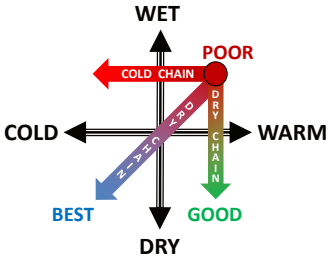
Seed Systems – Improving Seed Quality for Smallholders

Kent J. Bradford[1], Peetambar Dahal[1], Johan Van Asbrouck[2], Pedro Bello[1,2], Keshavulu Kunusoth[3], Indra Raj Pandey[4], Luke Colavito[5], Jwala Bajracharya[6], Ganesh Shivakoti[7], Daniel Karanja[8]

[1]University of California, Davis, USA; [2]Rhino Research, Phitchit, Thailand; [3]ANGRA University, Hyderabad, India; [4]CEAPRED, Nepal; [5]IDE, Nepal; [6]NARC, Nepal; [7]AIT, Bangkok, Thailand; [8]CABI, Nairobi, Kenya



In humid regions, the major factor contributing to loss of seed viability is lack of adequate drying. Seeds must be dried soon after harvest to preserve quality. Once dry, they must be packaged properly to prevent reabsorption of water due to ambient high humidity. After drying and packaging, such products will have an extended storage life even at ambient temperatures. We have termed this the "DRY CHAIN" in analogy to the "cold chain" for fresh produce. However, unlike the cold chain, dried and packaged products do not need to be refrigerated and no further energy input is needed to maintain their quality during storage. Dry and cold conditions are required for very long-term seed storage (e.g., in germplasm banks), but for medium-term storage for breeding or planting, simply drying to a low moisture content (MC) or equivalent equilibrium relative humidity (RH) is sufficient to preserve viability and quality.

Make it DRY
Keep it

In general, seeds are sun or air dried, which is unable to lower seed MC to safe levels for storage in humid climates. Heated air driers are generally unavailable for smallholders, and are less effective in humid climates. We have therefore introduced the use of Drying Beads, a novel desiccant drying technology that can enable seed drying to low MC levels, to farmers, seed cooperatives, germplasm banks, breeding stations, research centers and seed companies. Demonstration trials with onion, cucumber, bean, tomato, chili, green gram, African eggplant, okra, maize and other seeds have shown that drying to low MC using Drying Beads followed by storage in hermetic containers can greatly extend seed life even at ambient temperatures. In addition, drying and hermetic storage alone prevents both fungal and insect growth during storage. For example, studies by our Indian collaborators showed that there was 100% bruchid beetle death within 11 days at less than 40% RH, without any pesticides required.

Systems to dry relatively small seed quantities are well developed and the RH can be easily monitored using simple meters or humidicator strips. Larger seed companies in Nepal (SEAN) and Bangladesh (Lal Teer Ltd, Supreme Seed Co) are now exploring the technology. Large desiccant drying experiments using 25 kg onion seed were initiated in August 2013, and CIMMYT (Nepal) is storing 120 kg of foundation corn seed after drying with beads. Rhino Research has developed a FlexiDry system that will deliver large quantities of dry air (10% RH) and simultaneously regenerate the drying beads for continuous operation. This will enable drying of larger quantities of seeds or other products in humid environments.

USAID FROM THE AMERICAN PEOPLE
HORTICULTURE INNOVATION LAB
UC DAVIS UNIVERSITY OF CALIFORNIA

www.dryingbeads.org