

# Scaling and Commercialization of Drying Technologies for Improved Horticultural Seed and Processing Quality

## DRYCHAIN CONCEPT

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HORTICULTURE  
INNOVATION LAB

UC DAVIS  
UNIVERSITY OF CALIFORNIA



**Growing world population**

**Reduction of arable land**

**Limitation of primary resources**

**Increased stress on agriculture**

**Producing more food?**



# 1 / 3 of the food produced worldwide is wasted



**FOOD WASTE** is a major worldwide problem 

**1.3 billion tons** of all edible food produced worldwide is wasted or lost each year. That is 1/3 of the food produced annually.



A well known principle in postharvest handling of fresh produce.

Practiced routinely on a worldwide scale with enormous impacts and proven results. However, it requires large infrastructural investment and continuous energy input to maintain refrigerated transport and storage facilities.

Cold chain concept

As a concept is essentially unrecognized as a postharvest strategy.

Implementing the dry chain has a greater potential impact than the cold chain, with minimal infrastructure and no energy inputs after initial drying.

Dry chain concept

Make it  
Keep it **DRY**



# Considerations

- ▶ Maximum sun drying is often insufficient for storage
- ▶ Sun drying is not possible during rainy season
- ▶ Losses due to rodents, insects and birds
- ▶ Deterioration of quality and nutritional value
- ▶ Fungal infections & mycotoxins, health risks
- ▶ Humidity has a negative impact on temperature tolerance



# DryStore application

Supported by seed companies, improving farming quality



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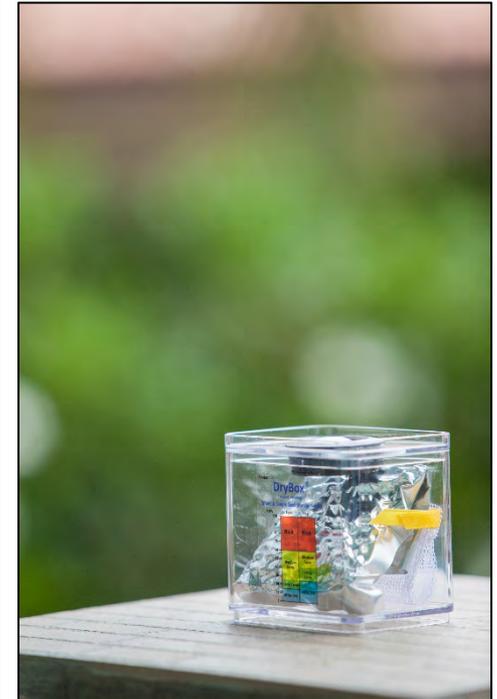
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# Drying beads



# Drying Beads, a continuous improvement



# DryBox & DrumDry



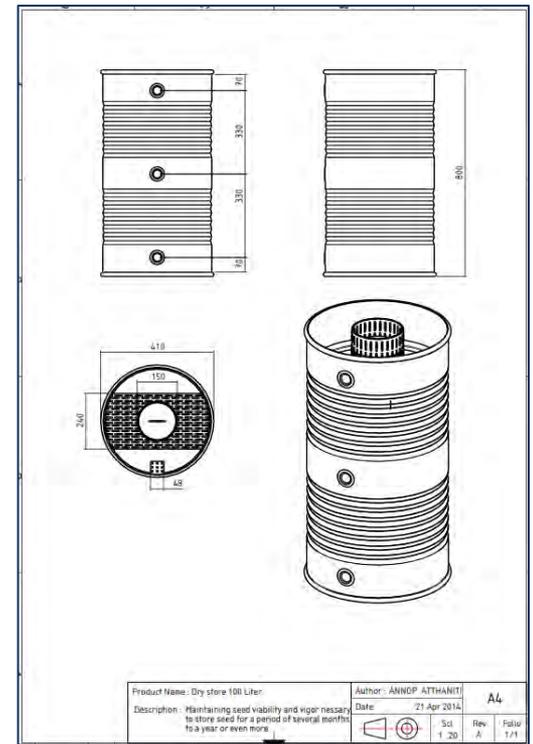
**DryBox®**

"Patent Pending"

