Ministry of Agriculture

Legumes: Beans and Cowpeas
Production Reference Book

Published by
giz

EAT HEALTHY
EAT DIVERSE
EAT DIFFERENT
FOOD GROUPS

Beans & Cowpeas Producer Reference Book

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On behalf of the
Federal Ministry for Economic Cooperation and Development (BMZ)
Germany

About this Book

This book is part of the Food and Nutrition Security, Enhanced Resilience Project (FANSER). FANSER has been initiated by the German Federal Ministry of Economic Cooperation and Development (BMZ) as part of the German Special Initiative ONE WORLD – No Hunger, which aims to address the challenge of hunger and malnutrition. GIZ has been commissioned to implement the global programme.

In Zambia, the FANSER Project is aiming to improve the nutritional situation for women of reproductive age and young children in the following three fields of intervention:

1. Strengthening of planning and coordinating capacities on district level;
2. Diversification of dietary intake and nutrition sensitive agriculture and hygiene practices;
3. Continuation and replication of model experiences.

FANSER reaches out to 72.000 women of reproductive age (15-49) and 52.000 children under the age of 2 years in Eastern and Luapula Provinces.

This book aims to improve the capability at household level to grow legume crops and allow families to eat healthy and diverse under consideration of the different food groups.

We hope, this book will help small scale farmers with low income to grow beans and cowpeas.

List of Abbreviations

BMZ	German Federal Ministry for Economic Cooperation
FANSER	Food and Nutrition Security, Enhanced Resilience Project
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
MoA	Ministry of Agriculture
NFNC `	National Food and Nutrition Commission
ZARI	Zambia Agriculture Research Institute
SEWOH	Special Initiative ONE WORLD - No Hunger

Table of Content

1. Introduction

Hello!

My name is Dalitso Zulu. This is my wife Enelesi and these are our three children Musa, Mizozi and Zelipa. We live in Eastern Province (Zambia) and produce beans and cowpeas in addition to maize. Beans and cowpeas are high value cash crops and also good food to support the nutrition needs of our family by providing proteins to our diet. They also help in maintaining soil fertility when practicing crop rotation with other crops.

We started growing beans and cowpeas some years ago and have continued since then. Our children enjoy the diverse nutritious diet and some of our friends have already adopted our methods.

In this book, I will share with you how to conserve the soil, plant, manage, harvest and preserve beans and cowpeas. It is my hope that you will learn more from this reference user book and start growing beans and cowpeas by yourself.

To grow crops and vegetables, all starts with the soil ...

2. Living Soil for a Good Harvest

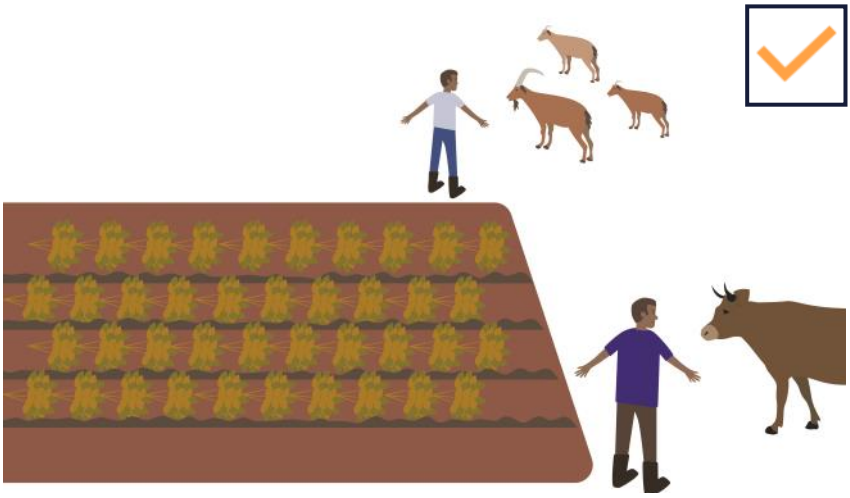
Benefits of Living Soil

- INCREASED HARVEST.
- BETTER PROTECTION AGAINST DRY SPELLS.
- LESS CHEMICAL FERTILIZER INPUTS. ⇒ SAVES MONEY.
- LESS PESTS AND DISEASES.

- Organic Material
- Micro-organism
- Minerals
- Living Organism

2.1 How we Support our Living Soil

We started to increase organic materials in the soil by leaving dead plant matter in the field and applying compost manure.



We keep animals away and do not let them graze on our plot. Animals eat the organic material on our field. That makes the plot less productive.

We cover the riplines/basins with crop residues or other organic material like cut grasses or leaves from nearby by trees. This improves soil fertility, reduces soil erosion and improves moisture retention on the field.

Why we cover our soil

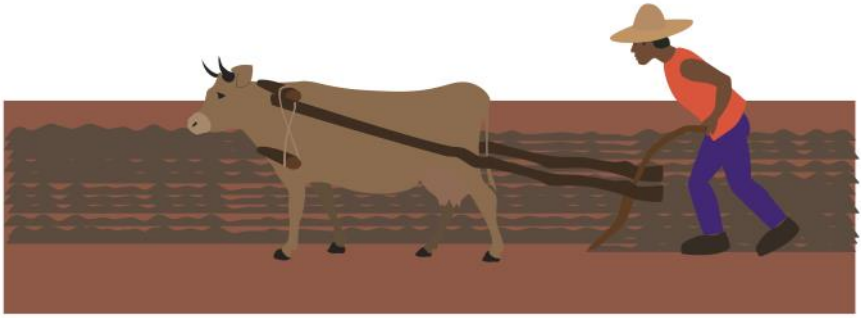
REDUCES TEMPERATURES TO SUPPORT POPULATIONS OF MICROORGANISMS. THEY CANNOT SURVIVE WHEN IT IS TOO HOT.

ALLOWS THE RAIN WATER TO ENTER THE SOIL WITHOUT DAMAGING THE SURFACE THEREBY SUPPORTING PLANT GROWTH.

