

 	Crop: Cowpea Function: Trial management	SOP # 05	IITA-CP-SOP05
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Standard Operating Procedure (SOP) for Trial Management



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1. Introduction

After establishing the trials, they need to be managed to ensure the required data quality. The management of trials includes a series of agronomic activities ranging from gap

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filling, thinning, weeding, fertilizer placement, and pest control. This SOP describes key considerations for managing cowpea trials.

2. *Purpose*

This SOP is designed to offer guidelines on the required management practices in cowpea trials that would ensure the generation of quality data.

3. *Scope*

- The SOP covers all the agronomic management for cowpea trials, including gap filling, thinning, weeding, fertilizer placement, and pest control.

4. *Definition of terms*

Trial management in this SOP is defined as systematic planning, organization, and execution of agronomic management practices to ensure the plant breeding experiments generate valid and reliable data. This process is critical for ensuring the reliability and validity of experimental results.

Agronomic practice refers to a set of techniques and principles applied in the cultivation and management of crops to enhance their growth, yield, and quality while ensuring sustainability and environmental protection. These practices encompass various aspects of crop production, from soil preparation and planting to pest control and harvesting.

Gap filling is the practice of re-planting to fill the gaps created in plots due to poor germination of some cowpea lines.

Thinning in plant breeding experiments is the practice of removing some plants from a population to reduce plant density. Thinning in cowpea experiments is used to manage population size and maintain experimental design integrity. It helps in focusing on specific traits by selecting plants that exhibit desired characteristics.

Weeding is the process of removing unwanted plants, typically weeds, that compete with the desired crop plants for resources such as nutrients, water, light, and space.

5. *Roles and Responsibilities*

Cowpea scientists, Research supervisors, and field technicians must use the Trial management SOP to be able to manage all the cowpea trials effectively. No alteration should be made to the procedures unless approved exceptionally by the program leaders. The individuals responsible for each section of the SOP are listed below.

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Crop Lead breeder (CLB): Responsible for the overall management of the breeding program and for delegating team responsibilities.

Associate scientists (AS): Support the CLB with follow up and guide the research associates, supervisors, and technicians in implementation of relevant trial management operations.

Entomologist: Responsible for advising on the kind of management required for each established cowpea trial. He is also responsible for identifying appropriate pesticides for cowpea trials, including advice on recommended dosages.

Research supervisors: Responsible for assigning trial management tasks, following up, and reporting any issues related to field trial management.

Field technicians: Responsible for implementing the activities related to managing the trials, including identifying the local resources (causal labours, discussing costs, etc) need to implement the activities.

6. *Procedure*

Gap filling

- Gap filling is necessary in case there is poor germination. Gap filling must be done early enough, at most six days after initial planting.
- Caution should be undertaken to use the exact variety for each plot to be replanted.
- Seeds should be treated (using for example, benomyl (50%) or Carbendazine, Captan, or Thiram at the rate of 3 g/kg (1 sachet) of seeds, or with Apron Plus at the rate of 10 g/4–5 kg of seeds (1 sachet), or Apron Star 42 WS at the rate of 10 g/8 kg of seeds/1 sachet) and not more than 2 seeds per hill should be re-planted

Step2: Thinning

- Thinning should be done 10-15 days after planting.
- For mechanized planted trials, thinning may be done to reduce plant population to around 40 plants per row.
- For manually planted trials, thin the plants to 2 seedlings per hill.
- Always remove weaker plants when thinning.

Step3: Weeding

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Plots should be kept free of weeds, and as such, plots should be monitored regularly from the time of planting till harvest to ascertain the right time to weed. Weeds can significantly affect the yield data and quality of seeds produced. Here are issues to consider for effective weed management:

Manual weeding

- During weeding, the task should be accomplished on a replication-replication basis, following the experimental design used. That is, the smallest unit of operation is a complete replication.
- If you have sufficient labour, then you should weed the entire trial in a single day NOT just part of it as this will introduce external variations within the plots.
- Perform the first weeding at 1-2 weeks after planting and second one at 5–6 weeks after planting. BUT note that weeding time must be determined based on weed pressure in the field.
- Avoid weeding right after it has rained as this will allow the weeds to regrow immediately.
- A good practice is to weed and pack the weeds out of the plot to reduce chances of the transplanting the weeds when the soil is too wet.

Chemical weeding

- Pre-emergence herbicides can be sprayed in plots with known high weed history immediately after planting.
- A mixture of paraquat (against grass and broad leaf weeds) and pendimethalin (for weed seeds germination) is recommended.
- With the identification of post-emergence herbicides, we need to advocate the use of these herbicides given that the manual weeding are not always effective in controlling the weeds mainly when it is raining frequently.

