

FORAGE VALUE CHAIN ANALYSIS FOR THE COUNTIES OF TAITA TAVETA, KAJIADO AND NAROK



FINAL REPORT OF A SCAN OF FORAGE SEED SUPPLIERS IN KENYA (PRIVATE COMPANIES AND RESEARCH INSTITUTIONS)

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ABBREVIATIONS AND ACRONYMS

AEZ	Agro Ecological Zones
ASAL	Arid and Semi – Arid Lands
ATC	Agricultural Training Centers
CIAT	Centre for International Tropical Agriculture
CP	Crude Protein
DM	Dry Matter
DUS	Distinctiveness, Uniformity and Stability
DRI	Dairy Research Institute
ICRISAT	International Crop Research Institute for the Semi-Arid Tropics
ILRI	International Livestock Research Institute
ISTA	International Seed Testing Association
KALRO	Kenya Agricultural and Livestock Research Organization
KCSAP	Kenya Climate Smart Agriculture Project
KEBS	Kenya Bureau of Standards
KEPHIS	Kenya Plant Health Inspectorate
KWS	Kenya Wildlife Service
ME	Metabolisable Energy
NAEDAP	Netherlands East African Dairy Partnership
NARS	National Agricultural Research System
NDF	Neutral Detergent Fibre
NGO	Non-Governmental Organizations
NPT	National Performance Trials
OIC	Orange International Seed Lot Certificate
PIP	Plant Import Permit
RAE	Rehabilitation of Arid Environments

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INTRODUCTION

The growth of livestock sector in Kenya depends on availability of forages all-year round. Most forages contributing to basal animal diets include tropical grasses supplemented by legumes, crop residues and concentrates (NEADAP 2019). Even though, availability of forage crop seeds and planting materials at farm level in the high potential zones and ASAL areas is still very low, this explains why progression of the value chain is slow. However, there have been efforts to promote adoption of forage crop seeds and planting materials to broaden the forage basket. Forage crop seed availability comprise both the formal and informal segments.

On the one hand, the formal segment entails forage seeds that are regulated by Kenya Plant Health Inspectorate Services (KEPHIS) and private companies licensed to trade the approved varieties. According to Mwendia et al., 2020, completion of registration entails two main activities namely National Performance Trials (NPT) and Distinctiveness, Uniformity and Stability (DUS) tests. The NPT entails planting the different crop varieties suggested for release in the areas expected to adopt by agroecological zones as well as running scientifically randomized trials by KEPHIS for a minimum of 2 seasons. The DUS test is conducted by the regulator to confirm the distinctiveness, uniformity, and stability of the particular variety (Mwendia et al., 2020). Both undertakings are paid for to KEPHIS by the party interested in having the varieties released. Completion of the whole process is estimated to cost US\$ 3,000 per variety (Mwendia et al., 2016).

On the other hand, the informal segment entails localized trading of seeds and planting materials that do not go through regulation by KEPHIS. Mwendia et al., 2016 reports that the segment is largely driven by individual farmers, farmer groups, Kenya Agricultural and Livestock Research Organization (KALRO) and Agricultural Training Centers (ATC). NGOs also play an important role, for instance promoting forage seed production and bulking among producers.

In Kenya, traders involved in the import and/or export of seed must register with the KEPHIS Directorate of Seed Certification and Plant Variety protection as seed merchants. A seed Import Permit and Plant Import Permit (PIP) must first be obtained before any importation of seeds is undertaken. All imported seeds must be accompanied by a phytosanitary certificate and test results from an accredited ISTA laboratory. Seeds of all crops (imported) are subjected to laboratory quality tests upon arrival and must meet the gazetted minimum standards before being offered for sale. Similarly, all seed for export must meet the gazetted minimum standards and be accompanied by Kenya's phytosanitary certificate and an export permit. Duplication of Inspection and Certification by KEPHIS contributes to the already high costs of the seed certification process; although recently, the government put aside the requirements for a KEPHIS certification based on issuance of Certificate of Conformity (CoC) by the regulator's appointed agents at the countries of seed/plant origin. Traders are also burdened with excessive documentation requirements where the same information is required by multiple agencies which cause delays in the clearance of consignments. KEPHIS has announced plans for the digitalization of the Seed Certification process, and from May 2020 to April 2021,

growers and seed crops are being registered and applications for inspections are to be submitted online (Land O'Lakes, 2021).

ICSIAPL project, implemented by SNV and KALRO initiated a forage value chain scan to recommend interventions that are likely to support the forage value chain, including improving access to forage seeds. This working paper focuses on the current situation of forage seeds in Kenya, as made available by both formal and informal sectors. It further seeks to provide useful insights to the project, agro-pastoralists, farmers and like-minded partners and stakeholders in the tropical forage seeds, especially in the Southern range lands of Kenya.

The consultants compiled a list (Tablet 1. below) of seed companies and research organisations registered in Kenya and supplying forage crop seeds (incl. grasses and legumes) or seeds that can be used as forage crops (e.g. maize, sorghum) and vegetative material. The list may not be exhaustive, and neither does it contain the many local seed bulkers/multipliers e.g. ATC farms and some CBO (Community Based Organizations), women groups, etc. who are active in seed multiplication and supply in Kenya.

Table 1: Suppliers and producers of forage seed and vegetative material in Kenya

	Seed supplier	Summary of varieties supplied
1.	Advanta Seeds Limited	Fodder sorghum, Fodder millet, Brachiaria, Rye grass, Lucerne
2.	Advantage Crops Limited	Brachiaria hybrids, <i>Crotalaria juncea</i> (Sunn hemp) Panicum cv Siambaza
3.	Agricultural Development Cooperation (ADC's) 7 large scale farms	Rhodes grass
4.	AgriSeedco Limited	Forage Sorghum
5.	Amiran (K) Limited	Brachiaria hybrids
6.	International Centre for Tropical Agriculture (CIAT)	Brachiaria hybrids, Panicum
7.	Continental Seeds	Maize
8.	Coopers (K) Brand	Lucerne, Purple vetch
9.	Corteva (K) Ltd/Pannar Seed	Maize, dual purpose Sorghum, Lucerne
10.	East African Seed Company	Maize, Lucerne, <i>Sorghum bicolor</i> (Sudan grass), Rhodes grass (Katambora), Desmodium, Fodder millet
11.	Fresco Seed Company	Maize
12.	Hygrotech Limited	Lucerne, Lupins, KowKandy, White buffalo grass, Tall fescue, Cock's foot, annual and perennial Rye grass, Fodder millet, Fodder turnips, Sunn hemp, Red and White clover, Buffel grass, Bottle brush grass, Smutsfinger grass, Rhodes grass (Katambora)

13.	International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)	Forage sorghum, Forage millet
14.	International Livestock Research Institute (ILRI)	Brachiaria
15.	Justdiggitt	Buffel grass, <i>Sesbania Sesban</i> , African foxtail, Maasai love grass
16.	KALRO Muguga, Kakamega, Embu, Ol Joro Orok, Beef/Lanet, DRI/Naivasha, ARLRI/Kiboko, Mtwapa, Kisii, Mariakani, Matuga, Kitale	Napier grass, Rhodes grass, Panicum, Brachiaria (Basilisk, MG4, Piata, Xaraes), Clitoria, <i>Dolichos lablab</i> , Leucaena, Vetch Gliricidia, Mucuna, Siratro, Tree Lucerne, Desmodium, Clover, Sorghum, Sweet potatoes, Lupins, Calliandra, Edible Canna, Buffel grass/African Foxtail, Bush Rye grass, Horse tail grass
17.	Kenya Forestry Research Institute (KEFRI)	Fodder trees and shrubs - Calliandra, Sesbania, Leucaenia, <i>Acacia spp</i>
18.	Kenya Highland Seed/Royal Seeds	Maize, Lucerne
19.	Kenya Seed Company	Maize, Columbus grass, <i>Sorghum bicolor</i> , Lucerne, Rhodes grass, Setaria grass, Guinea grass, Columbus grass, Oats, Desmodium, Cowpea
20.	Leldet Seeds Ltd	Rhodes grass, Forage sorghum variety E6518, Maize, Beans
21.	Monsanto	Maize Dekalb hybrid
22.	Elgon Kenya Limited	Maize
23.	Pioneer Hi-Bred (K) Ltd	Maize, Lucerne
24.	Rehabilitation of Arid Environments Ltd/Trust (RAE)	African Foxtail/Buffel grass, Bush rye grass, Maasai Love grass, <i>Sehima nervosum</i> , <i>Cymbopogon pospischilli</i>
25.	Seedballs Kenya	African Foxtail/Buffel grass, Masaai Love grass, Bush Rye grass, <i>Acacia spp.</i>
26.	Simlaw Seeds Company Ltd*	Lucerne, Rhodes grass, Desmodium, Bermuda grass, Kikuyu grass, Dolichos bean, Columbus grass
27.	U-Farm Holdings Ltd	Brachiaria hybrids, Panicum cv Siambaza, Lucerne, Sunn hemp, Vetch
28.	Western Seed Company	Maize

*Simlaw Seeds Company Ltd is a subsidiary of Kenya Seed Company, founded in 1929.

METHODOLOGY

The information in this report was gathered from a variety of sources: mainly through filled questionnaires, online interviews, physical interviews of key respondents, desk study of publications and reports on forage seed/planting material suppliers (private companies and researchers) in Kenya. A total of eleven (11) seed companies and three (3) research institutions responded via questionnaire interviews.

More information was gathered through phone calls and information collected from the websites of the list of seed suppliers and producers above.

QUESTIONNAIRE FINDINGS

Sections 1-7

SECTION 1: DETAILS SEED SUPPLIERS

Question 1(a) – (f): Table 1 and 2 summarizes question 1 (a to f) of the online questionnaire. They entail contact details of the seed suppliers/research organisations who responded to the questionnaire (14) as well as an inventory of the forage seeds they supply

See Annexure 1 for the full questionnaire.

