

Cowpea harvesting

The cowpea, *Vigna unguiculata* (L.) Walp is a leguminous plant grown everywhere in Benin. Its seeds are an important source of vegetable protein (around 25%), vitamins for human consumption provide income for farmers and animal fodder. Unfortunately, grain reserves are destroyed by a strong pest, the cowpea weevil or *Callosobruchus maculatus*. Controlling this destructive pest is part of good harvest management on the assumption that the pre-cultivation operations had been well done. This factsheet covers harvesting practices.

Cowpea products

Depending on the period and the goal, 3 products are derived from cowpea cultivation:

- Green pods that are cut and sold before cowpeas mature.
- Dry pods for dry seeds (the most targeted).
- Leaves are used as livestock feed, especially in the Guinean Savanna

Preparing cowpeas for harvesting

During harvesting, certain practices are recommended, while others are to be avoided to minimise infestation of cowpeas by certain insects and rot.

Harvesting process

- Harvest only when the pods are ripe and dry, i.e. the majority of pods are yellow (fig. 6): burst pods.
- Cowpeas should be harvested when the moisture content in the seeds is between 14 and 18%.
- Plan the harvest according to the variety involved, the quantity of pods remaining and availability of labour.

- Sundry the pods collected on the ground or on a plastic sheet.
- Harvesting of cowpeas is done at the beginning of the dry season, when the dry pods can await harvest within a week without getting wet.
- Avoid the end of the rainy season, which may lead to rotting of pods.
- Take into account the fact that all the seeds do not ripen at the same time because of different flowering times.
- After harvest, prepare cowpeas for storage: threshing of pods, cleaning and winnowing of the seeds to separate the vines.