REDUCES WEEDS AND HELP TO REBUILD SOILS FERTILITY. WEEDS COMPETE WITH CROPS FOR REQUIRED SOIL NUTRIENTS.

2.2 Things we Should Avoid to Protect our Soils

We do not burn crop residues because they are a perfect protection against wind, heat and erosion.



We avoid ploughing the land, because it exposes the soil to too much heat, wind and erosion that can carry soil nutrients away, and kill the living organisms in the soils.

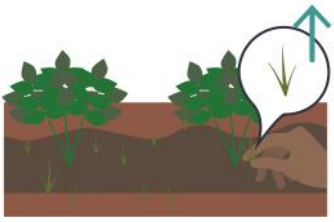
We do not use much inorganic chemicals, including fertilizer on our field. But we apply organic matter such as compost and manure in our field.

Why we avoid chemical fertilizer

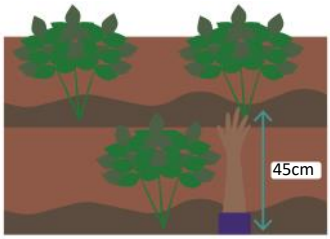
- **SOME CHEMICALS DESTROY THE POWER OF OUR SOIL TO SUPPORT CROPS.**
- **CHEMICAL FERTILIZERS ARE EXPENSIVE. THE MONEY WE SPEND ON THEM COULD BE UTILIZED FOR SOMETHING ELSE.**
- **EXCESSIVE USE OF CHEMICAL FERTILIZER CAN KILL LIVING MICRO-ORGANISMS THAT OUR SOIL NEEDS TO SUPPORT CROPS.**

2.3 Tips for High Yields

- [x] We keep our fields free of weeds. Weeds extract valuable minerals from the soil and affect plant growth.



- [x] We plant in rows 45 cm apart to reduce weeds and leave enough space for plant growth.



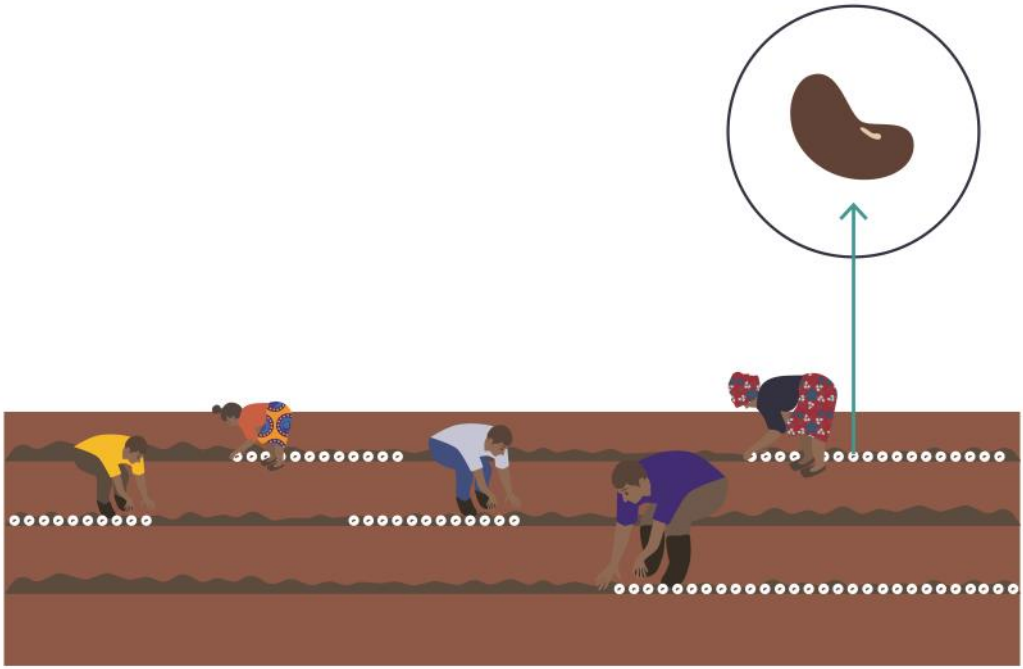
- [x] We plant our crops according to the planting calendar.

Jan	Feb	Mar	Apr
★	★		

- [x] We plant our crops using hybrid seeds. Each planting season we buy new seeds.

- [x] We practice crop rotation on our fields to allow the soil to recover. Different plants use different nutrients from the soil.

3. Bean Production



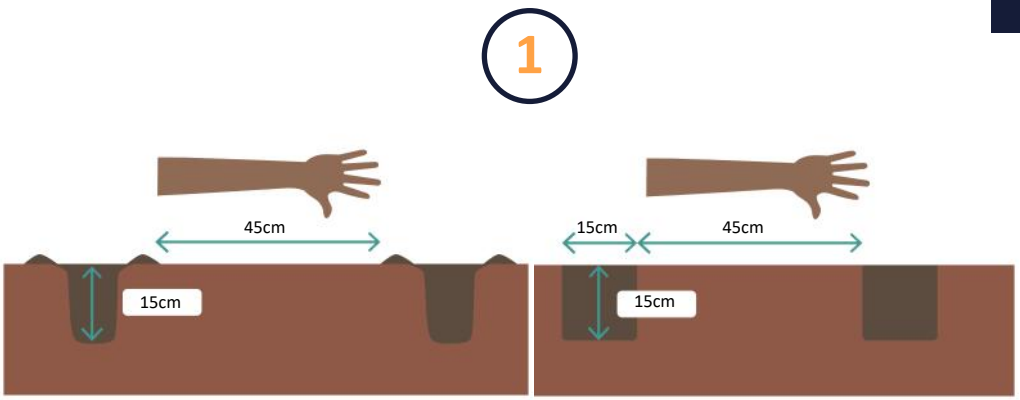
We have been planting beans for several years now and have achieved many benefits for our family:

- **Beans are nutritious. They are an important source of cheaper protein for better nutrition.**
- **Beans can also be rotated with other crops to support living soil.**
- **Beans assist to add nitrogen into the soil so helping to improve soil fertility.**
- **Beans can be sold adding cash to our household.**

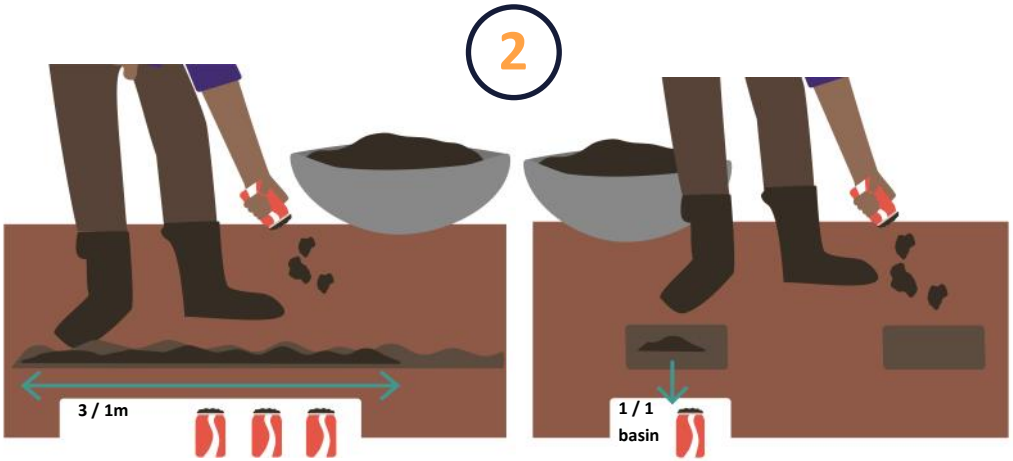
3.1 How we Prepare the Land

To prepare our land for the planting period we start working on the field in October, November and December.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
									★	★	★

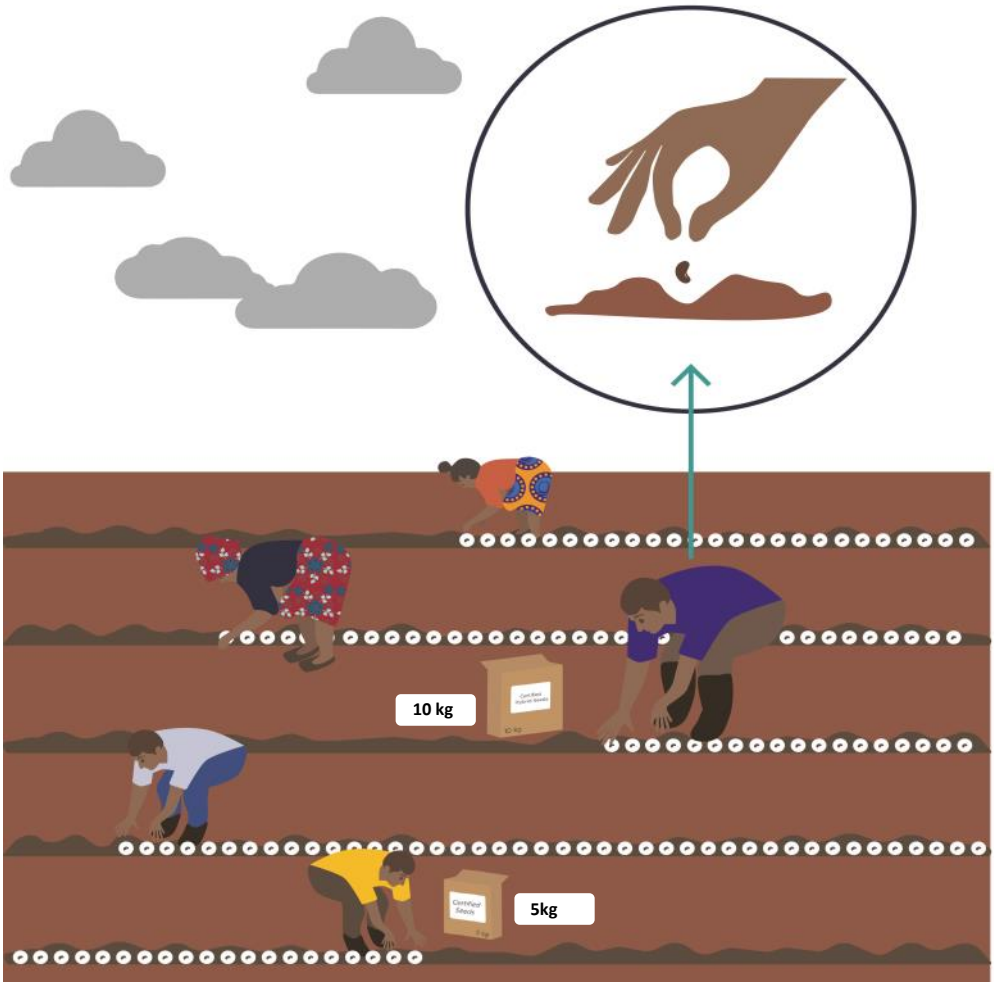


After clearing weeds from the field, we dig riplines or basins. Riplines should be 15cm deep, basins are 30cm long, 15cm deep and 15cm wide. Between the rows we leave 45cm space.