Table 2: Forage seed suppliers/stakeholders interviewed, location and contacts

	Seed supplier	Head office location	Contacts
1.	Advantage Crops Limited	Rodi, Homabay County Kenya	0715519922 / 0729152473 www.aclseeds.com
2.	Advanta Seeds International	Westlands, Nairobi Kenya	0743478081 www.advantaseeds.com
3.	Amiran Kenya Limited Company	Old North Airport Road, Embakasi Nairobi Kenya	0800720720 www.amirankenya.com
4.	East African Seed Company	Dakar Road, Nairobi Kenya	0722207747 / 0734333161 www.easeeed.com
5.	Hygrotech East Africa	Tigoni near Limuru and Naivasha, Kenya	0202053917 www.hygrotech.co.ke
6.	ILRI*	Naivasha Road, Nairobi Kenya	www.ilri.org
7.	Justdiggitt	Nairobi Kenya	www.justdiggitt.org
8.	KALRO Dairy Research Institute, Naivasha	Naivasha, Kenya	www.kalro.org
9.	KALRO ARLRI/Kiboko	KALRO, Arid & Rangelands Research Institute, Kiboko Kenya	www.kalro.org
10.	Leldet Seeds	Rajwera Farm - Nakuru Kenya	0723329393 www.leakeygroups.co.ke
11.	Rehabilitation of Arid Environments Ltd/Trust	Kampi ya Samaki, Baringo County Kenya	05351418 / 0721892566 www.raetrust.org
12.	Seedballs Kenya	Nairobi Kenya	0700380009 www.seedballskenya.com
13.	Simlaw Seeds Company Ltd **	Nairobi Kenya	020 2215067 www.simlaw.co.ke
14.	U-Farm Holdings Limited	5th floor, West point, Mpaka Road Westlands, Nairobi Kenya	0719227700 www.ufarm.biz

*ILRI is a custodian of a forage gene bank and distributes forage germplasm across the globe. It provides training and technical support on forage seed production to NARS scientists, private sector, and development partners.

**Simlaw Seeds Company Ltd is a subsidiary of Kenya Seed Company, founded in 1929.

Table 3: Inventory of improved grasses and forage crop seeds and/or planting material available through seed suppliers/stakeholders

Forage seed varieties	Seed supplier
Improved Grasses	
<i>Cenchrus purpureum</i> (Napier grass)	KALRO DRI/Naivasha
<i>Hybrid Brachiaria</i> varieties - <i>Mulato II</i> , <i>Cayman</i> , <i>Cobra</i> , <i>Camello</i>	Advantage Crops, Advanta Seeds, Amiran Kenya Limited, U-Farm
<i>Cultivar Brachiaria</i> varieties - <i>Xaeres</i> , <i>Piata</i> , <i>Basilisk</i> , <i>MG4</i>	KALRO DRI/Naivasha, KALRO Embu, ILRI
<i>Panicum maximum</i> varieties Siambaza/Mombasa	Advantage Crops, U-Farm
<i>Panicum maximum</i> variety Gatton (White Buffalo grass)	Hygrotech EA
<i>Panicum coloratum</i> (Coloured Guinea Grass)	KALRO Beef/Lanet, KALRO Mariakani
<i>Chloris gayana</i> (Rhodes grass) varieties Katambora, Boma, X-Tosi	East African Seeds, Hygrotech EA, Simlaw Seeds, KALRO ARLRI/Kiboko
<i>Festuca arundinacea</i> variety Kora (Tall Fescue)	Hygrotech EA
<i>Dactylis glomerata</i> variety Athos (Cock's foot)	Hygrotech EA
<i>Lolium perenne</i> variety Platform, Evens (Perennial Rye grass)	Advanta Seeds, Hygrotech EA
<i>Lolium multiflorum</i> variety Impact, Excellent (Annual Rye grass)	Advanta Seeds, Hygrotech EA
Forage grain crops	
<i>Pennisetum glaucum</i> (Pearl millet) varieties Nutrifeed	Advanta Seeds, East African Seeds, Hygrotech EA
<i>Sorghum drummondii</i> (Forage sorghum) variety Sugar graze variety E6518, E1291	Advanta Seeds, East African Seeds Leldet Seeds, KALRO DRI/Naivasha, KALRO Beef/Lanet
<i>Sorghum drummondii</i> (Dual-purpose sorghum) variety Ikinyaruka	KALRO DRI/Naivasha, KALRO Beef/Lanet
<i>Sorghum bicolor</i> variety Sudanese (Sudan grass) variety Kowkandy, Jumbo	Advanta Seeds, East African Seeds, Hygrotech EA, Simlaw Seeds
<i>Sorghum alnum</i> (Columbus grass)	Simlaw Seeds, Kenya Seed
<i>Avena sativa</i> (Oats)	Simlaw Seeds
<i>Zea mays</i> (Mais) variety ADV 2308 variety Bon bon Sweet corn variety H6218 variety PAN14 (Yellow maize)	Advanta seeds U-Farm Simlaw Seeds Corteva (Pannar Seeds)
Other forage crops	
<i>Brassica rapa oleifera</i> (Fodder Turnips)	Hygrotech EA
<i>Ipomoea batatas</i> variety Mafuta (Sweet potatoes)	KALRO DRI/Naivasha
<i>Beta vulgaris</i> (Fodder/pasture beet)	Simlaw Seeds

Legumes

<i>Medicago sativa</i> Lucerne/Alfalfa	Advanta Seeds, East African Seeds, U-Farm, Hygrotech EA, Simlaw Seeds, Kenya Seed
<i>Crotalaria juncea</i> (Sunn hemp)	Advantage Crops, U-Farm, Hygrotech EA
<i>Vicia villosa</i> (Hairy vetch)	U-Farm
<i>Vicia sativa</i> (Purple Vetch)	KALRO DRI/Naivasha, KALRO Ol Joro Orok, Coopers Kenya
<i>Desmodium intortum</i> (Green leaf)	Advantage Crops, East African Seeds, Simlaw Seeds, KALRO Embu
<i>Trifolium pratense</i> variety Oregon Red (Red clover)	Hygrotech EA, KALRO Beef/Lanet, KALRO, Ol Joro Orok
<i>Trifolium repens</i> variety Klondike (White clover)	Hygrotech EA
<i>Vigna unguiculata</i> variety M66 (Forage cow pea)	KALRO Katumani
<i>Stizolobium spp</i> (Mucuna/Velvet bean)	KALRO DRI/Naivasha, KALRO Ol Joro Orok
<i>Desmanthus virgatus</i> (Desmanthus)	KALRO DRI/Naivasha
<i>Lablab purpureus</i> (Dolichos bean)	Simlaw Seeds, KALRO Katumani
<i>Lupinus albus</i>	KALRO DRI/Naivasha, KALRO Beef/Lanet, KALRO, Ol Joro Orok

Rangeland grasses

<i>Cenchrus ciliaris</i> variety Baringo (Buffel grass/African Foxtail)	Rehabilitation of Arid Environments (RAE Trust), Seedballs
<i>Cenchrus ciliaris</i> variety Gayndah (Buffel grass/African Foxtail)	Hygrotech EA
<i>Cenchrus ciliaris</i> variety MGD1, TVT3 (Buffel grass/African Foxtail)	KALRO ARLRI/Kiboko
<i>Eragrostis superba</i> – (Maasai Love grass)	RAE Trust, Seedballs, U-Farm, KALRO Kiboko
<i>Enteropogon macrostachyus</i> – (Bush Rye)	RAE Trust, Seedballs, KALRO ARLRI/Kiboko
<i>Chloris roxburghiana</i> - (Horse Tail grass)	KALRO ARLRI/Kiboko
<i>Sehima nervosum</i>	RAE Trust
<i>Cymbopogon pospischilli</i>	RAE Trust
<i>Elymus hystrix</i> variety Wollie (Bottle brush grass)	Hygrotech EA
<i>Digitaria eriantha</i> variety Irene (Smutsfinger grass)	Hygrotech EA

Agro Forestry Trees

<i>Calliandara calothyrsus</i> (Calliandra)	KALRO Beef/Lanet, KALRO Ol Joro Orok, KALRO Embu
<i>Leucaena leucocephala</i>	KALRO Beef/Lanet, KALRO Ol Joro Orok, KALRO Embu
<i>Sesbania sesban</i>	Seedballs, KALRO Beef/Lanet, KALRO Ol Joro Orok
<i>Chamaecytisus palmensis</i> (Tree lucerne)	KALRO Beef/Lanet, KALRO Ol Joro Orok

Rangeland Trees

<i>Acacia nilotica</i>	Seedballs
<i>Acacia Senegal</i>	Seedballs
<i>Acacia tortilis</i>	Seedballs
<i>Acacia xanthopholea</i>	Seedballs
<i>Acacia kirkii</i>	Seedballs

Note: Some of these forage crop varieties are in trial with the National Performance Trial (see Table 4)

Other findings

Question 1 (g): What role(s) do you play in the forage seed subsector?

- Most of the companies (8 out of 11) are in importing, repackaging, distribution & marketing of improved forage seeds. Only a few are involved in seed selection and breeding/ multiplication within the country.

Question 1 (h): Rank your traded volume(s) of forage seeds for each variety on a scale of 1 to 5 (5 is highest and 1 is lowest)

- Following rankings of traded volumes, the forage grasses most traded include Rhodes grass, Brachiaria (hybrids) and *Panicum maximum* variety Mombasa/ Siambaza. Of the legumes, *Crotalaria juncea* (Sunn hemp) was most traded followed by Lucerne.

SECTION 2: FORAGE SEEDS AND REGISTRATION

Question 2: (a) Which forage seed varieties do you sell/have in stock, cost per kilogram, recommended seed rate per acre and estimated/predicted yield per acre for each variety?