Figure 1: Sale of green cowpea pods



Figure 2: A harvest of dry cowpea pods

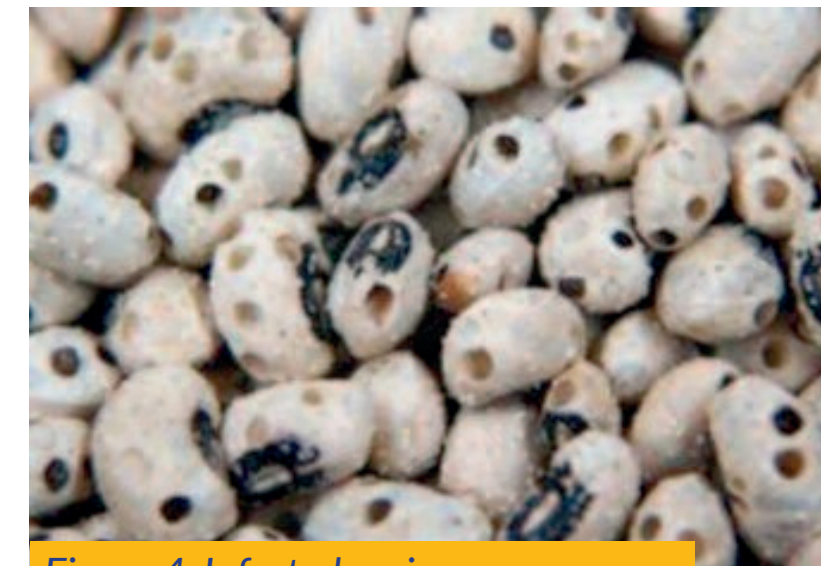


Figure 4: Infested grains



Figure 3: Dry cowpea seeds

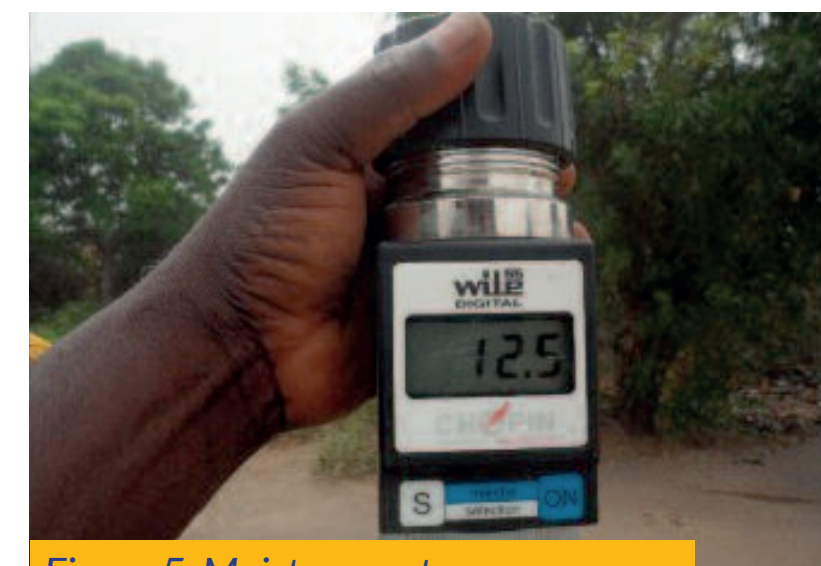


Figure 5: Moisture meter



Harvest only when the pods are ripe and dry, i.e. the majority of pods are yellow (fig. 6): burst pods.



Figure 6: Cowpea Pods



Figure 7: A harvest of dry cowpea pods



Figure 8: Cowpea varieties at different stages



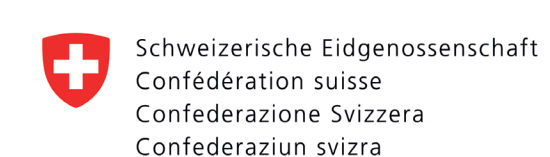
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Dry Cowpea Seeds

Good cowpea cultivation techniques are, unfortunately, insufficient in eliminating the cowpea weevil *Callosobruchus maculatus* at different stages of development: egg, larvae, pupa and adult (fig. 1). Grain reserves are constantly destroyed by *C. maculatus* if proper drying techniques are not applied. This fact sheet attempts to present good practices for drying cowpeas in order to stop the destruction of seeds by post-harvest parasites.

Choice of drying methods

Several cowpea drying methods can be used by farmers:

- Drying by direct exposure to the sun on clean and dry areas to avoid loss of seeds and mixing with sand.
- Quick thin layer drying on a plastic sheet under the sun. This drying method is more efficient as it eliminates eggs, larva and adult weevils.

Solar dryer for cowpeas

After peeling cowpea pods, the seeds still contain impurities. It is necessary to sort the grains and dry them before storage. The purpose of solar drying is to eliminate eggs, larvae and adult post-harvest cowpea pests. The guiding principles for solar drying are given below:

- To avoid condensation, the dryer is placed on a layer of a dry straw which prevents loss of heat to the ground (fig.3).
- Seeds can also be dried and disinfected within a shorter time, from a few hours to days depending on the existing moisture content and level of exposure to the sun. The seeds dry faster if the harvest takes place at the beginning of the dry season.
- This dryer can reach temperatures of 65°C or more. According to IRA/CRSP researchers, a temperature of 57°C is sufficient to kill eggs, larva, pupa and adult weevils.

How to make and use a solar drier

Solar drying is a method of direct drying which uses sun rays to reduce the water content in cowpea seeds and the number of cowpea weevil before storage. Solar drying allows you to disinfect seeds, reduce post-harvest losses and provide a dry product as well as a better quality market commodity