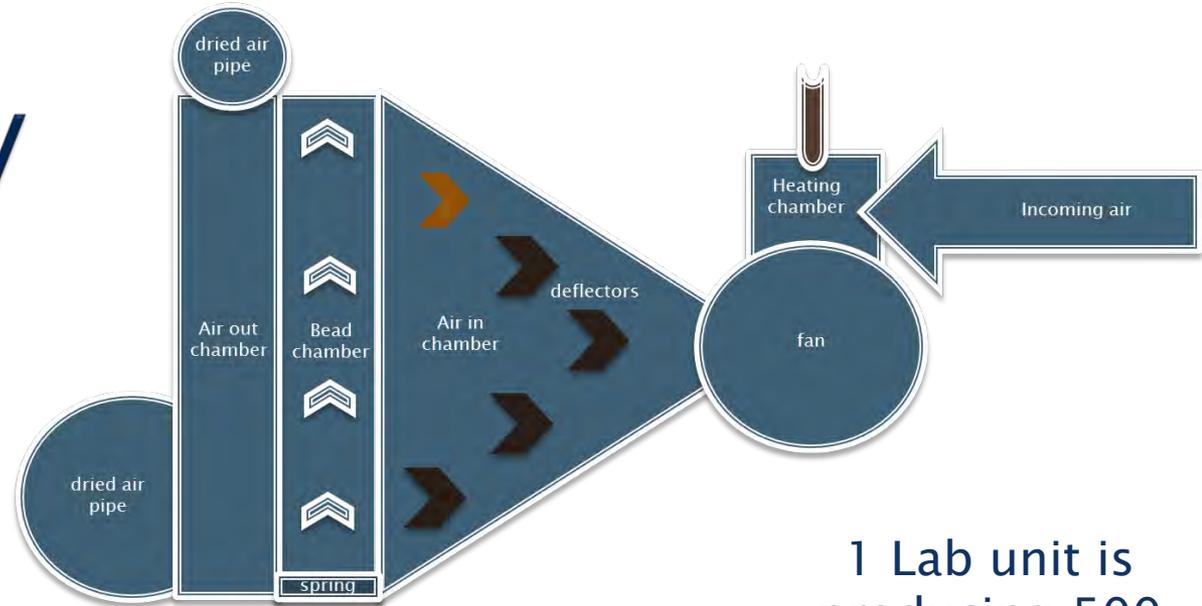
Smart & Simple Seed Storage System

RH%	Agro.	Veg.
100		
90	Risk	Risk
80		
70		
60		
50	Medium Term	Medium Term
40		
30		Long Term
20	Long Term	
10	Ultra Dry	Ultra Dry
0		

