



UNIVERSITÀ
CATTOLICA
del Sacro Cuore



PRODUCTION OF APPROPRIATE FOOD: sufficient, safe, sustainable

**USEFUL STRATEGIES FOR GRAIN'S STORAGE IN
DEVELOPING COUNTRIES UNDER FOOD AND AGRICULTURE
ORGANIZATION (FAO) GUIDELINES**

STRATEGY 1.

Strategy recommended for medium to small producers and released by FAO ten years ago in sixteen countries of the third world, including the Congo (never in India) always with positive outcomes.

The use of Household Metal Silos, FAO, 2008 "FAO metal silos" provides many operational benefits such as the possibility to assemble the silos on site (with the possibility to purchase the finished silo), using local labor and materials readily available; reduced space for the positioning of the silos, sheltered from light and rain (near houses); storage's temperature and humidity kept constant; sealing of the silo with the consequent absence of the rodents problem ; need for a single chemical initialtreatment (no residual fumigants) before closure of the silo, avoiding the use of additional synthetic substances (insecticides); grain quality unchanged for several months also as germinative capacity; possibility to store even feeds; pressure loss for transfers reduced (up to 50% less). Silos duration estimated for 15 years; variables capability (100-3000 kg / silos); purchase costs of silos finished variable depending on the conditions (transportation, distance, capacity, etc.):

- \$ 77.5 for a 900 kg silo.
- \$ 35.10 for a 250 kg silo.

To assembly on site you will need the following materials / devices: steel plates (100 * 200 cm and 0.5 mm thick) and simple tools for carpenters; training of a first group (max 15-20 people)of technicians belonging to national agricultural institutions and of a second group of farmers / artisans and local workers who learn on site the assembly technique and silos's management, spreading the socio-economic importance of this operational strategy. Forms of financing, also partial, are possible to the purchase of the base material, from many institutions that promote the spread of this system especially for families and small rural communities. These include the Agricultural and Food Engineering Technologies FAO TeleFood program, FAO's Technical Cooperation Programmes, NGOs (with their technical staff), South-South Cooperation (very active in the training of personnel through on-site meetings and workshops theoretical and practical).



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Various operating phases of assembly and management of the silos:

1. assembly of silos on site by washing the interior surfaces with soap and water before use;



2. Put the grain, previously sun-dried (humidity 13-14%), in the silo. Do not mix the old grain with new one or with grains from different vegetable species;
3. Insert in the silo an aluminum phosphide tablet / 225 liters, completing the filling of the silo (the only chemical fumigant treatment);
4. Keep the silo closed (with the cover) for at least five days;
5. Inspect the grain every thirty days or so, making sure to seal the silo after any control and / or inspection



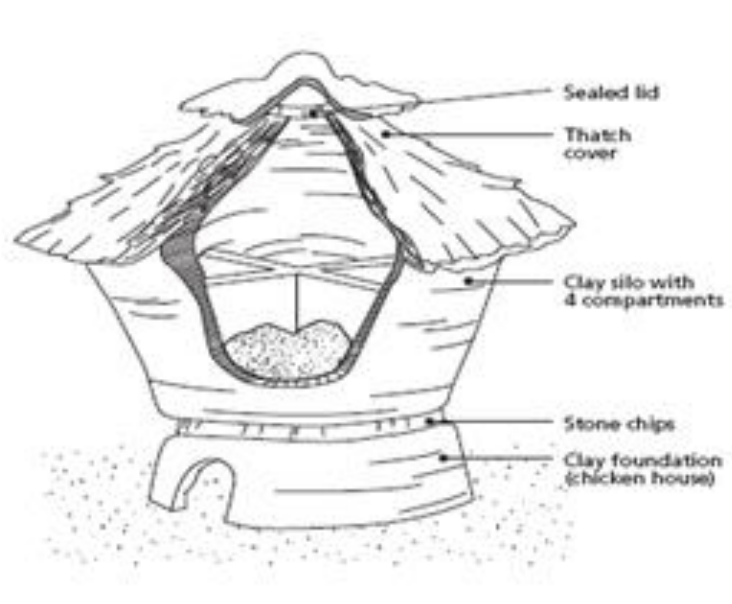
If local conditions do not allow the adoption of the previous strategy, FAO suggests to exploit existing structures by integrating them with appropriate design features. Such facilities should be located in close proximity to homes for better management and not in isolated areas (forest, countryside) as it often happens.

