a dual challenge for rural communities, given the rapid decline in the food and pasture availability. This became a major impediment to sustainable crop and livestock production systems in Somalia, and resulted in a mass migration of the population from rural communities to cities and IDP camps.

4.1.1. Crop production trend and ranking

The Focus Group Discussion (FGD) was held in 10 districts, participating 294 (95 women) farmers. The FGD crop ranking show (Table 4) that Maize and Sorghum as the most commonly cultivated cereal crops while cowpea and Mung bean were found to be the most cultivated pulse crops. Among the vegetable crops, tomato and Onions are found as the most prioritized vegetable crops. Other featured crop during the FGD was sesame where it has been identified as a priority crop in Burco district.

Districts	Table 4. Proportion of respondents for Crop ranking by district (location)				
	Maize	Sorghum	Cowpea	Sesame	Mung bean
Afgoye	96.4	82.1	71.4	35.7	25.0

Baidoa	74.1	88.9	74.1	63.0	0.0
Bardhere	100.0	89.3	50.0	0.0	85.7
Belet Weyn	100.0	81.8	90.9	72.7	0.0
Borama	100.0	85.2	22.2	0.0	63.0
Burao	85.7	78.6	60.7	92.9	0.0
Jowhar	77.4	90.3	90.3	19.4	58.1
Kismayu	93.8	75.0	78.1	65.6	0.0
Hargeisa	86.7	100.0	80.0	63.3	0.0
Iskushban	83.3	86.7	76.7	0.0	0.0
Overall	89.7	85.8	69.4	41.3	23.2

Crop ranking in order of priority is listed in Figure 2. Maize and sorghum are the most popular crops followed by cowpea, sesame and mung beans. The crop priority ranking is almost similar to the crop ranking results made during the seed security assessment in the year 2015. The women group (95 women) ranking is same as with Men group ranking and the below is overall FGD participants crop ranking.

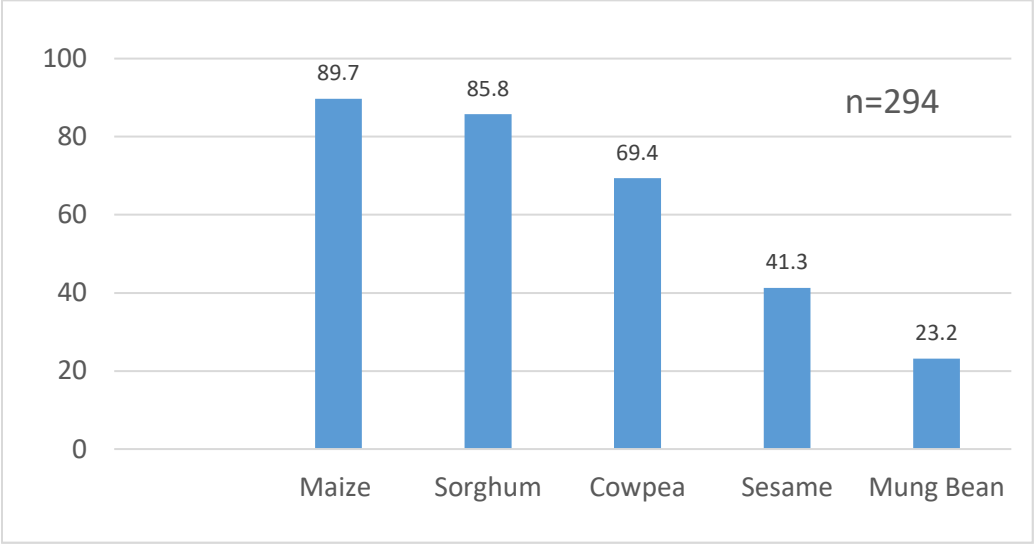


Figure 2. Crop preference ranking

Farmers in different parts of Somalia grow different varieties/landraces of crops depending on the source of seed and their corresponding desired traits. Each of the major crops such as Maize, Sorghum, Cowpea, Mung bean, and Sesame has different varieties/landraces cultivated. During the assessment, the results of the FGD discussion, the participants revealed the preferred crop varieties/landraces for major crops. However, based on the result of previous seed assessment

and other similar studies, each of the major crops has more than two varieties or landraces, which occupy the second level of preference as compared to the two community preferred crop varieties. In the below, paragraph the major crops are described with their preferred and available crop varieties as used by farmers in Somalia.

Table 5. Crop variety ranking by district

Crops	Varities	Districts																			
		Afgoyea (N=28)		Baidoa (N=27)		Bardere(N=28)		Beletweyne(N=33)		Boram (27)		Burco(N=28)		Jowhar(N=31)		Kismayou(N=32)		Hargeisa (N=30)		Iskushuban(N=30)	
		Rank	%	Rank	%	Rank	%	Rank	%	Rank	%	Rank	%	Rank	%	Rank	%	Rank	%	Rank	%
Maize	White	1st	96.4	1st	74.1	2nd	100.0	1st	100.0	1st	100.0	1st	85.7	2nd	77.4	1st	93.8	1st	86.7	1st	83.3
	Red	2nd		2nd		1st		2nd		2nd		2nd		1st		2nd		2nd		2nd	
Sorgum	White	2nd	82.1	1st	88.9	1st	89.3	1st	81.8	1st	85.2	2nd	78.6	2nd	90.3	1st	75.0	1st	100.0	1st	86.7
	Red	1st		2nd		2nd		2nd		2nd		1st		1st		2nd		2nd		2nd	
Cowpea	Red	1st	71.4	1st	74.1	1st	50.0	1st	90.9	1st	22.2	1st	60.7	1st	90.3	1st	78.1	1st	80.0	1st	76.7
	Digir	2nd		2nd		2nd		2nd		2nd		2nd		2nd		2nd		2nd		2nd	
Sesame	White	1st	35.7	1st	63.0	1st	0.0	1st	72.7	1st	0.0	2nd	92.9	1st	19.4	1st	65.6	1st	63.3	1st	0.0
	Black	2nd		2nd		2nd		2nd		2nd		1st		2nd		2nd		2nd		2nd	
Mung bean	Salbuuko	1st	25.0	1st	0.0	1st	85.7	1st	0.0	1st	63.0	1st	0.0	1st	58.1	1st	0.0	1st	0.0	1st	0.0
	Digir	2nd		2nd		2nd		2nd		2nd		2nd		2nd		2nd		2nd		2nd	

Maize

Maize is the most important crop in riverine areas and the second most important cereal crop in Somalia. The seed assessment conducted in 2015/16 has identified 9 different varieties or landraces for Maize crop as cultivated by the farmers. The findings of current assessment have prioritized the two most preferred Maize varieties (Table 6). The other varieties or landraces as revealed from the other seed assessment are also included in Table 6. The Somtux Maize variety was the first improved Maize variety produced and released to farmers in 1979 by the then Afgoya research center. Somtux variety during the time of release have demonstrated increased yield and superior agronomic performance when compared to the local varieties. However, in recent years, due to continues cross fertilization with the local varieties for the past three decades and the loss of the original foundation seed, the current Somtux variety is no longer pure. The red and white cob maize are the most preferred local varieties because of their adaptation to the local conditions. In addition, it has better taste and cooking qualities as compared to other varieties.

Table 6. Preferred and other varieties of Maize

Variety	Local name	Type
A. Preferred		
White cob Maize	Jaf cad	Local
Red cob Maize	Jaf gaduud	Local
B. Others		
Baidoa		Local
Alambey		Local
Galay Somalia		Local
Yaryarey		Local
Adey		Local
Galey Funjio		Local
Somtux		Local

Maize plantation at Vegetative Stage in Dollow, Somalia (Source: FAO Somalia)

Shebelle and Juba Riverine Valleys are considered as Maize production belts contributing to agriculture production in rainfed and irrigated maize. The annual cereal production in 2020 and 2021 in Somalia were the lowest accounting for only 84,000 MT in 2020 and 60,000 MT in 2021 (FAO post Gu and Deyr assessments 2021). During this period, Maize production is characterized by low yields (1 to 1.50 MT/ha). The low yields are mainly due to a lack of high-quality seeds, frequent drought conditions, endemic pests, diseases, and poor crop management practices.

Sorghum

Table 7. Preferred and other varieties of Sorghum

Variety	Local name	Type
A. Preferred		
White Sorghum	Mesegocadey	Local
Red Sorghum	Mesegogaduudey	Local
B. Others		
A mix of white with red and pink	Mesegocas	Local
Shamurey		Local
Barsana		Local
Farax		Local

Sorghum is considered as a major crop in agro pastoral areas for its food and fodder use by the farming community. Sorghum production has undergone through centuries of domestication using traditional practices. The seed assessment conducted in 2015/16 has identified 12 varieties or landraces being grown in different parts of Somalia. The FGD participants have prioritized the two preferred Sorghum varieties (Table 7).

The two preferred sorghum varieties by the majority of the farmers are called white and red sorghum. The white sorghum variety is preferred because it fetches better selling price in the market and is good for making porridges. The red variety is more tolerant to bird damage because of its high tannin content which acts as bird rebellion. The other varieties in the list are generally used in specific locations only.

The presence of head smut (*Sphacelotheca reiliana*), long smut (*Tolyposporium ehrenbergii*) and stem borers (*Chilo Partellus*) pose major constraints to sorghum production in Somalia.

Sorghum at maturity stage in Gebiley, Somalia (Source: FAO, Somalia)

Cowpea (Vigna unguiculata)

Cowpea is a major leguminous crop cultivated in rainfed areas of Southern Somalia. The Cowpea belt in Galmudug is known as the major production area in Somalia. The FGD participants have prioritized two important cowpea varieties (Table 8). Similar assessment conducted in 2015 has revealed other Cowpea varieties which are listed in Table 8.

Table 8. Preferred and other varieties of Cowpea

Variety	Type
A. Preferred	
Red	Local
Degelo	Local
B. Others	
Bobodo	Local
Abagalley	Local
Digir gaduudey	Local
Digir Somalia	Local
Baidoa	Local
Samama	Local

As per the FGD result, red cowpea and Degelo are the two preferred varieties. The variety Degelo is characterized by late maturity, longer pods and non-shuttering pod type. The other variety "bobodo" is a small seeded type, matures early after which the pods shatter dispersing the seed on the ground around the plant. The crop is said to establish itself from the shattered seeds so that farmers do not need to re-establish the crop every season.

The variety known as Abgaliti or Abgalley is assumed to be distributed by a relief agency, and originally sourced the seed from Lower Shabelle area and now considered as a local variety in some areas (Catherine 2002). Cowpeas are harvested and consumed both as a green vegetable, and once the seeds have matured. Although the crop is notorious for its susceptibility to insect pest attacks in many environments, the dry climate in southern Somalia results in reduced pest attacks. However, farmers have trouble storing the grain as it is highly susceptible to attack from small insect beetles called Bruchids. Adults of Bruchids lay eggs on seed pods; the larvae hatch and bore directly into the seed pod to feed inside the developing seeds.

Mung bean

Mung bean is the second major leguminous crop cultivated widely in Somalia. The FGD participants have prioritized two important varieties (Table 9). Similar other assessment conducted in 2015 has revealed other Mung bean variety, which is Filsan. The Filsan Mung bean variety was released in 1984 by Bonka research farm dealing with dryland agriculture in Somalia. Filsan is a non-shuttering, high-yielding, and early maturing Mung bean variety. This variety is assumed to exist in its true to type and is still grown among farmers in Somalia (SSA 2020).

Table 9. Preferred and other varieties of Mung bean

Variety	Type
A. Preferred	
Salbuko	Local
Diger	Local
B. Others	
Filsan	Improved

Sesame

In recent years, sesame production in Somalia has attracted several stakeholders, including private seed-producing and exporting companies. It is one of the cash crops in Somalia that has attraction to international markets. The crop is a prolific seeder and the seeding rate is very low, thus making the availability of sesame seed is rarely a problem. There is good potential to increase the returns to sesame cultivation by increasing awareness among sesame traders of the high value market for confectionary grade sesame (large white-seeded types) instead of the small black-seeded types that are only good for oil production. The FGD participants have identified white and black types as the preferred varieties. Other varieties are Humeria and Dunyar (Table 10).

The USAID funded GEEL project, which was operational in 2016-2020 has prioritized supporting the Sesame crop value chain in Somalia.

Table 10. Preferred and other varieties of Sesame

Variety	Type
A. Preferred	
White	Local
Black	Local
B. Others	
Humeria	Introduced
Dunyar	Local

The selection of the Sesame value chain has taken into consideration of the overall importance of the crop for its wider value regarding employment creation, export earnings, and enhancing other economic opportunity in the country. PIMS project raised sesame **productivity from as low as 0.2 ton per hectare to an average of 0.45 ton per hectare**. The GEEL project has introduced better performing Sesame seed variety named as Humeria from neighboring country Ethiopia. (SSA 2020)

4.1.2. Vegetable production

Vegetable production is among the common crop production practices in Somalia. Farmers produce various types of vegetables for enhancing household income and as a source of food for families. The FGD participants have prioritized Tomato, Onion, and hot Pepper as priority vegetable types produced by farmers (Table 11). The other vegetables include Spinach, Carrot, water Mellon, Lettuce, and Swiss chards. The majority of Vegetable seeds are imported from abroad and from neighboring countries. It is important to note that hybrids are gaining popularity in tomato. This is attributed to emerging greenhouses and the demand for uniform and high-quality tomatoes in the market. However, some farmers are producing vegetable seeds for tomatoes using local varieties. In addition, some Individual and cooperative seed producers are engaged local tomato seed production and marketing in some of the districts.

Vegetables	Table 11. Vegetable ranking (Proportion) per district										Overall
	Afgoye	Baidoa	Bardhere	Belet Weyn	Borama	Burco	Jowhar	Kismayu	Hargeisa	Iskushuban	%
1.Tomato	21.4	55.6	71.4	63.6	59.3	50.0	48.4	28.1	76.7	70.0	54.4
2.Onion	14.3	33.3	67.9		63.0			18.8	83.3	30.0	30.3
3.Pepper		14.8	50.0	51.5	18.5	46.4		28.1		0.0	21.1
3-spinach	32.1	0.0		48.5			9.7	40.6		0.0	14.6
4.Watermellon					29.6	50.0	45.2		0.0	0.0	12.2

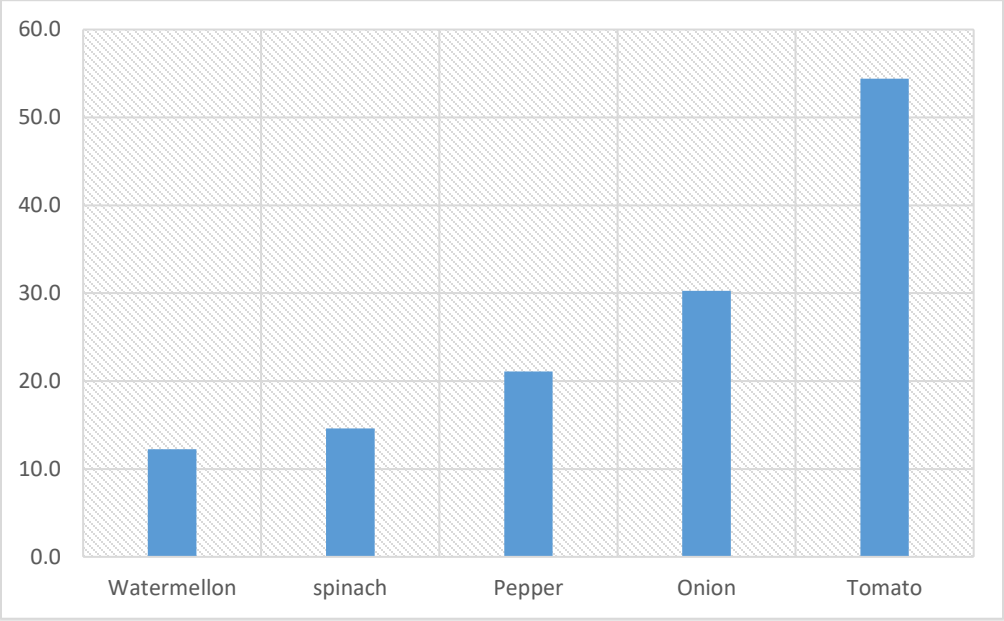


Figure 3. Priority vegetables expressed in percentage

Table 12. Priority vegetable types and their varieties

Vegetable	Preferred Varity	Type	Source
Tomato	Muraaley (Local cherry)	Local (O.P)*	Local
	Sunmarzano (Roma VF)	O.P	Italy/Kenya
	PROSTAR F1 hybrid	Hybrid	Kenya
	Bantam(Alkair) F1 hybrid	Hybrid	Holland
Onion	Basal gaduud/red onion (Bombay red)	O.P	Kenya/Italy
	Hadramut	O.P	Yemen
	Basalcad/White onion (Texas Early Grano	O.P	Kenya/Italy
	Basal gaduud/red onion (Red creole)	O.P	Kenya/Italy
Hot pepper (chilli)	Basbaas dhaadheer (Cayanne long slim)	O.P	Kenya/Italy
	Big Daddy – F1 hybrid	Hybrid	Holland

*O.P = Open Pollinated

4.2. Seed production and distribution in Somalia

This section summarizes the findings on the seed production and distribution approaches used by different stakeholders in Somalia. The findings are based on the interview of key informants dealing with seed production in the target areas. In general, it assesses and reviews seed production efforts in Somalia, with more attention to the approaches taken to produce seed, the organization involved, and profiles of the crops and varieties, as well as the quantities of seed being produced. In addition, other issues related to seed production such as seed processing, storage, distribution, seed quality control and the challenges involved in seed production and distribution have been examined.