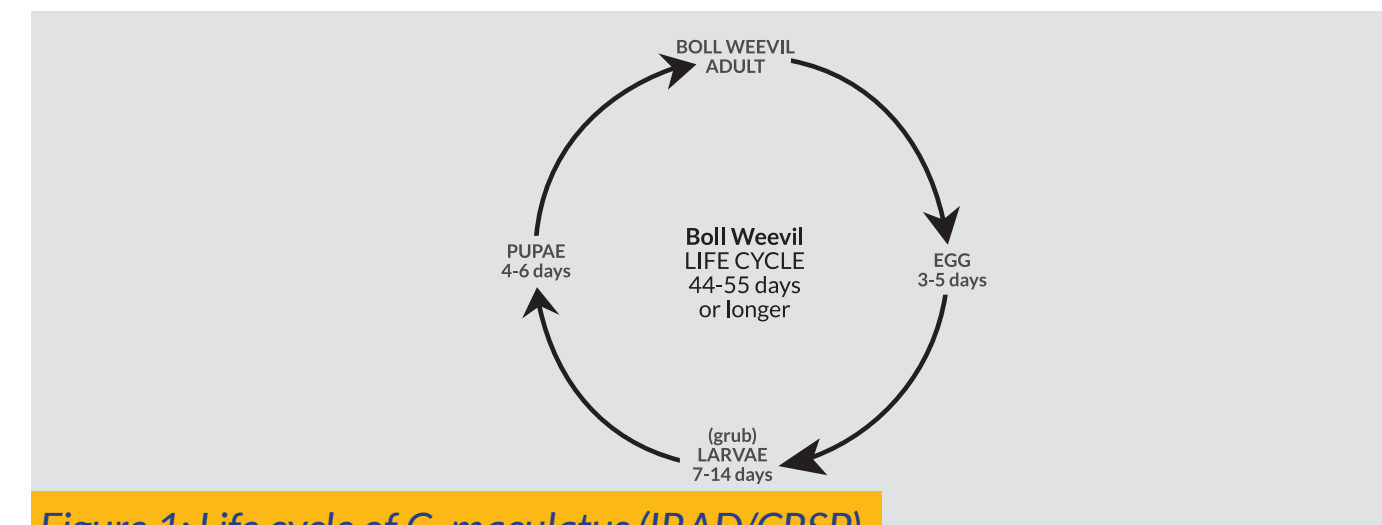


Figure 1: Life cycle of *C. maculatus* (IRAD/CRSP)