Table 4: Forage seeds against their current prices (June 2021), recommended seed rate and estimated yield per acre

Forage seed varieties	Cost per KG (KES)	Recommended seed rate per acre	Estimated yield per acre
Improved Grasses			
<i>Cenchrus purpureum</i> (Napier grass)	3.00 per cutting	1,800-2,000 cuttings	3-5 tonnes per acre/cut
<i>Hybrid Brachiaria</i>			
variety Mulato II	3,500-5,591	2 kg	
variety Cayman	4,500-6421	2 kg	
variety Cobra	4,500	2 kg	-
<i>Panicum maximum</i> varieties Siambaza/Mombasa	2,650-4,000	2 kg	2.8 tones
<i>Chloris gayana</i> (Rhodes grass)			
variety Boma	600-1,200	4 kg	8 tonnes irrigated
variety Katambora	2,500	2-3 kg	-
<i>Lolium multiflorum</i> variety Impact, Excellent (Annual Rye grass)	750	10 kg	6 tonnes irrigated
Forage grain crops			
<i>Pennisetum glaucum</i> (Pearl millet): varieties Nutrifeed	1,300-3,700	3-4 kg	30 tonnes
<i>Sorghum drummondii</i> (Forage sorghum)			
variety Sugar graze	700-2,200	5-6 kg	50 tonnes
Variety E6518	235	4 kg	-
<i>Sorghum drummondii</i> (Dual-purpose sorghum) variety Ikinyaruka			

<i>Sorghum bicolor</i> variety Sudanese (Sudan grass)	300	5-8 kg	-
variety Kowkandy	450	10 kg	6 tonnes Irrigated
<i>Sorghum alnum</i> (Columbus grass)	115		
<i>Avena sativa</i> (Oats)	120	-	-
<i>Zea mays</i> (Maize)			
variety PAN14 (Yellow maize)	325	-	-
Other forage crops			
<i>Brassica rapa oleifera</i> (Fodder Turnips)			
<i>Ipomoea batatas</i> variety Mafuta (Sweet potatoes)	3 per vine	4,500-5,000 vines	-
Legumes			
<i>Medicago sativa</i> Lucerne/Alfalfa	1,890-2,200	6-10 kg	4.3-8 tonnes (green)
<i>Crotalaria juncea</i> (Sunn hemp)	495	16 kg	3.2 tonnes
<i>Vicia villosa</i> (Hairy vetch)	850	10-12 kg	2.6 tonnes
<i>Vicia sativa</i> (Purple Vetch)	1,400		
<i>Desmodium intortum</i> (Green leaf)	4,445		
<i>Lupinus albus</i>	300-1,000	10-12 kg	3-5 tonnes
Rangeland grasses			
<i>Cenchrus ciliaris</i> variety Baringo (Buffel grass/African Foxtail)	1,000	10 kg	-
<i>Cenchrus ciliaris</i> variety MGD1, TVT3 (Buffel grass/African Foxtail)	500	5 kg	-
<i>Eragrostis superba</i> (Maasai Love grass)	500-1,000	5-10 kg	-
<i>Enteropogon macrostachyus</i> (Bush Rye)	500-900	3 kg	-
<i>Chloris roxburghiana</i> (Horse Tail grass)	900	5 kg	-
Agro Forestry Trees			
<i>Calliandara calothyrsus</i> (Calliandra)	3,000		
<i>Sesbania sesban</i>	500	-	-
<i>Chamaecytisus palmensis</i> (Tree lucerne)	4,000		

Rangeland Trees			
<i>Acacia nilotica</i>	500	-	-
<i>Acacia Senegal</i>	500	-	-
<i>Acacia tortilis</i>	500	-	-
<i>Acacia xanthopholea</i>	500	-	-
<i>Acacia kirkii</i>	500	-	-

Note: Prices for forage crop varieties vary amongst suppliers.

Question 2: (b) Among the forage seeds you sell, which ones are registered in the Kenya Crop Variety List (August 2020)?

See Table 4

Question 2: (c) Do you stock any seeds that are in the actual sense food crops but are widely used by farmers as forage crops (maize, sorghum, beans etc)? Yes/No If yes, please list the varieties.

The responses to this question were too few to make meaningful analysis and inferences

Question 2: (d) Among the forage seeds you sell, which ones are registered in the Kenya Crop Variety List (August 2020)?

See Table 4

Table 5: Companies versus forages registered under the Kenya Crop Variety List (August 2020) and on NPT

Name of seed supplier	Seed varieties in the Kenya Crop Variety List (Aug. 2020)	Forage seeds currently in trials with NPT
Advantage Crops Limited	Hybrid Brachiaria varieties Mulato II, Cayman, Cobra <i>Panicum maximum</i> variety Siambaza	Hybrid Brachiaria variety Camello
Advanta Seeds International	<i>Pennisetum glaucum</i> (Pearl millet) variety Nutrifeed <i>Sorghum drummondii</i> (Forage sorghum) variety Sugar graze	Sorghum (cv Mega Sweet) Sorghum bicolor var. Jumbo (Sudan grass) <i>Pennisetum glaucum</i> (Pearl millet) variety Nutrijet <i>Medicago sativa</i> (Lucerne/Alfalfa)
Amiran Kenya Limited Company	Hybrid Brachiaria varieties Mulato II, Cayman	
East African Seed Company	<i>Chloris gayana</i> variety Katambora (Rhodes grass) <i>Medicago sativa</i> variety Hunter (Lucerne/Alfalfa) <i>Desmodium intortum</i> - Green leaf <i>Pennisetum glaucum</i> (Pearl Millet) variety Nutrifeed Forage Sorghum (Sugar graze)	
Leldet Seeds	<i>Sorghum drummondii</i> (Forage sorghum) variety Sorghum E6518	
Rehabilitation of Arid Environments Trust	<i>Cenchrus ciliaris</i> variety Baringo - BUG 12 200 (Buffel grass / African Foxtail)	<i>Enteropogon macrostachyus</i> (Bush Rye); <i>Eragrostis superba</i> (Maasai Love grass);

		<i>Sehima nervosum</i> ; <i>Cymbopogon pospischilli</i> .
U-Farm Holdings Limited	<i>Medicago sativa</i> variety Al-fac (Lucerne/Alfalfa) <i>Panicum maximum</i> variety Siambaza/Mombasa <i>Crotalaria juncea</i> (Sunn hemp) Hybrid <i>Brachiaria</i> varieties Mulato II, Cobra, Cayman, Camello <i>Vicia villosa</i> (Hairy vetch)	<i>Brachiaria</i> cv. Basilisk <i>Eragrostis superba</i> – (Maasai Love grass)
Simlaw Seeds	<i>Chloris gayana</i> variety Katambora (Rhodes grass)	<i>Lablab purpureus</i> (Dolichos bean)
KALRO Arid & Rangelands Research Institute, Kiboko		<i>Cenchrus ciliaris</i> varieties MGD1, TVT3 (Buffel grass / African Foxtail); <i>Enteropogon macrostachyus</i> – (Bush Rye) <i>Chloris gayana</i> variety X-Tozi, (Rhodes grass) <i>Chloris roxburghiana</i> (Horse Tail grass)
KALRO Dairy Research Institute, Naivasha	<i>Sorghum drummondii</i> (Forage sorghum) varieties E6518/E1291/Ikinyaruka dual purpose sorghum) <i>Lupinus albus</i> (Lupin) <i>Cenchrus purpureum</i> (Napier grass) <i>Ipomoea batatas</i> variety Mafuta (Sweet potatoes) <i>Brachiaria spp</i>	<i>Brachiaria spp</i> ; <i>Lupinus albus</i> (Lupin)

Question 2 (e): What are the key challenges that you experience in your business as a forage seed supplier regarding registration of forage seed varieties in Kenya? (The challenges are ranked in the order of most to least pressing)

1. Long period to complete variety registration (NPT and DUS) and issuance of registration certificates. NPT is rainfed and season failure is common in ASALs.
2. Inadequate expertise knowledge and familiarity with native/endemic forage varieties especially range grasses.
3. Absence of suitable test protocols for evaluating performance of entries, suitable checks/controls (similar forage in the same category) against which performance of entries can be gauged. For instance, based on experience with some of the seed suppliers, on specific forage varieties, suggest that results from the regulator's seed laboratory testing protocol consistently posts significantly lower germination test values as compared to results from exporting countries and field-based germination tests. A consequence of this outcome has been that good quality seed lots are sometimes declared unfit for sale in the country once the germination values are below a preset threshold.

This is allegedly attributed to generalized environmental conditions for the laboratory-based test protocols for many plant varieties; a situation that does not coincide with the requirements of specific forage varieties e.g., longer lighting conditions, warmer test temperatures and high humidity conditions during the germination test. It means that possibly, setting special germination chambers within the testing laboratories would allow for control of these environmental parameters. All these greatly affect availability of forage seed to clients.

4. Expensive registration: High cost of NPT, OIC and registration.
5. Unstructured forage seed distribution channels and marketing leading to complaints of poor seed viability/quality sold by traders in the informal market segment; without following due procedures hence bottleneck to forage sector development.
6. Strict measures, policies and bureaucracies by government especially on importation: Restrictions and lack of a database on forages imported, need to have a central data system. It also takes too long to obtain Plant Import Permit (PIP) from the regulator.
7. Limited information to farmers about registration. Farmers lack the knowledge of seed registration process hence are not able to differentiate between registered seeds and those that are not.
8. Inadequate (dryland) forage seed regulations and enforcement.

Question 2 (f): What solutions do you propose to help resolve the challenges regarding registration?

Table 6: Classification of challenges and their respective proposed solutions as provided by various seed suppliers

Challenge	Proposed Solutions
Forage seed registration - duration, costs and inclusivity	• Concurrently undertake seed registration and the NPT trials in multiple sites to reduce on cost of trials and the number of seasons needed to generate data needed to make variety release decisions. • Reduce the cost charged per entry. Have more flexibility in the protocols followed during the evaluations and provide subsidies on registration charges. • Concurrently undertake DUS tests and collect other supplementary data so that this data is available as soon as NPT data is available for making decision on variety release to hasten registration. • Involvement and participation of stakeholders during forage registration e.g., engage farmers in informative sessions on the varieties from registration. • Tests on specific parameters to be conducted during NPT and DUS processes of forages registration. For example, current test is done for uniqueness (genotypically) and consistency (phenotypically). There is

	need to consider more parameters for testing to accommodate unique biodiversity needs for rangelands.
Capacity building regulatory body	• Strengthen capacity of forage registration body through researchers and joint preparation of the trial protocols. • Digitalize/computerize regulator's data systems. • Outsource expertise to team up with existing experts i.e. Early engagement of private seed companies and regulatory authority/agencies to onboard technical expertise from other organizations like KALRO, ILRI, CIAT.
Regulations	• Review importing and registration regulations. Develop seed regulations specific to dryland areas in collaboration with the knowledge and expertise of seed companies/researchers working in ASALs. • Enforcement of regulations (including germination trials etc.) by all parties concerned, including local dryland farmers and seed traders. • Self-regulation on quality control systems could be established and properly enforced and adhered to.
Partnerships	• Encourage public private partnerships in forage seed registration and distribution and dissemination. • Work with government to increase funding to support forage sector development, including research on rangeland grasses to avoid duplication. • Raising awareness through training on forage diversity (including dryland farmers/pastoralists) and mixed cropping, importance of quality seed at all levels of the value chain and use of traditional knowledge in forage sector. These will improve seed harvesting and treatment skills among others and ensure successful pasture development including in ASAL areas. • Explore irrigation especially for DUS. • Forage seed developers/public research should have a share of royalties.

Question 2 (g): According to your expertise, which parameters should be used to test forage crop varieties for registration on the National Crop Variety List? Please list and explain.

- i. Yield (forage/fodder biomass production)
- ii. Nutritional quality i.e., Dry matter, Crude protein/nitrogen, energy (ME), fibre (NDF) minerals and digestibility.
- iii. Adaptability to important biotic (e.g., pests and diseases) and abiotic (e.g., drought) factors.
- iv. Acceptability.
- v. Distinctness.
- vi. Uniformity.