Seed production or multiplication provides an opportunity to increase the availability and access of desired crop varieties. Different stakeholders are involved in various types of seed production practices in Somalia and they contribute to the seed availability and accessibility by the small holder farmers.

Seed sroduction and distribution approaches

The various types of seed production practices in the target area included: *a)* The Seed System Group (SSG) and FMoAI*;* b) Individual and cooperatives seed production and supply practice; and c) Seed production and distribution approaches by Private seed producing companies.

The observed seed production and distribution approaches as classified above are broad categories, where among the categories there is some minor variations and overlaps depending on the actors involved, scope or purpose of seed production and the process they used in maintaining seed quality while producing crop seeds.

4.2.1. Seed testing, seed production and multiplication

1) Foundation seed produced by the Federal Ministry of Agriculture and Irrigation

Through IFAD funding, SSG has implemented a variety trial in 2021/22 in partnership with the Federal Ministry of Agriculture and Irrigation. The trial has tested several early maturing maize, sorghum, cowpea and mung bean varieties introduced from KALRO (Kenya Agriculture and Livestock Research Organization). Replicated trials were conducted in two agro-ecological zones (Baidoa for rainfed crops and Jowhar for irrigated crops). As a result, foundation seed of the most promising varieties was produced for further seed multiplication. The details of crop types and varieties tested by SSG/ FMOAI in 2021/22 are listed under the Table 13.

Table 13. Crops and varieties tested by SSG/FMOAI

Crop	Varieties tested	Season, Year tested	Seed source
Maize	DH 02 and SC Sungura	Deyr, 2021	KARLO, Kenya
Sorghum	Karm Matama 1and Gadam	Deyr, 2021	ICRISAT
Cowpea	Ken Kunde and Kunde Faulu	Deyr, 2021	KALRO, Kenya
Mung beans	Biashara, Karembo and Tosha	Deyr, 2021	KALRO, Kenya

In addition to the variety testing and foundation seed production in partnership with the FMOAI, the Seed Systems Group (SSG) worked with three private seed companies for the production and distribution of certified seed to small-scale farmers. Using three private seed producers (Filsan, CSET and Horn Agro), SSG has supported the promotion of seed through a distribution of small sample packs (50-gram seed) of improved varieties of maize, sorghum and cowpea to small scale farmers using village-based advisors (VBA). In total during the year 2022, SSG has produced about 770 MT of seed and channeled the amount through a local NGO, in order to reach out to 24,000 small holder farmers in the Lower Shabelle, Middle Shabelle and Bay region.

As the director of SSG disclosed that SSG's support is not limited to the introduction of foundation seed only but they are also engaged in strengthening the public seed sector in Somalia to develop the required capacity needed for leading and coordinating the formal seed sector development in Somalia. The SSG support in this regard focuses on enhancing technical capacity building

through human capacity development (offering post graduate study on seed breeding), equipment and material support for seed quality testing and continuing foundation seed introduction of improved seed varieties through on farm trials).

2) Private sector coordinated on farm trial for hybrid Maize Variety

Considering the weak public institutions for testing and developing new improved varieties, the private seed sectors including non-governmental organization are emerging and starting to play an active role to engage in research and development, particularly in testing new varieties of sorghum and maize in partnership with ICRISAT and CIMMYT, as well as developing hybrids varieties of maize using CIMMYT inbred lines.

The Maize hybrid trial result (Table 14) conducted by SATG in 2021 shows that the yield of SIMAN F1 hybrid is 24% higher than the local variety. In addition, the days to 50% flowering and days to maturity are similar to the local. The 100 seed weight is far superior to the local. The trial was conducted in replicated plots following CIMMYT protocols. It is important to note that Filsan Seed Company has acquired exclusivity of the SIMAN parental lines and is currently producing the F1 hybrid seed locally.

Table 14. Yield and agronomic trait of F1 hybrid

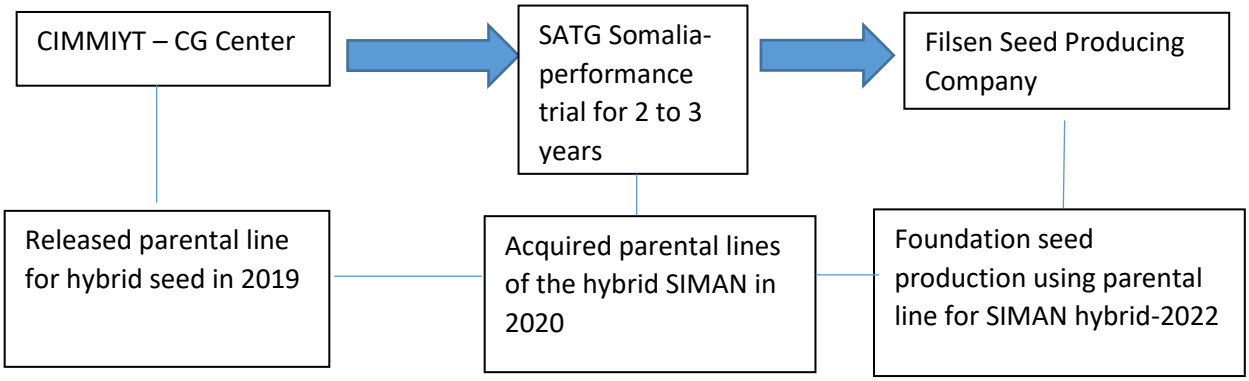
Treatment	Days to 50% flowering	Days to maturity	Yield (kg/ha)	Percent yield increase	100 seed weight (gram)
Local	48	89	5,544	0.00	30
KDV4	43	75	4,613	-20.2	31
HYB-513	47	82	6,088	+8.41	36
SIMAN	48	90	7,279	+23.8	38

In addition to seed varieties, SATG has acquired three Fall Army Warm resistant hybrids from CIMMYT in 2022. The average yield and agronomic data of the FAW screening trial is shown in Table 9. The grain yield of the local variety is significantly lower (3.8 MT/ha) as compared to FAW-resistant varieties with a yield ranging from 4.8 to 5.4 MT/ha for FAW 2001 and FAW 2003, respectively. The low yield of the local variety is mainly attributed to FAW damage. Plant height of the local variety is shorter (1.7cm) and stalk weight is smaller (10MT/ha) than the average value of the FAW hybrids that ranges between 1.85 cm and 2.04 cm for plant height; and 16.3MT/ha to 17.7MT for stalk weight, respectively. The local variety recorded high leaf damage throughout the growing season and high ear rot damage at maturity.

Table 15. Yield and agronomic traits of FAW hybrids										
Treatment	Agronomic traits									FAW screening
	Days to 50% flowering	Days to maturity	Plant stand	No of Cobs	Grain weight (T/ha)	Stalk weight (T/ha)	100 seed weight	Plant height (cm)	Ear height (cm)	Ear rot (%)
FAW 2001	59	114	24	20	4.8	16.3	32	2.04	1.1	1.2
FAW 2002	59	114	24	21	5.5	16.5	32	1.85	1.0	1.2
FAW 2003	59	114	24	20.3	5.3	16.7	31	2.0	1.1	1.9
Local	59	90-95	20.3	17	3.8	10.0	32	1.7	0.96	2.4

After repeated field trials on the selected varieties under the Somalia agro-ecology, the Maize hybrid seed "SIMAN" has met the criterion set for foundation seed production. In the year 2022, FILSAN seed company, the sister organization of SATG, has become actively engaged in hybrid seed production using parental lines derived from CIMMYT.

Diagram 1: SIMAN hybrid maize seed variety flow chart from the seed sourcing to multiplication channel in Somalia



In Gu season 2022, 2 MT of Certified seed of SIMAN hybrid seed was produced by Filsan company for further disseminated to the farming communities

Maize commercial seed production approaches

In 2021, SATG initiated a unique partnership approach towards seed production and certification for commercial release. In this partnership- several actors were involved and among them were: humanitarian organizations, emerging seed industries, out-growers/local cooperatives, public sector and the CG centers such as CIMMYT. The unique market-oriented seed production model has a combination of several emerging opportunities such as a) use of ~~local~~ local knowledge for local seed production; b) proper utilization of the humanitarian seed interventions; c) active engagement of the emerging seed industries; d) tapping into the off-shelve technologies and climate smart varieties readily available at the international agriculture research centers and, e) engaging the emerging regulatory services. Each of the partner's roles includes:

International agricultural research centers: Provision of technical support and improved seed materials to SATG. Over the last 4 years, CIMMYT and ICRISAT have provided to SATG over 100 new improved varieties of both maize and sorghum for adaptation to local agro-ecological conditions.

SATG: Coordinates all the project stakeholders and specifically provides training to the out-growers on seed multiplication protocols.

ICRC: Provides support to the out-growers to enhance the development of the formal seed system. ICRC basically gives in-kind assistance to the out-growers in the form of inputs, including the treated foundation seeds, fertilizers, bio-pesticides, pheromone traps, and storage bags.

Filsan Company: Accessed foundation seed for Maize from CIMMYT and distributed seeds to be utilized by the out-growers as planting materials. Initially, Filsan planted the foundation seeds at its own farm in Afgoye and Balaad where irrigation facility and technical know-how is readily available.

Out-growers- Cooperatives and Private Farm: These are the most important actors in the seed systems. They grew the foundation seeds of maize on a total of 65 hectares, with 10 hectares per cooperative and the remaining 5 hectares operated by a commercial farm, based in Afgoye.

SARIS: Supervises the commercial seed production process by undertaking multiple visits at various seed production stages. The field visits include during field preparation, growth and harvest stage. Based on the SARIS seed certification process or steps, finally the produced seed meets the seed quality standard, certification issues acknowledging the seed produced as certified seed.

Table 16. List of seed out growers participated in commercial maize seed production					
No.	Out growers	Hectare	Region	District	Villages
1	Wadani	10	Lower Shabelle	Afgoye	Jamabalul
2	Muruqshil	10	Lower Shabelle	Afgoye	Beled-amin
3	Barwaqo	10	Middle Shabelle	Jowhar	Baarey
4	Dayah	10	Middle Shabelle	Jowhar	Kulundi
5	Horusocod	10	Hiran	Beled Weyn	Domo-cade
6	Hakufin	10	Hiran	Beled Weyn	Hara-cadey
7	Sumbulah	5	Lower Shabelle	Afgoye	Mukeyga

SIMAN F1 Hybrid maize seed ready for distribution (Source: Filsan, Somalia)

Box 1: The New Modality of Seed Production Practiced by SATG and ICRC in Somalia.

The new business modality of the certified seed production, as illustrated in the figure 4 was developed from a series of humanitarian and business-oriented seed production model co-implemented by ICRC and SATG. The overall objective of the project was to enable vulnerable rural communities to improve their food production to a level that provides a stable economic security environment and sustainable livelihood opportunities in the long term. Specifically, the project was aimed to produce high quality seed while supporting the cooperatives with training by SATG and in-kind inputs by ICRC.

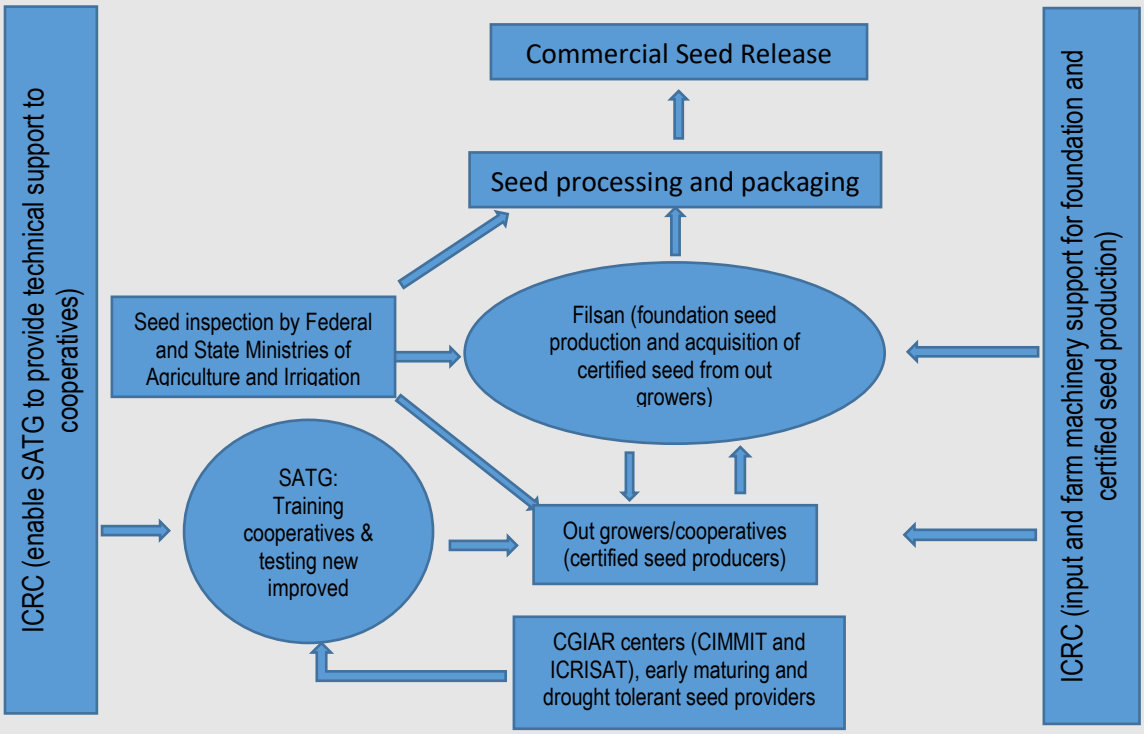


Figure 4. *Partnership on the production of certified commercial seed*

In addition to the seed out-growers/cooperative, the proposed model had multiple players, including SATG, ICRC, SARIS, CG centers, out-growers and Filsan Company. It was conditional for each cooperative to allocate 10 hectares of arable land with access to irrigation water and produce a minimum yield of 2 MT/ha of maize seeds. The project featured a business modality in which ICRC and Filsan had agreed to purchase, from the cooperatives, 30% and 20% of the produced seeds, respectively. The federal and state ministries of agriculture and irrigation were engaged to enhance the legitimacy of the formal seed production system and ensure that the process is in accordance with the SARIS regulations.

This model is adopted by IRiS (Inclusive Resilience in Somalia), supported by USAID, to scale up maize, sorghum and cowpea seed production in Afgoye, Baidoa and Balaad during the Gu 2023 season. Three seed companies registered by SARIS (CSET, Darusalam and Gaalooge) are contracted by IRiS to produce certified seed for the coming Deyr 2023 season. A total of 1550 ha of land has been planted to produce certified seed of maize, sorghum and cowpea.

In the last Gu season, 2022, the seed out-growers produced an average of 2.3 MT/ha of certified maize seed and in total more than **120** MT of improved Maize seed have been produced.

Strengths

- The seed out growers/cooperatives were provided with basic knowledge on seed multiplication, processing, storage and marketing
- They also supported with 'basic seeds' and other inputs such as improved storage bags
- The partnership intended to create linkages between the seed growers/ cooperatives and ICRC and Filsan Seed Company where both parties agreed to purchase, from the cooperatives, 30% and 20% of the produced seeds, respectively. These linkages have created market opportunity where 50 % of the volume of seed produced has been sold to Filsan and ICRC.
- The federal government SARIS has been involved to ensure the quality of seed production and grant finally certification for the seed produced.

Weaknesses

- Lack of proper crop improvement program in the country with crop specific breeding programs is a major challenge in developing new improved varieties that would address the needs of the farmers and mitigates the rising concern of climate change. Climate adaptation should be treated as a major priority in any future crop improvement program.
- SARIS technical team and laboratory services are not fully equipped to undertake the inspection and analytical services. SARIS has to be fully dynamic to cope with the emerging seed companies
- Out-growers/cooperatives are not formally registered as seed growers. This is important in order to differentiate between seed and grain production.
- Emerging seed industry to adapt to the ideas of seed purchase from seed out-growers. This will enable the private seed companies to purchase certified seed by SARIS.

4.2.2. Individual and cooperative based seed production and supply practices

Profile and seed production zones

The seed security assessment conducted in 2020 reported that seed production and dissemination to the farmers through sale by individuals or groups of farmers is not a well-established practice in Somalia. The SSA 2020 suggest that only few producers are found in Awdal, Mogadishu and Woqooyi Galbeed regions and they mainly produce and sell sorghum (42 percent), maize (25percent), Sesame (5 percent), and cowpea (4 percent).

Individual and seed-producing cooperatives are identified as key informants, where interviews and discussions with 8 of the seed producers have disclosed several findings related to seed production and distribution. One of the findings from the interview has shown that, most of the individual and cooperative-based seed producers are located mainly in Southern Somalia (Lower Shebelle, Middle Shebelle and Hiran regions), Table 17. The high proportion of the seed production operations in these regions could be due to favorable climatic conditions, availability of water resource through Shabelle river and available land for seed production.