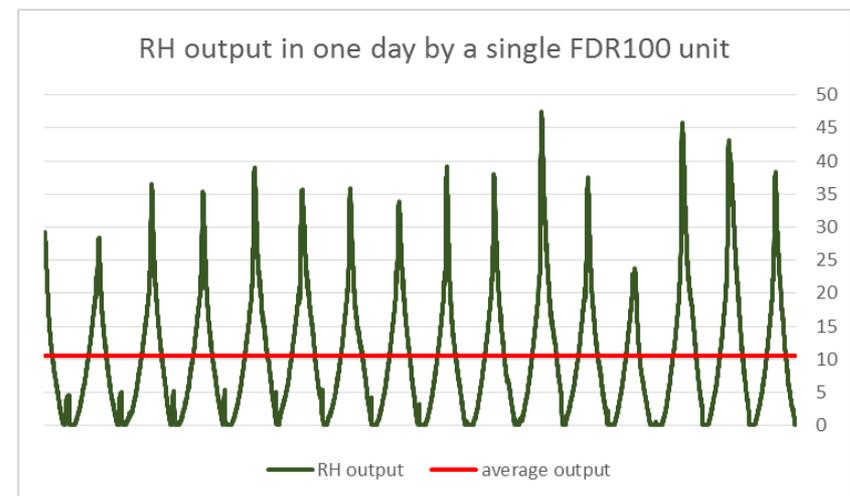
1L  
8L  
16L  
50L  
100L



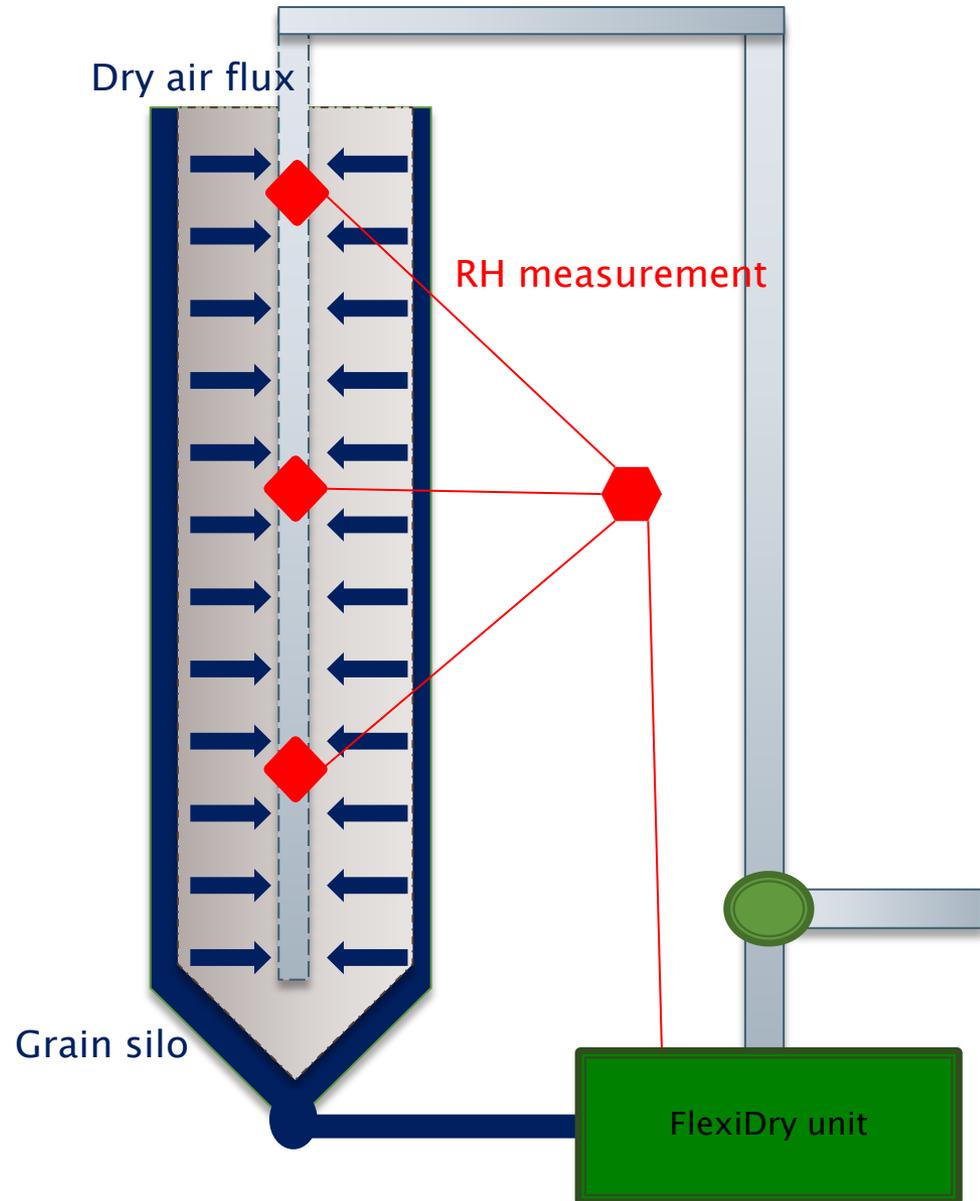
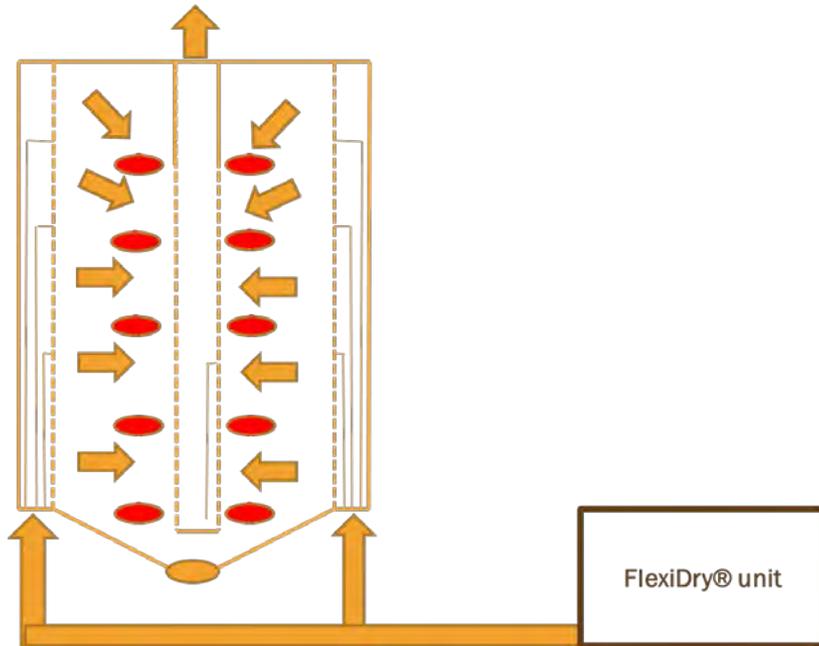
# FlexiDry