- vii. Regeneration after cuts, number of cuts etc.
- viii. Ecological suitability - Site specific germination rates, etc.
- ix. Response to different cutting intervals depicting grazing intensity.
- x. Availability of quality seeds/vegetative planting materials.
- xi. Genetic purity.

Question 2 (h): Give suggestions on how the registration process can be made more friendly

Responses merged with question 2 (f)

SECTION 3: ESTABLISHMENT AND PRODUCTION

Question 3 (a): List and classify your forage varieties into their recommended Agro-Ecological Zones (AEZ)

Table 7: Classification of forage varieties into their recommended Agro-Ecological Zones (AEZ) according to the seed supplier

Climatic zone	Forages
1. Arid Rainfall (100-400mm)	Forage grain crops: <i>Pennisetum glaucum</i> (Pearl millet) variety Nutrifeed; <i>Sorghum bicolor</i> var. Sudanese (Sudan grass); <i>Sorghum drummondii</i> (Forage sorghum) variety Sugar graze. Rangeland grasses: <i>Cenchrus ciliaris</i> varieties Baringo, Gayndah (Buffel grass/African Foxtail); <i>Chloris roxburghiana</i> (HorseTail); <i>Cymbopogon pospischilli</i>; <i>Elymus hystrix</i> variety Wollie (Bottle brush grass); <i>Enteropogon macrostachyus</i> (Bush Rye); <i>Eragrostis superba</i> (Maasai Love grass); <i>Sehima nervosum</i>. Rangeland trees: <i>Acacia nilotica</i>; <i>Acacia senegal</i>; <i>Acacia tortilis</i>
2. Semi-Arid Rainfall(400-600mm) Altitude (1,000-1,800mm)	Improved forage grasses: <i>Chloris gayana</i> (Rhodes grass) varieties Katambora, Boma; Hybrid Brachiaria varieties Mulato II, Cayman, Cobra, Camello; Cultivar Brachiaria varieties Xaeres, Piata, Basilisk, MG4; <i>Panicum maximum</i> varieties Siambaza/Mombasa. Forage grain crops: <i>Pennisetum glaucum</i> (Pearl millet) variety Nutrifeed; <i>Sorghum bicolor</i> variety Sudanese (Sudan grass); <i>Sorghum drummondii</i> (Forage sorghum) variety Sugar graze. Rangeland grasses: <i>Cenchrus ciliaris</i> varieties Baringo, Gayndah (Buffel grass/African Foxtail); <i>Cymbopogon pospischilli</i>; <i>Elymus hystrix</i> variety Wollie (Bottle brush grass); <i>Enteropogon macrostachyus</i> (Bush Rye); <i>Eragrostis superba</i> (Maasai Love grass); <i>Sehima nervosum</i>. Rangeland trees: <i>Acacia nilotica</i>; <i>Acacia senegal</i>; <i>Acacia tortilis</i>. Legumes: <i>Crotalaria juncea</i> (Sunn hemp); <i>Desmodium intortum</i> (Green leaf); <i>Medicago sativa</i> (Lucerne/Alfalfa).

3. Warm, Wet (Sub – humid) Medium Altitude Rainfall (600-1,200mm) Altitude (1,200-1,850mm)	Improved forage grasses: <i>Chloris gayana</i> (Rhodes grass) varieties Katambora, Boma; Hybrid Brachiaria varieties Mulato II, Cayman, Cobra, Camello; Cultivar Brachiaria varieties Xaeres, Piata, Basilisk, MG4; <i>Panicum maximum</i> varieties Siambaza/Mombasa, Gatton (White Buffalo grass). Forage grain crops: <i>Pennisetum glaucum</i> (Pearl millet) varieties Nutrifeed, Hy Pearl Millet; <i>Sorghum bicolor</i> var. Kowkandy; <i>Sorghum drummondii</i> (Forage sorghum) varieties E6518, Sugar graze. Rangeland grasses: <i>Cenchrus ciliaris</i> varieties Baringo, Gayndah (Buffel grass/African Foxtail); <i>Cymbopogon pospischilli</i>; <i>Enteropogon macrostachyus</i> (Bush Rye); <i>Eragrostis superba</i> (Maasai Love grass); <i>Sehima nervosum</i>. Rangeland trees: <i>Acacia nilotica</i>; <i>Acacia senegal</i>; <i>Acacia tortilis</i>. Legumes: <i>Crotalaria juncea</i> (Sunn hemp); <i>Desmodium intortum</i> (Green leaf); <i>Digitaria eriantha</i> variety Irene (Smutsfinger grass); <i>Medicago sativa</i> variety HL9, HL10, Al-fac (Lucerne/Alfalfa); <i>Vicia villosa</i> (Hairy vetch). Agro forestry trees: <i>Sesbania sesban</i>.
4. Cool, Wet (Sub – humid) Medium Altitude Rainfall (600-1,200mm) Altitude (1,850-2,400mm)	Improved forage grasses: <i>Chloris gayana</i> (Rhodes grass) varieties Katambora, Boma; <i>Dactylis glomerata</i> variety Athos (Cock’s foot); <i>Festuca arundinacea</i> variety Kora (Tall Fescue); Hybrid Brachiaria varieties Mulato II, Cayman, Cobra, Camello; Cultivar Brachiaria varieties Xaeres, Piata, Basilisk, MG4; <i>Panicum maximum</i> varieties Siambaza/Mombasa Forage grain crops: <i>Pennisetum glaucum</i> (Pearl millet) variety Nutrifeed; <i>Sorghum drummondii</i> (Forage sorghum) variety Sugar graze; <i>Triticosecale</i> (Triticale). Rangeland trees: <i>Acacia kirkii</i>; <i>Acacia nilotica</i>; <i>Acacia senegal</i>; <i>Acacia tortilis</i>; <i>Acacia xanthopholea</i> Legumes: <i>Crotalaria juncea</i> (Sunn hemp); <i>Desmodium intortum</i> (Green leaf); <i>Medicago sativa</i> variety HL9, HL10, Al-fac (Lucerne/Alfalfa); <i>Trifolium pratense</i> variety Oregon Red (Red clover); <i>Trifolium repens</i> variety Klondike (White clover); <i>Vicia villosa</i> (Hairy vetch). Agro forestry trees: <i>Sesbania sesban</i>.

5. Cold, Wet (Moist sub-humid) High Altitude <i>Rainfall (1,200-1,500mm)</i> <i>Altitude (2,400-3,000mm)</i>	Improved forage grasses: Hybrid Brachiaria varieties Cayman, Cobra; Cultivar Brachiaria varieties Xaeres, Piata, Basilisk, MG4; <i>Panicum maximum</i> varieties Siambaza/Mombasa; <i>Lolium perenne</i> variety Platform, Evens (Perennial Rye grass); <i>Lolium multiflorum</i> variety Impact, Excellent (Annual Rye grass). Forage grain crops: <i>Avena sativa</i> (Oats); <i>Pennisetum glaucum</i> (Pearl millet) variety Nutrijet; <i>Sorghum alnum</i> (Columbus grass); <i>Sorghum bicolor</i> var. Jumbo (Sudan grass); <i>Sorghum drummondii</i> (Forage sorghum) variety E6518, Mega sweet. Rangeland trees: <i>Acacia.abyssincca</i>; <i>Acacia kirkii</i>; <i>Acacia xanthopholea</i>. Legumes: <i>Crotalaria juncea</i> (Sunn hemp); <i>Medicago sativa</i> variety Al-fac (Lucerne/Alfalfa); <i>Trifolium pratense</i> variety Oregon Red (Red clover); <i>Trifolium repens</i> variety Klondike (White clover); <i>Vicia villosa</i> (Hairy vetch). Agro forestry trees: <i>Sesbania sesban</i>.
6. Humid <i>Rainfall (> 1,500mm)</i>	Improved forage grasses: Hybrid Brachiaria varieties Mulato II, Cayman, Cobra; Cultivar Brachiaria varieties Xaeres, Piata, Basilisk, MG4; <i>Panicum maximum</i> varieties Siambaza/Mombasa; Mulato II. Forage grain crops: <i>Pennisetum glaucum</i> (Pearl millet) variety Nutrijet; <i>Sorghum bicolor</i> var. Jumbo (Sudan grass); <i>Sorghum drummondii</i> (Forage sorghum) variety E6518, Mega sweet. Rangeland trees: <i>Acacia kirkii</i>. Legumes: <i>Crotalaria juncea</i> (Sunn hemp); <i>Medicago sativa</i> variety Al-fac (Lucerne/Alfalfa); <i>Vicia villosa</i> (Hairy vetch). Agro Forestry trees: <i>Sesbania sesban</i>.

Question 3 (b): Do any of your forage crop varieties that require specific soil conditions? Yes/No. If yes, please list and describe.

The forages listed below do well in a wide range of soils (less acidic, pH above 5.5) except extended waterlogged/swampy areas e.g., Black cotton soils.

- i. **Improved forage grasses:** *Chloris gayana* (Rhodes grass) varieties Katambora, Boma; Hybrid Brachiaria varieties Mulato II, Cayman, Cobra, Camello; Cultivar Brachiaria varieties Xaeres, Piata, Basilisk, MG4; *Panicum maximum* varieties Siambaza/Mombasa; *Cenchrus purpureum* (Napier grass).
- ii. **Rangeland grasses:** *Cenchrus ciliaris* variety Baringo (Buffel grass/African Foxtail); *Cymbopogon pospischilli*; *Enteropogon macrostachyus* (Bush Rye); *Eragrostis superba* (Maasai Love grass); *Sehima nervosum*.
- iii. **Forage grain crops:** *Pennisetum glaucum* (Pearl millet) variety Nutrifeed; *Sorghum drummondii* (Forage sorghum) variety Sugar graze.
- iv. **Legumes:** *Crotalaria juncea* (Sunn hemp); *Medicago sativa* varieties (Lucerne/Alfalfa); *Lupinus albus* (Lupin); *Vicia villosa* (Hairy vetch).
- v. **Other forage crops:** *Ipomoea batatas* variety Mafuta (Sweet potatoes).

Question 3 (c): Which agronomic practices are important for your forage crops to realize their full potential?