Table 17. Profile of individual and Seed Producer Cooperatives

Seed Producer	District	Establishment Year	Mode of Production	Land size in Hectare
1. Wadani cooperative	Afgoye	2010	Cooperative	10
2. Yasin Sharif Abdi	Afgoye	2015	Individual	1
3.Maryama Xasan Muse	Afgoye	2018	Individual	2
4.Mohamed Hassan Geedi	Afgoye	2005	Individual	2
5.Ibrahim Hassan Afdheer	Baidoa	2009	Individual	5
6.Horosucod cooperative	Belet Weyn	2009	Cooperative	10
7. Dayah Cooperative	Jowhar	2014	Cooperative	10
8. Barwaqo Cooperative	Jowhar	2012	Cooperative	10

The decision on the seed crop and the varieties to be multiplied mainly depends on farmers demands.

Crop and varieties under multiplication and sources of seed for seed production.

A range of staple crops is being multiplied by individual and seed-producing cooperatives in Somalia. The majority of the seed produced is mainly from local varieties or landraces. The

collapse of the breeding programs and the research centers in Somalia have led the existing seed producers to source basic materials from unconventional sources including the local markets

The out-growers/farmers carrying out seed multiplication activities tend to focus on local seed varieties, with little knowledge on the source of the mother seed. The use of locally sourced seeds raises many concerns about the genetic purity of the crop seeds multiplied from this source. Almost all interviewed farmers and cooperative producing seed reported that they are heavily dependent on locally sourced seed for their seed production as shown in Table 18. This clearly shows that apart from the vegetable seeds, that is generally sourced from outside the country, there are no new seed varieties available to the farmers when it comes to maize, sorghum, cowpea, mung bean and sesame.

Table 18. Crop type and sources of seed used by seed producers

Seed producer	Crop seed (varieties)	Sources of seed used for multiplication
1.Wadani	Maize (white and red)	Own production
	Cowpea (Bod boda and abagaley)	Own production
	Mung bean (local)	Own production
	Sesame	Filsan
2.Yasin Sharif Abdi	Maize (white and red)	Own stock
	Cowpea (Abagaley)	Own stock
	Sorghum (red)	Own stock
	Sesame	Local market
3.Maryama Xasan Muse	Maize (white and red)	Own stock
	Sorghum (white and red)	Own stock
	Cowpea (Bod boda and abagaley)	Own stock
	Sesame	Local market
4.Mohamed Hassan Geedi	Maize (white and red)	own production
	Cowpea (Bod boda and abagaley)	own production
5.Ibrahim Hassan Afdheer	Maize(white)	Own stock/Local market
	Sorghum(white)	Own stock and agro dealers
	Cowpeas(red)	Own stock and agro dealers
	Sesame(White large seeds)	Agro dealers and own stock
6.Horosucod cooperative	Maize (white)	Own stock/Local market
	Sorghum(red)	Own stock and agro dealers
	cowpea(red)	Own stock and agro dealers
	sesame(golden)	Agro dealers and own stock
7.Dayah Cooperative	Maize (white)	Maize Obtained from ICRC
	Sesame	Own stock / Local market
	Cowpea	Own stock
	Tomato	Own stock

	Watermelon	Local market
8.Barwaqo Cooperative	Maize (white)	Own stock / Local market
	Cowpea (red)	Own stock / Local market
	Tomato	Own stock / Local market

Quantity of crop seed produced in 2022 and seed production estimate for GU 2023 production season

The interviewed individual and cooperative seed producers have shared the volume of the seed they produced in the last two seasons (Gu and Deyr of 2022). They were asked to share their seed production estimate for the upcoming Gu 2023 season. The 2022 seed production volume and estimated seed volume for the upcoming season- GU 2023 has been described in the Table 19.

Table 19. Quantity of crop seed produced in 2022 and estimate for Gu 2023

Producer	Crop (varieties)	Quantity of seed in MT sold in GU season 2022	Quantity of seed in MT sold in Dyer season 2022	Quantity of seed in MT available for GU season 2023
1.Wadani	Maize (white and red)	2.45	3.45	3.225
	Cowpea (Bod boda and abagaley)	1	0.9	1.05
	Mung bean (local)	1.25	0.85	1.075
2.Yasin Sharif	Maize (white and red)	0.4	0	0.7
	Cowpea (Abagaley)	0.15	0	0
	Sorghum (red)	0	0	0.63
3.Maryama Xasan Muse	Maize (white and red)	0.1	0.225	2
	Sorghum (white and red)	0.225	0.5	0.675
	Cowpea (Bod boda and abagaley)	0.05	0.4	0.45
4.Mohamed Hassan Geedi	Maize (white and red)	0.5	0.45	2
	Cowpea (Bod boda and abagaley)	0.3	0.25	0.3
5.Ibrahim Hassan Afdheer	Maize(white)	0.55	0.65	0.8
	Sorghum(white)	0.6	0.8	0.85
	Cowpeas(red)	0.5	0.6	0.65
	Sesame (White large seeds)	0.45	0.4	0.55
6.Horosucod cooperative	Maize (white)	35	33	41
	Sorghum(red)	5	5	6

	cowpea(red)	3	3	4
	sesame(golden)	4	5	6
7.Dayah Cooperative	Maize (white)	3	1	1
8.Barwaqo Cooperative	Maize (white)	0.6	0.4	2.5
	Cowpea (red)	0.4	0.35	1.2

The quantity of seed going to be produced during upcoming Gu season in 2023 has been assessed, in order to estimate the potential seed availability. The reported volume gives awareness of the planned seed availability for the subsequent period. A comparison of the proportion of seed volume availability across two Gu 2022/23 season has been documented in the Table 20. Please note, the Gu 2023 is planned estimate seed production during the season.

Table 20. Comparison of the seed volume availability across two Gu season 2022/2023

Crop	No.	2022 GU	2022 Dyer	2023 GU	% difference b/n 2022 & 2023 Gu
Maize seed	8	42.60	39.10	53.22	24.942%
Cowpea seed	7	5.40	5.50	6.60	22.22%
Sorghum seed	4	5.80	6.30	8.15	39.91%
Mungbean seed	1	1.25	0.85	1.07	-14.00%
Sesame seed	2	4.45	5.40	6.55	47.19%

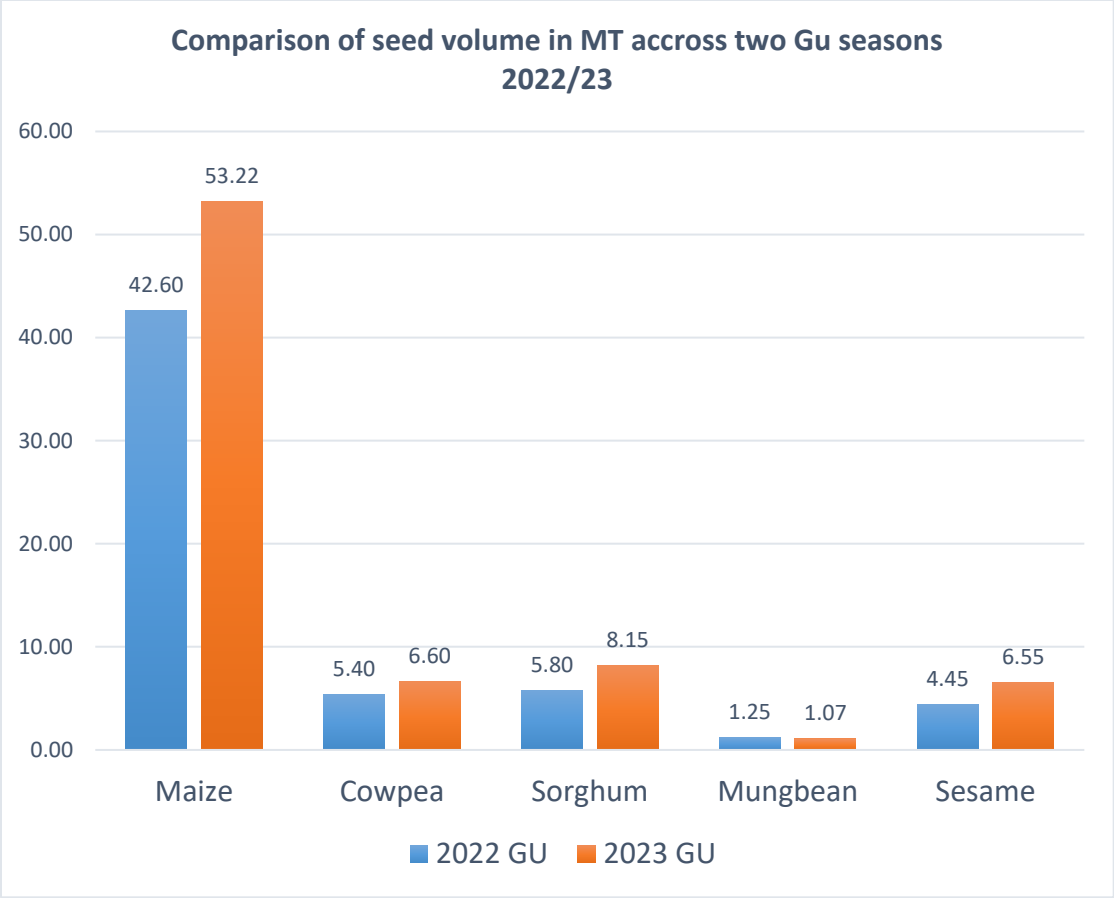


Figure 5: Comparison of seed volume in MT between two Gu seasons 2022/23

In 2023 Gu season, individual and cooperative seed producers anticipate better volume of seed production for majority of the major crops. They anticipate a higher volume of seed production for crops such as Sesame and Sorghum by 47 % and 40% respectively increased volume as compared to the previous year 2022 Gu season seed production for same crops.

Seed processing, storage and marketing

Seed storage: Majority of the seed producers use individual storage facility to store their seed produced. The three of seed producing cooperatives Horosucod, Daye and Birwaqoo have their own or have access to rented seed storage facility for storing their seed produced. Most of the individual seed producer used their own house and shops for seed storage. The quality of each of the storage facility hasn't been discussed further to find out the appropriateness of the available storage facility for storing seed at optimal temperature and humidity in Somalia.

However, from practice the available storage facility will not maintain the appropriate temperature and humidity required for storing seed for longer period.

Seed processing: Majority of the seed producers have access to their own or rented farm implements that contribute for seed cleaning, which is a seed cleaner. At individual and cooperative seed producer level, some of the seed cleaning tasks are aided by implements such as De-husking, size calibration, cleaning and conditioning. Majority of the seed producers don't have further seed treatment implements that assists in Phyto-sanitary treatment. It is only one of the seed producer's found using grading and packaging.

Seed quality: During the seed production process, the majority of individual and cooperatives seed production farm fields haven't been supervised by the available national seed inspection and supervision department. It is only Dayah cooperative seed production field have been inspected for quality seed production by SARIS. This might be due to the involvement of Filsan and ICRC collaborating as partner with Dayah cooperative.

Seed marketing: The individual and cooperative seed producer's sale their produced seed to variety of customers. All of the producers have cited- Farmers, seed traders and an Agro-dealers as their clients that procured the produced seed. In case of Dayah cooperative, the additional client who procured seed were Filsan and ICRC.

4.2.3. Seed production by private seed companies

In recent years, there is a great interest to take part in seed production business by various private companies. This new initiative is due to the relative improved security situation in the country and the start of relatively functioning government. Six private seed companies were interviewed to have a better understanding on the private sector engagement on seed production. Below are the findings on the motives the private sector to engage on seed business.

Box 2. Motives for seed producer companies for engaging in seed production business.

- Motivated by the lack of a seed multiplication system in the country, the community's fatigue from planting poor yielding varieties, and the fact that crop yields are typically lower than anticipated.
- Motivated by the fact that in Baidoa there was a gap in seed production, multiplication and the provision of quality seeds to the customers.
- The establishment of the company was motivated by the increasing demand for different seed variety that are resistant to pests and diseases since the local seed variety especially maize was not growing well in the area.
- Motivated by the FAO project that was encouraging access to improved seeds, particularly for the small holder farmers. The company took advantage of FAO initiatives in improving food security in Somalia through formal seed production.
- The establishment of the company was motivated by persistent crop failure due to poor seed quality and attempt to revive the local economy through production of rice, since rice import cost is extremely high compared to other food stuffs.
- The company has found a market opportunity to trade on sesame products to other countries such as turkey. In order to maximize productivity, they had to look for alternative ways to increase their own production and trading with certified seeds was the only means to achieve optimum result.
- The company was motivated by the fact that there were seed business gaps in the area and the demand of the local community to have access to improved seeds. There was constant failure of the crops due to lack of improved seeds, so they had to research on possible causes of crop failure and hence they initiated the idea to engage in seed production.
- The company was motivated by the lack of improved seed in the country, thus contributing to poor yield and quality.

Most of the interviewed private seed companies share similar types of motives for engaging in seed business. Understanding the motivation that pushed them in the business, will assists to understand the clear impel that propelled the seed business. In summary, the motive for starting the seed business entails- addressing the social concern of people as social enterprise, tapping

unmeet business need which is for profit, creating linkages with existing own enterprise where seed production will add more value in income, etc.

Operational area: target states

The majority of the private seed companies operate in the South West State and some have offices in Mogadishu, Baidoa, Afgoye, Balaad, Jowhar and Belet Weyn. Some of the private companies are targeting for expansion to other areas in the year 2023 and beyond.

Profile of private seed producers

Most of the seed companies have their own seed production farm. It is only the Bay Agro that doesn't own its own farm. In addition, most of the seed companies work with seed out growers for additional seed production.

Table 21. Profile of Private seed producing companies

Company	Establishment year	Location (State)	Production area in hectare	Out growers/ Contractors
1. Filsan	2016	South West	70	400
2. C-SET	2016	South West	8	180
3. Dursalem	2007	South West	100	200
4. Danwadaag	2008	Hirshabelle	300	7000
5. Bay Agro	2010	South West	NA	300
6.Gaalooge	2008	Hirshabelle	319	50

Major crop seed produced by private seed producing companies

The majority of private seed producers engaged in major crop seed production, which area Maize, sorghum, Cowpea and Mung bean. One of the seed producers have started to producer Rice seed using foundation seed from the International Rice Research Institute (IRRI). Selected priority crops along with their respective actual and estimated seed volume is summarized under Table 22 and 23.

Table 22. Quantity of seed produced by private companies in 2022 and estimate for Gu 2023						
	Company	Crop	Variety	Seed produced in MT in 2022 Gu	Seed produced in MT in 2022 Deyr	Seed production estimated for 2023 Gu in MT
1	BAY AGRO	Maize	White	180	180	300
			Baydhabey	16	160	300
		Cowpea	Jowhar	80	80	150
			Red	120	120	150
		Sorghum	White	70	70	250
			Red	70	70	200
		Mungbean	N/A	90	90	100
2	CSET	Maize	white	1.2	1.25	1.4
		Sorghum	white	1	2	1.6
		Cowpea	red	0.9	1	1.15
3	DAARUSALAAM	Maize	Somtux	81	110	200
		Cowpea	Abgaaley	110	118	280
			Cagaartooy	52	32	180
		Sorghum	White	15	48	150
			Red	18	21	80
		Sesame	Dunyar	90	43	270
4	DANWADAAG	SESAME	Dunyar	30	40	60
			Humarey	15	20	35
5	FILSAN	Maize	SIMAN F1 hybrid	2	0	40
		Maize	Local	20	0	60
		Cow pea	Local	2	1.5	20
		Sorghum	Local	2	0.8	5
		Sesame	Local	6	0.4	7
6	GAALOOGE	Maize	White	70	60	80
			Red	50	48	50
		Sorghum	White	30	35	40
		Cowpea	Degaley	75	70	80
			Hamareey	60	60	80

The quantity of seed going to be produced in the upcoming Gu season 2023 by private seed producer shows an increase overall production by 130 % as compared to similar last Gu 2022has been assessed. This estimated value gives an awareness on planned seed availability for the subsequent period. Seed production comparison between two Gu season (2022/23) expressed in percent difference highlighted under Table 23.

Table 23. Seed production by private companies between two Gu seasons 2022/2023				
Crop seed	Seed sold in 2022 Gu Season, MT	Seed production expected in 2023 Gu Season, MT	Difference in volume, MT	Percent (%) difference
Maize	420	1,031	611	145.4
Cow pea	500	941	441	88.2
Sorghum	206	727	521	252.1
Sesame seed	90	100	10	11.1

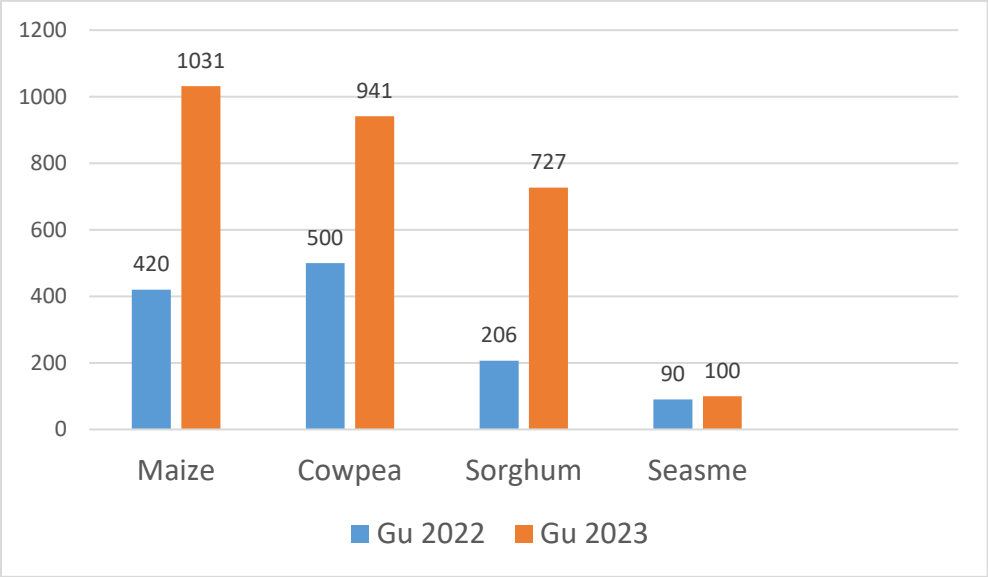


Figure 6. Comparison of seeds produced by private seed companies between two Gu seasons (2022/23)

Strengths

- ***Certified seed producer***: All of the private seed producing companies have passed though the SARIS certified seed requirement standard. The supervision of most seed production activities is normally done by SARIS staff. The seed certification process requires field level supervision during the land preparation & growth stage and latter collection of sample seed for laboratory germination, purity and moisture content testing.