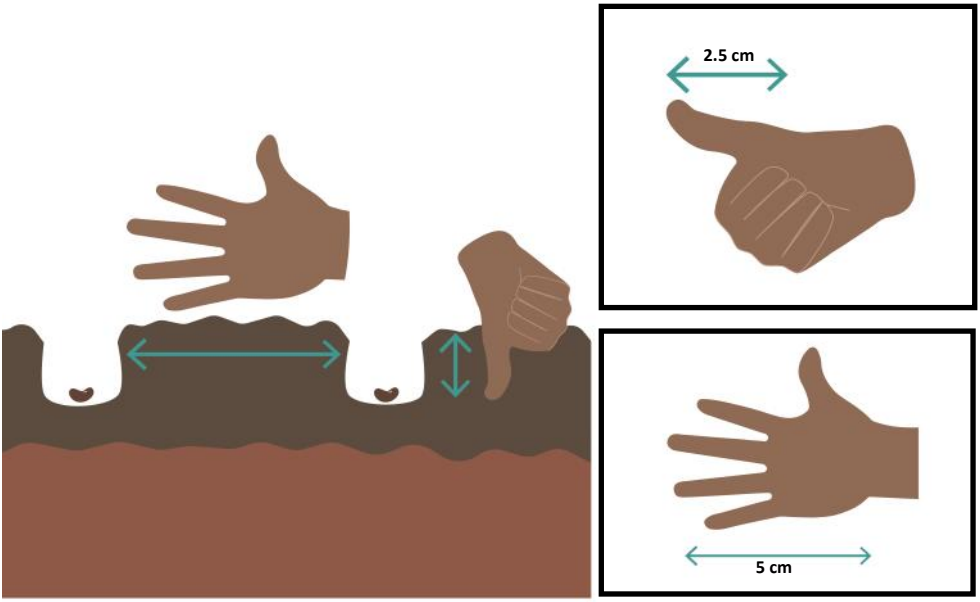
We then apply compost or dry manure to the riplines or basins. Use one full drinking tin (one double handful) per basin or 3 tins (two double handful) per meter in riplines.

3.2 How we Plant the Beans



After preparing the land, we plant the beans immediately after the first effective rains in January or February. We normally use 15 kg of seeds for one lima.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
★	★										

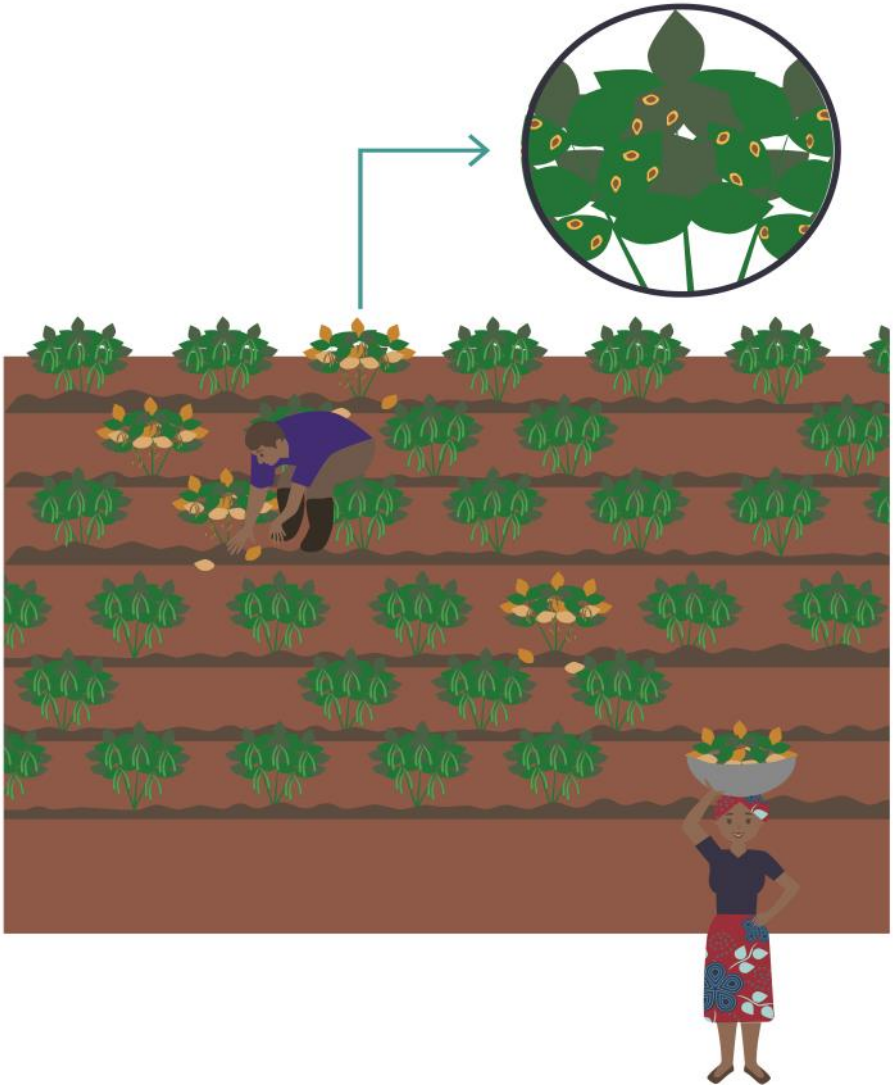


We plant 1 seed per station in the ripline or six seeds per basin. The seeds are spaced 5cm apart and planted 2,5cm deep.

What is the perfect planting date?

- **BEANS ARE BEST PLANTED BY THE FIRST WEEK OF JANUARY/FEBRUARY FINISHING ONE FIELD IN LESS THAN ONE WEEK.**
- **IN GENERAL, THE PLANTING DATE SHOULD BE ADJUSTED TO ALLOW THE HARVEST TO TAKE PLACE AFTER THE MAIN RAINS HAVE PASSED.**
- **DRY SEASON PLANTING CAN BE DONE IN LATE JULY TO EARLY AUGUST IN DAMBOS OR UNDER IRRIGATION.**

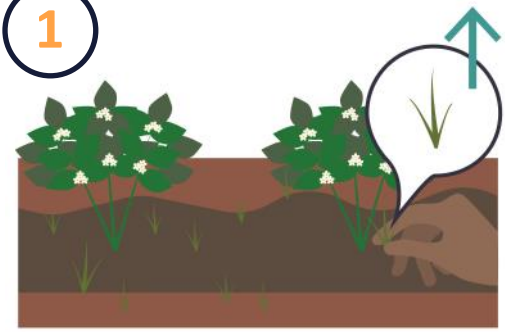
3.3 How we Manage Pests and Weeds



During the whole time while our beans were growing, we observed the fields to ensure our crops are healthy. We removed diseased plants as soon as possible.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
★	★	★									

1



Handy weeding should be done during flowering stages to avoid dropping of flower buds. Weed control reduces competition for nutrients, water and sunlight.

