german cooperation
DEUTSCHE ZUSAMMENARBEIT

Implemented by: giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

ግብርና ሚኒስቴር
MINISTRY OF AGRICULTURE

Guide on Lowland Contextualized Crop Options

Introduction

As the options for agriculture increase in the lowlands with the development of water spreading weirs, dry stone measures and other water retention systems, the opportunities for a broader range of crops increases. Dryland crops need to be resistant to droughts and high temperatures and make effective use of the stored soil moisture.

Several type of pulses fit well in these demanding conditions. Pulses have several other advantages:

- They are a prime source of protein
- They add to the fertility of the soil
- They can be dried and hence easily stored and transported.

Here we introduce three types of pulses that can be grown in the Ethiopia lowlands.

Table of contents

Mung Bean

Characteristics

- Mung bean has a high protein content and provides high quality nutrition to consumers
- Because of the high protein content crop residues can be used as a fodder
- Mung bean adds nitrogen to the soil and improves soil fertility
- It also improves soil quality by fixating nitrogen
- Soil fertility is improved also when mixing mung beans with other
- It can be dried and stored and sold over long distances

Land preparation

- Mung beans grow on different types of soil. It is suitable for them to have a high soil moisture content but the soil should not be too swampy or saline.
- The maximal slope of the land should be 5%.
- It is advised to plough the soil two to three times before sowing.
- Various methods that can prevent that too much moisture devare tie-ridging or raising the edges of the field.

Water management

- Mungbean is suitable for annual rainfall of 250-650 mm.
- It can withstand a shortage of rain until flowering, but it needs ample water from the time of budding to the time of harvest.

Varieties

Name	Year released	Total growing days	Productivity		Growing height a.s.l.[1]	Annual Rainfall (mm/ year)
			Research field (quintal/ hectare)	Farmer field (quintal/ hectare)		
NVL-1	2014	60-70	7.5-15	-	450-1670	350-750
Arkebe	2013	60-68	20-24	13-17	560-760	400-650
Rasa (N-26)	2011	65-80	8-15	5-10	900-1670	350-550
Bordi (MH-97-6)	2008	60	16-20	-	1100-1750	>500

Seed management

- Mung bean can be sown in late February to mid-March, as spring rains begin to fall.
- It also can be sown in early July, when it rains
- In irrigated areas mung bean can be sown from the beginning of January/February to the end of the frost season
- Best is to sow the seeds in a row, with 25 cm between rows and 5 cm between plants.

[1] Above Sea Level (m)

- In winter, when the humidity increases, leave 30 to 40 cm between rows and 5 cm between plants.
- It is preferable to plant two seeds in a hole. Remove the weak one plant after a while and remove the weeds.
- Use 25 to 40 kg per hectare, but double it when two seeds per hole are sown.
- Place the seeds 2.5 to 4 cm deep.

Crop planning

- Mung bean is often produced alone, without mixing with other crops. It can be intercropped with sorghum and maize. Enough distance between the crops is vital so that the mung bean is exposed to sufficient sunlight.
- Best is to do one line mung bean, and one line of the other crop or two lines mung bean and one line of the other crop.

Use of artificial fertilizer

- Use of artificial fertilizer is not encouraged, as the crop is nitrogen fixing by nature.

Use of natural fertilizer

- Natural fertilizers such as animal manure and compost improve the moisture retention capacity of the should. It should be mixed well with the soil.
- 25 quintals (equals 2500 kg) of compost is recommended.
- The amount of manure to be applied has to be decided taking into account the current soil fertility and the deposited sediments. Sediments in flood-based systems also carry nutrients.