- ***Seed processing and treatment facility***: All of the private seed producers have seed cleaning and treatment facility that enhance the quality of seed they distribute. Seed processing, cleaning, grading, treatment and appropriate packaging normally offer producers the advantage of being able to sell at a premium price in a given market.
- ***Seed quality testing facility***: Majority have some seed testing laboratory. The laboratory facility is operational providing basic services such as testing for seed germination and analyses of purity and moisture content.
- ***Collaboration with Research centers***: At least three of the interviewed seed producers have working relationship with international agricultural centers such as ICRSIAT, CIMMYT and IRRI. This established collaboration has created opportunity to access improved varieties and foundation seed from the research centers.
- ***Collaboration with FAO and INGOs such as ICRC***: ICRC has shown a great interest in supporting seed out-growers model and linking the seed producers with seed companies and inspection services while purchasing quality seed from out-growers for further seed distribution
- ***Working with seed out growers***: A new innovative model is emerging by working with seed out-growers for production of certified seed.

Weaknesses

- ***Limited operational presence in other location in the country***. Majority of private seed producers located in South West state. Though some of the companies have plans for expansion outside their current location, still their concentration in limited location might be their weakness which limits improved seed availability and accessibility to small holder farmers.
- ***Limited improved seed as foundation seed***: Limited engagement in seed production or multiplication using improved variety for major cereal and legume crops. Only- Rice and Sesame crops improved variety were reported. In addition to Maize hybrid seed production by Filsan seed company.

Seed processing, storage and marketing

Most of the private seed producers use advanced seed processing facilities for seed cleaning, seed grading, treatment and packaging. Seed packaging is normally done using suitable packaging material that fits the interest of the seed buyers. In this case small seed packaging are used. This packaging clearly distinguishes between seed and grain. Seed processing, cleaning, grading, treatment and appropriate packaging normally offer producers the advantage of being able to sell at a premium price in a given market.

Seed quality control

Field inspection is an important aspect of the seed production and is generally conducted by SARIS. Seed production plots are inspected at least two to three time during the growing season to ensure the trueness to type of the seed variety. After harvest, seed bags are sub-sampled for seed laboratory testing (germination, purity and moisture content) and based on the result seed certification is issued by SARIS.

Some of the private seed companies such as Filsan is equipped with advanced seed laboratory facilities that facilitate seed germination, purity and moisture testing. The laboratory was operational from 2016 providing basic services such as testing for seed germination and analyses of purity and moisture content.

Box 3: SARIS and Seed certification process in Somalia

The Somali Agricultural Regulatory and Inspection Services ("SARIS") was established after the Somali Federal Parliament passed SARIS laws and governing structures on November 15, 2020. It is a regulatory agency primarily working with the Federal Ministry of Agriculture and Irrigation (FMAI) and responsible for monitoring agricultural activities in Somalia, including, but not limited to, plant protection and implementation of control measures by setting up quarantine regulations, seed inspection and certification, fertilizer quality inspection and certification, pest control product inspection and certification, and the introduction of related subsidiary instruments. SARIS also serve to enact regulatory standards governing the sale, production, storage, and distribution of seeds.

At present, SARIS is hosted by the FMAI and is overseen by the Director of the Department of Plant Protection. The Ministry is also home to SARIS's laboratory facilities and is currently providing services on field seed inspection, seed testing for germination, purity and moisture content, in collaboration with Federal Member State Ministries of Agriculture and Irrigation. Based on these results, SARIS issue a certification result to the registered seed companies. A total of 9 seed companies are currently registered with SARIS. Ultimately, the aim is to establish an independent SARIS authority with its own board of directors, offices, laboratory services and executive members who will run the day-to-day activities of the authority.

The emerging formal seed system, seed quality is very important as all seed produced must be tested for germination and purity. Somali Agriculture Regulation and Inspection Services (SARIS) is tasked, among many others, with regulating the formal seed systems in the country. The new seed production and seed quality assurance modality includes:

- ⇒ Field level inspection, at least two or three time during growing season, to ensure a good crop establishment and trueness to type of the planted variety.

- ⇒ At harvest, SARIS inspectors collect seed samples from the out-grower farms to conduct quality tests, including germination, purity, and moisture content.

- ⇒ Upon satisfactory result of the seed analysis, a SARIS seed certificate is issued to ensure that the seed can officially be sold as certified seed. Though SARIS is not fully equipped and operational to conduct a high-level service, it is a good start that can be tapped into to develop a full-fledged formal seed system

Major challenges affecting seed production in Somalia

The major challenges to seed production in Somalia include poor access to foundation seed; recurrent drought and flooding; pests and diseases; insecurity; poor infrastructure and lack of access to credit and other services.

Poor access to basic or foundation seed: Production of high-quality seed starts with the acquisition of good basic or foundation seed. Many of the seed producers- Individual, cooperatives and private seed companies are still using locally sourced seed. This raises many questions about the quality (genetic and phytosanitary) of the seed being produced in Somalia.

Inadequate capacity for seed quality control: Currently in Somalia, there is a formal body –SARIS who is responsible for quality checks on the seed being produced. However, in 2022 very limited number of out-growers seed plots has been checked for quality standards. This clearly shows that SARIS lacks the capacity to undertake field inspection services.

Seed Germination Testing in Seed Lab, Hargeisa, Somalia (Source: FAO, Somalia)

Pests and diseases: High incidence of, and damage by, both field and storage pests and diseases are some of the concerns at the field level. The phytosanitary quality of the seed being produced in Somalia is not being systematically checked, particularly on those seed produced by individual and some of the cooperative seed producer level.

Insecurity: The presence of Al Shabab poses major risk for the seed companies to operate freely in seed multiplication activities using out-growers management scheme. Most of the agriculture production area is still controlled by Al-Shabaab.

Poor road access: Generally, the problem of poor feeder roads is a challenge not only to the government staff but also its development partners and farming communities. Poor roads limit movement of people and technology for seed quality assurance.

Poor access to credit and other services: In Somalia many private, individual and cooperative seed growers still rely on the limited support provided by Government, NGOs and other institutions. Many financial institutions are still skeptical about giving loans for agricultural production targeting individual and also group-based seed growers.

4.3. Acute seed security findings

This section highlights the Acute seed security field level findings obtained from the FGDs, and an individual farmer's interview which assessed the seed sources in meeting the seed needs for the last two cropping seasons, namely Gu and Deyr, across the 10 selected districts in the three states. The choice of sites offers good representation of Somalia's smallholder agricultural regions characterized as riverine, rain fed, and a combination of riverine and rain fed.

The rapid seed security assessment fieldwork took place in the month of December 2022, which is close to end of Deyr crop production season. This coincides with the Deyr farming time contributing to having relatively "fresh memory" in recalling the seed sources farmers used during Deyr 2022 production season. However, this year's seed source assessment unfolded in a relatively poor season or in a period where Somalia is facing its worst drought conditions.

Understanding the farmer's seed sources for planting season, considers two major themes. These are analyzing the short-term or acute seed security situation, focusing on the main 2022 seasons-both Gu and Deyr where farmers already cultivated their crop and forecasting or estimating the upcoming Gu season production. The Gu 2023 production season will start in the month of April 2023. The seed sources assessment includes assessing and understanding immediate seed procurement strategies farmers could use and analyzing crop profiles and their seed sources for the coming crop production season.

4.3.1. Farmers seed sources used in Gu and Deyr 2022

The FGD participants discussed in groups on those questions assessing the sources of seed used by the participants and the major findings are shown in Figure 7.

The farmers' own-saved is the most important source of seeds accounting for 34.5, 37.8, 33.4 and 36.7 per cent of maize, sorghum, cowpea and sesame seed demands, respectively. The local market is the second most important source of seed for maize (27.8 %), sorghum (34.7 %), cowpea (31.9 %) and Sesame (33.5 %), while seed aid is an important source of seed for Maize (13.4 %), Cowpea (13.2 %) and Sorghum (4.8 %). The agro dealer's account for (19.9 %) for maize, (12.4 %) for sorghum, and 21.4 % of Sesame seed needs. The social network account for 10.4 % of Sorghum seed needs.

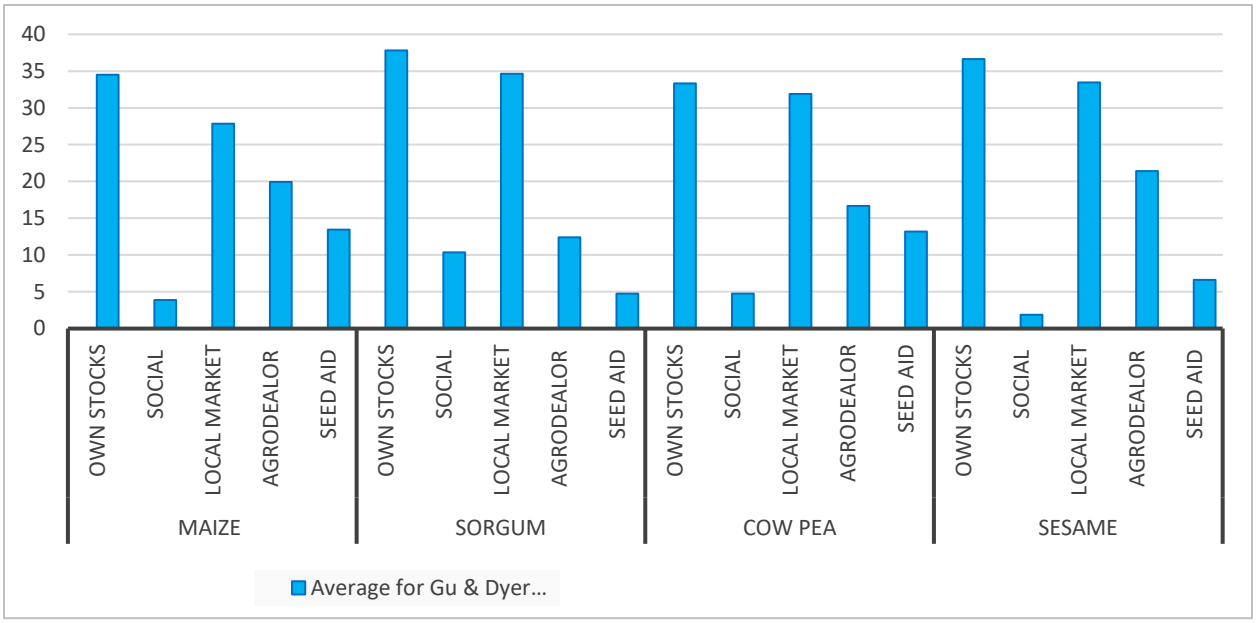


Figure 7. Sources of seed used (% of farmers) in 2022 season

An Interview from 22 participant farmers (11 men and 11 women) were made to assess the seed sources they used during the Gu and Deyr 2022 season. Each of the individual farmer was requested to rank the seed sources based on their level of importance (1-3 scale, where -1 is most important, 2- second most important 3- Third important seed source) during the last two seasons. In the table 21, individual farmers have rated *Own sources* for Maize and *local market* for Sorghum, Cowpea and Sesame as the most important sources. The second most important sources for Sorghum, Cow pea and sesame has been suggested as farmers *own source*.

Table 24. Farmer's seed sources used in Gu and Dyer 2022 season (22 Individuals)

Level of importance	Sorghum					Maize					Cowpea					Sesame				
	1	2	**3**	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Most Important	33.33	0	**44.4**	13.9	8.33	42.9	9.52	23.8	16.7	7.1	34	14	46	5.7	0	23	0	43	17	17
2nd Important	**48.48**	15.2	18.2	18.2	0	21.4	9.52	38.1	19	11.9	32	21	29	18	0	34	0	17	34	14
3rd important	15.79	15.8	21.1	21.1	**26.3**	14.3	21.6	16.2	35.1	10.81	17	20	20	29	14	20	0	23	27	30
	Sources: 1- Own 2- social network, 3- Local Market, 4- Agro dealer, 5- seed aid																			

Both FGD and an individual interview has shown that own seed sources and local market are main seed sources farmers used during the last Gu and Dyer 2022 productions season.

An interview with 22 farmers were made to assess the future GU season seed source and its quantities per sources. On this discussion, individual farmers were asked about the sources of

seed they expect to cover a hectare of land in Gu 2023 for major crops. From the discussion result it has been noticed that Farmers are using different seeding rates for major crops to cover a hectare of land. Based on suggested farmers seeding rate, proportionally allocated the suggested seed amount as per the different sources they are expecting to be sourced in the Gu 2023 season. As, in the below table 25, proportionally allocated seed sources by individual farmers interviewed.

Table 25. Seed sources expected to be used proportionally for Gu 2023

Crop	Own stocks	Social networks	Local market	Agro dealer	seed aid
Sorghum	30.33	0	30.33	11.5	27.87
Maize	26.27	0	12.44	18.4	42.86
Cowpea		21.36	4.85	32	41.75
Sesame	37.78	0	44.44	0	17.78

Practically farmers access seed from various sources to meet their seeding needs and its very rare for farmers to depend on single sources per crop. Depending on the situation or condition of crop harvest, farmers usually save small number of seed in the house (26 to 38% as in the table above 25) to meet their next season seed needs and they couple the available home saved seed with additional seed sources such as local market, social network and might be from seed aid. Thus, the individual farmers interview has revealed that they are expecting to use or depend on using multiple seed sources for major crops, though one seed source usually comes from own saved seed sources for most of major crops, except Cowpea seed.

Assessing the Gu 2023 season crop seed sources for major crops is more of understanding the projected seed sources, where farmers are expecting to meet their seed needs. As result It should be considered as ‘planned seed sources’, which contributes for understanding if there is any vulnerability from farmers side in terms of access to available seed.

Box 4 Seed saving and seed acquisition by farmers across Gu to Deyr season in Somalia

Data collected in 1996 in southern Somalia by the International Plant Genetic Resources Institute revealed that seed is often kept on the roof of the house in the weeks between the *Gu* harvest and the *Deyr* planting season, whereas it is kept in containers inside the house over the longer period between the *Deyr* harvest and *Gu* planting season (Friis-Hansen and Kiambi, 1997).

Ideally, farmers aim to maintain stored seeds throughout the year, replacing stocks with fresh seeds after each harvest season. Thus, some of the seeds selected from the *Gu* season harvest will be used for planting (and re-planting) in the *Deyr* season and some will be kept until the *Deyr* season harvest when it will be replaced with freshly-harvested seed. Similarly, some of the seed from the *Deyr* season harvest will be sown in the *Gu* planting season and (ideally) some will be saved up to the *Gu* harvest and then replaced.

In this way, even in the event of a harvest failure, farmers will have seed stored from the previous harvest for planting. In practice, however, not all farmers are able to save seed in this way throughout the year: survey results on seed saving practices advices the important to note that the timing of the seasons is such that the period between the *Gu* harvest and the *Deyr* planting season is approximately one month (but can be as little as ten days), whereas the period between the *Deyr* harvest and the *Gu* planting seasons is approximately four months. Some farmers find it difficult to save seed over the longer *Deyr-Gu* period. Approximately half the farmers interviewed used own-saved seed in the *Gu* 2000 season, but this percentage increased significantly in the following *Deyr* season, reflecting the relative ease of saving seed from *Gu* to *Deyr season* (Catherine, 2001).

4.3.2. Seed security parameters

Seed quality

Good quality seed generally leads to more vigorous seedlings, which can produce more flowers (ears of corn or bean pods) and result in higher yields. Good quality seed contributes for better germination rate, as result farmer use fewer or less seed amount and it fosters quicker germination, where the seedling will be able to make use of limited moisture supplies in dry areas, which are common in Somalia. Seed quality encompasses both seed per se and varietal quality dimensions, where each of the seed quality dimensions are further elaborated under below Box 5.

Box 5: Seed quality definitions/ concepts

*Seed quality is defined along two broad dimensions: **seed quality per se and varietal quality**. It is Important to think of the two as quite distinct.*

***Seed quality** consists of the health, physiological and physical attributes, such as the absence/presence of disease, whether grains are fully mature (and not broken), and the absence/presence of inert material such as stones or dust weeds.*

***Variety quality** refers to the genetics of seed. It may consist of attributes such as plant type, duration of growth cycle, yield potential, seed color and shape*

In supplementing information about the sources of seed, the assessment interested to examine on the quality of seed used or sown by farmers in the targeted areas. As assessed by farmers themselves, overall, and across crops the FGD participant farmers were asked whether they are satisfied or not on the seed they sown and found out that the majority of farmers seem not pleased (62.9 %) and it is only 37.1 % satisfied with quality of seed they sowed, ratings on the quality of the seed they used, as the Figure 8, as below.