After Planting	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
1st Weeding	★	★				
2nd Weeding				★	★	

2

Diseased plants need to be removed with their roots immediately. We bury them away from the fields. If we keep them close to our fields or garden they might infect healthy plants even when buried. How to manage diseased plants:
See ANNEX 1.

After Planting	Week 1	Week 2	Week 3	Week 4	Week 5	Week 5	Week 6	Week 7	Week 8	Week 9
Check		★	★	★	★	★	★	★	★	★

3.4 What we do After the Harvest

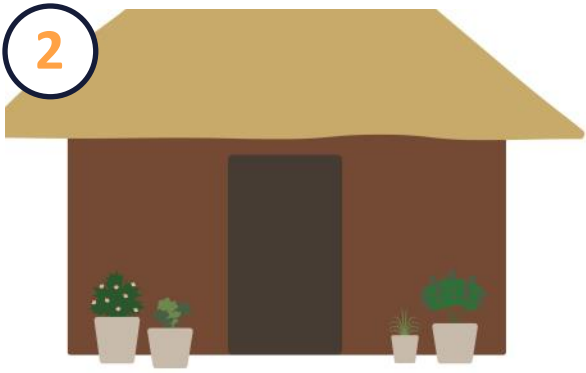
We start harvesting the beans when the pods are fully mature (when pods turn brown and leaves drop off). Sometimes a second harvest is necessary to ensure we get the beans when they are fully ripe. We do not uproot the plants, because the roots decompose and add valuable nitrogen to the soil which is good for soil.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			★	★	★						

1

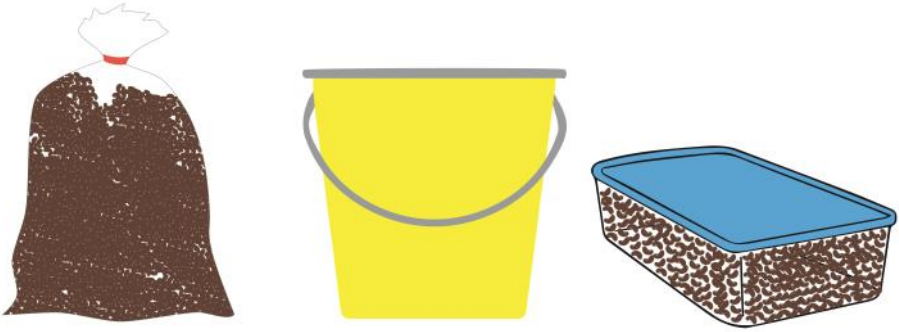
After the harvest, we thresh pods using a stick. We clean the beans and separate them from chuffs through winnowing. To sort out good and clean beans by grading we use our hands.

2



After separating the beans from chuffs and sick plants we dry them in the sun. We regularly clean the beans by removing dust and other foreign materials.

3.5 How we Store the Beans

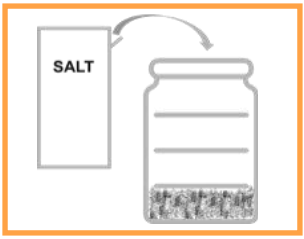


We store the beans in clean and dry containers. We use airtight polythene bags, plastic buckets or bins. So our family has some nutritious food throughout the year and we can even sell surplus beans. Did you know, that dry beans can be stored up to 8 to 12 month?

The salt test

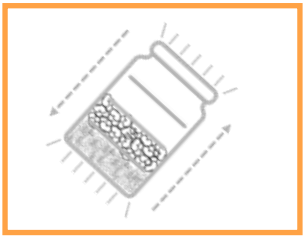
THE BEANS SHOULD BE DRIED BEFORE STORAGE. WE ASSESS THE MOISTURE WITH THE SALT TEST.

WE NEED A CLEAN DRY JAR, SALT AND A SAMPLE OF DRIED BEANS.



WE PUT SALT IN THE JAR (UP TO A QUARTER)

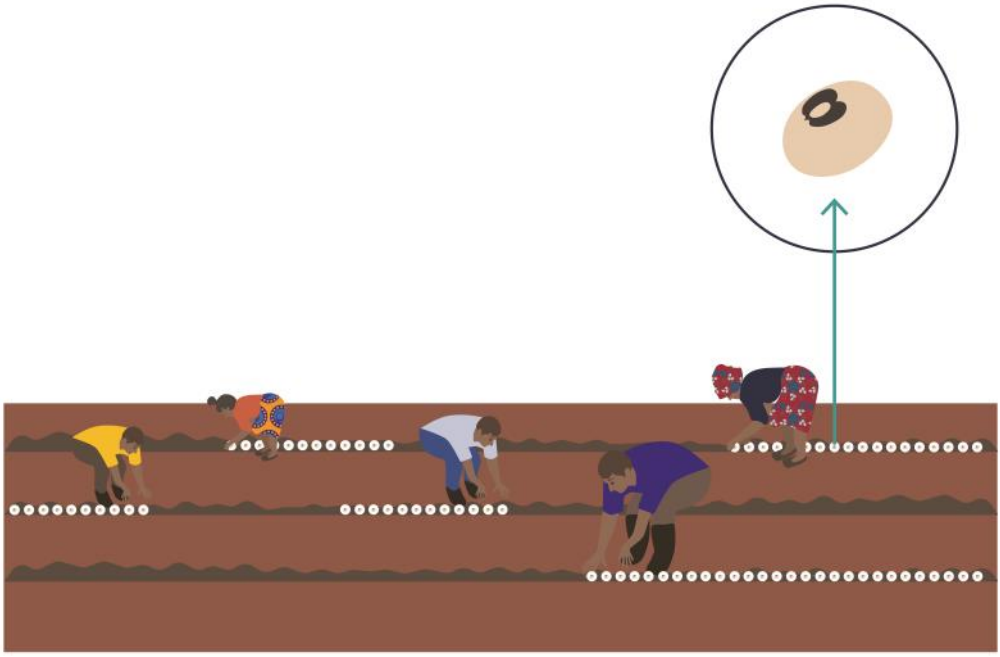
THEN WE ADD THE SAMPLE OF BEANS (UP TO HALF).