Table 3: Recommended herbicides and rates for weed control

<i>Product</i>	<i>Product rate/ha (L)</i>	<i>Time of application</i>	<i>Remarks</i>
<i>Paraquat and Pendimethalin (50EC)</i>	3 L of Paraquat and 3 L of Pendimethalin	Applied within 2 days of planting	Good for grasses

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	(250 mL of each/20-L sprayer)		
<i>Paraquat and Dual Gold</i>	3 L of Paraquat plus 2 L of Dual Gold (= 250 mL of Paraquat plus 200mL of Dual Gold in 15-L sprayer (= 1½ milk tins of Paraquat plus ¾ milk tins of Dual Gold)	Applied within 2 days of planting	Grasses and Broad leaf weeds. Where sowing is done after 1 week of land preparation, application must be within 12 h after planting.
<i>Paraquat plus Butachlo</i>	3 L of Paraquat plus 4 L of Butachlor (= 250 mL of Paraquat plus 350mL of Butachlor in 15-L sprayer) (= 1½ milk tins of Paraquat plus 2½ milk tins of Butachlor)	Applied within 2 days of planting	Grasses and Broad leaf weeds.
<i>Fusilade forte</i>	1–1½ L (150 mL (= 1 milk tin)/15-L sprayer)	Post-emergence Apply 21–28 days after sowing	Selective herbicide, for grass weed control
<i>Round-up or other Glyphosate products</i>	4 L (= 350 mL/15-L sprayer)	Pre-emergence (before land preparation)	Controls Perennial weeds, apply at least 2 weeks before planting)

Source: Adopted from Dugje et al., 2009

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Insecticide application

Insects are a problem in cowpea and need to be monitored continually and controlled. At every stage of the cowpea growth, there are insects that severely attack the plants. At the seedling stage or pre-flowering stage, aphids (*Aphis craccivora*) are the main insects that significantly destroyed the crops if there is drought. At flowering stage, flower thrips (*Megalurothrips sjostedti*), blister beetles (*Mylabris spp.*), and maruca pod borer (*Maruca vitrata*) are the main damaging insects. At podding stage, pod sucking bugs (complex of *Clavigralla tomentosicollis*, *Riptortus dentipes* and *Anoplocnemis curvipes*)) are the key destroying insects. The following actions are to be considered in the control of insect pests in the field:

- Obtain enough and properly functional knap sack sprayers.
- Use the right pesticide or pesticide combination.
- Apply at the right time. Normally we recommend scouting to determine the pest threshold before spraying. However, for most of trial locations, at least 3 to 4 sprayings are required to ensure good crop of cowpea.
- Supervise spraying operators to be sure they are spraying correctly.
- Normally, spraying during windy days should be avoided as this reduces spray efficiency and also poses safety threat to the spray operator.

Table 4: Recommended pesticides and rates for insect control

Product	Product rate/ha (L)	Time of application	Remarks
Act force	100ml to 20lts water	7-10 days interval beginning from flower bud initiation.	Effective against Aphids, Cowpea pod borer (<i>Maruca testulalis</i> Geyer), Flower Thrips
Cyper force	100ml to 20lts water		Effective against Aphids, Cowpea pod borer (<i>Maruca testulalis</i> Geyer), Flower Thrips
Cyper Diforce	100ml to 20lts water		Effective against Aphids, Cowpea pod borer (<i>Maruca testulalis</i> Geyer), Flower Thrips

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Source: Adopted from M. Ayodele, L. Kumar, available at <https://croptgenebank.sgrp.cgiar.org/index.php/management-mainmenu-434/stogs-mainmenu-238/cowpea/guidelines/insects>

Fertilizer application

- Cowpea requires fertilizer boost at seedling stage.
- Often, we use NPK (15-15-15), applied by 2 weeks after planting.
- Application should also follow the trial design, whereby a complete block is finished before starting a new block.
- Fertilizer must be applied in time and at the right rate (100Kg/ha NPK).
- When applied separately, 15kg/ha for nitrogen and 30 kg/ha for phosphorus is recommended.
- Near each hill, a small quantity of fertilizer is applied and covered with soil.
- Variable quantity and placement methods should be avoided as this will introduce unintended variation.

7. *Appendix*

Contacts for support

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Genetic support: Christian Fatokun; C.FATOKUN@CGIAR.ORG

Physiology support: Saba Baba Mohammed; s.mohammed@cgiar.org

8. *Further reading*

Dugje, I.Y., L.O. Omoigui, F. Ekeleme, R. Bandyopadhyay, P. Lava Kumar, and A.Y. Kamara. 2009. Farmers' Guide to Soybean Production in Northern Nigeria. International Institute of Tropical Agriculture, Ibadan, Nigeria. 21 pp