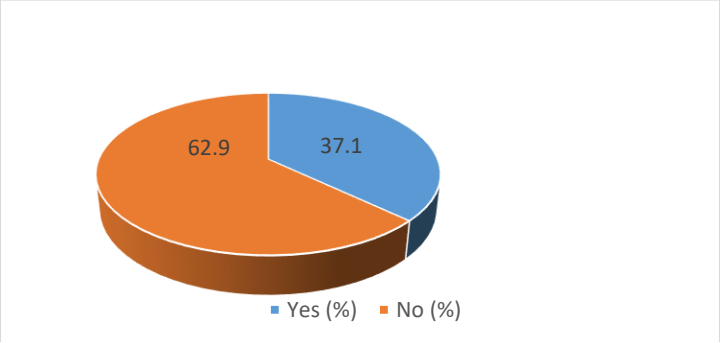


Figure 8 Farmers rating on seed quality satisfaction

It is Important to stress here that the quality standards are local ones (farmers own evaluation).

Seed availability:

Adequate or sufficient seed availability to small scale farmers is a key to food security. Seed availability at local farmer's level depend on the availability of seed either due to good harvest where farmers reserved their available seed or more seed could be available due to free seed aid support. Market also plays key roles in increasing local seed availability, as they supply sustainably the required or needed seed at local market close to farmers during the right planting time or a head of planting time.

In this assessment FGD participants discussed in order to understand that seed was available for farmers in the past two crop production seasons in Somalia and also to forecast that seed will be available for farmers for the upcoming Gu 2023 crop production season.

The crop production yield indicator for major crops such as maize and sorghum showed a negative trend for seed availability in 2022. The FASNU – agricultural assessment has shown that year 2022 has recorded the third lowest crop yield in Somalia. The major cereal production harvest has been found below the average yield. The overall crop yield reduction is mainly due to the prevalence of drought affecting seed availability at farmer's level, particularly for poor and more vulnerable household who have limited opportunity to compensate the shortage of seed availability through accessing seed from other sources such as local market.

The other evidence used to assess the availability of seed for Gu 2023 season was assessing the performance of Gu 2022 season crop harvest. Farmers were asked under the FGD to assess or evaluate the overall crop harvest for Gu 2022 crop production season. Majority of the FGD participants reported the overall crop harvest for Gu 2022 as poor (Table 26). Some respondents suggested the Gu season harvest as a very poor. Some respondents reported as a good harvest season.

Table 26. *Farmers evaluation of the performance of Gu 2022 harvest*

Crop	Good	Poor	Very poor
Maize	21.6	42.8	35.6
Sorghum	24.6	45.6	29.8
Cowpea	27.5	42.3	29.6
Sesame	33.0	46.1	20.9
Average	26.7	42.2	29.0

Seed (sourced) supplies from local seed producers- The assessment on local seed producers in the area, has shown normal seed supply for seed traders, Agro-dealers, farmers and others such as NGOs. In 2022 both Gu and Deyr crop production season, the local seed producer have produced similar volume of seed for major crops such as Maize, Sorghum, Cow pea and Mung bean. The seed production volume as compared to similar season in 2022 (Gu 2022) has shown significant volume surplus. Individual and cooperative seed producer anticipate a volume increase of ***43%*** *in maize and* ***41***% in sorghum for Gu 2023. Similarly, Private seed producer estimate more volume of seed to be produced in the Gu 2023 for Maize, Sorghum, Cow pea and

Sesame. In some of crops such as Maize the expected volume proportion almost double, **93%** increase in proportion to the seed they produced in Gu 2022 season.

Seed sourced from local market: Seed/grain traders (N=9 observations) estimates for Gu 2023 shows 'normal' or 'more abundant than normal' with a focus on Maize, Sorghum, Cow pea and Sesame supply. Majority of the seed traders expect the seed availability to be Normal for the remaining period or time of the year, this includes the Gu 2023 crop production season. Very few respondents suggested to be more than normal supply.

Seed accessibility

Seed accessibility can sometime become a major challenge, though sufficient number of seed is locally available to major seed sources. Proximity to major seed sources determines the farmers' chances of being able to access or get the desired seeds for sowing in good time. This proximity also influenced by the level of infrastructure, transportation means, security condition and others.

However**,** the civil unrest and control of Al-Shabaab in most of the agriculture producing area are the major drivers limiting seed accessibility. This is exacerbated by poor main and feeder roads that makes access from seed available or surplus area almost impossible. In addition, heavy rains early in the season makes the movement of seed extremely difficult as most of the main road outside the major cities are poorly developed. As a result, farmers may not have access to seed when they need the most at the start of the growing season.

The majority of seed producers consists of individuals, cooperatives and private seed producing companies, almost all of them are located in ***Southern west state*** of the country. This will contribute for better seed availability for the south west state farmers but still due to poor road infrastructure, the transportation of produced seed from the South West region to other states might not result in better seed accessibility.

Farmers' preference and access to preferred seed from a particular source is determined by ***the local market price at the time of farmer's*** need for that particular seed type and the price that farmers are willing to pay or afford for a given quantity of seed.

Assessment of the price trend at local seed/grain market has shown an increase price trend. A price comparison was made between Gu 2022 and Gu 2023 (estimate). In general, there are price increment observed for price of major crops seed. This would give an indication of the level of seed affordability by farmers in the coming GU 2023 season. This seed price increment has been more vivid in crops such as sorghum and maize and to some extent on sesame. The Gu 2023 estimated price shows a 54%, 50% and 17.3 % increase as compared to past Gu 2022 season.

Table 27. Average Price comparison for major crops across the two Gu seasons.				
Crop	Average price in Gu 2022 in USD/Kg	Average price estimate for GU 2023 season in USD/Kg	Average price difference b/n Gu 2022 & 2023in USD/Kg	% difference
Maize	1.00	1.5	0.5	50
Sorghum	1.1	1.7	0.6	54
Cow pea	2.1	2.2	0.1	4.7
Sesame	2.3	2.7	0.4	17.3

Seed adaptability

During the Gu and Deyr 2022 production season, farmers have cultivated major crops such as maize, sorghum, cowpea, mung bean, and sesame. The cultivation of all major crops has been based on locally available seed varieties. During this assessment, the results of the FGD participants has revealed that locally available varieties, generally known as landraces, are highly suitable under local conditions though yields may be low. Please see the preferred crops variety for each major crops section under this report.

Over the years, the local seed varieties developed high level of adaptation to the local conditions. In addition, farmers and consumers claim that food prepared from the local landraces are testier than the introduced varieties. In contrast, however, the suitability of vegetable crops can be questionable as most of the seed varieties grown in Somalia are imported from outside the country. In this case, most farmers generally go with the varieties that they already know its performance from previous years. In recent years, hybrid varieties of tomato and green-pepper with superior yield and quality are becoming popular in a newly emerging greenhouse vegetable production system.

Though farmers in Somalia heavily rely on the locally adapted landraces for major cereal and legume crop, in the past year -2022 improved new maize hybrid seed variety was introduced in as part of contributing for local area food availability. ***SATG in partnership with various stakeholders has introduced the first of its kind- Maize hybrid seed in Somalia in Year 2022 production season.***

4.3.3. Seed rate determination

The seed requirement for planting a given area of land by the farmer depends on several factors. Farmers long years of experience in the field play a role major in deciding the amount of seed per required per unit area. Farmers within the same village use a different seeding rate to cover

almost the same size of land. This difference might be due to the different practices and assumptions used by each of the farmers. However, in most cases, the amount of planting material depends on factors such as the germination rate, amount of available seed, planting time, soil type, cropping practice, and exposure to drought, flood, etc.

As part of the planting material needs assessment, individual farmers were interviewed in the selected target area. All of the interviewers were asked about the amount of seed they use for covering a hectare of land for major crops. In addition, a document review has been made to understand the recommended seeding rate at small holder farmers' level. Both findings have shown that there are differences in the amount of seed farmers suggested and commonly recommended seeding rate by Institutions or organizations who followed some rational approaches for determining seeding rate. However, in practice, there are factors that need to be considered while determining the appropriate amount of seed to cover a hectare of land. These factors include the following:

1. ***Cropping practices***: Farmers who practice mono-cropping in a given season need more amount of seed for a given crop seed than, a farmer practicing intercropping or mixed cropping.

2. ***Livelihood zone***: Farmers residing and cultivating land near the Riverine area use the "normal" amount of seed per area since they depend on the available water for irrigation. While farmers in rain-fed areas- might use some additional amount of seed to compensate for poor germination that could result from moisture or rainfall deficit. In this case, farmers use more seeding rate per area than the "normal" amount of seed to compensate for late rain set, where later in case of more germination and growth from the over-sown seed, farmers will adjust the crowd crop stand using ***a thinning practice***- where selected and usually weak crop will be thinned out from the stand and fed to livestock. Other option is farmers in the rain-fed area might use the normal rate, and in case of rainfall shortage and poor germination, farmers again use some additional seed, to cover the lost area which is commonly known as a ***gap filling*** practice.

3. ***Seed quality***: farmers using better seed quality use relatively less amount of seed than farmers using poor quality seed. Poor quality is generally associated with poor germination and less crop emergence.

4. ***Seed availability at planting time***: farmers who accessed their seed needs at the right planting time, will use the available moisture and will use the normal planting amount. On the other side, late delivered seed aid, usually contributes to late planting and poor germination which again forces farmers to re-plant or gap fill to the previously sown and lost area.

5. ***Soil type***: Farmers who have better soil type, which conserves available soil moisture contributes to having relatively better moisture retention that supports better seed germination rate and a vigor stand growth. In contrast, farmers having less moisture conserving soil type such

as sandy soil will have lesser soil moisture holding capacity, which affects available soil moisture for seed germination.

6. ***Available Knowledge, Skill, and practices***: farmers who are knowledgeable or have experience in Good Agricultural Practice (GAP) such as early planting, row planting, proper weed control, soil moisture conservation, soil amendment application such as manure, compost and/or inorganic fertilizer application will contribute for better seed germination, as result reduces seed lose.

Understanding the factors that affect seed germination and later the vigor growth of the plant germinated from a given seed is the first step in determining the amount of seed needed per area. Secondly, since some of the above factors are commonly shared or uniformly shared among a given geographic area or livelihood zone, it is better to categorize these factors as common factors for a given location. For instance, in the Somalia context, livelihood zoning, is one of the constant factors, where farmers in the Riverine area share uniformly this factor and similarly in the Rain fed zone farmers share some level of uniformity as all farmers residing in the rain fed area depend mainly on available rainfall pattern. Another factor is soil type farmers in Riverine or Rain fed areas uniformly to some extent will share similar soil types, as a result, though there are some variations in the type of soil however as a factor, these might not be significantly affected or as some of the impacts related to this factor could be taken into consideration under the other factor such as livelihood zoning factor.

The other factors- seed quality, timely seed availability, level of knowledge, and skill could be assumed factors. The assumption is that deliberately during the planning or implementation of seed support intervention all farmers despite their livelihood zones difference, could access the preferred seed quality, timely seed distribution, and GAP support uniformly across all locations. Based on the above understanding and these assumptions, we categorized the calculation of planting material seed requirement at the farmer's level under two scenarios, which is calculating the seed need for Riverine and Rain fed districts.

The additional seed requirements by farmers cultivating at Rain fed livelihood zone, is due to the above assumption, that it is better for farmers' initially to over sow (Use more seed quantity than recommended) then depending on the available moisture they practice thinning, where overcrowded plants are uprooted and normal spacing achieved. Thinning has two advantages as compared to the gap filling practices. These are, it helps to use the available moisture as the rain happens. Secondly, the thinned-out seedlings will be served as livestock feed, where crop – livestock integration supported. The other advantage is that over sowing and later stage thinning out creates better uniformity in the crop filled.

A Gap filling is done when normal seeding rate used during the planting period and latter in case of poor germination, additional seed used for a gap filling. But due to dry moisture zone, it has been less predictable to anticipate when the next moisture will be available for a gap filling

practice. A gap filling- has some risk, since the onset of the next available moisture is less predictive, it is better to over sow and then thinning out. The other disadvantage is a gap filling creates less uniformity across the crop field, as later planted seedlings remain younger as compared to the initially sown and emerged seedlings, which later at harvesting stage, the crops planted based on a gap filling mature at different times, which creates some difficulty during harvesting period.

Cattle feeding on Sorghum, Gabiley, Somalia
(Source: FAO Somalia)

Recommended emergency seed aid support- 2022/23 drought affected years

The overall farmer level seed availability relates to crop yield recorded during the season. Whenever there is a good harvest (normal year), farmers will have a better capacity to store some produce as a seed source for subsequent planting season. In the contrary, whenever the crop yield gets low due to various reasons (drought year), farmers will look for external support as they face shortages in crop yield. According to the FASNU agricultural assessment report, the year 2022 has recorded the third-lowest crop yield in Somalia. Though the year 2022 was one of the lowest crop harvests recorded year, still farmers have some seed saved as their own seed source to be used for the subsequent planting season. Figure 7 in above shows that, farmers have some amount of seed saved for major crops and which has been used during the two seasons in the year 2022. Based on the above understanding, emergency seed recommendations have been forwarded for the subsequent season (seasons in 2023, which still fits under drought-affected years in Somalia) for both livelihood zones. More detailed on the assumptions or consideration are described in the below section.

Key assumptions or considerations used in emergency seed distribution

- **Recognize what is available as own saved seed**: In the recommendations, the available seed at the farmers' side has been taken into account and the emergency seed support should

cover the required and needed seed amount for the target groups. On average Gu and Dyer 2022 season farmers used 34.5% of maize, 37.8% of Sorghum, 33.4 % of cowpea, and 32% of Mung bean from their own sources as their own saved seed. The emergency seed support should recognize the available seed at farmers level and need to cover the deficit. During normal or better harvest year, target groups meet their seed need fully from their own saving without external support.

- **Contribute to meeting target beneficiary preference or choices and meeting the required wider food needs:** The recommendations are supporting crops that are contributing to staple food crops in the target area. Both Maize and Sorghum are major cereals contributing to the local staple food consumption and where as the preferred pulses which are Cowpea and Mung bean are commonly produced for food and supplementing household income. In addition, vegetable seeds are selected to contribute to improved nutrition and generating additional income for the target beneficiary.

- **In line with ecology or livelihood Zone**: During the emergency support, no new crop varieties that haven't been tested for local adaptation will be introduced. The emergency seed support will focus on selected crops and their varieties or landraces that demonstrated adaptation to the local agroecology. In addition, the emergency seed support will take into consideration the different ecology or livelihood zone impacts or influences on selected crop production. As a result, the target groups in Riverine and rainfed-based livelihoods will receive a varying amount of seed for cereals and pulse crops which takes into consideration some of the factors such as the variability of rainfall. Secondly, the vegetable seed support will be limited to Riverine livelihood zones targeting individuals and groups who have access to water resources from the river, boreholes, shallow wells and other means to stage irrigation-based vegetable production.

- **Based on seasonality or seasonal cropping calendar**: Somalia has two major cropping seasons, which are mainly known as Gu and Dyer seasons. Each of the seasons offers different opportunities for crop production across the country. In addition, the availability of water or moisture which is a crucial factor in Somalia is greatly affected by the seasons. Thus, the choice of crop and decision on the emergency seed support will follow or suit the appropriate production season per the cropping Calander. In addition, the emergency vegetable seed support will base on water resources as explained earlier, the opportunity to harvest water during the longer rainy season could be seen as a second criterion in addition to limiting its production to the Riverine areas.

- **Contribute to enhancing the resilience of the local seed system**. The emergency seed support in addition to the agricultural input support, includes supporting the different technical awareness, and skill development related to improved agricultural practices adoption.

Support for Good Agricultural Practice (GAP) promotion will continue using appropriate promotion services. Based on the target farmer or agro-pastoralist level of knowledge, interest, or willingness improved practices such as crop diversification, better soil management, post-harvest handling, etc. will be supported as part of enhancing the knowledge and skill of the target groups. In addition, support for the formal and informal seed sector through different interventions such as promoting local seed sourcing, technology promotion such as improved storage bags, irrigation practices, targeted support for seed production, storage, and marketing actors through other developmental seed projects will complement the emergency seed interventions for creating resilience of local seed system in Somalia.

