

**Somalia Growth, Enterprise, Employment and Livelihoods (GEEL)  
“Sesame Research, Training & Demonstration Plots in Jowhar and  
Balad, Somalia”**



**CEFA**  
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**SESAME PRODUCTION MANUAL FOR  
SMALL-SCALE FARMERS IN SOMALIA**



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## Introduction

Sesame is an annual herbaceous crop grown for its oil-rich seeds. Sesame has been grown for the last over 2500 years. The crop's ability to grow in adverse conditions such as dry weather and high temperatures has enabled its spread in many parts of the world.

Apart from its leaves and seeds being eaten as food, Sesame crop has many uses. Its seeds contain Sesame Oil which is used for many things including but not limited to; Pharmaceutical industries in the manufacture of cosmetics such as Soap, Skin Creams, etc. It is also used in pyrethrum industry for the manufacture of insecticides and human medicine to manage diarrhea, cough, asthma, ulcers etc.

According to research and studies, Sesame is one of the leading Agriculture enterprises contributing about 300 million Us Dollars (about 5.25% of GDP) to Somalia's income. Most Sesame production is done along river Shabelle and River Juba in the country due to access to water for irrigation. Up to 2012, Somalia was ranked the 12<sup>th</sup> leading Sesame exporting country, that's before the production went low for the last 2 years.

Because of its ability to survive adverse conditions, Sesame Crop can be planted using traditional methods. This has made it easy for many Somalia Farmers to draw value from the crop and to be able to produce it in large scale production systems.

The European Committee for Training and Agriculture, CEFA carried out a trial with 5 Sesame varieties in Kulundi, Jowhar and also had an additional 3 other plots for demonstration planted with the 5 varieties. This was done to test for the performance of the varieties subjected to the same conditions. The activities, funded by USAID through the Growth, Enterprise, and Employment & Livelihoods (GEEL) were conducted with the aim of boosting farmer knowledge on the production practices and the performance of the different sesame variety.

This manual is as a result of the activities conducted by CEFA in Jowhar and Balad Districts with additional information on good production practices that can help boost sesame production if adapted by Sesame farmers.

## Plant Morphology and Growth Characteristics

Sesame plant is erect with a characteristically woody stem. The plant can grow up to 1.5M producing an average of about 55 capsules each containing 15-20 seeds. The deep rooted plant can survive harsh environmental conditions such as water shortage. This, among other characteristics makes this crop popular among the Somali people.

The crop takes 5 to 8 days to germinate after planting. From germination, the plant only shows vegetative growth up to about 40 days from planting where flowering begins. The reproductive (flowering and seed formation phase) takes the next 40 days after the beginning of flowering. Maturity and drying of the seeds then take another 20 days and that marks the end of the crop cycle.