Figure 3: Mulching and laying the black plastic sheet



Figure 2: Clean cowpeas for storage and preservation



Figure 4: Black plastic sheet in place

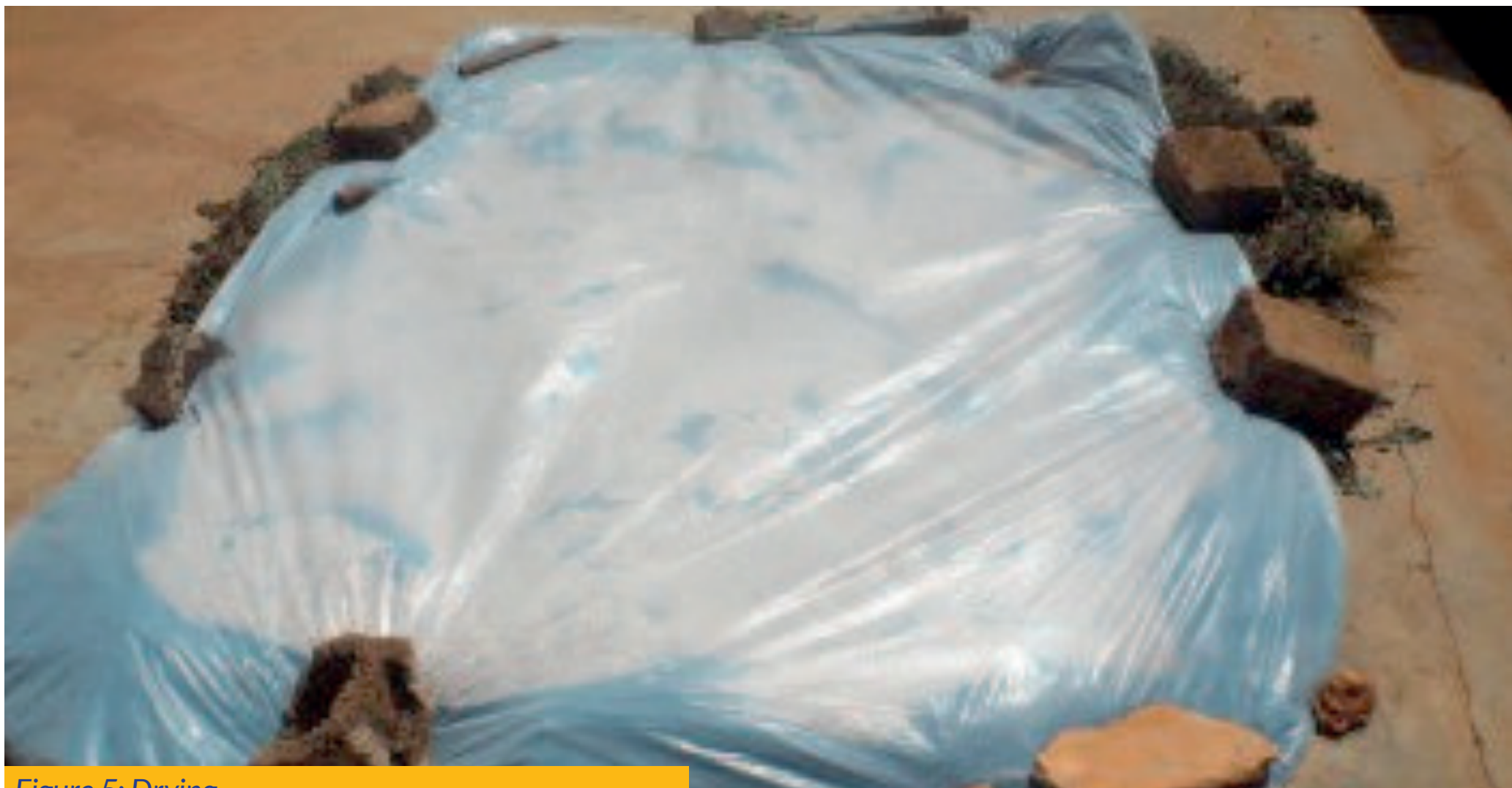


Figure 5: Drying

Materials used

The device is made up of an insulator like layer of straw and two polyethylene sheets, one black, and the other one transparent. Sun rays penetrate the transparent sheet, are absorbed and transmitted to the cowpea seeds. The black plastic conserves the heat produced by the sun rays. This drying method may affect the viability of seeds, and is therefore recommended for foodstuff.

A solar dryer which is made up of two plastic sheets; a transparent one which is resistant to the sun and a black one meant to absorb heat from the sun, thus eliminating weevils and drying the cowpeas. The greenhouse effect in between the two plastic sheets lowers the moisture content of the grains, destroying eggs, larva and adult weevils that are within the seeds (fig. 4-5).

Steps for solar drying

The process of solar drying (fig. 5) is as follows:

1. Spread the dry straw on the ground
2. Spread the black plastic sheet out on the straw to conserve heat.
3. Spread out the seeds to be dried onto the black plastic sheet.
4. Cover the seeds with a transparent plastic sheet which lets the sun rays through (solar energy).
5. Fold the edges of the two plastic sheets.
6. Keep the edges in place using stones or pieces of wood.
7. Leave it to dry from 11 a.m. to 1 p.m (when the sun is directly overhead.)
8. Repeat the solar drying 2- 3 times before storing the seeds.

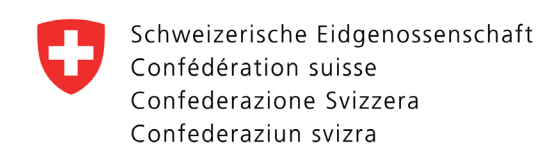
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Storage and Preservation of Cowpeas

It is necessary to ensure proper storage and preservation of cowpeas after harvesting well and drying it properly. This factsheet describes best practices for cowpea storage and preservation.