AFTERWARDS, WE CLOSE THE JAR, SHAKE IT AND LET IT SETTLE FOR ABOUT 10 MINUTES.

IF DAMP SALT IS STUCK ON THE SIDES OF THE JAR, THE BEANS ARE STILL TOO MOIST.

4. Cowpea Production

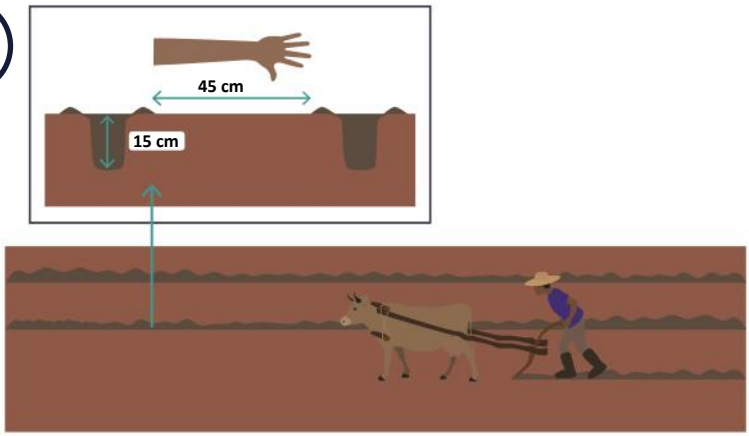


Instead of beans we sometimes also plant cowpeas. They are a good alternative in our planting system:

- **Cowpeas are very beneficial to our diet. Especially that the leaves are edible as well.**
- **Cowpeas add nitrogen to the soil and help improving soil fertility.**
- **Cowpeas can be used as a cover crop to protect soil from erosion and prevent weeds in the field.**
- **Cowpeas can be sold adding cash to our household.**

4.1 How we Prepare the Land

1



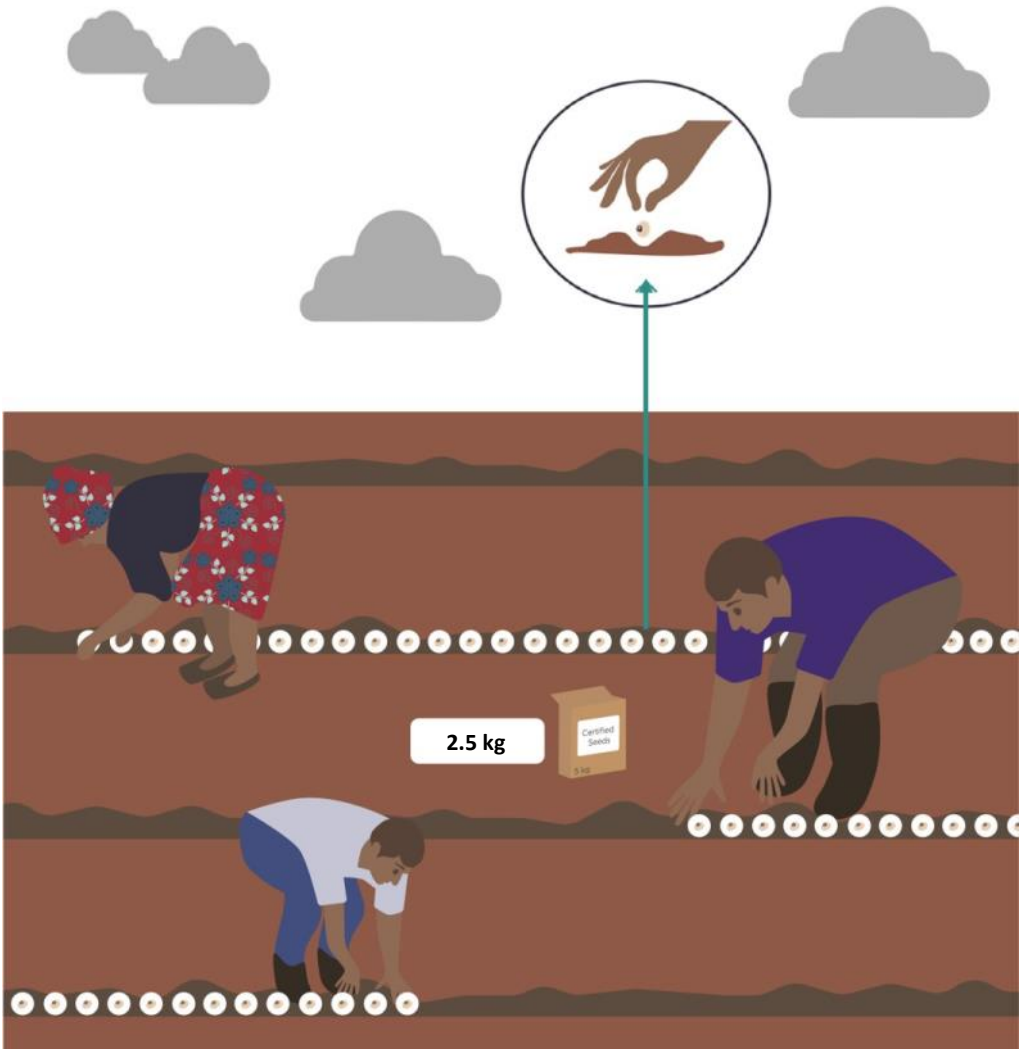
After clearing weeds from the field, we dig riplines or basins. Riplines should be 15cm deep, basins are 30cm long, 15cm deep and 15cm wide. Between the rows we leave 45cm space.

