



# SEED MULTIPLICATION OF IMPROVED, OPEN- POLLINATED VARIETIES

## Preface

These technical guidelines explain some of the methods that can be used in seed multiplication. The guidelines may be used by a community group, private company or secondary processor. Steps and options for community-based seed multiplication techniques required are outlined. These guidelines are a result of various scientific experiments and experiences with communities in semi arid areas of Matabeleland South Province. Lessons from this province resulted in the production of these technical guidelines - to enhance the capacity of smallholder farmers and service support institutions in semi arid areas to strengthen sustainable community - based seed selection, production and multiplication.



These technical guidelines are therefore aimed at offering a practical set of tools in strengthening the technical capacity of both practicing farmers and field facilitators working with grassroots people in participatory technology development, mostly focusing on seed resources development for improved food and livelihoods security.

Knowledge gained from the guidelines should foster mutual learning by participants who are also expected to draw on their own practical experiences. Also, knowledge and skills gained from this guide should put farmers and development work facilitators in a way that challenges and influences the design, implementation, monitoring and evaluation of future development programmes at different levels for the benefit of all.

The technical guidelines were developed and produced through wide consultations with partners and stakeholders involved in Practical Action Southern Africa's project on Enhancing Food and Livelihoods Security of Vulnerable Communities in Drought prone Areas of Zimbabwe being implemented in Gwanda, Matobo, Bulilima and Mangwe Districts of Matabeleland South Province. Practical Action Southern Africa hopes that these technical guidelines will become a useful resource for smallholder farmers and development workers involved in community-based seed multiplication schemes in the region.

## Introduction and background

Sub-Saharan African continues to suffer from food deficits and poverty largely due to lack of adequate agricultural inputs, among other constraints. In Zimbabwe, nearly 70 per cent of the population lives in rural areas and is highly dependant on agriculture for survival. Most of the communal farmers have abandoned traditional crop varieties in favour of improved hybrids. The demand for hybrid seed in communal areas had grown to an extent that 80 per cent of hybrid maize seed, for example, was being bought by this sector in any given season by 1994.

However the hyper inflationary environment experienced in Zimbabwe since the late 90s has resulted in seed and fertiliser prices escalating beyond the reach of most smallholder farmers, causing a decline in maize produced by this sector.

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technical brief

To restore food security among smallholder farmers, stakeholders have been calling for the implementation of sustainable agricultural practices. Open-Pollinated Varieties (OPVs) are an option for achieving sustainability. Most OPVs are said to perform well under low external input. To date, several organisations have been participating in promoting and advocating for the production and utilisation of OPVs among small holder farmers.

Crop production in Matebeleland South Province is mostly rain-fed. But, the province receives less than 600mm of rainfall per annum, which usually results in successive droughts and crop failures. The few seed stocks and grain reserves are wiped out before the onset of the next farming season. Community-based seed multiplication of OPVs can mitigate against hybrid seed unavailability and its soaring cost thereby increasing access to standard seed for communal areas, especially in drought prone areas.

### Types of seeds

**Standard grade seed:** is seed that has not been produced under the certification scheme but meeting purity and germination test standards e.g. Retained seed.

**Certified Seed:** is grown under the seed certification scheme e.g. hybrid

### Activities in open pollinated varieties (OPVs) seed multiplication

#### Field crop inspections

Done at least four times

- Before planting
- When crop is still young and growing in the field
- When crop is flowering, and;
- When crop is producing seed