- i. Some forage seeds require establishment in a nursery to ensure good germination i.e., above 95% germination. Direct planting or broadcasting can cause poor germination percentage.
- ii. At transplanting or direct planting, prepare soils/seedbed adequately as per recommendations e.g., proper tillage to ensure fine seedbed.
- iii. Use of recommended seed rate/correct planting density to facilitate quick establishment.
- iv. Water properly at the beginning for good establishment.
- v. Maintain good soil moisture and nutrient management.
- vi. Use recommended fertilization rates/correct soil amendment according to crop requirements.
- vii. Control pests and diseases that may hamper productivity.
- viii. Control weeds.
- ix. Harvest at the right stage based on the crop utilization objectives e.g., vegetative stage, flowering stage with optimal energy or crude protein.
- x. Harvesting: Cut at the right stubble height to facilitate regeneration in the next season
- xi. It is always advisable to apply nitrogenous fertilizers (farm yard manure, compost, intercropping with legumes, synthetic fertilizers) after every cut or 2-3 cuts.

SECTION 4: FEEDING (UTILIZATION) OF THE FORAGE CROP

Question 4 (c): What is the targeted category of livestock for your forage crops? (Beef/Dairy/Dual purpose/Small ruminants)

The forage varieties most suitable for use in beef, dairy, dual purpose and small ruminants:

Forage grasses

- Cultivar *Brachiaria* varieties Xaeres, Piata, Basilisk, MG4.
- Hybrid *Brachiaria* varieties Mulato II, Cayman, Cobra, Camello.
- *Panicum maximum* variety Siambaza/Mombasa.
- *Chloris gayana* (Rhodes grass) varieties Katambora, Boma.
- *Lolium perenne* variety Platform, Evens (Perennial Rye grass).
- *Lolium multiflorum* variety Impact, Excellent (Annual Rye grass).
- *Dactylis glomerata* variety Athos (Cock's foot).
- *Festuca arundinacea* variety Kora (Tall Fescue).
- *Panicum maximum* variety Gatton (White Buffalo grass).
- *Cenchrus purpureum* (Napier grass).

Rangeland grasses

- *Cenchrus ciliaris* varieties Baringo, Gayndah (Buffel grass/African Foxtail).
- *Cymbopogon pospischilli*.
- *Enteropogon macrostachyus* (Bush Rye).
- *Eragrostis superba* (Maasai Love grass).
- *Sehima nervosum*
- *Elymus hystrix* variety Wollie (Bottle brush grass).
- *Digitaria eriantha* variety Irene (Smutsfinger grass).

Forage grain crops

- *Pennisetum glaucum* (Pearl millet) varieties Nutrifeed.
- *Sorghum bicolor* varieties Kowkandy, Sudanese (Sudan grass).
- *Sorghum drummondii* (Forage sorghum) varieties E6518, Sugar graze.

Leguminous forage crops

- *Crotalaria juncea* (Sunn hemp).
- *Trifolium pratense* variety Oregon Red (Red clover).
- *Trifolium repens* variety Klondike (White clover).
- *Vicia villosa* (Hairy vetch).
- *Medicago sativa* variety HL9, HL10, Al-fac (Lucerne/Alfalfa).
- *Lupinus albus* (Lupin).
- *Desmodium intortum* (Green leaf)

Other fodder crops/rangeland trees

- *Ipomoea batatas* variety Mafuta (Sweet potatoes)
- *Acacia kirkii*; *Acacia nilotica*; *Acacia senegal*; *Acacia tortilis*; *Acacia xanthopholea*.

Question 4 (b): In which farming system(s) are your forages mostly used? (Cut and carry-zero grazing)/Extensive grazing/Both systems)

Both Intensive (cut and carry-zero grazing) farming and extensive farming (free grazing)

- **Improved forage grasses:** *Chloris gayana* (Rhodes grass) varieties Katambora, Boma; Hybrid Brachiaria varieties Mulato II, Cayman, Cobra, Camello; Cultivar Brachiaria varieties Xaeres, Piata, Basilisk, MG4; *Panicum maximum* varieties Siambaza/Mombasa, Gatton (White Buffalo grass); *Lolium perenne* variety Platform, Evens (Perennial Rye grass); *Lolium multiflorum* variety Impact, Excellent (Annual Rye grass); *Dactylis glomerata* variety Athos (Cock's foot); *Festuca arundinacea* variety Kora (Tall Fescue).
- **Legumes:** *Medicago sativa* varieties HL9, HL10, Al-fac (Lucerne/Alfalfa); *Digitaria eriantha* variety Irene (Smutsfinger grass); *Trifolium pratense* variety Oregon Red (Red clover); *Trifolium repens* variety Klondike (White clover); *Vicia villosa* (Hairy vetch).
- **Forage grain crops:** *Pennisetum glaucum* (Pearl millet) varieties Nutrifeed, Hy Pearl Millet; *Sorghum bicolor* var. Kowkandy; *Sorghum drummondii* (Forage sorghum) varieties E6518, Sugar graze.
- **Rangeland grasses:** *Cenchrus ciliaris* varieties Baringo, Gayndah (Buffel grass/African Foxtail); *Cymbopogon pospischilli*; *Elymus hystrix* variety Wollie (Bottle brush grass); *Enteropogon macrostachyus* (Bush Rye); *Eragrostis superba* (Maasai Love grass); *Sehima nervosum*.

Cut and carry only

- **Legumes:** *Crotalaria juncea* (Sunn hemp); *Desmodium intortum* (Green leaf).
- **Forage grain crops:** *Sorghum drummondii* (Forage sorghum) varieties Sugar graze.
- **Agro forestry trees:** *Sesbania sesban*.
- **Other forage varieties:** *Ipomoea batatas* variety Mafuta (Sweet potatoes)

Extensive grazing only

- **Rangeland trees:** *Acacia kirkii*; *Acacia nilotica*; *Acacia senegal*; *Acacia tortilis*; *Acacia xanthopholea*.

Question 4 (c): In which form can your forages be used and fed? (Hay, silage, fresh)

Hay, silage, fresh

- *Dactylis glomerata* variety Athos (Cock's foot); *Festuca arundinacea* variety Kora (Tall Fescue); Hybrid Brachiaria varieties Mulato II, Cayman, Cobra, Camello; *Lolium multiflorum* variety Impact, Excellent (Annual Rye grass); *Lolium perenne* variety Platform, Evens (Perennial Rye grass); *Panicum maximum* variety Gatton (White Buffalo grass); *Panicum maximum* varieties Siambaza/Mombasa; *Cenchrus purpureum* (Napier grass).

Hay, fresh

- *Chloris gayana* (Rhodes grass) varieties Katambora, Boma.
- *Crotalaria. juncea* (Sunn hemp); *Desmodium intortum* (Green leaf); *Medicago sativa* variety HL9, HL10, Al-fac (Lucerne/Alfalfa); *Vicia villosa* (Hairy vetch).
- *Cenchrus ciliaris* varieties Baringo (Buffel grass/African Foxtail); *Cymbopogon pospischilli*; *Enteropogon macrostachyus* (Bush Rye); *Elymus hystrix* variety Wollie (Bottle brush grass); *Eragrostis superba* (Maasai Love grass); *Digitaria eriantha* variety Irene (Smutsfinger grass); *Sehima nervosum*.
- *Pennisetum glaucum* (Pearl millet) varieties Nutrifeed

Silage, fresh

- *Sorghum bicolor* varieties Kowkandy, Sudanese (Sudan grass); *Sorghum drummondii* (Forage sorghum) variety Sugar graze *Pennisetum glaucum* (Pearl millet) varieties Hy Pearl millet, Nutrifeed.

Silage

- *Sorghum drummondii* (Forage sorghum) varieties E6518, Sugar graze

Fresh

- *Trifolium pratense* variety Oregon Red (Red clover); *Trifolium repens* variety Klondike (White clover).
- *Sesbania sesban*.
- *Ipomoea batatas* variety Mafuta (Sweet potatoes).
- *Acacia kirkii*; *Acacia nilotica*; *Acacia senegal*; *Acacia tortilis*; *Acacia xanthopholea*.

Question 4 (d): Describe the management skills required to feed/utilize the forage crop(s) to increase animal productivity

Low-moderate

- *Cenchrus ciliaris* varieties Baringo (Buffel grass/African Foxtail); *Chloris roxburghiana*; *Cymbopogon pospischilli*; *Eragrostis superba* (Maasai Love grass); *Enteropogon macrostachyus* (Bush rye); *Elymus hystrix* variety Wollie (Bottle brush grass); *Sehima nervosum*.
- *Acacia kirkii*; *Acacia nilotica*; *Acacia senegal*; *Acacia tortilis*; *Acacia xanthopholea*.
- *Chloris gayana* (Rhodes grass) varieties Katambora, Boma; *Cenchrus purpureum* (Napier grass); *Dactylis glomerata* variety Athos (Cock's foot); *Festuca arundinacea* variety Kora (Tall Fescue); Hybrid *Brachiaria* varieties Mulato II, Cayman, Cobra, Camello; Cultivar *Brachiaria* varieties Xaeres, Piata, Basilisk, MG4.
- *Pennisetum glaucum* (Pearl millet) varieties Hy Pearl millet, Nutrifeed; *Sorghum drummondii* (Forage sorghum) variety Sugar graze; *Sorghum bicolor* varieties Kowkandy, Sudanese (Sudan grass).
- *Ipomoea batatas* variety Mafuta (Sweet potatoes).
- *Sesbania sesban*.

Moderate to high

- *Crotalaria juncea* (Sunn hemp); *Medicago sativa* variety HL9, HL10, Al-fac (Lucerne/Alfalfa); *Vicia villosa* (Hairy vetch); *Lupinus angustifolius* (Lupin).
- *Trifolium pratense* variety Oregon Red (Red clover); *Trifolium repens* variety Klondike (White clover); *Lolium perenne* variety Platform, Evens (Perennial Rye grass); *Lolium multiflorum* variety Impact, Excellent (Annual Rye grass); *Panicum maximum* varieties Siambaza/Mombasa.

Question 4 (e): What is the estimated nutritional value for ruminants that can be realised for each forage variety?