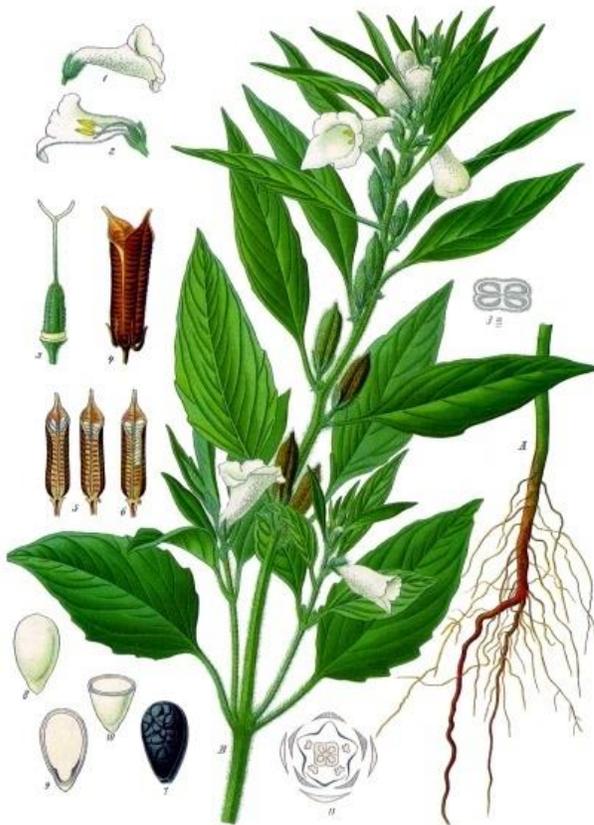


Figure 1 Parts of Sesame plant

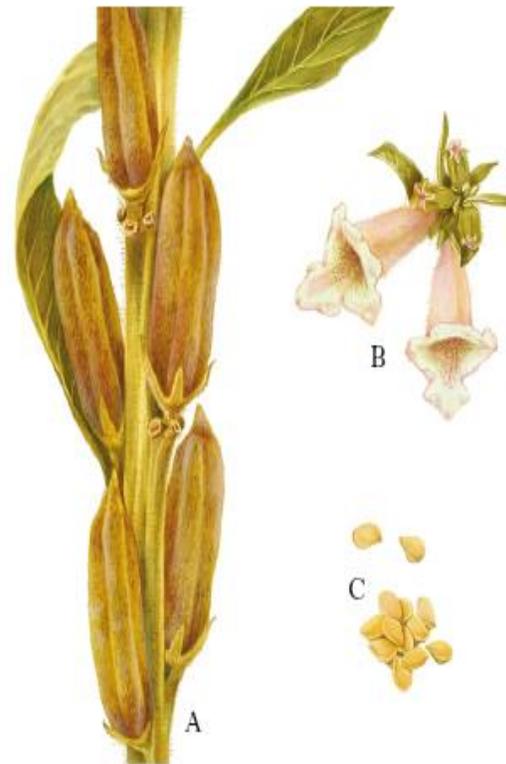


Figure 2 A-Capsules B-Flowers, C-Seeds

### Sesame Varieties

In Somalia there are various varieties of Sesame that are cropped by the farmers for the local and export market. Dunyar is the local variety planted mainly by the small-scale farmers for the local processing of sesame oil. Farmers planting sesame for export mainly crop the Humera variety as it has higher oil content and other characteristics that favor it in the export market.

During the Haagai planting season, CEFA conducted a seed trial with 5 seed varieties. These are listed below as well as some characteristics. This manual is however going to focus on 5 varieties that were tested during the trials. The agronomic practices however cut through all the varieties of Sesame grown.

Variety	Seed Color	Av. Yield per Ha.	Maturity duration (days)	Oil Content (%)
Dunyar	White	300-400 Kgs	75-85 for Deyr crop 90-95 for Gu-Haggai crop	44-48
Humera	White	800-1000 Kgs	100-120	54-56
Setit	White	700-900 Kgs	100-110	52-54
Nigerian	Black	750 Kgs	102-115	About 45
Abasena	Grey	900 Kgs	110-120	44-48

The agronomic practices implemented during the trails and demonstrations conducted by CEFA are described herein.

## Land Preparation

Sesame crops like many other small-seeded crops require a fine tilth for good germination and crop establishment. Land preparation is done in the dry season to allow sunlight to act on weeds and insect pests in the soil before the rains start. Land preparation for Sesame planting involved ploughing by disk plow then harrowing with disk harrow. Ridging, leveling and furrowing were done manually.

### 1. Ploughing

Ploughing is done to first open up soil. Tractor-Mounted disk ploughs are used where a large piece of land is being prepared. Hand-hoes and Oxen driven ploughs can be used when production is done in small scale, less than an acre. It is however advisable to use tractor-mounted disc-ploughs for better results since it digs deeper thus ensuring good route penetration. Ploughing should be done when it's still dry, two weeks before planting to give time for the weeds to die.



Figure 3 Standard disc plough



Figure 4 Land ploughed using a disk plough

### 2. Levelling

Levelling is done manually to ensure that the ridges are well levelled to allow for even germination and to good establishment of the crops. Tractor drawn implements can also be used where large scale production is practiced.



### 3. Harrowing

Harrowing is mainly done using tractor-mounted disc harrows. The purpose of harrowing is to break down the big soil clods and to ensure uniformity in the field. Farm rakes and fork hoes can be used if harrowing is to be done manually, on small scale.