1 Lab unit is producing 500 qbm/hr with an average RH <5%

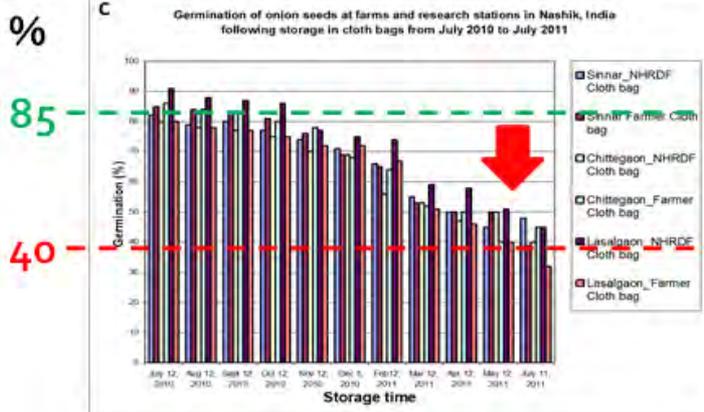
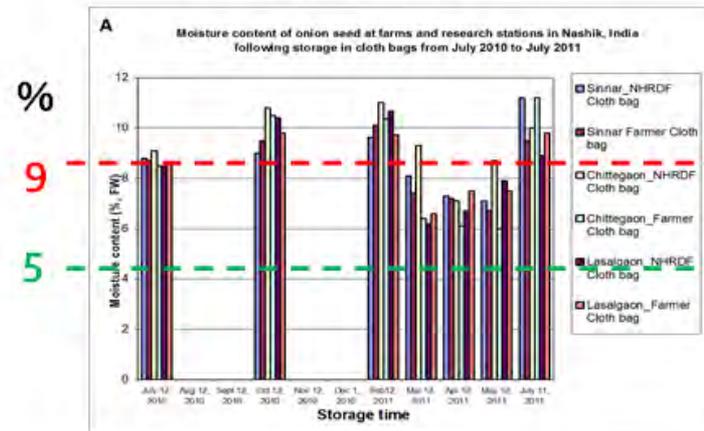