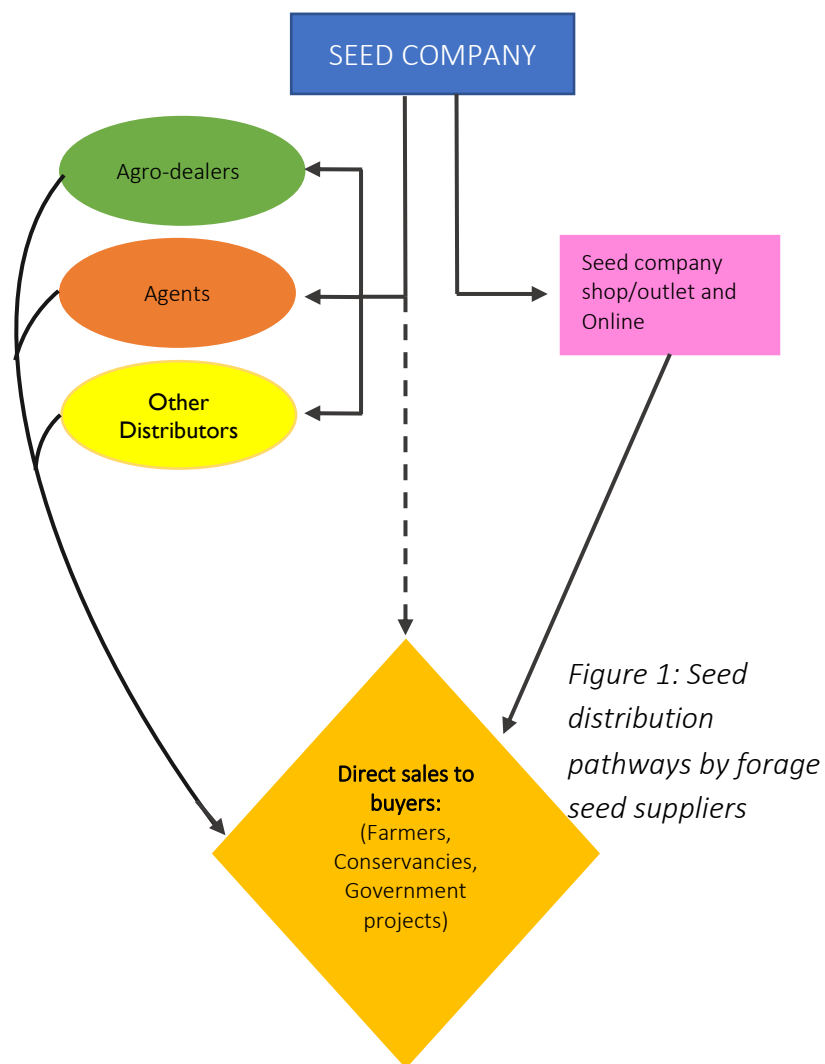
Table 8: Estimated nutritional value for ruminants that can be realised for various forage varieties as shared by the seed suppliers

*Note: the information provided in table 8 originates from the stakeholders filling in the questionnaire. The authors want to point out here that agronomic practices e.g. N application and cutting interval/stage will influence CP, NDF and digestibility. The table is therefore not intended to make a comparison between the different forages but to show the information the seed suppliers share with their clients about nutritional value (utilisation) by ruminant livestock.

Forage seed varieties	CP*	Digestibility	NDF
Improved forage grasses			
<i>Cenchrus purpureum</i> (Napier grass)	6-8%	-	-
<i>Hybrid Brachiaria</i> varieties - Mulato II, Cayman, Cobra, Camello.	16-18%	66-68%	34-42%
<i>Panicum maximum</i> varieties Siambaza/Mombasa	14-16%	75%	34%
<i>Panicum maximum</i> variety Gatton (White Buffalo grass)	8%	60%	71%
<i>Chloris gayana</i> (Rhodes grass) varieties Katambora, Boma, X-Tosi	8%	75%	71%
<i>Festuca arundinacea</i> variety Kora (Tall Fescue)	8%	60%	50%
<i>Dactylis glomerata</i> variety Athos (Cock's foot)	8%	60%	50%
<i>Lolium perenne</i> variety Platform, Evens (Perennial Rye grass)	8%	60%	50%
<i>Lolium multiflorum</i> variety Impact, Excellent (Annual Rye grass)	8%	60%	50%
Forage grain crops			
<i>Pennisetum glaucum</i> (Pearl millet) variety Nutrifeed	16-20%	65-82%	50-65%
variety Sugar graze	10-12%	60-70%	50-60%
variety E6518	5-8%	70-86%	-
variety Kowkandy	8%	63%	58%
Other forage crops			
<i>Ipomoea batatas</i> variety Mafuta (Sweet potatoes)	8-10%	-	-

Legumes			
<i>Medicago sativa</i> Lucerne/Alfalfa	22-28%	80-90%	25-30%
variety Al-fac	21%	-	-
variety HL 9 and HL 10	18%	63%	45%
<i>Crotalaria juncea</i> – (Sunn hemp)	19%	-	-
<i>Vicia villosa</i> (Hairy vetch)	17-25%	-	-
<i>Lupinus albus</i>	25-30%	-	-
Rangeland grasses			
<i>Cenchrus ciliaris</i> variety Baringo (Buffel grass/African Foxtail)	10%	50%	85%
<i>Eragrostis superba</i> (Maasai Love grass)	9.2%	50%	80%
<i>Enteropogon macrostachyus</i> (Bush Rye)	13%	60%	40%
<i>Chloris roxburghiana</i> (HorseTail)	15%	60%	79%
<i>Elymus hystrix</i> variety Wollie (Bottle brush grass)	8%	60%	71%
<i>Digitaria eriantha</i> variety Irene (Smutsfinger grass)	8%	60%	71%

SECTION 5: DISTRIBUTION AND MARKETING



Question 5 (a): How do the forage seeds you supply get to the end user?

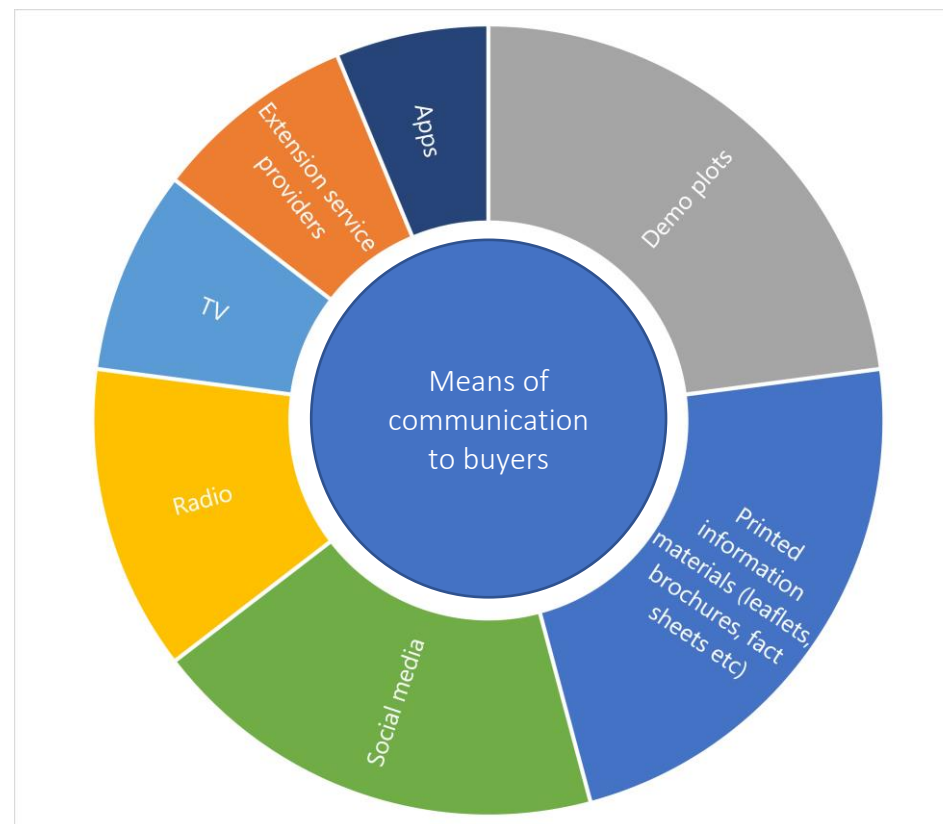


Figure 2: Information dissemination means as used by forage seed suppliers to reach customers

Question 5 (b): Please tick the method(s) you use to disseminate information on your forage seed products to customers

Question 5 (c): What are the most pressing challenges/problems you face when trying to increase your market share for forage seeds in ASALs areas?

- i. Unfavorable climatic conditions such as drought and unpredictable weather patterns.
- ii. Unavailability of water to increase chances of plant survival.
- iii. Land tenure system- most of the land is communally owned, this promotes free grazing.
- iv. Low demand for forage seeds in the pastoralist areas associated with availability of native endemic grasses for farmers grazing their livestock and priority for food crops.
- v. Reaching the pastoralists is a challenge due to vastness of areas.
- vi. Low level of skills and knowledge in production of forages. This is exacerbated by low literacy and language barrier. Little success from demo plots has also been seen owing to poor management resulting from the low level of skills and knowledge.
- vii. Competition from informal seed merchants/slow registration of seeds.
- viii. Insufficient funds to scale up business.

Question 5 (d): What are the most pressing challenges that you face regarding government regulations and policies (both national and county governments) and how they relate to your forage seed business?

- i. Trading related costs. High costs of business permits, taxes such as value added tax (VAT) and levy charges by Counties on forage seeds increase the costs which makes forage seeds expensive to farmers.
- ii. Stringent regulations on introduction of superior varieties of forage seeds affecting the forage sector e.g., Lucerne (Alfalfa).
- iii. Limited government extension staff leading to poor extension services in a number of areas within the pastoralist communities.
- iv. Lack of enforcement of dryland seed regulations and policies as well as breeding programs to ensure quality dryland pasture seeds and sustainable forage management practices. Sometimes regulations on grasses are impractical given the needs of rangelands.
- v. Lack of incentives/funding support for forage systems from the county governments.
- vi. Lack of organized market structures for forage seed systems.

SECTION 6: INVOLVEMENT IN ICSIAPL PROJECT

Question 6 (a): In which ways could the project support forage seed companies to increase their market share and adoption rate of forage seeds by end users (farmers/agro-pastoralists, ranches, conservancies) in the counties of Narok, Kajiado and Taita Taveta?

- i. Establishment of an efficient seed distribution network to enhance market reach by connecting the seed companies to pastoralist communities e.g., by setting up field demos/trials in different areas within the counties.
- ii. Enhance registration of (new) varieties targeting ASAL areas. Dialogues with KEPHIS and national government to strengthen policy and release of the varieties.
- iii. Catalyze the process of registration of private forage seed traders with seed trader's association of Kenya to help do away with informal seed traders.
- iv. Help subsidize seed costs for resource poor agro-pastoralists and farmers.
- v. Capacity build farmers on commercial forage production (establishment, management and utilization/conservation), exchange visits, field days.
- vi. Introduce new technologies and innovation that support forage system such as drones etc.
- vii. Buy seeds from registered seed merchants during setting up demo plots. Ensure that only quality (dryland) seeds are distributed and are in the market.
- viii. Raise awareness at all levels on the importance and necessity of dryland seed regulations to ensure quality at all stages of the value chain.
- ix. Foster stakeholder engagements and networking and advocacy e.g., Inclusion of county governments to support forage value chains.
- x. Support research in forage seeds.
- xi. Participatory forage evaluation of suitable forage varieties for different climatic conditions. E.g., On-station and on-farm evaluation of potential forage varieties for adaptation, biomass production, pests and disease resistance and nutritive values.

