

## **PROTOCOL FOR TESTING STORAGE WITH PICS BAGS**

The Purdue Improved Cowpea Storage (PICS) technology was developed by Purdue University in collaboration with various national agricultural research institutions in Central and West Africa. The PICS technology is a triple layer hermetic storage bag which has an outer woven polypropylene bag and two inner bags - 80 microns thick each - of high density polyethylene (HDPE) bags. Hermetic storage with PICS bags works like any other hermetic storage by restricting availability of oxygen to the insects. The insects go dormant and stop reproducing because of lack of oxygen. Adult insects and most larva, especially the early stages, die within a few weeks of sealing the bags.

### **A. TESTING PICS BAGS**

#### **I. Sample preparation:**

1. Prepare the quantity of grain to be tested - Remove any crop debris - the grain should be inspected visually; Make sure the grain is as dry as possible;
2. Be sure that the grain is infested: you may see adults insects moving in the grain, note the presence of eggs on the grain surfaces, and check for larvae inside the seeds;
3. Weigh the desired amount of the grain.
  - For on-farm trials, use at least 30 kg. Involve a maximum of 5 farmers as volunteers in a village; explain to them how the technology works, The 5 bags can be filled by you. Describe how to store them after they are filled.
4. Assess the damage level of grain going into the bags. Each lot (identical quality and/or variety) of grain should be tested separately.
  - a. Take three random samples, each from a different place inside the PICS bag)
  - b. Count out 100 seeds from the mixed samples
  - c. Count the total number of damaged grain by insects (Exclude grains with mechanical damage, i.e., broken grains).
  - d. Count the total number of insect holes.
5. Always have a control- grain stored in woven plastic bag or other typical non-hermetic storage method used by farmers.

**II. How to store in PICS bags:** *a poster is available at the end of this document and a video is available online at <http://www.ag.purdue.edu/ipia/pics/pages/Video7.aspx>*

1. Buy PICS bags from approved merchants.
2. Separate the three PICS bags and check the two inner bags for holes and tears. Do not use bags that have holes or tears.
3. Gently pour 2-3 kg of grain into the inner bag. Drop the partially filled inner bag into the middle plastic bag (one inside the other). Put the two plastic bags into the woven bag. Fold the tops of the bags inside-out. Fill the inner bag with more grain. Make sure no grain gets between the bags.
4. Fill the inner bag far enough so that a lip remains for tying. Pack the grain tightly to remove air.
5. Twist the lip of the first bag tightly shut. Fold it over and tie firmly with string at the base of the twist and over the folded twist.
6. Pull the middle bag up over the first one so that it completely surrounds it. Twist the lip shut, fold over and tie, as before. Follow the same steps for the outer/woven bag.  
*=> This is how you use the PICS technology; It is easy, simple and effective. Clean grain with no insecticides.*

### III. Storage of PICS bags

1. Store the PICS bags and the controls in a sheltered place where possibility of rodent damage is minimal and where temperature is not extreme - never in full sunlight.
2. In village trials the grain should be stored for at least 3 months. If several bags are stored, they can be opened at two or three month intervals to assess the quality of the stored grain. The storage test can last as long as a year or more.
3. Inspect the stored bags at least each month, the bags should be cool to the touch, emit no insect feeding sounds; inspect the bags for rodent damage.

### IV. Some considerations before and after storage

1. After opening the bags: Assess the quality of grain as described in step I. 4
2. Before and after storage: Assess how has the quality of the grain changed during storage in PICS bags and in the non-hermetic containers. Note whether there is any mold or discoloration after storage in PICS bags and non-hermetic containers.
3. Record the price of the grain at the time of closing the bags (beginning of storage) and at the opening of the bags (end of storage). Assess the value of damaged grain versus undamaged grain in the local markets.
4. Learn whether people storing the grain use insecticides on it, and if so, which ones, and if people report any negative health impacts of insecticide use.
5. If there is a question about the insect species, collect some of the insects found associated with the grain and preserve them in alcohol for later identification.
6. **If the grain will be used as seed, do a simple germination test before and after storage.**
  - a. Take three random samples, each from different places inside the container (e.g., PICS bag)
  - b. Count out 100 seeds from the mixed samples, clean them using any antiseptic solution for moving dust and fungus
  - c. Wrap the 100 grains in a paper towel, place it on a tray
  - d. Wet it and keep it in a warm place.
  - e. Each day check that the paper towel remains moist and record number of germinated seeds. Do this for 10 days.
  - f. Compute germination test for five days and ten days



$$\text{Germination rate (\%)} = \frac{\text{Number of seed germinated}}{\text{Total number of seed tested}} \times 100$$

If after 10 days, 90 seeds germinated in a tray of 100 seeds

$$\text{Germination rate (\%)} = \frac{90}{100} \times 100 = 90\% \text{ germination}$$

## Nonchemical cowpea storage using PICOS bags



**1** Buy PICOS bags from approved merchants.



**2** Ensure that your cowpea is completely dry and clean (no debris).



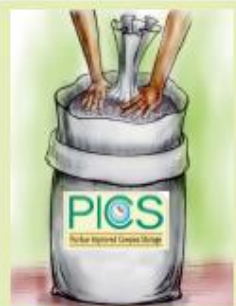
**3** Take the three PICOS bags apart and check the two inner bags for holes and tears. Do not use a bag that has holes or tears.



**4** Pour a small amount of cowpea into the inner bag, starting gently. Make sure there are no air pockets at the bottom.



**5** Put the three bags together (one inside the other). Fill the inner bag with more cowpea. Make sure no grain gets between the bags.



**6** Fill the bag far enough so that a lip remains for tying. Pack the grain tightly to remove air.



**7** Twist the lip of the first bag tightly shut. Fold it over and tie firmly with a heavy string at the base of the twist and over the folded twist.



**8** Pull the middle bag up over the first one so that it completely surrounds it. Twist the lip shut, fold over and tie, as before. Follow the same steps for the outer bag.

### Tying steps



**Step 1**  
Inner bag first

**Step 2**  
Middle bag next

**Step 3**  
Outer bag last

### Contact

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