Figure 5 A set of Disc Harrows

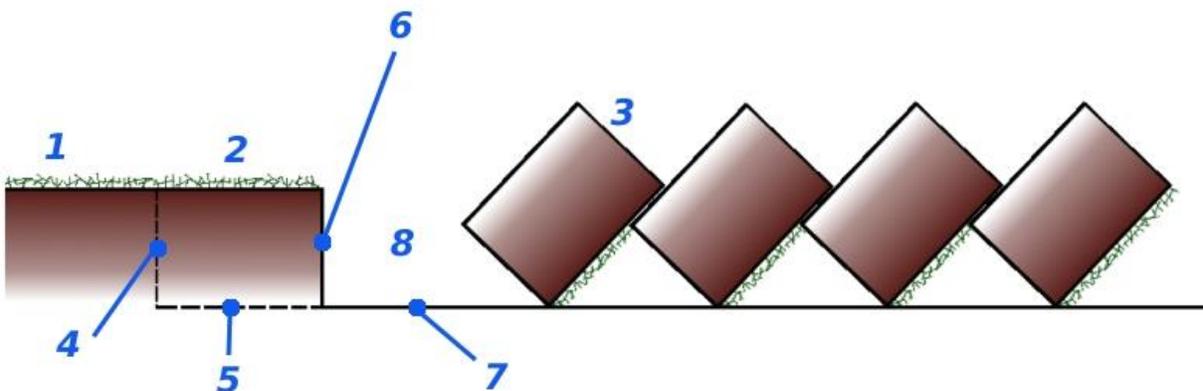


Diagram: 1. Land 2. Slice hard seconded 3. Revolted Slices 4. Vertical cut 5. Horizontal cut 6. Wall 7. Hard pan 8. Furrow

### 4. Ridging

Ridging is done by heaping soil together giving a clear demarcation between the planting zone and the water path for a smooth irrigation. This is done manually before planting is done.

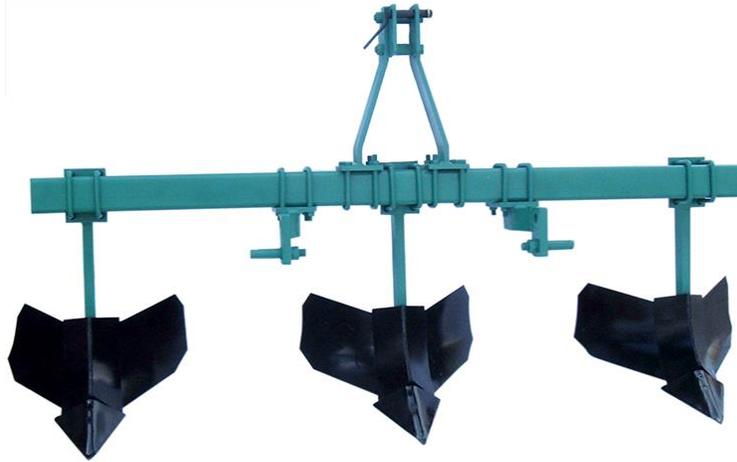


Figure 6 Ridging implement, tractor or animal mounted

### 5. Furrowing

Furrowing is very important to ensure smooth flow of water in the field. This can be done manually or using tractors.



Figure 7 Manual Ridging and leveling being done during land preparation

### Planting

Planting should be done after first rains or before the rains (dry planting). However, in dry weather conditions irrigation should be done to a level of about 7cm of water in the soil to provide adequate moisture required by the seeds for good germination and crop establishment.



Figure 8 planting under drip irrigation system

During seedbed preparation, apply complex fertilizer enough to supply the soil with 100kgs of Nitrogen, 120kgs of Phosphorus and 80kgs of Potassium per hectare.

During planting the seeds are mixed with sea sand to a rate of 1 seed per 3 sand grams, the sand has to be cleaned with running water to get rid of salts that might accumulate in the soils. The seeds are then drilled at spacing of 60 cm by 20 cm to a depth of 3 cm. This however might be determined by other factors such as water moisture content and soil nutrient content.

## Management practices

### Thinning

Thinning is the removal of excess plants in the field to reduce unnecessary competition between the plants. Thinning should be carried out about 2 weeks after planting when the crops are about 15cm tall. This is considered so as to be able to see the plants potential and remove only the weak and slowly growing plants to remain with the robust plants in the field. Thinning should be done to ensure that only 2 plants are left per hill to avoid competition between plants. Weeding can also be done along with this activity. The plants that have been removed should be reserved just in case they are needed for Gaping.

### Gaping

Gaping is the filling in of spaces in the plant rows caused by failure of some seeds to germinate, early pest attack such as White grubs that might destroy some young plants drought, etc. Gaping is very important to ensure that there is uniform distribution of crops in the field and that there is no room for weeds to sprout and dominate in the field.