Question 6 (b): Do you have any plans to set up demo plots of your forage seeds in any or all of the 3 counties of focus? (Yes/No) If yes, which counties? (Taita Taveta/Kajiado/Narok)

Question 6 (c): ICSIAPL Project plans to set up demo plots in these counties. What type of support would you offer to make this intervention successful and to promote your forages?

Question 6 (e): Do you have any ongoing collaborations with NGO Projects/County Government / Farmer Groups/Cooperatives? (Yes/No) If yes, please state nature of collaboration

See Table 9 for summary of these questions

Table 9: Seed suppliers versus their plans to set up forage seed demo plots in the project's 3 counties of focus

(Type of support to make interventions successful and to promote forages, opportunities that can benefit them and farmers pastoralists, ranches, conservancies, commercial forage producers and support needed to seize them).

Seed supplier	Counties you plan to set up demo plots	Areas of collaboration with ICSIAPL	Existing collaborations
Advantage Crops Limited	Taita Taveta Kajiado Narok	Technical support Product information Training and support during field days	RTI through Kenya Crops Dairy Market Systems Activity Accelerated Value Chain Development Project at ILRI Tropical Forages program of CIAT Meru Dairy Cooperatives Union 2Scale, KIT Royal Tropical Institute
Advanta Seeds International	Taita Taveta Kajiado Narok	Forage seeds Technical support Product information Training and support during field days	Farmer's training - Demo establishment, field days Stocking of forage seeds - Co-operative stock and distribute seeds to members 2Scale, KIT Royal Tropical Institute, Barenbrug, ILRI, Land O'Lakes, KALRO, Crop Nuts, Wakulima and Meru Dairy Union, KCSAP.
Amiran Kenya Limited Company	-	Forage seeds Technical support Product information Training and support during field days	-
CIAT Alliance for Biodiversity	Taita Taveta Kajiado Narok	Forage seeds Technical support/training Field days, farmer exchange visits Product information	2Scale, Meru Union/Advantage Crops, KCSAP Tharaka Nithi, Send a Cow Kenya, NWO project (KIT, Barenbrug, CIAT, Advantage Crops)
East African Seed Company	-	Forage seeds Product information Training and support during field days	-
Hygrotech East Africa	Taita Taveta Kajiado Narok	Forage seeds Technical support	-

		Product information Training and support during field days	
ILRI	-	Technical support Product information	KENAFF - Scaling of Brachiaria grass
Justdiggitt	Kajiado	Technical support Product information Training and support during field days	Amboeli Ecosystem Trust - On farm implementation and support Maasai Wilderness Conservation Trust - On ground implementation and support
KALRO Dairy Research Institute, Naivasha	Taita Taveta Kajiado Narok	Forage seeds Technical support Product information Training and support during field days	NGOs, County governments, Farmer groups, cooperatives
KALRO ARLRI/Kiboko	Taita Taveta Kajiado Narok	Technical support Product information Training and support during field days	Farmer groups - Technical support to the farmers, provision of seeds, market links
Leldet Seeds	Narok	Product information Other - Innovative ideas	KWS and ICRISAT - Forage sorghum on field trials CIAT - Forage seed fields to trial for pigeon pea
Rehabilitation of Arid Environments Ltd / Trust	Taita Taveta Kajiado Narok	Forage seeds Technical support Product information Training and support during field days	NGOs, County Governments, Farmer Groups and Cooperatives
Seedballs Kenya	Kajiado Narok	Forage seeds Technical support Product information Training and support during field days Other - Native seed sourcing	-
Simlaw Seeds	Kajiado	Forage seeds Technical support Product information Training and support during field days	NGOs - Availability of seeds County government of Meru – Demo
U-Farm Holdings Limited	Taita Taveta	Technical support Product information Training and support during field days	-

Question 6 (d): Which opportunities do you see that can benefit you and farmers, pastoralists, ranches, conservancies, commercial forage producers? What support do you need to help you seize them?

Opportunities that can benefit seed producers and end users:

- i. Forage marketing/promotion: Product advertising and wide dissemination of information about (rangeland) forage varieties and associated forage products offered as well as the importance of use and understanding of native forage seed varieties in order to improve demand for both rangeland and improved forages.
- ii. Developing product information (fact sheets, brochures, training materials, etc.).
- iii. Technical support/capacity building farmers on good production and utilization practices for the range of forage varieties presented.
- iv. Establishment of seed distribution network for the target varieties to increase farmers access to seeds.
- v. Registration of new forage varieties targeted for the ASALs.
- vi. Establish sustainable fodder banks thereby enhancing livestock production.
- vii. Linking national planning to local implementation of land utilization focused on community needs.

Nature of support required to seize opportunities:

- i. Enhance market penetration e.g., through structured/organized markets, demo plots, sample forage seeds to farmers, financing, marketing apps, print information etc.
- ii. Market linkage for forages produced by farmers.
- iii. Establish coordinated registration of new forage varieties to the ASALs.
- iv. Linkages to funds e.g., innovation funds - for landscape restoration and other innovations.
- v. Co-financing of investment in forage production, value addition and marketing.
- vi. Capacity building farmers, agro-dealers, national and county governments on forages.
- vii. Supporting research on forages. Marketing of existing academic studies of biodiversity and ecosystem health.
- viii. Introduction and promotion of new technologies and innovations of forage production.

SECTION 7: SUMMARY OF KEY ISSUES AND RECOMMENDATIONS

This chapter provides a general summary of the key issues noted in in this study and recommendations for further action.

(a) Summary of key issues identified by the study

- i. Little demand for improved forage seeds and planting materials among farmers and livestock keepers.
- ii. Limited information on availability of registered, certified forage seeds among farmers.
- iii. Low level of knowledge and skills on forage seed/planting material handling, production, conservation and utilization.
- iv. Limited availability and therefore access to improved forage seeds and planting materials.
- v. Absence of reliable forage quality testing facilities and lack of knowhow on the nutritional qualities (CP, NDF, ME, digestibility, etc.) for ruminant livestock of the forage crops be it fresh or after conservation (hay/silage).
- vi. Lack of elaborate and well structure distribution structure for forage seeds and planting materials.
- vii. Majority of seed companies (8 out of 11) depend on imports as their source of certified forage seeds. This means forage seed varieties that are locally developed and tested have not been exhausted, providing room for more research work and bringing the newly researched technology to the market.
- viii. Improved forage seeds are expensive, limiting adoption rate by farmers.
- ix. Import of forage seeds is surrounded by time and money consuming bureaucratic protocols and stringent restrictions.
- x. The registration process is long and tedious, with protocols not always clear to all stakeholders and high-cost implications attached. The high cost-implications make the registration process un attractive because the forage seed volumes sold are relatively small in Kenya.

(b) Recommendations

The recommendations below are limited to observations within the theme of forage seed market (especially in the southern rangelands) and responses as received from the forage seed suppliers on the questionnaire and interviews.

Policy and regulation

- i. Make the application and registration process open and transparent e.g. by digitalizing the process.
- ii. Inform clients in advance within which period feedback can be expected. (e.g permit will be issued, test reports will be shared, registration process will be finalized).
- iii. Review all protocols and involve experts and stakeholders in the process.
- iv. Share all the relevant operation procedures (SOPs) for NPT, DUS, period of testing during the registration process e.g. “online”.

- v. Keep testing period and cost of testing as short as possible (do different tests parallel) and or subsidize the cost of testing particularly for forage crops seeds, because traded volumes are generally low as compared to food crops.
- vi. Campaign, educate and train farmers about the benefits of registered, certified forage crop seeds (incl. grasses and legumes) in collaboration with relevant Government bodies, the private sector and development partners.
- vii. Incorporate informal forage seed producers (grasses and legumes) gradually into the formal system e.g. allow informal producers to register and perform basic tests on the seeds allowing to track and trace.
- viii. Allow forage crops such as grasses and legumes to be registered for different purposes on the national variety list (e.g. intensive farming, rangeland, landscape restoration, gardening) and adjust the required parameters and set targets as best suitable for the purpose.
- ix. Use recommended and certified laboratories for testing and analyses which can be used by all stakeholders in the forage seed sector.
- x. Parameters to be considered regarding registration of forage crop seeds on the National crop variety list
 - Productivity
 - Fresh yield
 - DM yield
 - Quality aspects
 - Crude protein (CP) content
 - Fibre content (NDF, ADF, ADL)
 - Starch content (e.g. maize silage)
 - Digestibility
 - Palatability
 - Climate Zone
 - Location (Altitude)
 - Soil characteristics and soil fertility
 - Purpose of use (rangeland grazing, intensive forage crop production, landscape rehabilitation)
 - Susceptibility to diseases (disease resistant)
 - Drought resistant (water efficiency)
 - Distinctiveness, Uniformity and Stability

Forage seed suppliers (companies and researchers)

- i. Technical support: offer technical backstopping services to farmers in establishment of forage seeds i.e., land preparation, planting and on good management practices.
- ii. Forage seed distribution: Revise forage seed distribution structure to improve channels for access to forage seeds by farmers.
- iii. Collaborations: expand networks of collaborations (with projects and dairy/beef/forage producer groups) to increase awareness, knowledge and demand for improved forages.

- iv. Lobby groups: need for forage seed suppliers to unite and form a forage seeds association to lobby for favorable policies and related issues in the sector.
- v. Educational campaign to explain the farmers the benefits of registered, certified forage seeds as compared to on-farm produced forage seed multiplication.

County governments

- i. Incentives and resource allocation: recognize the forage sectors as a stand-alone value chain and commit resources in the CIDPs towards its development; as well as incentives through contracts with forage seed companies to supply producers with certified improved forage seeds and agro-inputs for forage crop production and conservation.
- ii. Policy development: forage production in the southern rangelands is seasonal and rainfed. There is therefore the need to develop a forage value chain policy and action plans to support development of the forage value chain in each County.
- iii. Policy enforcement: surveillance and enforcement of the forage value chain policy.
- iv. Business environment: create an enabling environment for seed suppliers in terms of business permits, licensing, levy charges and other trading frameworks.
- v. Research: facilitate research on rangeland forages through collaborations with tertiary learning institutions (e.g., Taita Taveta University, Kajiado Pastoral Training Centre and Maasai Mara University) and research organizations such as KALRO, ILRI, CIAT, ICRISAT etc. to promote suitable (improved) varieties as well as locally developed and tested (improved) forage varieties for extensive grazing and landscape restoration.
- vi. Collaborations: support and create a collaborative working approach with donor funded projects with interventions on forage value chain e.g., ICSIAPL.