**Before planting:** To check on crops grown in the previous year.

**When the crop is growing:** To check on isolation distances, weeds and removal of off types.

**At flowering:** To check for weeds, diseases and how crop is being managed.

**Before harvesting:** To make sure that all off types have been removed.

### Requirements for seed multiplication

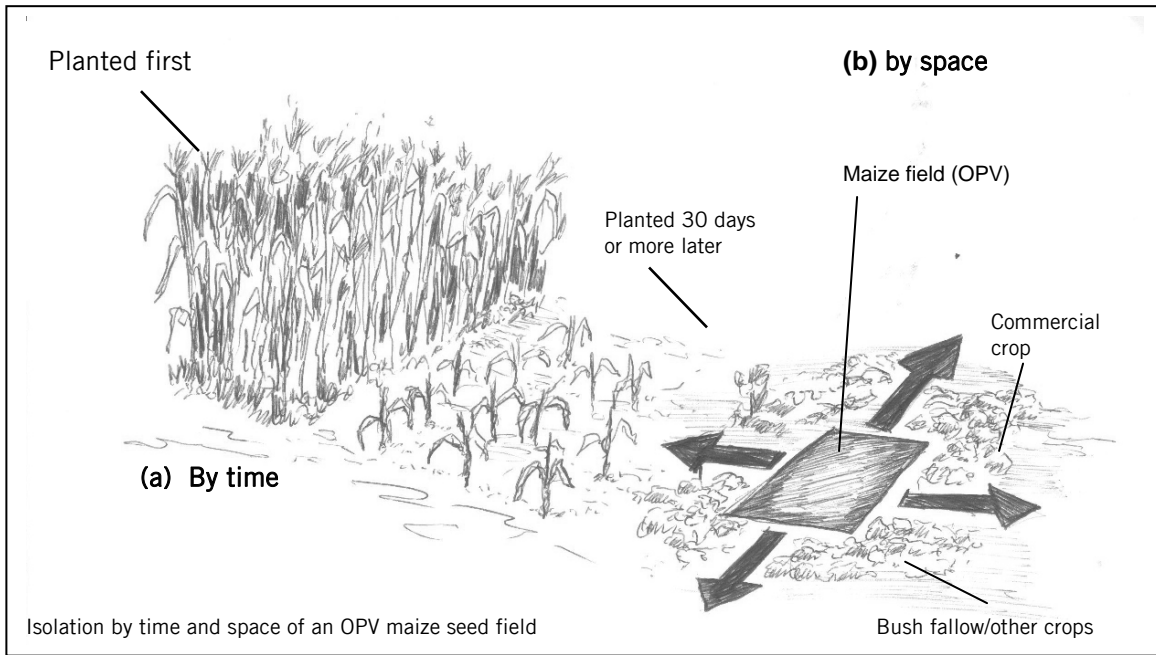
**Land requirements;** A seed crop should not be grown on a field that was grown on the previous year so as to:

- Reduce pests and diseases
- Reduce weed pressure
- Improve soil structure
- Ensure that seeds of previous crop will not germinate and mix with your variety and;
- Use of residual nutrients

#### Isolation

This is the distance that should be left between similar seed crops to prevent cross pollination.

The OPV seed production fields may be isolated in space or time, or both. The isolation distance for OPV seed production is normally 250 - 350 m.



Adapted from " Strategies for Strengthening and Scaling Up Community-Based Seed Production (CIMMYT), 2006.

Isolation by time requires a planting interval (difference in sowing time) of 4 to 6 weeks to ensure that there is no pollen contamination of seed plots by other maize fields. The number of days to tasseling and silking of the seed field and neighbouring fields helps to determine the proper time isolation. If farmers cannot isolate by time or distance, they may harvest from the middle of their fields to minimise contamination, and the field should be at least about one hectare.

### Field Management for Seed Multiplication of Open Pollinated Varieties (OPVs)

#### Planting

- Grow seed of chosen variety alone (sole crop) to allow proper management  
Plant clean, viable seed
- Get support from extension staff, trained farmers or crop guidelines so as to:
- Plant using the correct spacing  
Use the correct seed fertiliser rates
- Plant in rows for easy weed control and removal of off type plants  
Learn of the appropriate planting periods (use of seasonal calendar).

#### Weeding (why we should weed)

- Weeds reduce yield
- Weeds reduce crop quality
- Weed within four weeks after planting  
Inspect for pests and diseases
- Thereafter, weeding depends on weed growth

Weeding can be done mechanically using hoes, cultivators hand picking or chemically using herbicides.

#### Rouging

- Is the removal of off type plants
- Off types are plants that do not resemble the variety grown  
Rouging is meant to have pure seed
- Remove plant tha look different from the variety, e.g. plant height, leaf shape, leaf colour, flower colour
- Rouge at least three times.