Figure 1: Vessels and airtight containers



Figure 2: Tins



Figure 3: Cask and silo



Figure 4: PICS bags or triple bagging

Quality of cowpeas for storage

Grains should be stored after threshing, drying and sorting:

- Do not store if the seed is visibly not in good condition e.g. seeds with too many holes, insect infested or mouldy ones.
- Ensure that it does not have impurities, or else clean and sort the seeds to remove spoilt, perforated, insect infested ones and foreign bodies (leaves, stones, pieces of wood, etc.),
- Ensure that the cowpeas are dry, and if not, dry them properly using the solar drying technique to bring the moisture content to between 9% and 11%. A properly dried seed should be crunchy between the teeth.
- In case of long term storage, disinfect the seeds to prevent insects from attacking the rest of the stock.
- released on bond, investigations into this case have since been completed, the file has been sanctioned and the police officer is due to appear at the Anti-Corruption Court to answer corruption charges. She was also directed by the PSU to pay back all the money she falsely received from Lucy and her father.

Choice of cowpea storage facility

- The storage facilities most used by peasants are:
- Tins and casks: indigenous knowledge , efficient (fig 2 and 3)
- Metallic silos (fig.3)
- PICS bags or triple bags (fig.4)

Good cowpea storage and preservation conditions: general principles

- Clean the store before storing fresh harvest. Residues from the previous harvest must be removed and burnt.
- Only store cleaned and properly dried seeds.
- Maintain cleanliness in the storage area and check for any change in storage conditions every two weeks.
- Keep rodents away.
- Place sacks or casks on pallets away from the wall to avoid transfer of moisture from the soil or wall.

Storage in containers and airtight containers

- These include, metallic casks, sealable oil tins, high density plastic bags, etc.
- Check that the container does not have a hole.
- Dry it properly
- Fill the container with seeds
- Finally, add recommended insecticide e.g. Actalm, Actellic Super PP or Sofagrain , 50 g for every 100 kg.
- Close it tightly.
- Keep the container in the shade and do not open before a minimum of 15 days.



Ensure that the cowpeas are dry, and if not, dry them properly using the solar drying technique to bring the moisture content to between 9% and 11%. A properly dried seed should be crunchy between the teeth.

Storage in pics bags and description of pics bags

The cowpea weevil *C. maculatus* cannot live without air, therefore storing cowpeas in anaerobic conditions is an effective method of fighting this insect. The PICS method (triple bagging) ensures that once the bags containing the cowpeas are tightly closed and inserted one into another, no air can enter and all the insects within die, thus stopping their reproductive cycle. PICS bags are made up of 3 bags. 1 woven polypropylene exterior bag - 1 transparent plastic polyethylene bag (in the middle); and 1 other transparent plastic polyethylene bag (the inner bag).

Necessary steps for proper storage and preservation in pics bags

- Only store cleaned and properly dried seeds (use the solar drying method
- Packaging in PICS bags
- Check the sealing of the plastic bags.
- Remove as much air as possible from the bag.
- Fill the bag with cleaned and dried seeds.
- Remove the air and tie the packages separately.
- Clean the area around the store.
- Clean the interior of the store
- Pile the PICS bags containing seeds on a raised area.
- Keep rodents away from the bags.
- Close the store.
- Close the bags immediately after each removal.
- Check the stock regularly to detect any change in the conditions of the stored product