# SiloSafe

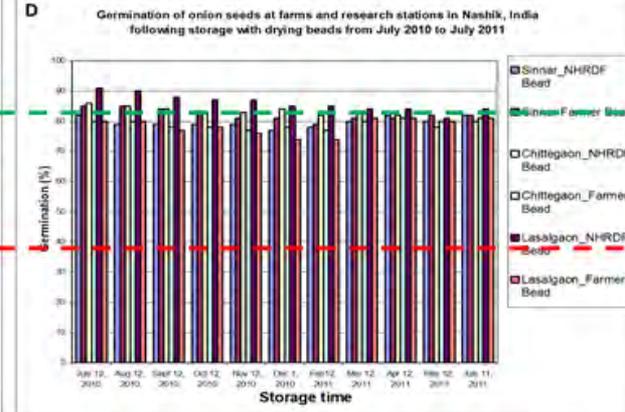
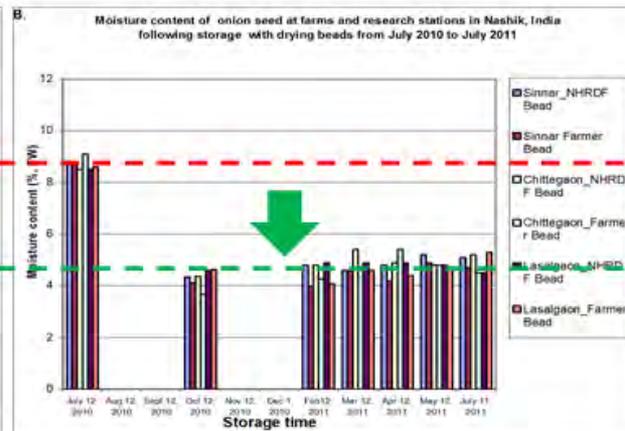