2

We than apply compost or manure to the riplines or basins. One tin (one double handful) per basin or 3 tins (two double handful) per meter in riplines.

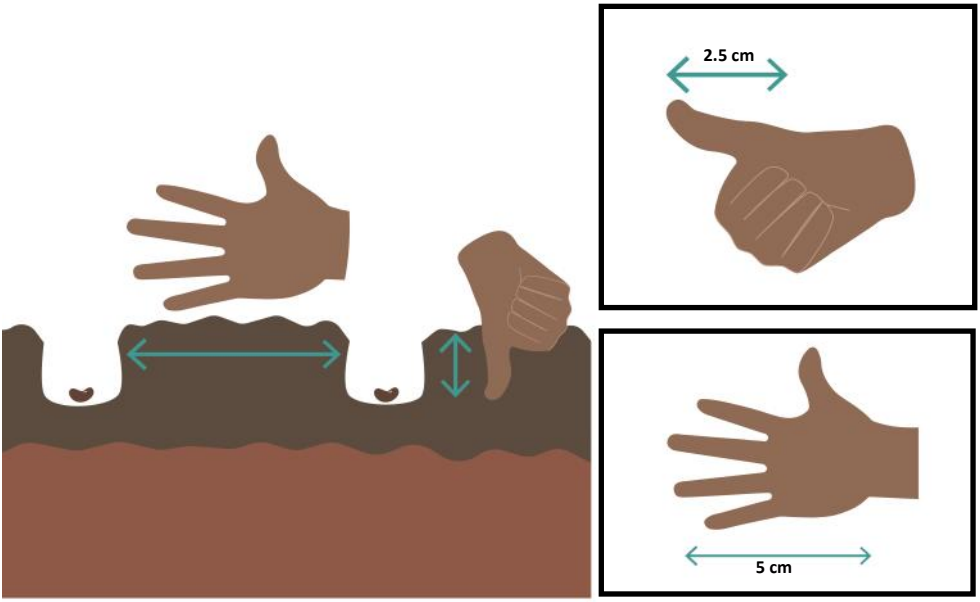
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
									★	★	★

4.2 How we Plant Cowpeas



After preparing the land we start sowing the cowpeas immediately after the first effective rains of the season. We normally use 2.5kg of seeds for one lima.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
★											★

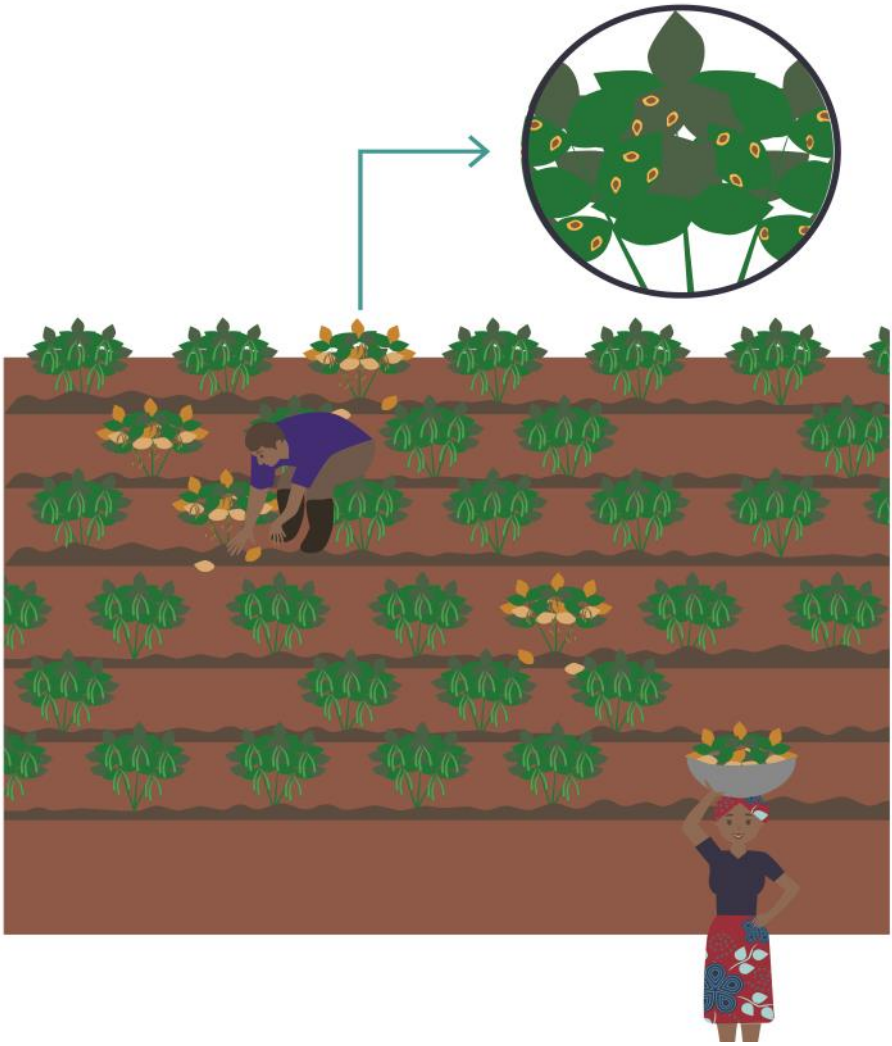


We plant 1 seed per station. The seeds are spaced 5cm apart and planted 2,5cm deep

Intercropping

- **AS A COVER CROP COWPEAS CAN BE INTERCROPED WITH MAIZE,SORGHUM OR MILLET.**
- **IF INTERCROPPED, COWPEAS SHOULD BE PLANTED AT ABOUT 4-6 WEEKS AFTER PLANTING MAIZE, SORGHUM OR MILLET WITH 20 CM BETWEEN ROWS.**
- **WE DO NOT INTERCROP WITH MAIZE IF WE PLANT COWPEAS AS SEEDS.**