In these cases the product also must be previously treated with fungicide / pesticide (powders, sprays and fumigation) to be preserved and to ensure a shelf life over time. This would create costs for the management(training) and the purchase of pesticides, many of which are still widely used in India, and now banned by the European standards for their danger to man, animals and the environment. FAO therefore promotes the spread of silos previously described as a sustainable strategy. Below some of the most common integrated strategies.



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This structure is very frequent in Africa and it consists of four interior compartments for storage of products often different (up to 2-3 tons of product) which is accessed by an apical opening (closed by a stone cover which gives the possibility of intern inspections). The retaining walls are made of clay / mud, thatched roof, a flat stone on which rests the small silo. The structure is made up of clay / mud, often used as a shelter for poultry. Protect the outside wall with a mixture of mud + lime / cement, preventing crack formation (moisture infiltration). Alternatively, it's possible to insert plastic sheets during the construction of the walls improving the insulation of the structure from external agents. Leave clean the area around the silo.

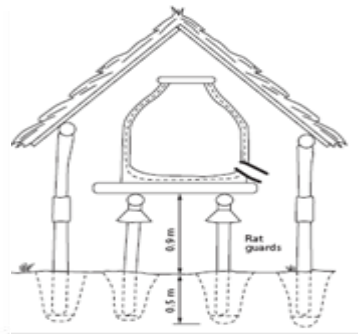


STRATEGY 3.

This structure is elevated from the ground with wooden supports which support a small silo laid on a horizontal stone surface (Fig. 1). The roof is thatched. The storage room for the products is situated in a central position and often made with only mud, it presents two openings, one end for filling and the other at the base for the withdrawal. FAO recommended raise the structure (up to 90 cm), integrating the support poles with septa / tips and plastering them with a mixture of cement and clay. This eliminates the problem of rodents, without any intervention of rodent control as well as extend the life of the structure over time. The little silo should be made with concrete, allowing greater isolation of the product from the outside. For structures of greater capacity and height (up 7-8 m) it is possible to build the entire silo with bricks (Fig. 2). Such a strategy, however, is not suitable for tropical climates as subjected to infiltration of moisture. To obviate this problem it would be possible to coat the silo with insulating material, composed of a mixture of cement-sand-mud (1: 2: 6).



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STRATEGY 4.

This strategy is based on the grains conservation in jute sacks, ideal in environments where it's difficult to dry the crops, allows an easy inspection, requires high operating costs, suggested for the supply of large quantities of product (on at the time and often it remains open). The bags must be stored in well-ventilated and raised from the ground clearance (up to 90 cm), proportionated in relation to the mass to be preserved. For small quantities it is possible to employ structures with Bambuacee (bamboo) walls covered with straw (Fig. 3). For huge masses structures may be made of concrete instead (up to 20 m² for 15 tonnes of grain) ensuring a longer life over time of the building (Fig. 4) in addition to the more controlled hygienic conditions. In this last solution we are provided small openings towards the outside (above the door) necessary for the exchange of air. Also in this case, the bags must be located on wooden boards raised from the ground.

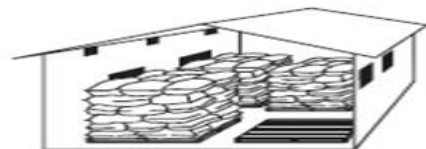


Figure 16.28 Proper stacking for easy management. The bags are placed on dunnage