# Some results on storage & germination

## Open bags



## With beads

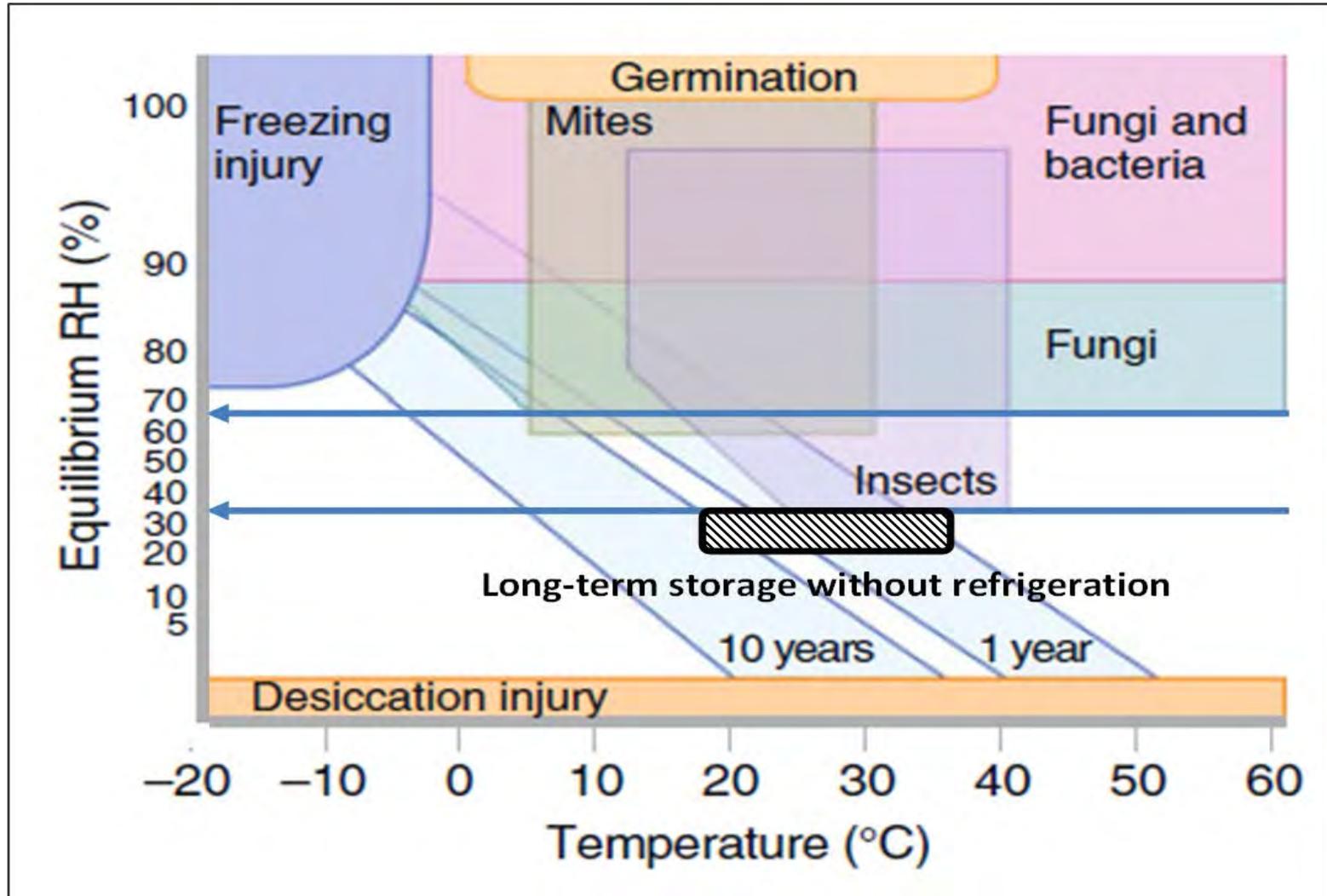


Stored for 1 year by farmers

Seed MC reduced by 4% with beads.

Germination decreased by 45% in open bags.

# Impact on insects, fungi & bacteria and thus on mycotoxins and aflatoxin



# A few companies have been selected

## ▶ Bangladesh

- Lal Teer
- ACI
- Metal Seeds
- Getco
- Supreme
- DAI

Each of them has one clear and specific objective as a business case.

From each company 1 or 2 people are selected for training.

## ▶ India

- Rasi Seeds
- Bioversity



# Training setup over 2 year period

- ▶ Practical training on drying beads and related activities
- ▶ Theoretical training on drying of seeds
- ▶ Theoretical training on longevity, storability, maturity, aging...
- ▶ Theoretical training on storage systems
- ▶ Practical calculations on viability (Ellis & Roberts), eRH, Aw and SMC (Cromarty equation), Psychometric chart ...
- ▶ Setup and execution of drying trials and comparison between different absorbents
- ▶ Writing complete business case for management



Tell me and I forget  
Show me and I may remember  
Involve me and I understand

ISA – proverb (International Seed Academy)

# Providing a business case study for each company



- ▶ Increase seed quality of hybrid tomato seed production by providing adequate drying technologies to the seed farmers
- ▶ Increasing shelf life of stored seeds and reducing the need for cold/dry storage, while maintaining germination and vigor
- ▶ Safekeeping foundation and breeder seeds in an efficient but cost effective manner
- ▶ Reducing risk and better management of pests and diseases at farmers and warehouse level.
- ▶ Keeping lab samples under ideal conditions
- ▶ Bringing the local production of cabbage and onion seeds to the same quality level as produced in the US and/or Japan.

# Support of these companies by the setup & implementation

- ▶ 7 training sessions in 2 years (3–4 months interval)
- ▶ Home work with basic trials and implementation of the technology
- ▶ Adaptation of the technologies towards company specific methods, systems, structures and goals
- ▶ Support during the implementation, ensuring a correct approach and thus a forecasted outcome.
- ▶ One on One support, so that each company can target their key issues



# Our target



- ▶ To bring the technology to the seed farmers through the support of the seed companies.
- ▶ To bring the technology from these seed farmers to all farmers in general, and thus not only drying seeds, but definitely also commodities.
- ▶ To ensure that all farmers can be self – sufficient and can store their produce for own use for a whole year.
- ▶ To disseminate this technology from Bangladesh towards whole South Asia.

# Thank You for the Attention



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