## How to multiply open pollinated varieties (OPVs)

- Buy recommended certified OPVs for your area.
  - Grow OPVs in your poorer fields where you expect to harvest less than 15 bags per acre.
  - The seed produced can be recycled for one or two seasons without any significant decline in vigour.
  - Maintain purity of your seed and remember, in maize the tassel is the male flower that produces pollen and the silks constitute the female flower.
  - Plant your OPVs for seed multiplication 200 - 300m away from other maize crops to avoid contamination.
  - Inspect your crops before flowering and remove any plants that look different from others to keep your seed pure.
  - When harvesting, take the ears of crops from the centre of the field for seed where there are least chances of cross pollination from other crops.
  - Keep your seed separate from other grain and protect it from storage pests.
- Commercially available varieties :ZM421, ZM521, ZM561, Matuba, KEP, Obantanpa

### Open-pollinated varieties (OPVs)

Open pollinated varieties are known sources of pollinated plants. Some have been improved and have variety names. The grain of an OPV may be saved for replanting if it is isolated from other maize varieties, or harvested from the middle of the field. The recycled seed will grow and yield as well as the original plants. Compared to hybrids, OPVs are less uniform ( and usually lower- yielding than hybrids in optimal environments). OPVs, however, have the advantage of being more stable than hybrids in low - yielding or stress environments.

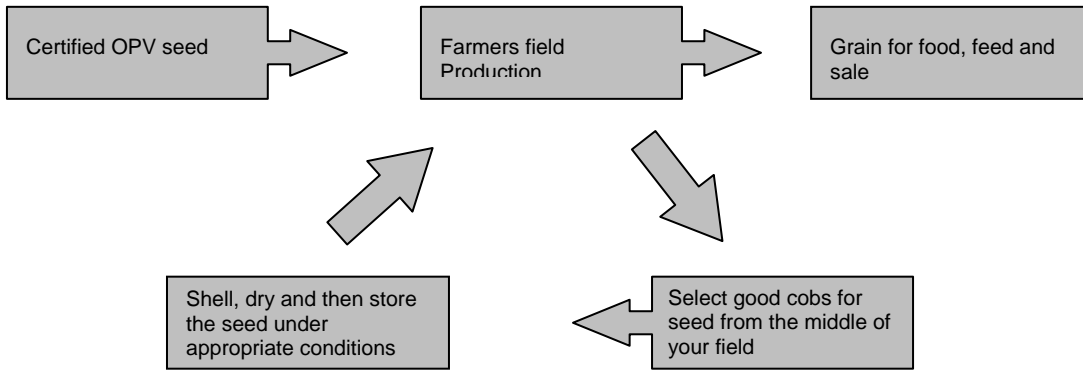
### Farmers' checklist on when to grow a hybrid or OPV.

When to grow a hybrid	When to grow an OPV
The farmer expects to harvest more than 2 tonnes /ha (15 bags per acre) of maize grain	The farmer expects to harvest more than 2 tonnes /ha (15 bags per acre) of maize grain
The cost of hybrid seed will be recovered from its yield.	The cost of hybrid seed may not be paid for by the farmer
The farmer is located in a high potential environment and can afford inputs such as fertiliser and pesticides	The farmer is located in a low potential environment and cannot afford extra inputs.
Hybrids adapted/suitable for local conditions are available.	Not locally adapted / suitable hybrids are available
The farmer can obtain seed for timely planting	The farmer cannot readily obtain seed

Adapted from " Strategies for Strengthening and Scaling Up Community-Based Seed Production (CIMMYT), 2006.

### Open-Pollinated Varieties seed production

Farmers who are far from seed retail shops can benefit from growing maize OPVs, as the grain they harvest may be replanted as seed without significant yield loss. OPV seed may be recycled for a maximum of three seasons without significant yield loss. The longer a farmer recycles OPV seed, the greater the risk of contamination by pollen from neighbouring fields, and the deterioration of the variety. Seed production of OPVs is simpler than that of hybrids, because only one variety is planted and there is no need for detasseling. Nevertheless, maintenance of the OPV and production of the foundation seed of OPVs requires some special procedures, similar to hybrid seed production.



YOU MAY RECYCLE AN OPV FOR 1 - 3 SEASONS BEFORE BUYING NEW CERTIFIED SEED

**How to harvest, dry, shell and store seed**

At least 500 cobs should be harvested to ensure that the OPV maintains its own distinct variability. It is recommended that farmers harvest their ears at grain moisture content of about 16-20% (i.e, once the husks are dry) and sun dry to about 14 percent moisture content before shelling for uniformity and quality (i.e, pest and disease-free not discoloured) and spread out in the sun for drying. In most areas, farmers may sun-dry their seed to the desired, moisture content.