Gaping process should be preceded with irrigation to ensure that the filled-in crops do not die off but establish quickly and catch-up with the rest of the plants. Gaping should be done to ensure that two plants are left per hill. Weeding can also be done along with this activity

## Crop Protection Practices

### Weeding

Weeding is the removal of unwanted plants in your field. These plants compete with the Sesame crop for water, light, space and nutrients. The first weeding should be done three to four weeks after planting. In this process, all plants that bring about competition to the sesame crop should be removed to ensure that the Sesame crops are growing in healthy and free environment. This is done manually using hand-hoes where the weeds are carefully uprooted to avoid injuring the plant roots.



Figure 9 A farmer weeding at the CEFA Demonstration plots



Figure 10: A Weed free plant

Second weeding is done during the flowering period. This is done to remove all emerging weeds to give the plants a good finishing environment for their full development and maturity. This is done manually by use of hand-hoes. The weeding should be timed for a dry period to ensure that the uprooted plants are not able to regenerate after weeding.

### Pest Management

Like many other food crops, Sesame crop attracts insect and animal pests to feed on it. This pest if not managed may end up destroying many crops in the field thus the need for proper management methods. Integrated pest management methods should be

used to control the pests and farmers are advised to use Systemic pesticides only where cultural and biological methods have failed. Some of the common insects that affect the Sesame plant include: White grubs, Aphids, Spilosoma Spp. (Tiger moth) these insects are described in the pictures below.

### **White grubs**

White grubs are brown-headed a C-shaped insect with three pairs of legs and a slightly enlarged abdomen. Fully grown grubs can measure up to 35 mm in length but range from 20 to 45 mm long. White grubs attack the plant root zone and can lead to a lot of destruction particularly if there is sufficient moisture in the soil to facilitate its activities.



Figure 11 A white grub infestations

White grubs are managed by spraying Malathion, 5% on the affected crop.

### **Aphids**

Aphids are small insect pests that attack the Sesame crop and other broad-leaved crops. Aphids suck plant sap thus denying plants vital nutrients leading to stunted growth in the crop. If not properly managed. Aphids can cause upto 10-15% Yield losses in Sesame. Aphids cause more effect to younger leaves and shoots.



Figure 12 a plant infested by Aphids

Farmers can control aphids with natural remedies we can choose the Neem which can be used successfully to combat these pests naturally, especially to prevent further future attacks.

Use 2 to 4 liters of Neem Oil per hectare, depending on the density of infestation plants and the type of equipment employed. Initially mix 10 liters of warm water and 1 kilogram of a natural emulsifier (example dish soap, soap sulfur), then stir vigorously. Add Neem Oil while continuing to stir vigorously. Add this mixture in 90 liters of water, stir vigorously. The solution can then be applied using knapsack sprayers or tractor driven sprayers for largescale.

### **Web worm**

Web worm attacks sesame plants in their larvae stage. They feed on the plant externally, majorly attacking young leaves and shoots. At a later stage, the larvae now infest the sesame fruit capsule making an entrance hole on the lateral side and feeding on the seeds inside the capsule; they then leave their wastes on the seed:



Figure 13 an adult Web worm. Source, Infonet

### **Cut worm**

Cutworms affect the Sesame crop at young stage. This pest destroys the crop by cutting down the plants at the base. Plants destroyed by Cut Worms are less likely to redevelop and grow again. This therefore leads to a lot of losses hence the importance of routine scouting to identify the pest at its first instance.



Figure 14 Image of a cutworm. Source-Wikipedia

Cutworm can be controlled by spraying Malathion with observation of the first symptoms. Use of Organic pesticides like neem products is however encouraged as it conserves the environment:

### General pest control measures

For insect control systemic insecticides like Malathion 50% EC, Ethiosulfan 35% EC 1-3 times, Karate 0.8% ULV can be applied.

In order to reduce to a minimum, the attacks of insects and maximize the effectiveness of the pesticide treatments it is essential to adopt the rotation of pesticides and also the crop rotation to avoid an increase in the population of insects.

### Sesame Disease management measures

Diseases like Bacterial blight and phyllody which occur in humid and drier areas are serious diseases resulting in huge economic losses while powdery mildew and wilt are sporadic with minor economic impact.