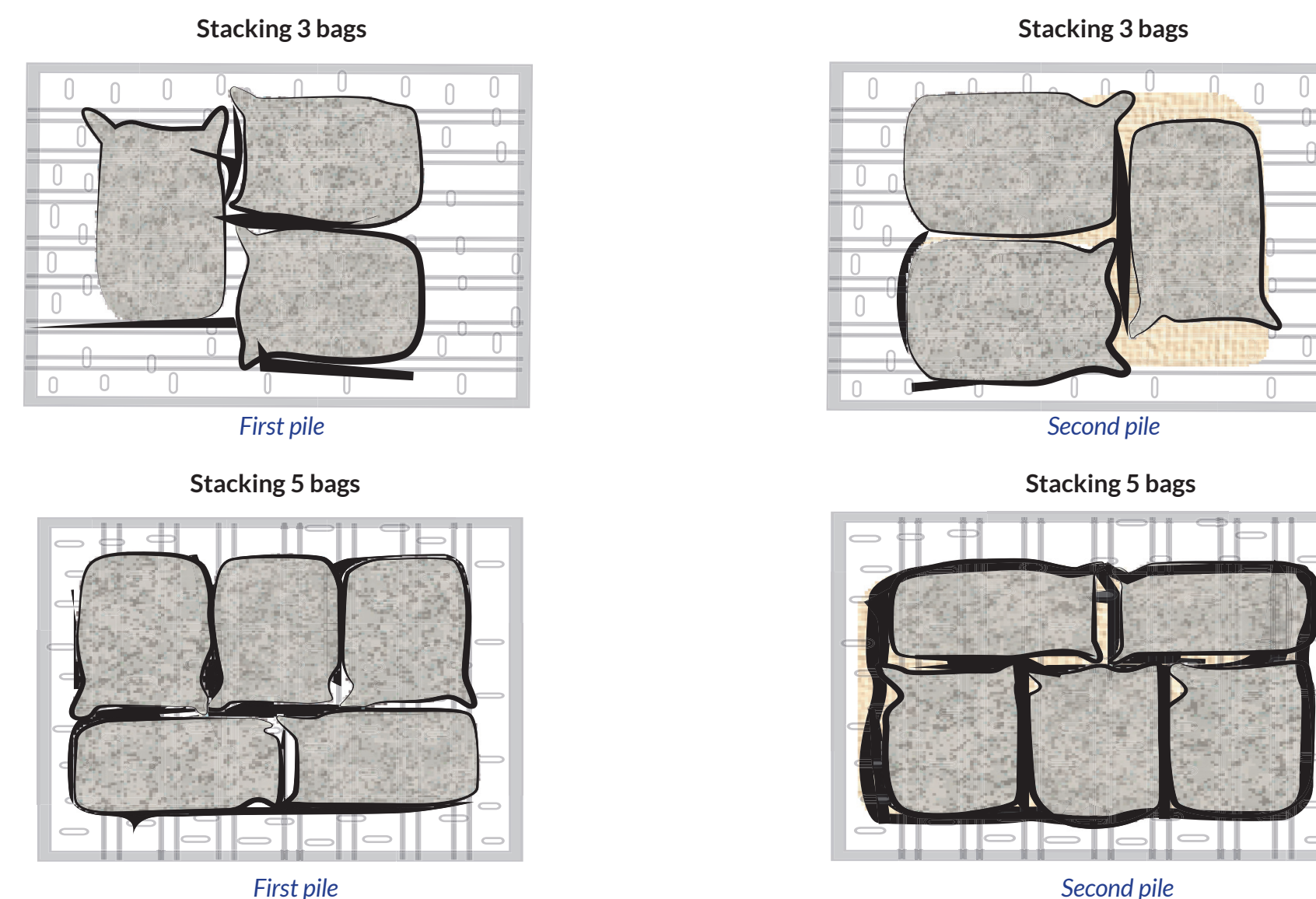
Follow up measures for cowpeas in storage

Follow-up during storage period is important to guarantee good quality stock. It is necessary to:

- Check the quality of the seeds from time to time after 15 days of storage in casks or tins.
- Inspect the seeds and clean the store once a week.
- Avoid putting freshly harvested seeds on top of old stock within the granary or store.
- In the store, apply the classic rule 'First in, First out'



Figure 5 : Stacking PICS bags



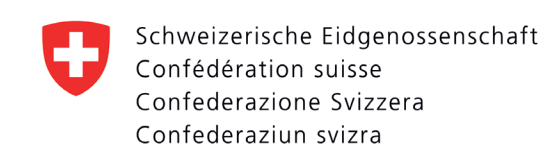
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