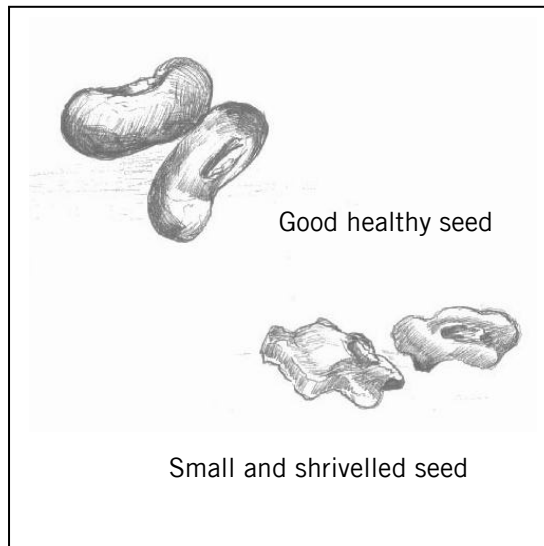
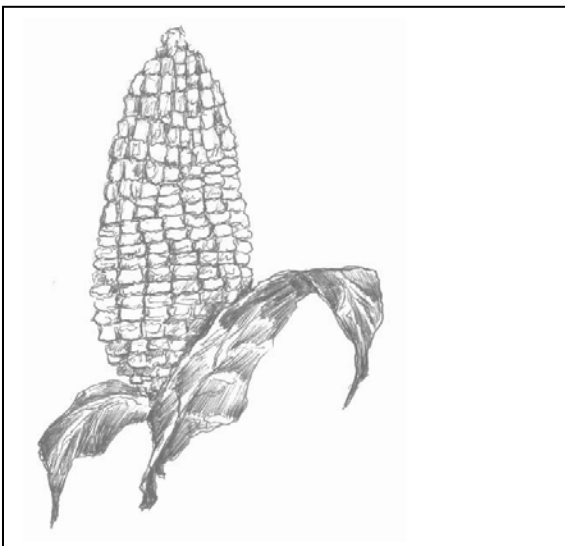
When sun-drying, ensure that the seeds are turned frequently to prevent "sun-burn" damage to the embryo.

Most farmers sun dry their maize seed on a concrete slab, but if this is not available, the seed may be spread out on black plastic sheeting. Shelling may begin once the grain has reached moisture content of 14%. Farmers can apply the simple test to check whether the seed has reached 14% moisture content. Shell a cob and mix about 100 kernels with one gram of salt; if the salt feels moist after five minutes, then the cob needs to be dried further, but if the salt remains dry, then the shelling can begin. Shelling by hand minimises seed damage, but if a mechanical sheller is used, lower the settings (speed and severity of the threshing action). The shelled seed may then be cleaned (winnowed), and any chipped or diseased seeds are removed by hand. The seed is then treated with insecticides and fungicides against storage pests and fungi. When treating pesticides, observe safety recommendations and ensure that the seed is uniformly treated. Treated seed must never be used as food for animals or humans.

**Conditions necessary for seed storage**

It is important to know that seed is living and should be handled with care

- Healthy viable seed has about 10% water.
- Seed that is not dried well will rot whilst in storage and will not germinate when planted



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**Conditions suitable for seed storage are:**

- Low temperature
- Low humidity
- Low oxygen
- Free from pests and rodents

**Low temperature**

Temperatures of less than 4°C are ideal for seed storage

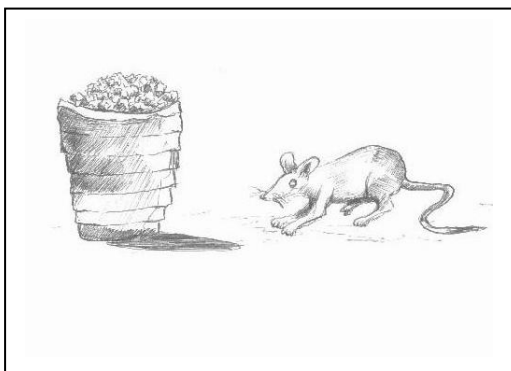
- Low temperatures do not promote germination
- At low temperatures, seed is kept inactive but alive
- Germination in many plants only occurs when the temperatures are warm, usually above 20°C