Table 28.Recommended emergency seed support based on livelihood zones

Crop	Seeding rate -Mono cropping, Kg/ha	Seeding rate- Inter cropping, crop (Kg)/ha	Available own saved seed in (%) (Kg)/ha	Amount suggested for seed aid support in (Kg) /hectare
A. Riverine Livelihood zone				
Maize	20	Maize (10 kg) and Cowpea or Mung bean (6 kg)	Maize 34.5 % (7kg) Cowpea 33.4% (4 kg)	Monocropping- Maize 13kg
				Intercropping- Maize 3 kg and cowpea or mung bean 2 Kg
Cowpea OR Mung bean	12	See above in case of intercropping	Cowpea 33.4% (4 kg)	Monocropping – Cowpea 8
B. Rain-fed Livelihood zone				
Sorghum	20	Sorghum (10 kg) with Cowpea or Mung bean (9 kg)	Sorghum 37.8 % (8 kg) Cowpea 33.4% (4 kg)	Monocropping- Sorghum 12 kg
				Intercropping- Sorghum 2 kg and cowpea or mung bean 5 kg
Maize	25	Maize (13 kg) with Cowpea or Mung bean (9 kg)	Maize 34.5 % (7kg) Cowpea 33.4% (4 kg)	Monocropping- Maize 18 kg Intercropping – Maize 6 kg and cowpea or mung bean 5 kg
Cowpea OR Mung bean	15	See above in case of intercropping	Cowpea 33.4% (4 kg)	Monocropping – Cowpea 11 kg

Vegetable production

Vegetables are produced on both sides of the river Shabelle and Juba in Somalia. Due to the availability of river water, these regions are the most suitable regions for vegetable production in Somalia. Most of the vegetables produced in the Shabelle and Juba region depend on irrigation from the river, moisture from flood recession, and a very limited number of farmers produce vegetables in rainfed agriculture. The major vegetable crops such as Onion, Carrot, lettuce,

Cucumber, and Pepper are produced under irrigation. Tomato production is reported using irrigation, flood recession, and in some cases under rainfed conditions. Similarly, watermelon is produced using flood recession and rain-fed conditions as the plant will grow with available moisture. (FEWS NET vegetable study in middle and lower Shabelle, 2014)

The term or concept of home gardens is used in a similar way as household gardens, kitchen gardens, or homestead gardens. Home garden interventions combine hands-on training in vegetable gardening and the provision of quality vegetable seed (sometimes combined with fruit trees, poultry, or fish) with nutrition education to simultaneously increase the year-round supply of and demand for nutrient-rich food within the household. Such interventions usually focus on women as they are most likely in charge of household food preparation and family health. The intervention is thought to be particularly suitable for low-income households with limited access to markets for nutrient-rich food (World Vegetable Center, 2016)

Based on the interview of individual farmer's, during the current assessment on the size of land used for vegetable production using home gardens revealed the smallest and largest size of land used per person which ranges from 0.02 hectares in Jowhar to 0.12 hectares in Bardhere. However, most study participants used between 0.05 hectares and 0.12 hectares of land. The overall average (combined average) of land size in hectares used per person to produce vegetables was reported to be 0.07 hectares. The review of literature on the average size of land used for vegetable production in three East African countries shows the mean area planted for vegetables for the three East Africa Countries was 0.19 ha., where the highest vegetable planted area is In Tanzania (0.3901 ha) and the lowest reported in Kenya (0.1542 ha). (L. Depenbusch WVC,2021)

Table 29: Vegetable seed recommendation

Types of vegetables	Small plot (60 M2) *		Large plot (100 M2) *	
	Transplanted	Direct seeding	Transplanted	Direct seeding
Tomato	1.05	7.2	1.75	12
Onion	18	36	30	60
Pepper	2.7	13.2	4.5	22
Carrot	0	27		45
Lettuce	3	10.2	5	17
Cucumber	0	16.2		27
Cabbage**	1.8	0	3	0
Watermelon	0	15		25
Total	26.55	124.8	44.25	208

*Recommended Seeding rate for vegetable seed is based on FAO Guideline for seeds in Emergency.

** Cabbage is mostly cultivated in the Northern Somalia regions.

Suggestion and its assumption used for homestead vegetable production

Option 1: Small plot owning HH: Each HH will allocate 60 m^2 per vegetable type and Watermelon will be planted in a 100 m^2 area. Therefore, Each HH in total will plant a maximum of 520 m^2 per production season covering 7 vegetables and watermelon.

Option 2: Bigger plot owning HH: Each HH will allocate 100 m^2 per vegetable type and in total 7 vegetable types covering 700 m^2 area. The area for homestead vegetable production is based on the result of the current experience on the size of the plots used by farmers in the target area.

Production season:

Both riverine and rainfed farmers could engage in vegetable production two times a year (Gu and Deyr season). While the riverine farmers have access to river water, the rainfed-based farmers will either use Boreholes or shallow wells to support vegetable production. Thus, during the targeting process, the rain fed farmers have to be assessed for the availability of supplementary irrigation from the above sources. If water is not available for rain fed farmers, it will limit the production of vegetables during the short rainy season (Deyr season).

Training on vegetable production and good nutrition practice will assist in further enhancing the skill, and awareness of the target farmers and it will contribute to the effectiveness of the interventions.

Box 6. Setting a seed package needs to base on an iterative learning process

The failure of the public sector to lead agricultural research programs in Somalia has created challenges and difficulty in generating continuously needed innovations from the practices. Parallelly Somalia is prone to multiple hazards such as drought, locust, conflict, etc that needs frequent responses by the different stakeholders. Each disaster situation creates unique impacts or different damages on the vulnerable groups, as a result, the required responses need to be addressed uniquely as context demands. One of the practices used by the target farmers for compensating for the losses incurred in seed after planting is gap filling.

A Gap filling is a practice where target farmers or Agro pastoralists re-sow on some portion of the plot to compensate for losses or damages incurred due to moisture shortage or other factors after planting. *A review of the Cash + agricultural input distribution post monitoring for Gu 2021 season assessment report has shown that 35%, 26%, 42%, 40%, and 37% of the farmers interviewed indicated that they actually did gap-filling for cowpea, sorghum, somtux maize, mung beans, and assorted vegetables respectively. Most of the farmers did gap filling because of the poor germination rates. But also, there are other factors such as poor rains after sowing, seed damages by soil borne diseases and insects and birds feeding on planted seeds. (Personal communication with Hussein Hajji)*

Thus, a gap filing practice used by the target beneficiary farmers in Somalia as risk mitigation, where the target beneficiary uses a significant amount of seed for the gap filling purpose. Thus, during the planning process, due considerations have to be made for gap filling seed as part of the emergency seed packages, factoring or anticipating the potential hazards emanating from climatic and non-climatic factors. Thus, during the implementation phase understanding the effectiveness of the practice such as gap filling and others under the different contexts or livelihood zones and assess their influence in emergency seed support practice ***needs to be seen as part of the iterative learning process***, where learnings from practices needs to regularly contribute or shape the design of the subsequent emergency agricultural seed

4.4. Seed supply and demand

Local markets are one the important sources of seed for farmers. In the 10 districts assessed, local markets ranked first and second most important seed source for Maize, Sorghum, Cowpea and Sesame crops. In addition, farmers reported local market as second most important seed sources for the upcoming Gu 2023 crop production season, for most of the major crops. In some of the crops such as Sorghum, local market has been identified as the primary seed sources, where farmers meet their seed demands.

Box 7. The importance of local market as seed (planting material) source for farmers.

The importance of local market for seed in Somalia has been documented earlier by Catherine Longley in 2001. In her study, she found that the seed markets are very well developed in Southern Somalia than other parts of Somalia. There is a network of small seed traders, mostly women, who are specialized in marketing seed in addition to grain. These female traders buy seed at harvest time from farmers in the surrounding villages with a premium price for good quality seed. They store the seed in drums, keeping apart the different types of local landrace. The differences in the land landraces will be sorted mainly based on color. The priority seeds sold in the market by the women traders include sorghum, maize, groundnut and cowpea. The demand for seed varies from season to season depending on the seasonal performance. In poor season, the demand for seed is higher than in good season, whereas in good season, where relatively available seed in the market and at the event when there is low demand for seed, in such cases, the seed is simply sold as grain at a slightly lower price.

(Catherine L. 2001)

Furthermore, local market channels have been important for giving Somalia farmers access to new varieties. New varieties/hybrids of vegetable seeds introduced from neighboring countries are sold in this market. In addition, farmers use local markets to sell grain of different kinds. The local markets are also source for other agricultural tools such as local or traditional storage facilities, farm tools both modern and local/traditionally made.

The local market trade activities in small towns and villages vary from daily and weekly trades to more long term and permanent trade.

Profile of seed/grain traders

In this assessment, an interview was administered with 10 seed/grain traders, operating in 10 separate markets, which are spread across 7 districts in Somalia. The assessment team

documented two traders' view in the districts of Afgoye, Baidoa and Jowhar. In other districts- Bardhere, Belet Weyn, Hargeisa, and Kismayu, one trader per district was interviewed.

The assessment showed that majority of the seed/grain traders have more than 10 years of experience in marketing seed/grain in markets.

In terms of their commitments to trading as a business, most participants are full time traders and have seed/ grain storage facility either owned or rented to store the seed. The majority of the traders has mentioned that they don't own their own vehicle. They use various means of public transport facility to transport their seed/grain. Only two of the traders based in Jowhar own a Pickup vehicle and a truck for transporting their seed/grain.

Major crops traders' stock at local market and their respective buyer's

Most of the seed traders mentioned that they stock crop seeds of Maize, Sorghum, Cowpea, Sesame and Mung bean seeds. Different varieties/types of each crop seed were stored and sold at the local markets.

Majority of seed buyers from the local market are farmers. There are other traders who buy seed/grain from the local market and sale on other market.

Seed sources for seed/grain traders

Local market traders in Somalia acquire seeds from different sources within the country. The traders mentioned four major sources of seed for their stock. These include: 1) direct purchase from farmers, 2) agro dealers, 3) big traders and 4) seed companies.

Table 30*: Distinction between Agro dealer shops and Local seed trader in the market*

	Features	Agro dealer	Local seed trader
1	Types of agricultural inputs stocked or traded	- Vegetable seed, food crops seed, farm tools, fertilizer, pesticide, hermetic bag, etc.	- Food crops (cereals, pulses and other crop seed)
2	Trading facility - shops	- Operate at permanent shops	- Temporary shelter at the open marketplace
3	Seed trading periods	- Trading done or occurs during weekdays when most of the time as shops are open.	- Trading only happens during the market day.
4	Operational areas or location	- Urban and peri-urban areas mostly	- Rural villages but also available in peri urban areas.
5	Sources of seed supply	- Vegetable seeds are accessed from importers, wholesalers. - Seed from farmers, seed producing companies	- Food crop seeds are procured from farmers, traders, and private seed producers
6	Seed supply share average during the 2022 Gu and Dyer seasons.	- Agro dealer shops accounted to meet less than 20% of food crops seeds demands. - 100% of vegetable seed	- Local market accounted to meet 27.8 % of maize, 34.7% of sorghum, 31.9% of cowpea, and 33.5 % of Sesame seed demands.
7	Seed quality support during storage and sales	- Availability of Storage facilities at some of the Agro dealer's shops and usage of recommended storage facilities assists in maintaining the seed viability.	- Seeds displayed at the local market expose them to higher temperatures and unwanted impurities, which affects seed quality.
8	Seed price	- The price of food crop seeds is relatively higher compared to local markets.	- Less expensive as compared to Agro dealer shops for the same crops.
9	Potential for differentiating seed from grain	- Relatively better as most of the vegetable seeds are packed in small containers having clear labeling. - seeds received from seed companies are also packed with clear labels	- difficult to differentiate seed from grain. However, farmers have some knowledge (practice) in differentiating seed from grain. - no packaging, labeling that separate seed from grain

Traders' observation how farmers distinguish seed from grain

To further determine whether there is a real distinction between seed and grain at local market level and the criteria usually used by farmers to distinguish seed from grain. Traders were asked to focus on their customers and describe signals showing a buyer/ farmer, how farmer seeking seed. The signals seem to be well known and occur across markets at sowing time. Important to emphasize is that farmers do not buy just 'anything' available in the market, instead they request for seed in specific way and the farmers request has been understood by local seed traders.

Thus, the 10 seed traders were asked, how they notice farmers are differentiating seed from grain and what are the criteria farmers used while distinguishing seed from grain at market place. The following as Table 30 trader's observation documented.

Table 31. Trader's observation how Farmers differentiating seed from grain (N=10)

Crop	No. of traders	farmers who Ask specifically for seed	farmers who Ask specifically for grain	farmers who ask if the grains can also be planted	farmers who ask the origin of the grains	farmers who buy seeds in small quantities	farmers who have no specific criteria used	other
Maize	10	9		3	2	2	0	0
Sorghum	10	8	2	3		2	0	0
Cowpea	10	9		3		3	0	0
Sesame	7	7		2	1	5	0	0

The majority of the local seed traders observed that Farmers ask specifically for seed than just buying grain instead. In addition, other criterion used by farmers as observed by traders include that, farmers asks if the grains can also be used as planting material. In some crops such as Sesame that farmers buy seeds in small quantities and try them instead of buying large quantities where they are not sure of either it is seed or grain.

4.4.1. Crops and vegetable seed supply

The majority of farmers acquire their major cereal and legume crop seed requirements from local market and an Agro dealer shop. Thus, in order to assess or forecast weather seed is going to be available for the upcoming season, the supply trend was assessed. Table 31 shows details of crop seeds stocked, sold in Gu and Deyr of 2022 and estimated supply for Gu 2023 season.

A. Assessed seed supply trend at different districts by seed traders

Table 32. Seed sale in two seasons (2022) and estimated seed sale for Gu, 2023 season

Districts	# of Traders	Crop (variety)	Seed Sold in MT in Gu, 2022	Seed sold in Deyr, 2022 in MT	Seed Gu, 2023 (estimate) in MT
Afgoye	2	Maize (white& Red cobod)	2.9	2.95	4.75
		Sorghum(white)	2.8	3.8	2.8
		Cowpea(Abgaaley)	1.99	2.53	2.28
Baidoa	2	Maize (white)	1.6	0.75	2.56
		Sorghum(white)	1.95	1.72	4.07
		Cowpeas (Degelo)	1.3	1.1	3.6
		Sesame (white large)	0.7	0.55	2.1
Bardhere	1	Maize(white)	1.15	0.89	2.9
		Sorghum(grey)	0.75	0.63	2.5
		Cowpea(saalk)	0.52	0.76	1.6
Belet Weyn	1	Maize (white)	2.2	1.8	5.5
		Sorghum (red)	1.58	1.5	4.3
		cowpea(red)	1.36	1	2.8
		sesame(white)	1.25	1.12	3.8
Hargeisa	1	Maize (caday and casay)	6	5	22.78
Jowhar	2	Maize(white)	45.9	36.7	47.8
		Sorghum(red)	3.95	3.5	7
		Cowpeas(red)	26.05	18.4	27.5
		Sesame (small white)	30.65	28	31.9
Kismayu	1	Maize	1.6	1.1	2.4
		Sorghum	0.15	0.15	1.5
		Cowpea	1.2	0.7	0.45
		Sesame	0.12	0.7	0.2

B. Local seed trader's evaluation (self-evaluation) of supply trend for future –Gu 2023 season

Table 32 shows local trader's evaluation of seed supply trend for major crops grown in Somalia. The estimate based on 10 observations for the current year shows that the seed availability is normal for both maize (8 out 10) and sorghum (8 out of 10). Similar trend is also reported for the rest of the year.

Table 33. Local trader's evaluation of supply trend for major crops

Crop	Estimation of the availability up to now over this year			Estimation of the availability over the rest of this year		
	Normal	Less than usual normal	more than usual / normal	normal	Less than usual normal	more than usual / normal
Maize	8	1	1	8	2	0
Sorghum	8	2		8	2	0
Cowpea	4	3	1	6	2	0
Sesame	4	2	1	4	3	0

C. Supply summary of the quantity of seed sold in Gu 2022 and Estimated seed quantity for Gu 2023 by seed traders. This is summary for table 33.

Table 34. Seed sold in Gu 2022 and estimated seed for sale for Gu 2023

Name of Crop	Quantity of seed sold in Gu 2022 and estimated for Gu 2023 (10 seed traders)		Difference	%difference
	Gu 2022 sold in MT	Estimated quantity for Gu 2023 in MT		
Maize	61.35	88.69	27.34	44.4
Sorghum	11.18	22.17	10.99	98.3
Cowpeas	32.31	38.23	5.92	18.3
Sesame	31.72	36.55	4.83	15.2

D. Supply trend at agro dealer level

Table 35. Supply estimate for Gu 2023 season at Agro dealer shops (N=8 Agro dealers)				
Crop	Crops and Vegetables sold in Gu 2022 season in MT.	Crops and vegetables are estimated to be available for Gu 2023 season in MT.	Quantity supply Difference across Gu 2022 and Gu 2023 seasons	% Difference
A. Major Crops				
Maize	33.8	39.95	6.15	18.2
Sorghum	16.79	22.25	5.46	32.5
Cowpea	17	22	5	29.4
Sesame	37.82	63.15	25.33	67.0
B. Vegetables				
Tomato	1.35	3.6	2.25	165.7
Onion	1.6	4.5	2.9	180.5
Spinach	0.48	0.83	0.35	72.9

The seed supply trend as assessed by the seed trader's own assessment shows overall for each major crop, the seed supply indicates generally being normal or as usual supply trend. As indicated in the table 33, the seed volume likely to show close to double (98 %) in amount for Sorghum Crop. The remaining all other seeds supply shows positive supply trend for Gu 2023 season.

In addition, the supply trend at an Agro dealer's level again, the crop and vegetable supply trend show a positive for major crops and vegetables (Table 33). Particularly for vegetable seed the estimated supply by Agro dealers shows more than normal supply as compared to Gu 2022 season.

4.4.2. Crops and vegetable seed price

The price trends for major crops and vegetables have been assessed to understand if any sharp spike in price for certain crops and vegetables at sowing time. The price assessment was made at local seed/grain traders and an Agro dealer shop level. In general, as documented in the below tables (Tables 35) and also as discussed in the Table 27 earlier part of this report, shows there are marked price shifts upwards.