Bacterial blight and bacterial leaf spot of sesame are caused by two pathogens; *Xanthomonas sesami* and *Pseudomonas sesame*, which can cause complete yield failure. Incidence may reach up to 100% where high humidity persists, while 10-50% in semi-arid areas. Water logging encourages the spread of the diseases.

We can control Bacterial blight using tolerant varieties such Abasena or through adopting agricultural practices such as clean seed, stable removal, burning, deep plowing and crop rotation.

Phyllody is most destructive disease of sesame in drier areas. It causes deformation of leaves and flowers. We can control it by avoiding the use of infected seeds, destroying infected plants, and burning them.

Wilt is caused by fungus like *Fusarium oxysporium* and *Fusarium sesame*. The symptoms include; infected terminal leaves turn yellowish, desiccate and droop, progresses

### Fertility Management and Fertilizer application

Like many other crops, Sesame crop requires adequate supply of certain important nutrients that the plant requires for optimal growth and production. This can be done through proper management of available soil nutrients and additional application of nutrient-containing fertilizers. Most commonly used fertilizer includes: Di-ammonium Phosphate (DAP), Urea and Calcium Ammonium Nitrates (CAN).

The first application of fertilizer is done during land preparation or during planting. The application is more useful during land preparation that during planting as it allows the fertilizer to settle deeper in the soil, about 15cm to 20cm to prevent it from being carried away by running water.

### Urea/CAN Application

Urea and CAN are both nitrogenous fertilizers and are applied interchangeably. These fertilizers are mainly applied as top dress which can either be done once or in two different phases. The first top-dress is done when the plant is 3-4 weeks after planting and the second application is done during the start of flowering. Urea fertilizer is prone

to leaching easily when applied. This therefore makes it advisable to apply the fertilizer when the crop has well established roots to prevent losses caused by high leaching of the fertilizer. Soil Nutrient management methods

In any production, it's important to manage properly, soil nutrients for efficient production and more sustainable land use. The following methods can be used to effectively manage soil nutrients in sesame fields.

### Application of organic manure

Addition of organic manure in the soil during land preparation is a good practice that ensures that the soil retains its fertility and its good qualities. Manure from animal sheds, properly composted green manure can add a lot of nutrients to the soil hence useful when applied. This practice would definitely increase the land productivity with time.

### Incorporating plant material in soil during land preparation

When carrying out land preparation, plant materials from the previous crop and dead weeds can be incorporated in the soil. However, if the previous crop was infested by diseases, it's better not to use as it will lead to emergence of the disease in the new crop being established.

### Harvesting

Sesame varieties mature after different durations from planting. This should be considered when planning for harvesting as it helps to guide the farmer on the time that the crop will be ready for harvesting. One should therefore do proper timing for harvesting to prevent seed loss and to ensure that the produce harvested is of good quality.

Sesame is harvested between 75 to 105 days after sowing. Proper inspection should be done to check for maturity signs to prevent premature harvesting which might cause low quality produce.

When the lowest pods are ripe and about to open, the harvesters uproot the plants, tie branches in small stooks, and place them upright in one area of the field. As most sesame plants mature unevenly, this process is repeated several times until the entire field is stoked. Stook sizes vary from 0.75–1.5 m in diameter. The crop is then undisturbed for approximately 15 days, to ripen fully.



Figure 15 Bundling of the sesame plants in stock after harvesting

During the initial dry-down stage the capsule tips open just enough to let moisture escape the capsule and seed to dry. There may be some light seed loss from the tips of the capsules; however, the bulk of sesame's weight is further down in the capsule. This stage ends when 10% of the plants have a dry capsule.

The late dry-down stage is the final stage. The stage ends when the seed has 6-8% moisture and can be harvested. An indication that sesame has reached 6-8% moisture is when the plants are brittle, and capsules easily snap off.

The seed is then cleaned, winnowed and sieved, and dried to a moisture content of about 6-8%. Threshing is carried out to remove the seeds from their pods. Winnowing is later done to remove unwanted material from the seeds by wind. The following guidelines are important to ensure that the seeds are not lost and that their quality is maintained.