Crop protection

- Weed control:
    - Repeated ploughing of the field
    - Select a biological and mechanical measure to control the weeds, such as:
        - Weeding.
        - Proper field cleaning prior to planting
        - Selecting weed resistant species
- Pest control:
    - Select biological and mechanical pest control measures such as:
        - Intercropping with cereals
        - For birds, use means to create noise and scare them away
        - For birds, install a stick with a cloth or plastic which moves with the wind
- Disease control:
    - Seasonal sowing
    - Proper field cleaning
    - Using clean seed
    - Controlling pests
    - Using disease-resistant species

Harvest and post-harvest practice

- To decide if the crop can be harvested, check whether the bud is dried well, open it and check if the seeds are dry.
- Store the harvest it in a well-ventilated area that is dry and clean.
- The harvested pulses should be dried before packing and entering the storage.

Figure 1:Mung bean

Pigeon Pea

Characteristics

- Pigeon pea is a rich crop containing several nutrients for nutrition
- Pigeon pea is very useful animal feed and can be a reliable source of fodder during the dry season.
- Pigeon pea contributes to soil conservation because it takes fixes nitrogen into the soil.
- It is useful for fencing and wind protection in residential areas.
- As it can be dried, it can be kept and sold – even over far distance.

Land preparation

- The land should not be very sandy. Ideally it has a maximum slope of 5%. The land should not have excessive water in the soil.
- The land should be ploughed two or three times before sowing
- Various methods that conserve basic moisture are advisable: tie-ridges, raised edges in the field.

Water management

- Annual rainfall of 400 to 1000 mm is suitable for crop growth. The root of the crop is deep which is useful to take deep soil moisture.

Varieties

Name	Year released	Total growing days	Productivity		Growing height a.s.l.[2]	Annual rainfall (mm)	Seed size
			Race product (quintal/ hectare)	Fodder product (quintal/ hectare)			
Gaga	2017	150	74.5	145.4	1000-2000	500-1200	4-4.8
Enter	2017	160	26.98	60.2	1000-2000	800-1200	4-4.8
Arrive / ICEA / P877091	2009	120-150	10-15		1000-1650	350-750	4-6
Respect	2014	116	48	115	967-1200	600-800	3-4
Tsigab	2014	104	53	123	590-1000	400-650	3-4

Seed management

- Pigeon pea needs enough moisture to grow. Therefore, the optimal sowing time is between early June to mid-June.
- The root system will then be able to withstand the drought after the rainy period.
- For short-lives pigeon varieties, sow two seeds in the same hole between 20 and 60 cm.

[2] Above Sea Level (m)

- Once the sprouts are fully grown, leave the stems and remove the weeds.
- One needs 45 to 50 kg seeds per hectare. If two seeds are sown in one hole, one should double the seeds.

Crop planning

- Pigeon pea can be intercropped with sorghum and maize.
- Pigeon pea helps to develop soil fertility and breaks the pest during the dry season.

Use of artificial fertilizer

- Use of artificial fertilizer is not encouraged, as the crop is nitrogen fixing by nature.

Use of natural fertilizer

- Natural fertilizers such as animal manure and compost improve the soil moisture retention capacity. Such natural fertilizers should be mixed well with the soil.
- The amount of manure to be applied has to be decided, taking into account the current soil fertility, as well as the deposited sediments. Sediments in flood-based systems also carry nutrients.

Crop protection

- Pest control:
    - Adjust the seed season based on the pest cycle
    - Reduce pest damage by intercropping with cereals
    - Select biological and mechanical pest control measures such as:
        - For birds, use means to create noise and scare them away or install a stick with a cloth or plastic which moves with the wind

Harvest and post-harvest practice

- When the pods are ready to be harvested, their skin turns brown and dries completely.
- Check how dry the pigeon peas are by opening their pods and bite into the bean.
- Pigeon seeds should be stored well to prevent spoilage. Store it in clean and use dry sacks, even hermetic bags.
- Avoid rats and mouses near and around the storage place, to minimize post-harvest losses.

Figure 2: Pigeon pea

Cowpea

Characteristics

- Cowpea is important animal feed: the fodder is a reliable feed during drought.
- Cowpea fixates nitrogen and adds it to the soil.
- Soil fertility increases significant if the branches and leaves of the cowpeas are left on the land and are decomposed on the soil.
- Cowpea can withstand high temperatures: it grows up to 35°C but optimal temperature is between 30°C and 35°C.
- Cowpea grows in areas with 400-700 mm annual rainfall, up to 1500 mm rainfall.