Price trend at agro dealer shops

Price trends at an Agro dealer shop level show an increment for major crops and vegetables. However, the average price trend for vegetables shows a normal price or modest incremental trend. The price increment for the Sorghum crop at an Agro dealer shop level shows a higher price estimate as compared to the year 2022 Gu season.

Table 36. Price trend for crops and Vegetables across two Gu seasons-2022/23

Crop	Seed Price per season in USD/Kg		% of differences
	Average price/Kg for 2022 Gu season	Average price/kg for 2023 Gu season Estimate	% difference
A. Crops			
Maize seed	1.28	1.49	17.2
Sorghum seed	0.97	1.44	49.0
Cowpea seed	1.56	1.73	10.4
Sesame seed	2.27	2.86	25.8
B. Vegetables			
Onion	64.23	67.48	5.1
Spinach	23.33	23.38	0.2
Tomato	35.10	36.25	3.3

4.5. Chronic seed security findings

4.5.1. Improved agricultural practices

Improved agricultural practices such as crop diversification through intercropping and crop rotation are not yet widely adopted by farmers. Past Seed Security Sector Assessment (SSSA) conducted in 2015 disclosed that 92% of the farming households cultivated a sole crop (either maize or sorghum) at any given time with only 8% practicing intercropping either of the crops with pulses. Fifteen percent of the farming community in the Puntland State, adopted intercropping while the difference (85%) practiced sole crop cultivation. The highest (97%) proportion of farmers practicing mono cropping was registered in the Somaliland State.

The emergency agricultural/livelihood support project by FAO started to promote crop diversification even during its response to drought effects. This has happened through supporting farmers to access emergency livelihood package. Either of the primary staple cereal crops (sorghum or maize) along with either of two pulses (cowpea or mung bean) have been constituting the package assisting farmers in the diversification of their crops.

Access to new improved crop varieties was observed to be very limited in the target areas assessed. The SSG/FMOAI conducted varietal trial and latter distributed improved maize, sorghum and cowpea varieties and this is believed to be the recently observed improved variety distribution to target farmers in the area.

The use of soil amendments both inorganic and organic (manure) was assessed as part of examining the improved agricultural input in the target areas. This assessment has been used to complement the analysis of the factors related to improved agricultural input. Potential yield can only be realized when all factors contributing to production are optimal, therefore, the use of organic and inorganic fertilizers is critical. Studies conducted by the seed system assessment in 2015 shows that only 29% of the farmers apply inorganic fertilizer and among the inorganic fertilizer's urea is the most commonly used fertilizer in Somalia.

In 2020, the Federal Ministry of Agriculture and Irrigation announced a ban on imports of all types of fertilizers under the pretext that fertilizers are used as explosives by terrorist organizations. The ban on fertilizers have resulted in a price hike, which affected the availability of fertilizer at market, including at an Agro dealer shop level.

4.5.2. Fertilizer use practices

The FGD participants in the targeted 10 districts have revealed that, out of the 10 districts farmers use inorganic fertilizer practices observed at 8 of the districts. The highest number of fertilizer use was observed at Afgoye district (100 % of the respondents) followed by Borama where 81 % of the respondents reported the use of fertilizer at least once in one of the crops. In the contrary at the districts of Burao and Hargeisa no farmers have been reported using fertilizer at least on

one of the crops. Overall, the use of inorganic fertilizer revealed to be low, out of the FGD participants only 40.4% reported to use fertilizer at least in one crop during the 2022 year.

Crop emphases and quantity or application rate for inorganic fertilizer use

Fertilizer rate studies conducted by SATG in 2014/15 clearly show that the use of DAP (3 bags of 50 kg/ha) at planting time followed by urea (2bags of 50kg/ha) in a split application, coupled with the application of good agriculture practices increases maize yield significantly by two to three-fold. Experience from banana commercial farmers also indicates that fertilizer use plays an important role in banana production. Unlike banana growers, the majority of the small-scale vegetable farmers use organic fertilizers. Manure, particularly goat manure, is the most common organic fertilizer used by vegetable growers (SATG 2015 Fertilizer assessment study).

In terms of the crop focus for inorganic fertilizer application, Maize and Sesame were the two top crops priorities for Urea application by farmers. As in the table 36 below, the amount of fertilizer applied per hectare of land varies per crop.

Table 37. Amount of fertilizer used, and sources accessed in Gu and Dyer 2022 season

A. Crop	Amount of fertilizer applied in Kg per hectare	Sources				
		Own	Social	Local market	Agro dealer	NGO/FAO support
Maize	80-150			54	31	15
Sesame	60-80			82	18	
Sorghum	80-100			71.9	25	3.1

Based on the above fertilizer application rate, it is difficult to mention the efficiency of the fertilizer use by farmers.

Sources of fertilizer - Past two seasons

As per the FGD participant's results, The Local market, Agro dealer direct purchase and Agro dealer purchase through the support of NGO are identified as main sources for the inorganic fertilizer.

Recommended fertilizer Requirement per house hold

Based on studies conducted by SATG, the general recommendation of fertilizer (Kg/ha) use in maize, sorghum and sesame are as follow:

Table 38. Recommended fertilizer application for major crops

Crop	Broadcast method		Micro-dosing method	
	DAP (kg/ha)	Urea (kg/ha)	DAT (kg/ha)	Urea (kg/ha)
Maize	150	100	100	50
Sorghum	100	100	50	50
Sesame	50	50	50	50

The micro-dosing method requires less fertilizer as the fertilizer is applied directly in the hill along with the seed. It is important however to keep a distance between the seed and fertilizer placements.

4.5.3. Improved storage use practices

The use of storage input – both improved and traditional – was also examined during the SSSA, as a complement to the analysis of improved storage input practices used by farmers across the different districts in Somalia.

Post production studies conducted by SATG and FAO in 2011 suggest an average post-harvest and storage loss of 20 to 30 percent. The loss is in the order of 50,000–80,000 tons of cereals a year, valued at USD 15–20 million. The grain losses are associated with the use of traditional underground storage systems. The traditional storage systems are highly prone to moisture contamination, particularly during the rainy season, as result enhance bacteria and fungi contamination. Human health hazards including stunted growth, delayed development, liver damage, and liver cancer have even more serious effects than the direct economic losses related with un appropriate storage practices. The situation is exacerbated by the lack of agriculture policy and regulations or of food quality control measures.

The same assessment report by the above two organizations conducted in the Bay Region reveals that grain losses associated with the traditional storage systems (underground pits) are significantly higher than those associated with post-harvest techniques (harvesting, transportation, and drying), at an estimate of 40% and 20%, respectively. Most farmers are resorting to storing their products in a sealed drums and air tied plastic containers to protect against storage insects (weevils).

Improved storage bags mainly Hematic bags is becoming very popular in Somalia. In most cases it is widely supported by the INGO including FAO. In 2021 FAO has distributed 877,950 hematic bags to its beneficiaries in Awdal, Bay, Bakool, Gedo, Hiiraan, Lower Juba, Lower Shabelle and Middle Shabelle (Post distribution assessment, Gu 2021). Similarly, ICRC in partnership with SATG has distributed 1080 hematic bags during the Gu season of 2022 to their seed producing cooperatives in the Lower Shabelle, Middle Shabelle and Hiiraan (SATG, 2022). Generally, the hematic bags are sourced from companies based in Nairobi, Kenya. Some local Agro-dealers in the local markets are selling these products to the farmers.

Table 39. Common pests and disease affecting crops during storage period in Somalia			
Crop	Common pests	Common disease	Magnitude of lose
Maize	Maize weevil (*Sitophilus zeamais M.*), Angoumois grain moth (*Sitotroga cerealella*), and Rodents (Rats)	Aspergillus flavus and Fusarium Moniliform	20 to 30 %
Sorghum	Maize weevil (*Sitophilus zeamais*) and Rodents (Rats)	Aspergillus flavus and Fusarium Moniliform	20 to 30%
Cowpea	Seed beetle (*Callosobruchus maculatus*) and Rodents (Rats)		30 to 40%
Sesame	Cautella		5 to 10%

Storage input use practices: improved and traditional storage practices

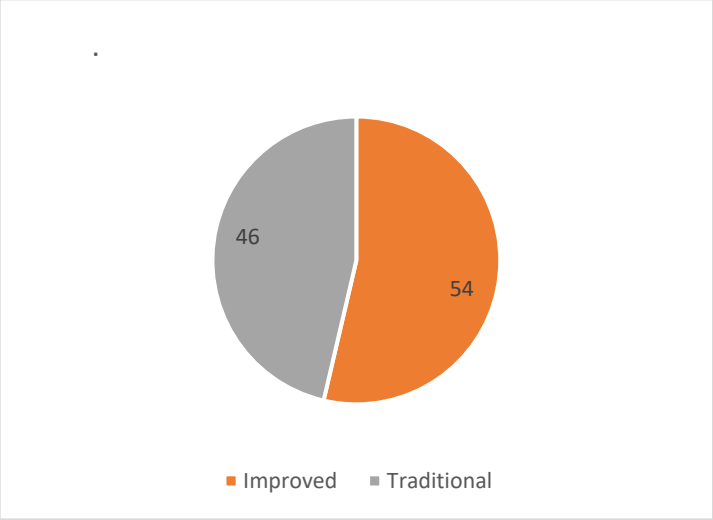


Figure 9 Proportion of Improved and Traditional Storage bag Use by FGD participants

Improved storage bag use based on FGD participants has shown that about 54 % of the participants used at least one pieces of improved storage bag. Highest number use of improved storage bag has been observed at districts of Hargeisa, Iskushuban and Burco districts. The lowest use has been observed at Jowhar and Borama districts.

Priority crops for improved storage bag use

The FGD participants reported Sesame and Cow pea crops as the top priority crops preferred to be stored using the improved storage bags.

Sources for improved storage bags

Local market and an Agro dealer shop has been suggested as the major sources for the improved storage bags

Projected improved storage bags requirement per household

The average yield of major crops shows that:

1. The yield harvest for maize ranges between 20 to 25 quintals/ha in irrigated agriculture and between 10 to 15 quintals/ha in rainfed agriculture
2. The yield harvest for sorghum is between 5 to 8 quintals/ha in rainfed agriculture and no sorghum is grown under irrigation
3. The yield harvest for Mung bean is between 5 quintals/ha under irrigation and 3 quintals/ha under rainfed agriculture.
4. The average yield for cowpea is 4.5 and 3.5 quintals/ha under irrigation and rainfed agriculture respectively.

The key assumption on the average volume of storage expected:

1. Once the crop is harvested, promising and healthy produce are identified and stored as seed for subsequent planting season using different storage techniques. Roughly estimating the isolated seed volume from the average harvest could be 20-30 % of the harvest. This will include seed for own use and sales of seed for others if needed.

2. The remaining harvest which is labeled as grain is used for household consumption and sale to generate income. Household consumption and sales go up to 40% of the total smallholder farmer's harvest.

3. It is expected that 30-40 % of the average harvest is expected to be stored in improved storage bags for longer periods. The emergency improved storage bag could cover roughly 50 % of the available grain while introducing the improved technology and encouraging the target farmers to cover the remaining 50% of the need through technology demonstration and creating demand which could contribute to the sustainability of the improved storage bag supply and use in the area.

Table 40. Estimating improved storage bag need based on livelihoods Zone

Crop	The average yield in quintal /ha per household in Irrigated Agriculture	The average yield in quintal /ha per household in Rainfed Agriculture
Maize	22.5	12.5
Sorghum	N/a	6.5
Cowpea	4.5	3.5
Mung bean	5	3
Average cereals and Pulses yield cumulative	32	25.5

40% of the average harvest to be stored under improved storage bags by the FAO and beneficiary contribution.	(12.8 quintals) =1280 kg 640 kgs for FAO	(10.2 quintals) =1020 kg 510 kgs for FAO
# of bags to be supported per HH by the FAO (20% of the share)	13 Pieces*	11 Pieces

*1 piece of bag = 50 kg

4.6. Seed aid impact on local seed security

Emergency seed aid is the most common seed intervention in Somalia. The seed aid generally targets farmers that lost their crop due to drought and flooding. The emergency seed support has created access to different types of seed for selected crops using vouchers and cash support.

In addition to emergency seed support some of the donor organization has supported developmental type of seed interventions that contributed for improving the availability of quality seed throughout-growers management scheme while engaging the regulatory authorities to inspect the crop while still in the field and test the harvested seed for germination and purity. This is a sustainable system and will likely lead to the emergency of formal seed system.

In the below section, the emergency seed intervention implemented by FAO Somalia and developmental seed interventions are highlighted.

4.6.1. Emergency seed intervention

Seed aid is very common in Southern Somalia and many INGOs are engaged towards reviving Somalia agriculture by supplying seeds and fertilizer to farmers in both riverine and rainfed areas. The seed intervention is generally based on using locally available seeds from traders and agro dealers using the voucher system. Timely seed distribution is a major challenge in Somalia given the fact of the poor infrastructure and lack of security in most of the agriculture areas. Seed and input distribution plan set out by FAO during the Deyr 2021 season followed distribution models with the focus on maize, sorghum, cowpeas, mung beans and assorted vegetables. Legume crops are promoted due to nutritional value and quick income through crop sales. Sorghum, on the other hand, is promoted for its tolerance for soil low nutrients and adaptation to local agro-ecological zone (drought tolerant). In contrast however, Maize requires more water and is mainly promoted in the irrigated agriculture.

4.6.2. Developmental seed related projects

The following projects are directly related with the seed sector development in Somalia. Though all of the projects have been completed but still their impact or contribution will support the future seed related intervention in Somalia.

1. ***Somaseed Project (2016 -2019)***: The Somaseed project is the most important seed related intervention carried out in Somalia during the past five years. The objective of the Somaseed project was to preserve the existing gene pool of crops in Somalia by collecting and purifying the local landraces adapted to local environment. The uncontrolled introduction of exotic varieties eroded the genetic purity of the local germplasm, which created vulnerability to extinction and genetic erosion. To reverse the trend, Somaseed project enhanced the availability of quality, locally adapted germplasm to farmers in Somalia. The project built the capacity of the Ministry of Agriculture in collection, purification, testing and bulking of the germplasm for Maize, Sorghum, Cowpea and Rice crops. The purified landraces were planted in isolation in four multiplication centres: Afgoye in Lower Shabelle, Jowhar in middle Shabelle, Dolow in Gedo, and Aburein in Somaliland. The Somaseed project also trained about seven agronomists on research methodology and germplasm collection methods at ICRISAT. In addition, the project established seed laboratories at Mogadishu and Hargeisa. Also trained about 945 seed industry stakeholders, 600 lead farmers and 290 seed growers on seed purification and good agricultural practices. The Somaseed project activities were supposed to be a precursor for future breeding program and formal seed system development in Somalia.
2. ***Promoting Inclusive Markets (PIMS project 2015 to 2019)***: The PIMS project was funded by DFID and DANIDA with the aim of stimulating growth in the agricultural sector by supporting initiatives that create jobs and reduce poverty. The project focused on Dairy, Fishery and

Sesame sectors. PIMS raised sesame **productivity from as low as 0.2 ton per hectare to an average of 0.45 ton per hectare** in collaboration with commercial companies such as Al Mizan, Al Asharaf, Danwadag, Al Mumin Group and Horn Afrique. This was achieved by introducing Good Agricultural Practice (GAP) in the form of proper seed selection, furrow farming, fertilizer application, reducing post-harvest losses, improving market linkages and value addition. In the end, the interventions resulted in expanding the sesame farmland with additional 4,856 hectares and creating 8,398 full jobs, where the collaborating companies hired private extension workers and managed large pool of contract farmers.

3. ***Growth, Enterprise, Employment and Livelihoods (GEEL Project: 2016 to 2020)***: The GEEL project was a 74 million USAID funded project aimed at promoting inclusive economic growth throughout Somalia. The project recognized the high potential for agriculture, fishery, dairy, renewed energy, and prioritized sesame and banana value chains in the agriculture sector.

   During this period, the GEEL project introduced high yielding sesame varieties from Yemen and Ethiopia and conducted multi-location and multi-year trial of six local and exotic varieties. The best performing varieties were later identified and adopted by farmers. The introduced Sesame varieties include Humeira from Ethiopia and Dunyar that is a locally adopted variety. Then seed multiplication was carried out by contract farmers for wider multiplication and dissemination in the country. Based on the observed performance or quality, the commercial growers opted or shown preference to grow Humeira variety which is high yielding under optimum conditions while the smallholders chose to grow Dunyar which has better adaptation to local environment. The same big commercial companies that benefitted from PIMS also worked with GEEL project as well. The selected companies as the beneficiaries of the project were assisted in developing business plans and a grant was given to those that had good business plans. The grant partially covered sesame processing plants expenses which are now operationally in Mogadishu and in Kismayo cities.

4.6.3. Suggested programmatic interventions

In the recommendation part of this report, potential programmatic interventions appropriate for short-term (Emergency seed support) and other interventions that go beyond short-term focus have been forwarded. In the below section brief highlights of the programmatic interventions made.

A. Short-term - emergency seed support

In the recommendation part, we emphasized that the appropriate emergency interventions should follow the need and requirement of the target farmers and also it should consider the available seed on the farmers' side, where the emergency seed support need to contribute to meeting the deficits. As an approach, we forwarded two interlinked approaches, and targeting areas for the interventions should base on the agro-ecological zones.

