Postharvest Management and Storage of Pulses in India: Challenges and Opportunities

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Food Security

- World population is expected to grow by over 2.3 billion by 2050
- Demand for cereal grains is expected to increase by 70% (IFPRI)
- 2.6 billion tonnes of grains are produced but 10-30% post-harvest losses occur which could be used to feed additional 1.35 billion people

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Pulses in India

- Pulses are the major vegetarian source of protein in India and country is among the world's top producers and consumers of pulses
- However, due to huge gap b/w production and demand, India may need to import up to 10 million MT of pulses annually
- Insufficient and poor storage infrastructure, lack of knowledge of advanced pulse management technology, and harsh climatic conditions

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Storage Losses

- Significant quality and milling losses due to mold growth, carcinogenic mycotoxin development, insect damage

- Discolouration, darkening due to oxidation, broken/cracked/split/peeled seeds, sprouting, odour, heat damage, and binburnt damage

- Pulse growers, traders, and processers incur huge economical losses due to both quality degradation and quantitative loss of pulses in storage

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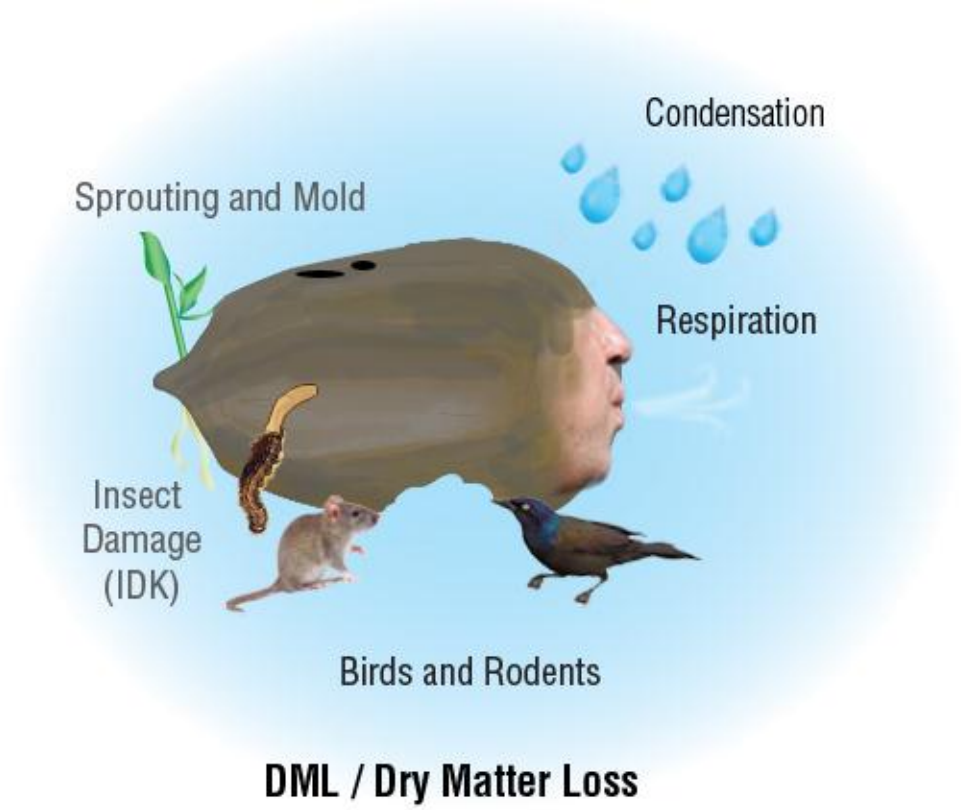
Stored Grain Ecosystem