- Thresh near the *hillas* on canvas, plastic sheet of enough size; free from soil, gravel, dust, chemical and other inert materials



Figure 16 Threshing of the harvested crop

- Do not carry dry plants long distance as this causes significant seed losses
- Use drying plot as threshing site or thresh next to the *hilla*. If not possible, take the plastic sheet to *hillas* ready for threshing
- Repeatedly winnow the seeds until 98-99% cleanliness is obtained
- Avoid contamination with soil, gravel stone or other inert materials
- Fill sesame in clean bags avoiding over filling in order to facilitate manual movement of the bags, is recommended to use bags from 25 up to 50 kilos. The bags of 100 kilos are difficult to handle, easy to break and if you perhaps notice any cases of black mold, the damage would be more contained if we use small bags
- Sesame may be stored at room temperature < 20°C for not more than 5 years without loss of viability if the seed has been suitably dried up to a humidity not exceeding 6-7%

- Do not store under very hot temperature as it affects seed viability
- Store sesame in clean well ventilated concrete floored rooms

It is essential to schedule sesame planting for harvest in the dry season, between January and March. Any rainfall during harvesting can cause considerable losses.



Figure 17 A mature capsule cut open to present seed arrangement

### Trial and demonstration plots results

Sesame seed variety trials were conducted in various demonstration plots in Jowhar and Balad. The variables of interest were as follows:

- the seed colours
- days to maturity
- plant height at the time of harvesting
- number of capsules per plant
- 1000 seed weight in grams
- yield per plot
- estimated yield in kgs per hectare

The detailed results per plot are as shown in the tables below:

Table 1: Balad demonstration plot results

No.	Variety	Color	Maturity (days)	Plant height (cm)	No. de capsules per plant	1000 seed weight grams	Yield per plot (kg)	Yield kg/ha
1	Dunyar	White	79	85.9	45	3.1	18	206
2	Humera-1	White	79	82.6	39	2.9	26	297
3	Setit-1	Cream	87	89.9	51	2.9	14	160
4	Nigeria	Cream	87	91.9	83	3.1	24	274
5	Abasena	White	92	103.5	49	2.7	11.2	128

**Table 2: Kalundi Trial Plot results**

No.	Variety	Color	Maturity	Plant height (cm)	No. de capsules per plant	1000 seed weight grams	Yield per plot (kg)	Yield kg/ha
1	Dunyar	White	80	95.5	75	3.0	18	450
2	Humera-1	White	79	80.8	64	2.9	14	350
3	Setit-1	Cream	79	82.8	66	2.8	12	300
4	Nigeria	Cream	81	81.9	47	2.8	9.5	238
5	Abasena	White	93	107.7	70	2.7	16	400

**Table 3: Kalundi demonstration Plot results**

No.	Variety	Color	Maturity (days)	Plant height (cm)	No. de capsules per plant	1000 seed weight grams	Yield per plot (kg)	Yield kg/ha
1	Dunyar	White	75	100.1	75	3	38	475
2	Humera-1	White	81	93.9	67	2.9	32	400
3	Setit-1	Cream	80	96.4	65	2.8	32	400
4	Nigeria	Cream	78	75.9	46	2.8	16	200
5	Abasena	White	92.75	98	56	2.7	25.5	319

**Table 4: Jowhar demonstration plot results**

No.	Variety	Color	Maturity	Plant height (cm)	No. de capsules per plant	1000 seed weight grams	Yield per plot (kg)	Yield kg/ha
1	Dunyar	White	78	89.8	70	3.0	39.5	449
2	Humera-1	White	84	96.5	68	2.9	25.5	286
3	Setit-1	Cream	82	95.5	60	2.8	27	307
4	Nigeria	Cream	82	88.8	45	2.8	25	284
5	Abasena	White	96	94.4	52	2.7	20	227

From the above results, the performance of the crop under drip irrigation was not as good as the crop under the conventional channel irrigation approach commonly used by many farmers in the area. There is a variation in the performance of the different sesame varieties in the different plots.

Generally, Dunyar variety being the local variety performed well especially in the Kalundi and Jowhar demonstration plots. As expected Dunyar showed early signs of positive growth, resistance to local adverse conditions; however, the Humera-1 variety has recorded better yields per plot / Ha amongst the five varieties followed by the Nigerian variety.

The local Somali variety Dunyar has shown early flowering, agreement with local environmental conditions but has trailed in terms of maturity and yield /plot. Humera also gave good results particularly in the different plots. The yields received from Humera support the idea of encouraging farmers to change from cropping the local Dunyar variety to Humera. This is mainly because it is the favored variety in the international market as the oil content in this seed variety averages 55% compared to 45% found in the Dunyar variety.