B. Mid- and long-term interventions

1. **Crop improvement**: Functioning crop improvement program with experienced and competent plant breeders that are fully engaged in the development and maintenance of basis/foundation seed production of various crops is a pre-requisite for the seed industry to become fully operational and for the seed growers to produce and multiply the certified seed of new improved varieties. There should be a constant supply of new improved varieties of seed every year to add to the old stock of varieties available to the farmers. Developing and releasing a new variety is a lengthy process that generally starts with an assessment of large accessions from early-generation material followed by replicated trials in preliminary and advanced trials. The end result is the release of a few promising varieties. The program is highly technical and should be administered by a competent institution such as either the private sector or by the Federal and State Ministries of Agriculture and Irrigation. A brief summary of crop improvement activities is described below.

Table 41*:* A Simplified Version of a Crop Improvement Program

Evaluation	Activity	Tentative duration
Screening and evaluation of early generation material	Assessment of New introductions, F2, F3 and F4 populations.	3-4 years
Preliminary trial	Testing the best performing lines from F4 population into replicated preliminary trials	1 year
Advance trial	Testing the best preforming lines from preliminary trial into replicated trial	1 year
Regional trial	Evaluation of the best performing varieties into a replicated regional trial. The number of tests depends on approved protocols by the variety registration committee	1-2 years
Variety recommendation and maintenance of breeders' seed followed by small scale, medium scale and large-scale release of the variety		

2. Seed multiplication

Once the formal research and development system develops a genetically improved variety for commercial production, the following task is to multiply and produce quality seeds for end users. Within the formal seed system, multiplication of seeds is commonly a multi-generation process undertaken over three to five years period. Generally, it starts with breeder seed followed by foundation and certified seed.

Seed multiplication activities can be organized in a number of ways that include: a) vertically integrated seed company farms; b) contract seed growers, and c) smallholder seed bulking farms.

The choice will largely depend on the resulting cost implications. Seed company farms that carry out all stages of seed multiplication at a central large-scale facility can achieve significant scale and size economies. However, the feasibility of centralized seed multiplication depends on the cost of serving the market from one location. Using contract growers to produce bulk amounts of certified seed from foundation seed is less management-intensive than running a centralized seed farm. It also permits better tailoring of the quantities produced to meet seed demand and allows firms to shift some of the production and marketing risk to contract growers. Contract seed multiplication does involve additional costs, e.g., regular supervision and seed inspection visits must be made over a much wider area, and growers must be paid premiums for seed production.

3. **Seed processing and packaging:** After seed is multiplied it goes through several processing steps. Within the formal seed system, seed processing is a mechanized activity using specialized equipment, facilities, and products. The seed processing plant is usually one of the largest capital investments in a formal seed system. Currently, there are private seed companies are currently involved in seed processing and packaging and also it would be good to support cooperative seed producers in this regard.

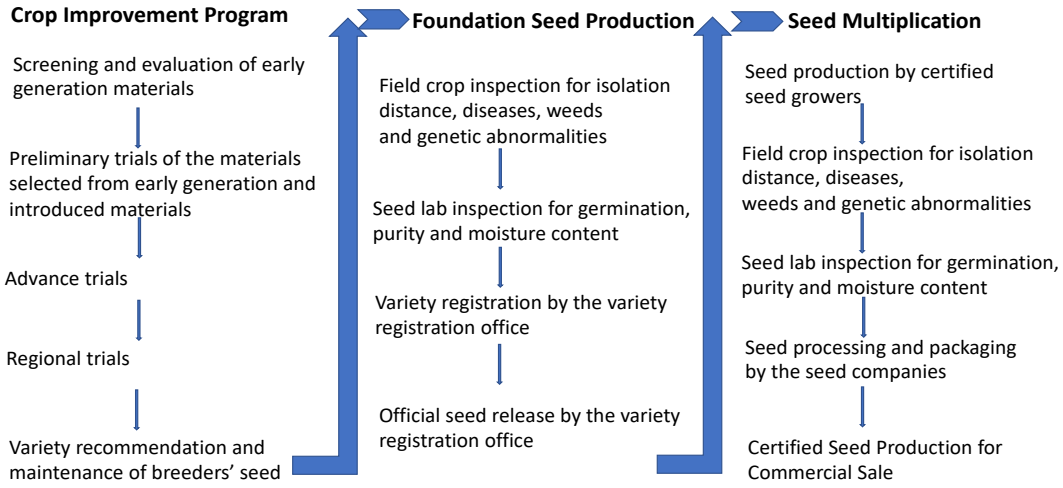


Diagram 2: A simplified version of the certified seed production process

With the exception of Somaliland, the agro-ecological condition is very similar in most parts of Somalia, which means a maize variety developed in the South West can easily adapt to most regions of Somalia.

At the initial stage, it is important to limit the number of crops to a minimum, for example, maize and sorghum in South West State, where maize crop improvement will be done under irrigated

areas whereas the sorghum crop improvement will be done under rainfed agriculture. It is important to develop a partnership with the best-performing University or any other private sector engaged in agriculture research work.

Table 42. Priority crops for crop improvement program in each state

State	Partner	Priority research crops
South West	South West Ministry of Agriculture and Irrigation + University	Maize, sorghum
Hirshabelle	Hirshabelle Ministry of Agriculture and Irrigation + University	Sesame, rice
Jubaland	Jubaland Ministry of Agriculture and Irrigation + University	Maize, cowpea
Puntland	Puntland Ministry of Agriculture and Irrigation + University	Date palm, horticulture crops
Galmudug	Galmudug Ministry of Agriculture and Irrigation + University	Cowpea, mung beans horticulture crops
Somaliland	Somaliland Ministry of Agriculture and Irrigation + University	Sorghum, horticulture crops

5 Conclusion and recommendations

The planting material and improved agricultural in put assessment has targeted diverse and representative districts across Somalia. Districts having different livelihood zone participated in the assessment. Discussion with several stakeholders has furnished very valuable information or evidences regarding the available planting material, particularly on the farmer's crop seed security parameters and improved storage input practices. Based on the assessment findings a conclusion has been drawn and a set of recommendation has been forwarded. Below, we put forward a set of recommendations that apply across the regions assessed. These include recommendations related to possible emergency response; but others go well beyond that, to address chronic stress concerns as well as developmental opportunities

Recommendations mainly focus on 1) Emergency seed aid; 2) Planting material and improved storage input support 3) New variety introduction or crop improvement; 4) sustainable seed production and agro-enterprise linkages for sustainability.

5.1 Conclusion

The informal seed system dominates the seed supply system in Somalia. Farmers in Somalia depend on own saved seed, social networks and seed market where most of the seed supplied are local variety/land races. Only seed for horticultural crops is purchased through formal channels and almost all vegetable seeds are imported from outside the country. The vegetable seeds are generally sold at agro-dealer shops. The formal seed sector is just about to emerge as most of the pre-requisites for a formal seed system such as crop improvement, seed out-growers, private seed companies and regulations governing the seed sector are coming to play by both the private and public sectors. In recent years, both the public and the private seed industries started to engage in crop improvement programs in collaboration with CG centers such as CIMMYT, ICRISAT and INGOs. Good practice on commercial seed production started to emerge and needs to be documented, and supported for the scaling up.

The seed security for majority of target farmer seems ***unstable*** while assessing the immediate crop production season, which is Gu 2023 crop production season. For the Gu 2023 season, Farmers are expecting to source reasonable amount of seed from seed aid, from external assistance. The Main reason for farmers to anticipate or aspire their seed needs to be meet from external source in the form of seed aid is due to effects of drought which affected significant areas.

Seed supply available at local seed markets, private seed producing companies, seed traders and an Agro dealer shops is normal or close to normal for the upcoming Gu 2023 crop production

season. However, there is price increment anticipated for majority of major crops such as maize, sorghum, cowpea and sesame. The high price increment anticipated for sorghum and maize which is 54% and 50 % higher price in Gu 2023 season as compared to Gu 2022.

The use of inorganic fertilizer is very low. Overall, the use of inorganic fertilizer revealed to be low, out of the FGD participants only 40.4% reported to use fertilizer at least in one crop during the 2022 year. The use of improved storage bags is also noted as low level where 54 % of the Focus group discussants has reported to use (at least one pieces) of improved storage bag in one of the crops during the two seasons in 2022. Mainly due to the inefficient public crop seed support system, smallholder farmers are likely to continue facing chronic seed insecurity related challenges.

5.2 Recommendations

A. Emergency seed aid

1. In some areas, for instance Southwest and Hirshabelle states, seed may be readily available, but access can be limited particularly for certain segments of the community such as poor and marginalized households, and returnees. In such scenario, input trade fairs and seed voucher system seem to be the most feasible options to increase access to crop seeds. The current seed voucher system is limited to accessing seed only from Agro-dealers. Opening the seed market to all relevant actors has the potential to strengthen the seed market resilience. However, the choice for seed voucher system or seed trade fairs depends on the local security situation.
2. In areas where access and availability of crop seeds are challenging, priority should be given to local seed collection from areas having similar agro-ecological conditions where the same crop varieties are grown and distribute to the target farmers. Apart from Somaliland and the arid zones of Puntland and Galmudug, where annual precipitation is low, most the southern states have similar agroecological conditions.
3. New varieties should not be introduced in an emergency seed aid as these varieties may lack adaptation to the local condition.

B. Planting material and improved storage input support

1. Emergency seed aid distribution should follow the need and requirements of the target farmers as well as the recommended seeding rates. This should also take in to account the farmers' own-saved seed available, as result the emergency seed aid distribution only fills the deficit from the required amount. Based on the Gu and Deyr 2022 season average available own saved seed availability at the farmer's side has been recognized, as result the required emergency seed to cover the deficit is **13** kg for maize, and 12 kg for sorghum per HH/ ha under irrigation and rainfed livelihood zones respectively under monocropping

practice. In addition, a pulse crop- cowpea of 2 kg and 5 kg for intercropping with cereals under the irrigated and Rainfed livelihood zones respectively. In the case of intercropping the amount of maize and sorghum would be half needed from the above.

2. The FAO improved storage bag distribution should support the storage needs of the preferred crops which include maize, sorghum, cowpea and sesame. The improved storage bag support should contribute to reducing meaningful amount of losses associated with in appropriate storage. The improved storage bag support should reduce losses at least by 40% of the average HH harvest per season. This could be possible by taking share or contribution among the beneficiary and FAO support. Depending on the average crop yield record for the season which varies as per the livelihood zones (Rainfed Vs irrigated areas), the average number of improved storage bags for Rainfed and irrigated area HH would be **11** and **13** pieces of bag respectively to be supported each by the FAO and other by direct beneficiary, where each piece of the bag accommodates 50kg of produce.
3. Non-governmental organizations and FAO supported projects are found to be main suppliers of improved storage bags for community. Recently, Agro dealers are becoming one of the actors in supplying improved storage bags (Hermetic bags) to farmers. To assist agro-dealers and ensure sustained supply, attention should be given to promote demand and adoption of the technology by farmers. To adopt a technology, farmers need to understand how to use the technology and have clarity on the benefit of its use. Thus, FAO and partner NGOs should promote the demand through common technology familiarization means, which include: hands-on direct training for farmers, promotion and media campaigns, technology demonstrations.

C. New crop variety introduction

1. With support from FAO and other developmental actors, the FMoAI should develop guidelines for the introduction of new improved varieties, variety testing, crop inspection, foundation seed production, seed multiplication crop production, inspection, and variety release.
2. Developmental actors should support the establishment of a public sector managed crop improvement program along in collaboration with CGIAR centers and regional programs. Variety registration and protection services must be established to enhance the breeding program and make new varieties of superior qualities available to the farmers.

D. Link seed producers with other major crop seed value chain actors

1. **S**eed production, processing and marketing at individual, private and cooperative levels should be supported and encouraged, and all the key actors need to be well linked. Seed processing activities namely mechanized cleaning/conditioning, grading, packaging, and labelling will help end users (farmers) to clearly distinguish seed from grain on the market. This will also help producers sell their products at a premium. Linking seed production to

agro-enterprises and value chain possibilities that FAO Somalia is currently supporting should help to ensure the sustainability of the crop seed supply.

References

Catherine Longley, Richard Jones, Mohamed Hussein Ahmed and Patrick Audi, 2001. Final report submitted to EC Somalia Unit. ODI/ICRISAT.

Damanio, A.B. and Rao V.A. 1980. Collecting Sorghum in Somalia. FAO/IBPGR Plant Genet. Resour. Newslett 40: 14-16.

Deyr 2021 crop yield and livelihood support impact assessment report. FAO Somalia.

FAO 2020. Impact Assessment of Desert Locust Infestation on Household Livelihoods and Food Security in Somalia.

FAO 2015/2016. Seed System Security Assessment Report. FAO Somalia.

FAO/Sida (2020). Seed system security assessment in Somalia.

FAO, 2021a. FAOSTAT Database: Production. Cited 15 March 2023. https://www.fao.org/faostat/en/#data

FAO, European Union and CIRAD. 2022. Food Systems Profile – Somalia. Catalysing the sustainable and inclusive transformation of food systems. Rome, Brussels and Montpellier, France. https://doi.org/10.4060/cc0074en

FAO. 2021. National gender profile of agriculture and rural livelihoods – Somalia. Mogadishu. doi.org/10.4060/cb6316en

FAO Emergency Division (2020). Crisis, desert locust crisis. Somalia and FAO strengthen cooperation to curb the spread of desert locust. In: FAO in Emergencies.www.fao.org/emergencies/fao-in-action/stories/stories-detail/en/c/1271751

FEWS NET Somalia (2014) Vegetable study in middle and lower Shabelle, Somalia.

FSNAU & FEWS NET. 2021a. Post Gu Technical Release, 9 September2021. www.fsnau.org/node/1890

FSNAU & FEWS NET. 2021b. Somalia Food Security Outlook, 20 December 2021. www.fsnau.org/node/1890

FSNAU & FEWS NET. 2022, Post Deyr Technical Release, 10 February 2022. www.fsnau.org/node/1890 FSNAU-FEWS%20NET-2021-Post-Deyr-Technical-Release.pdf

Friis-Hansen, E. and Kiambi, D. (1997) Re-introduction of germplasm for diversification

of the genetic base of the Somali agricultural production system. IPGRI technical project

termination report. Mimeo.

Gavin R, Hussein H, Jelinski N & P Porter. 2018. On-farm irrigated maize production in the Somali Gu season. African Journal of Agricultural Research. 13(19): 969–977.

Gu season 2021. Cash + agriculture post distribution field monitoring report. FAO Somalia.

H. Haji, 2007. Improvement and sustainable use of plant genetic resources program in Somalia. Final report prepared for ICRISAT.

Heritage Institute. 2020. Somalia's agriculture and livestock sectors: a baseline study and a human capital development strategy. Heritage Institute for Policy Studies and City University of Mogadishu. reliefweb.int/sites/reliefweb.int/files/resources/Agriculture- HCDM-REPORT.pdf

L. Depenbusch (2021). Assessing the Impact of home garden interventions in East Africa**.**

Prasada Rao K.E., Hussein Mao Haji and Mengesha M.H. 1989. Collecting Sorghum Germplasm in Somalia. FAO/IBPGR Plant Genet. Resour. Newslett. 78-79: 41.

Remington, T., Maroko, J., Walsh, S. Omanga, P. and Charles, E. (2002). Getting Off the Seeds–and–tools Treadmill with CRS Seed Vouchers and Fairs. Disasters, 26 (4): 316-328.

SATG, 2014. Post-harvest and grain storage losses. Research and innovative solutions to reduce grain losses. https://satg.org/agriculture/#grain

SATG, 2014. Phosphorus as the most important factor limiting crop production. https://satg.org/agriculture/#phosphorus

SATG, 2022. Improving food production by strengthening the regional staple seeds production sector in Somalia. SATG/ICRC Final report.

Smith D. R., Mohamed, B. A. and Housh, H.G. 1978. MUCIA/FAO/UNDP. Strengthening Agricultural Research in Somalia. Administered by Ohio State University. Agricultural Research Project 72-014.

Vargas, R. R., Alim, M. 2007. Soil survey of a Selected Study Area in Somaliland. FA0- SWALIM. Project Report L-05. Nairobi, Kenya.

Vargas, R. R., Omuto, C., and Alim, M. S. 2007. Soil survey of the Juba and Shabelle riverine areas in Southern Somalia. FA0-SWALIM. Project Report L-08. Nairobi, Kenya.

World Bank & FAO. 2018. Rebuilding resilient and sustainable agriculture in Somalia. Country Economic Memorandum, Volume I. Washington DC, USA. World Bank & FAO. documents1.worldbank.org/curated/en/781281522164647812/pdf/124651-REVISEDSomalia-

CEM-Agriculture-Report-Main-Report-Revised-July-2018.pdf

World Bank. 2018. Somalia Drought Impact Needs Assessment. Washington DC, USA, World Bank

World Bank. 2020. Somalia 2019 Floods Impact and Needs Assessment. Washington DC, USA, World Bank documents1.worldbank.

org/curated/en/764681585029507635/pdf/Somalia-2019-Floods-Impact-and-Needs-Assessment.pdf

Research Team

The report was prepared by a team of consultants comprised of Mr. Moges Bekele, lead consultant, and Hussein Haji (Dr.), Co-lead consultant. Field level data collection was coordinated by Savana Consultancy and Research Services Limited (SCRS).