**Low humidity**

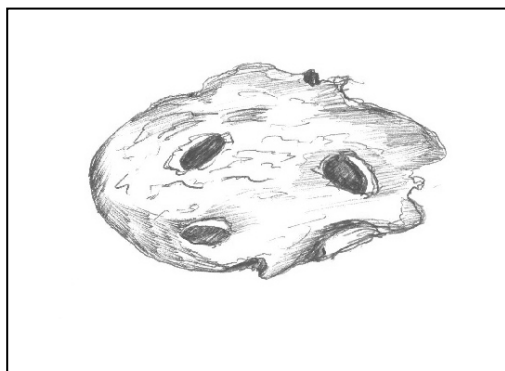
- Living things need water
- Humidity has water that can make the dry seed wet whilst in storage  
The seed may germinate or it can rot if the humidity is high
- Low humidity makes the storeroom cool
- The storeroom should have no holes that may allow wet air to enter

**Low oxygen**

- Oxygen is needed for seed germination
- Low oxygen reduces breathing of the seed and seed does not germinate

**Free from pests and rodents**

Seed should be free from pests and rodents



Damaged Seeds

- Weevils, mice and rats can damage the stored seed
- The damaged seed may not germinate. If damaged seed is planted, germination will be poor
- It is important to protect seed from pests and rodents

**Other ways of improving seed storage**

- There are some seeds that are not easily eaten by weevils. These seeds store well even without chemicals.
- Store seed in airtight containers, e.g, metal drums or plastic bags that cannot be easily entered by weevils
- Mix grain with chemicals. In some crops like cowpeas, mixing grain with wood ash from cooking fires or any other grained inorganic material such as sand, results in less damage to the grain. A ratio of least 3 parts ash, 4 parts grain can be used. Unfortunately, this does not affect pests already in the seed
- Vegetable oil can also be used in storage, 1-5 ml of oil per kilogram of threshed grain is effective
- Pesticides such as Malathion dust, Actellic super and Shumba dust, can be used to control storage pests
- Store seed when it is mature and has the right moisture content.
- Control rodents in the storage room.

- The room should allow air to move freely and should not have holes.

### Project financing

Seed Multiplication projects require a lot of funds if the group is going to set up their own seed plant. Sources of funding can be community contribution, or loan from a commercial or microfinance institution.

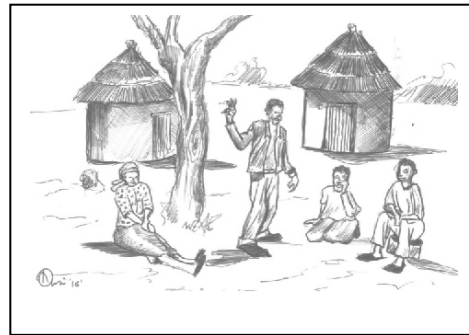
Community contribution is in the form of money; labour and locally available material and these can be costed. The community funds are used for the every day running of the enterprise-transport, record books.

### Project organisation

Institution arrangements are important in seed multiplication as the success of the enterprise depends on how organized the group is. The Seed Multiplication Project, also, depends on the ability to maintain the quality of the group and non-project members.

If the whole community wants to be involved, an association maybe necessary. There is therefore, need for the association to have committees in the local areas to cater for the every day running of the project and for close monitoring of the resource. The local area committees are also responsible for the mobilization of other farmers and also the monitoring of research plots.

From the local committees, there is need to have board for the association. This is called the Executive or Steering Committee, which is comprised of representatives, selected from the area committees. The Executive Committee links the project to the outside world and enters into contracts on behalf of the project proponents.



Community participation in important

### Key implementation partners

The Seed Multiplication Project/Group may need to collaborate with the following:

- Ministry of Agriculture-product development and quality control
- Seed producing companies-product testing and processing
- Supermarkets and chain stores-retailing
- Packaging companies-packaging
- Local authorities and institutions responsible for seed resources-access to by-laws, regulations and quality standards.

### Conclusion

The focus of this training guide is on providing for further specialized initiatives in improving the expertise of smallholder farmers and development experts. Such contributions in advancing and promoting agricultural standards and improving sustainable food production strategies of farmers will help in the design of improved food and livelihood technologies for all farmers interested in the uptake of new technologies.

This technical guide can therefore be described as a "capacity improvement" guide as it allows for a continued input and improvement to suit farmers' ever-changing situations.

There is vast potential for increasing food production in drought prone areas of Zimbabwe through a wide range investment in human capital and institutional development. This is further enhanced by the deliberate promotion of innovations in technology and information sharing between all stakeholders in food and livelihoods security.

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