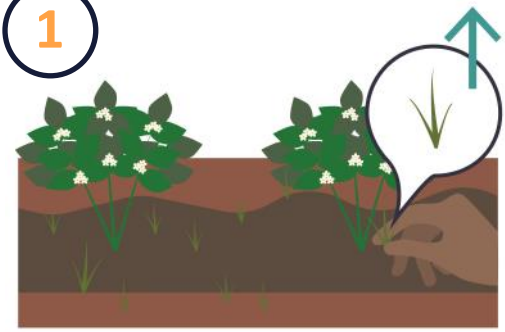
4.3 How we Manage Pest and Weeds



While our cowpeas were growing, we kept an eye on the fields to ensure our crops were healthy by removing weeds and diseased plants as soon as possible.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
★	★	★									★

1



Handy weeding should be done during flowering stages so as to avoid dropping of flower buds. Weed control reduces competition for nutrients, water and sunlight.

After Planting	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
1st Weeding		★				
2nd Weeding				★	★	

2

Diseased plants need to be removed with their roots immediately. We bury them away from the fields. If we keep them close to our fields or garden they might infect healthy plants even when buried. How to manage diseased plants:
See ANNEX 1.

After Planting	Week 1	Week 2	Week 3	Week 4	Week 5	Week 5	Week 6	Week 7	Week 8	Week 9
Check			★	★	★	★	★	★	★	★

4.4 What we do After the Harvest

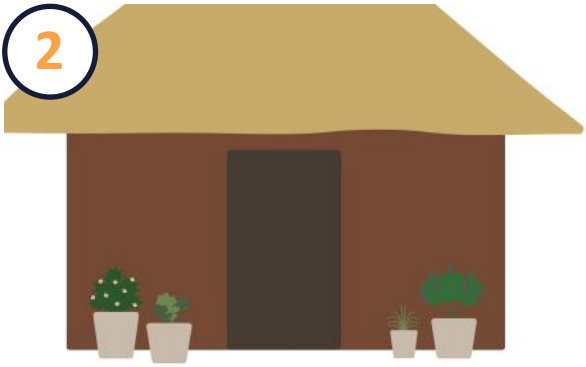
We harvest when the pods are fully mature (when pods turn brown and leaves drop off). During the harvest we need to ensure we pick the cowpeas when they are fully ripe and dry. We do not uproot the plants, because the roots are good for soil fertility. Delayed harvesting encourages weevil infestation in the field.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			★	★	★						

1

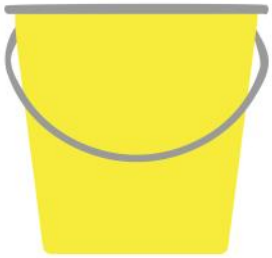
After the harvest, we thresh pods using a stick. We clean the cowpeas and separate them from chaffs through winnowing. To sort out good and clean cowpeas, we grade using our hands.

2



After separating the cowpeas from chuffs and diseased plants we dry them in the sun. We regularly clean the cowpeas by removing dust and other foreign materials.

4.5 How we Store the Cowpeas



We store or preserve the cowpeas in clean and dry containers. We use airtight polythene bags, plastic buckets or bins. Our family therefore, has access to nutritious food throughout the year and we even sell surplus Cowpeas to the neighbours. To ensure that our cowpeas are dry enough we use the salt test.

Infected cowpeas (or beans)

- **IF OUR COWPEAS (OR BEANS) HAVE HOLES AFTER WE STORED THEM, WE IMMEDIATELY SEPARATE THE AFFECTED COWPEAS FROM THE REST AND STORE AGAIN BY GRADING.**
- **TO PROTECT THE COWPEA GRAINS FROM PESTS, WE ADD ASH OR GLIRIRICIDIA LEAVES.**

Did you know, that dry cowpeas can be mixed with ash and stored up to 8 months using a clean and air tight packaging materials such as sacks, plastics or containers. We also preserve cowpea leaves by adding salt waterm drying and keeping the dried leaves in a clean and air tight packaging materials (sack, plastic or container) for future home consumption especially in the dry season when vegetables are scarce.

ANNEX I: Identification and Management of Plant Diseases & Pests

Common Pests

Cowpea is very attractive to insects. The main pests during the growing season are:

1. **Aphids**
2. **Pod sucking bugs**
3. **Blister beetle**
4. **Pod borer.**

Controlling pests by one or two applications of organic substances is invariably necessary.

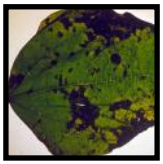
Organic methods to control pests and diseases by practicing the following: Crop rotation, companion planting, mixed cropping, use of hands and a mixture of organic substances such as:

- ⊕ **Tephrosia**
- ⊕ **Chilli powder**
- ⊕ **Tobacco snuff**
- ⊕ **Moringa tea/powder**
- ⊕ **Garlic powder**
- ⊕ **Neem/Eucalyptus tea**

Common Diseases

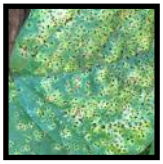
Signs of diseased plants

Anthracnose: Brown lesions along the veins of the lower surfaces. They spread to the upper side, to the steam petioles, pods and seeds.



Angular leaf spot: Small greyish-brown spots at the leaf veins. In severe cases, the leaves turn yellow and drop prematurely.

Scab: Circular, grey spots along the veins. The centres of lesions on leaves often fall out leaving "shot-hole" leasions.



Bean Rust: Redish-brown spots in the upper and lower leaf surface, steams and pods.

Bean common mosaic virus: Mosaik-green vein-banding, leaf curling and plant stunting.

Common bacterial blight: Water-soaked lesions on leaves. The lesions enlarge and merge.

A publication of the Food and Nutrition Security, Enhanced Resilience (FANSER) Project in Zambia

Ministry of Agriculture

Published by