ICSIAPL project

Policy interventions

- i. Together with the County governments, the project should facilitate formation of forage producer associations/businesses to encourage specialization (forage producer only; not dairy/beef farmer cum forage producer). This will also promote formal negotiations and contracts between the associations and forage seed suppliers.
- ii. Work with the regulator (KEPHIS) to review standards/policies around regulation of seed registration protocols, timelines and financial implications.
- iii. Review, if existing, “Ranching and Grazing Management Policies” to promote uptake of improved varieties.
- iv. Together with the regulator and representatives of seed companies, the project to facilitate review of measures and restrictions on seed imports regulations.

Forage seeds and production

- i. Promote adoption of improved forage seeds and planting materials of high nutritional value for ruminant livestock to increase feed efficiency of ruminant livestock, through establishment of forage demo plots in strategic and easily accessible locations.

- ii. Capacity building farmers and related stakeholders on benefits of registered forage crops seeds, forage production, preservation and effective extension approaches like farmer field schools, adult and blended learning systems and dissemination of information through local vernacular media stations.
- iii. Facilitate creating formal working contracts between machinery/equipment service providers and farmer groups/cooperatives to ease availability of equipment, which is a key bottleneck in the development of the sector.
- iv. Set up demo farms to demonstrate viability of improved forage production in a holistic manner and enlist local lead farmers (champions) to increase awareness among all farmers.
- v. Promote and support existing and start-up reliable forage testing facilities to create a better knowledge and understanding of the variation in forage quality and nutritional value of forages as well as the effect of production, conservation and storage systems used on the nutritional value for ruminant livestock. This will spur demand for improved forage varieties and seeds/planting materials among livestock farmers and commercial forage producers.
- vi. Reliable forage testing facilities will further allow ruminant livestock keepers and small holder farmers to calculate cost price per unit ME and CP produced on the farm or in the commercial forage market and move towards a forage market where the relation between nutritional value and price is more realistic in a viable ruminant livestock sector.

Youth and women

- i. Facilitate formation of youth owned commercially viable business start-ups i.e., service provider groups and forage crop production support businesses covering sourcing (certified) forage seeds distribution, forage crop production, harvesting, conservation (hay and silage) and storage.
- ii. Undertake training programs for youth and women groups to equip them with requisite skills so as to become trainers and providers of extension services for farmers and forage producers in their localities.
- iii. Together with the County government, review forage value chain policies/plans to integrate youth and women engagement, activities and forage related innovations i.e., youth and women as a special target group.

We also recommend that the project pays attention to issues raised in **Section 6** alongside these recommendations.

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ANNEXES

Annex 1: Questionnaire for Forage Seed Suppliers for Taita Taveta, Kajiado and Narok Counties (Southern Rangelands)

Questionnaire for Forage Seed Suppliers for Taita Taveta, Kajiado and Narok Counties (Southern Rangelands)

Introduction

SNV Kenya/Netherlands Development Organisation (SNV) and Kenya Agriculture and Livestock Research Organisation (KALRO) are implementing the “Integrated & Climate Smart Innovations for Agro-Pastoralist Economies and Landscapes in Kenya’s ASAL” project. The project is branded as ICSIAPL and its lifetime is from 1 January 2021 – 31 December 2023. The project works in the Counties of Narok, Kajiado and Taita Taveta and is funded by the European Union and the Government of the Kingdom of the Netherlands.

In order to achieve its objectives, ICSIAPL Project has commissioned a forage value chain study, to obtain relevant information to guide interventions necessary to address identified constraints and capture opportunities in the forage value chain. Please find below a questionnaire for information gathering from forage seed suppliers in the country. Filling of the questionnaire may take about 30 minutes.

Seed suppliers are defined for the sake of this questionnaire as private seed companies, research institutions, government bodies, parastatals, or any other service provider involved in breeding, selection, registration, distribution and sales for forage seeds or vegetative materials (either/or). Kindly send us the filled questionnaire before 19 May 2021.

Thank you for your cooperation,

ProDairy EA Ltd and Perfometer Agribusiness Ltd for ICSIAPL Project, Nairobi, May 2021

Date of filling the questionnaire (dd/mm/yy): _____

Name/contacts of person filling the questionnaire: _____

Questions

1. Seed Supplier Details

- a) Name of seed supplier: _____
- b) Location _____
- c) Ownership: ☐ Local ☐ International
- d) In how many counties do you operate in Kenya? _____
- e) Tick the county(ies) in which you are represented: ☐ Taita Taveta ☐ Kajiado ☐ Narok

- f) Do you have collaborations/partnerships with international seed companies or research? ☐ Yes ☐ No
If yes, please list the partner(s) _____
- g) What role(s) do you play in the forage seed subsector
☐ Seed selection ☐ Breeding ☐ Multiplication ☐ Seed collection ☐ Importing, repackaging, distribution & marketing ☐ Others (specify) _____
- h) Rank your traded volume(s) of forage seeds for each variety on a scale of 1 to 5 (5 is highest and 1 is lowest)

Forage seed variety	Volume ranking

2. Forage Seeds and Registration

- a) Which forage seed varieties do you sell/have in stock, cost per kilogram, recommended seed rate per acre and estimated/predicted yield per acre for each variety?

Forage seed variety	Cost per kilogram (KES)	Recommended seed rate per acre	Estimated yield per acre

- b) Among the forage seeds you sell, which ones are registered in the Kenya Crop Variety List (August 2020)

Forage seed variety	Registration number/ code	Trade name (traded as)

- c) Do you stock any seeds that are in the actual sense food crops but are widely used by farmers as forage crops (maize, sorghum, beans etc)? ☐ Yes ☐ No
If yes, please list the varieties _____
- d) Do you have any forage seeds that are currently in trials with the National Performance Trials (NPT)? ☐ Yes ☐ No
If yes, please list them _____

- e) What are your key challenges (maximum 5) that you experience in your business as a forage seed supplier with regard to registration of forage seed varieties in Kenya? List and rank the challenges on a scale of 1-5 (5 is most pressing and 1 is least pressing)

No	Challenges	Ranking
1.		
2.		
3.		
4.		
5.		

- f) What suggestions do you have on how to address the above challenges?

Challenge 1 _____
 Challenge 2 _____
 Challenge 3 _____
 Challenge 4 _____
 Challenge 5 _____

- g) According to your expertise, which parameters should be used to test forage crop varieties for registration on the National Crop Variety List? Please list and explain.

- h) Give suggestions on how the registration process can be made more friendly for you.

3. Establishment and Production

- a) List and classify your forage varieties into their recommended Agro-Ecological Zones (AEZ)

Climatic zone	Grasses	Legumes
1. Arid <i>Rainfall (100-400mm)</i>		
2. Semi-Arid <i>Rainfall(400-600mm)</i> <i>Altitude (1,000-1,800m)</i>		
3. Warm, Wet (Sub – humid) Medium Altitude <i>Rainfall (600-1,200mm)</i> <i>Altitude (1,200-1,850m)</i>		

4. Cool, Wet (Sub – humid) Medium Altitude <i>Rainfall (600-1,200mm)</i> <i>Altitude (1,850-2,400m)</i>		
5. Cold, Wet (Moist sub-humid) High Altitude <i>Rainfall (1,200-1,500mm)</i> <i>Altitude (2,400-3,000m)</i>		
6. Humid <i>Rainfall (> 1,500mm)</i>		

b) Do any of your forage crop varieties that require specific soil conditions? ☐ Yes ☐ No
If yes, please list and describe.

Forage crop variety	Specific soil condition required
1.	
2.	
3.	
4.	
5.	

c) Which agronomic practices are important for your forage crops to realize their full potential?

7. Feeding (utilization) of the Forage Crop

a) What is the targeted category of livestock for your forage crops?

Livestock category	Forage crops
1. Beef cattle	
2. Dairy cattle	
3. Dual purpose	
4. Small ruminants (Goat & Sheep)	

b) In which farming system(s) are your forages mostly used?

Forage variety	Farming systems (cut and carry-zero grazing)/ extensive grazing/ can be used in both systems)

c) In which form can your forages be used and fed?

Forage variety	Forms of usage (hay, silage, fresh)

d) Describe the management skills required to feed/utilize the forage crop(s) to increase animal productivity?

Forage variety	Level of management skills required

e) What is the estimated nutritional value for ruminants that can be realised for each forage variety?

Forage seed variety	Parameters			
	Crude protein	Digestibility	Starch content	Fibre (neutral detergent fibre)

8. Distribution and Marketing

a) How do your seeds get to the end user?

b) Please tick the method(s) you use to disseminate information on your forage seed products to customers and rank on a scale of 1 to 5 the most effective.

Method	Tick	Ranking (5 is most effective and 1 is least effective)
Printed information materials (leaflets, brochures, fact sheets etc)		
Extension service providers		
Demo plots		
Radio		
TV		
Social media		
Apps		
Others (List)		

c) What are the 3 most pressing challenges/problems you face when trying to increase your market share for forage seeds in ASALs areas?

d) What are the most pressing challenges (maximum 5) that you face regarding government regulations and policies (both national and county governments) and how they relate to your forage seed business?

9. Involvement in ICSIAPL Project

a) In which ways (maximum 5) could ICSIAPL project support forage seed companies to increase their market share and adoption rate of forage seeds by end users (farmers/agro-pastoralists, ranches, conservancies) in the counties of Narok, Kajiado and Taita Taveta?

- b) Do you have any plans to set up demo plots of your forage seeds in any or all of the 3 counties of focus? ☐ Yes ☐ No

If yes, which counties? ☐ Taita Taveta ☐ Kajiado ☐ Narok

- c) ICSIAPL Project plans to set up demo plots in these counties. What type of support would you offer to make this intervention successful and to promote your forages?

Type of support/involvement	Tick as appropriate
1. Forage seeds	
2. Technical support	
3. Product information (fact sheets, brochures, training materials, etc)	
4. Training and support during field days	
5. Other (specify)	

- d) Which opportunities do you see that can benefit you and farmers, pastoralists, ranches, conservancies, commercial forage producers? What support do you need to help you seize them? Rank (5 is highest and 1 is lowest)

Opportunity	Ranking	Nature of support required

- e) Do you have any ongoing collaborations with NGO Projects/County Government / Farmer Groups/Cooperatives? ☐ Yes ☐ No

If yes, please state nature of collaboration:

Collaboration	Description

****END THANK YOU****