

# Stored Grain

Department of Entomology

## PURDUE IMPROVED CROP STORAGE (PICS) BAG: SIZE MATTERS!

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The Purdue Improved Crop Storage (PICS) bag is a cost-effective technology for storing grain to reduce post-harvest losses.

The PICS bag is a chemical-free hermetic container composed of one outer polypropylene (PP) woven bag, and two liners of high density polyethylene (HDPE) 80 microns thick. Further description of the PICS technology can be found in Purdue Extension Bulletin E-262-W <<http://extension.entm.purdue.edu/publications/E-262.pdf>>. PICS bags have been extensively disseminated in West and Central Africa for cowpea storage (Baributsa et al. 2010). The technology is effective for storing dry grains other than cowpea including maize, dry bean, groundnut, pigeon pea, mung bean, millet, sorghum, wheat and Bambara groundnut. To avoid mold growth only dry grain should be stored in PICS bags.

Most of the PICS bags sold to date have 100 kg capacity but sometimes 50 kg bags are available. Both sizes of bags perform well for grain storage (Baoua et al, 2012). Farmers and others often ask for smaller sizes of bags to store seed or grain for human consumption. The need for different sizes arises for several reasons including when: (i) there is a limited quantity of grain, especially seed, to store, (ii) there is limited capacity for lifting and stacking of the larger bags, and (iii) there is need to distribute smaller amounts of grain for seed or for humanitarian purposes. This bulletin explores the benefits including cost-effectiveness and efficacy of 100kg versus 50kg bags. Table 1 displays the advantages and disadvantages of 100 and 50 kg PICS bags.

*In deciding on the best size of bag for a particular application, several factors should be considered.*

➤ **Price of the PICS bag:** Based on prices given in Table 1, the storage cost per kg of grain is lower for a 100 kg bag (US \$0.022 per kg) compared to 50 kg bag (US \$0.036 per kg). For a modestly higher cost of about 25%, a farmer can store twice the quantity of grain.



Side by side: 50 kg on the left and 100 kg on the right.

- **The type of product to be stored:** High value products such as grain to be used for seed versus grain for bulk food may justify investing in 50kg bags.
- **Quantity to be stored:** Unless the quantity to be stored is small, e.g., less than 20 kg, the quantity itself should not influence the choice of the bag because both sizes can effectively store quantities smaller than their full capacity. This is because both bags can be tied at the level of the grain eliminating unnecessary airspace and the oxygen in it, which can't be done in rigid containers like drums where it is difficult to remove the excess oxygen.

PICS bags of 100 kg capacity are frequently recommended because the cost per unit of storage is substantially lower and they are readily available in marketplaces throughout areas where the technology has been disseminated, while 50 kg bags require a special order from manufacturers. Many small-scale farmers treat PICS bags as granaries and do not need to move them around or take them to the market, so the larger size is

<b>Table 1. Advantages, disadvantages, characteristics, and price of 100 versus 50 kg PICS bags.</b>		
	<b>100 kg PICS bag</b>	<b>50 kg PICS bag</b>
Advantages	Stores more grain than the 50 kg size and can also be used for quantities less than 100 kg.	Lighter and thus easier to lift and handle. Can store less than 50 kg.
	Cost per volume is lower - the retail price is at most 25% more than the 50 kg size.	Resists bursting when stacked in large grain storage facilities.
Disadvantages	Heavy to lift and to handle when filled to capacity.	Cost per volume is higher. Retail price is only slightly lower (at most 25%) than 100 kg.
	Greater tendency to bursting than 50 kg when stacked in large stores.	Can only store 50 kg or less.
Bag dimensions (cm)	70 x 137	60 x 113
Capacity (liters)	135	70
Retail bag price (USD)*	\$2.20	\$1.80
*The retail price is the cost of two liners (HDPE) and one woven sack (PP) in Burkina Faso in 2012. The retail price varies with country, location within a country, and other factors.		

not a disadvantage. To facilitate handling and stacking in warehouses, transport and distribution, development partners such as Non-Governmental Organizations (NGO's), etc., generally prefer 50 kg bags.

#### Recommendations:

If storing grain for consumption or sale, use the 100kg bag because the cost per unit of volume stored is lower than for the 50kg bag. For small-scale farmers who store limited quantities of grain, 100 kg bags are more economical.

- When grain is stored for household consumption and there is need to open and close the bags frequently over several months, any size of PICS bags can be used; but the frequency of opening the bags should be kept to a minimum. PICS bags should be closed immediately after removing the grain.
- If the quantity of the grain to be stored is less than 20 kg, it may be best to use smaller hermetic storage containers (e.g., plastic jars, jerrycans, etc.). If storing small quantities of different type of grains (seed or grain for consumption), put each type of grain into small bags or other plastic containers and then place them inside a PICS bag.

➤ For large-scale storage (grain traders, farmer organizations, food security agencies), 50 kg bags may be more appropriate because they are easier to lift and more resistant to bursting during handling.

➤ For seed storage, the higher value of the seed may justify using 50kg bags, even though the retail price is only 10-25 % lower than the 100kg bags.

➤ Save the PICS bags for reuse the following year -- most farmers reuse the same bags for two or more years.

#### References:

Baoua, I.B., V. Margam, L. Amadou, L.L. Murdock. 2012. Performance of triple bagging hermetic technology for postharvest storage of cowpea grain in Niger. *Journal of Stored Products Research*, 51: 81–85.

Baributsa D., J. Lowenberg-DeBoer, L. L. Murdock, B. Moussa. 2010. Profitable Chemical-Free Cowpea Storage Technology for Smallholder Farmers in Africa: Opportunities and Challenges. *Proceedings of the Tenth International Working Conference on Stored Product Protection*, 27 June-2 July 2010, Estoril, Portugal, pp 1046-1052.

***The PICS bag is a simple chemical-free crop storage technology and easy to use.***



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