Land preparation

- Land is prepared by deep ploughing before the seeds are sown
- Various methods can be used that enhance soil moisture, such as tie-ridges and higher the edges of the field.

Varieties

Name	Year released	Colour	Productivity		Growing height a.s.l.[3]	Annual rainfall (mm)
			Research field	Farmer's field		
Jargada	2020	Cream	20-30	18-25	600-1600	450-850
Giraffe	2020	Red	19-32	17-27	600-2600	450-850
Kanketi (IT99K-1122)	2012	Red	22-32	17-21	1000-1850	350-1100
(82D-889)	2008	Pink	26	20	1300-1650	350-750
Bola (85D-3517-2)	2006	Red/white	19	17	350-1850	350-1100
IT 98K-131-2	2006	Cream	17.9	14	1100-1750	500
Tithing (IT 92KD-3)	2001	Cream	22-22.5	16.6	1450-1850	660-1025
First (838 689 4	2001	Reddish brown	19-21	19.6	1450-1850	660-1025

Seed management

- Cowpea grows in low-lying areas with low rainfall.
- Best time to sow is in late June to early July.
- 60 to 70 kg seeds per hectare is recommended
- It is recommended to sow 60 cm between crops and 20 cm between rows.

[3] Above Sea Level (m)

Crop planning

- Cowpeas can be intercropped with sorghum and maize
- Strip cropping can be done, with two lines of sorghum and four rows of legumes/ cowpea.

Use of artificial fertilizer

- Use of artificial fertilizer is not encouraged.

Use of natural fertilizer

- Animal manure and compost improve the soil moisture and the water retention capacity.
- It is important to mix the animal manure very well with the soil and not scatter it under the stem.

Crop protection

- Weed control can be done by:
    - cleaning the field before farming,
    - repeated ploughing of the field,
    - use of crop drying.
    - weed removal: first weeding should be done within 2-3 weeks after sowing. Second weeding is done 25-35 days before flowering.
- Seeds should be properly covered with soil and adequate oil moisture should be assured.
- Pest control:
    - Adjust the seed season based on the pest cycle
    - It is possible to reduce the damage by intercropping with cereals
    - Select biological and mechanical pest control measures such as:
        - For birds, use means to create noise and scare them away
        - Install a stick with a cloth or plastic which moves with the wind
- Disease control:
    - Carrying out crop rotation
    - Removal of infected crops as well as host crops
    - Proper cleaning of the field and crop drying

Harvest and post-harvest practice

- If the leaves are used for vegetables, the leaves can be softened.
- If the pods are to be used as fodder, they must be harvested before drying out.
- Cowpea is mostly used as a cereal: 85-90% of pods should be collected when their skin turns yellow and is dried completely. Open some pods during harvesting to check if they are dry.
- Dry the harvested product well before crushing it.
- Seeds should be stored in a clean and dry place.
- Proper drying reduces the chances of seed rot.
- The seeds stored in a sack should be placed free from the wall and ground, and preferably be placed in a rack.

Figure 3: Cowpea

Published by	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH Registered offices Bonn and Eschborn, Germany Afar Soil Rehabilitation Project (ASRP) GIZ Office P.O. Box 100009, Addis Ababa Phone +251 11 6629 983 / +251 11 5540 764 giz-aethiopien@giz.de www.giz.de
As at	January 2022
Printed by	
Design	MetaMeta, The Netherlands (www.metameta.nl)
Photo credits	GIZ/SDR-ASAL
Text	MetaMeta, The Netherlands (www.metameta.nl)
On behalf of	Federal Ministry for Economic Cooperation and Development (BMZ)
In cooperation with	Ethiopian Ministry of Agriculture (MoA)

GIZ is responsible for the content of this publication