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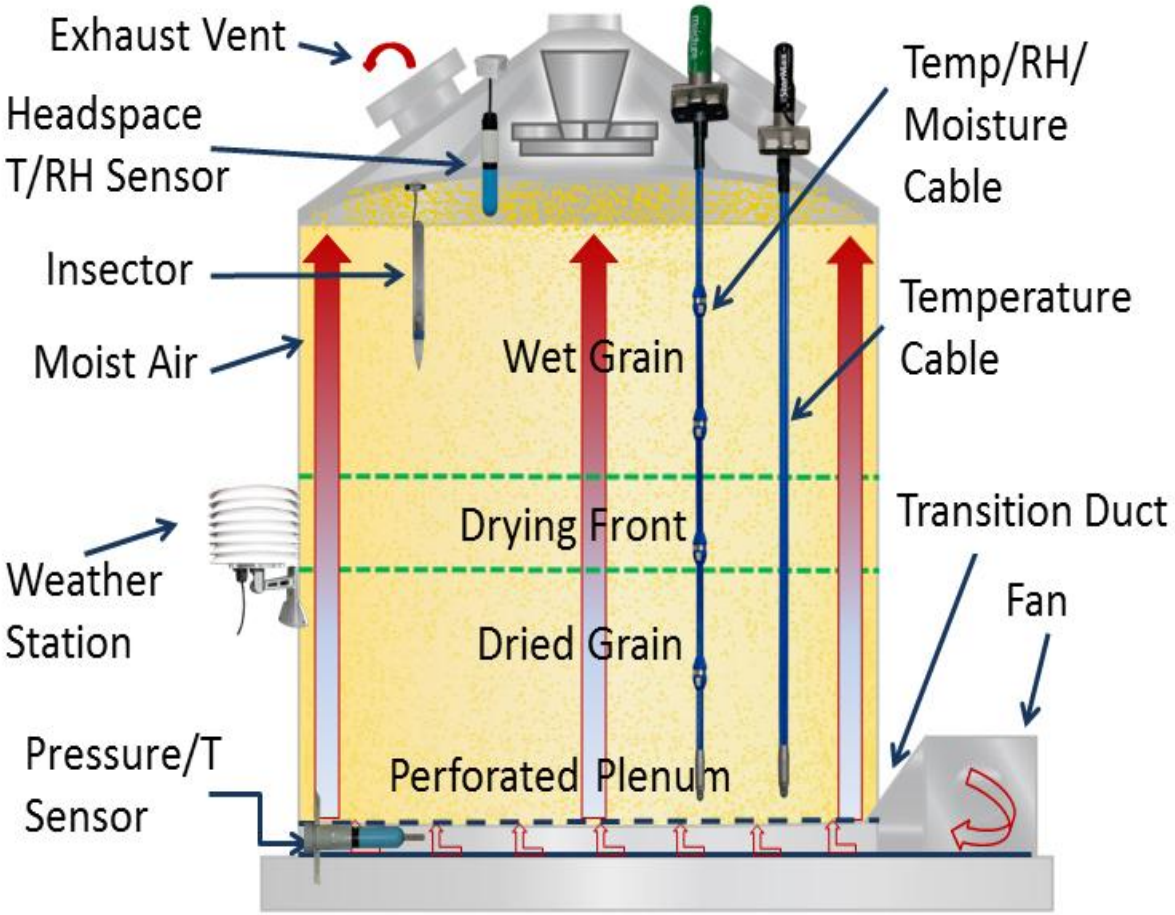
Grain Management System



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Poor Grain Management

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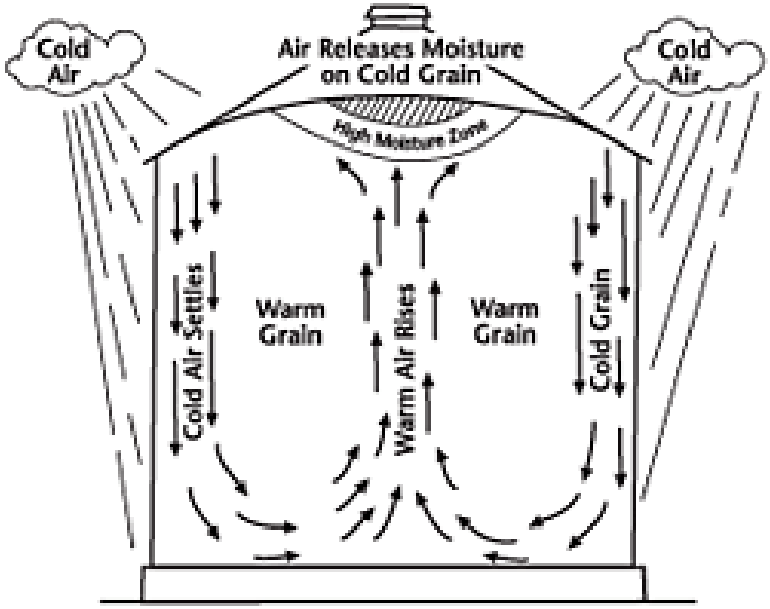
Condensation Issue

- Headspace and sidewall condensation is common in winter



When air cools, water condenses due to reduced water holding capacity of air

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Grain Management

- Safe storage
- Reduce spoilage
- Maintain/improve quality or the highest grade grain
- Highest premium ($ value) on the grain
- Minimize storage cost
- Peace of mind

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Safe Storage

- 'Safe storage' refers to the storage of pulses for longer periods without any spoilage and quality loss
- Stored pulses change physically and chemically
- **Temperature** and grain **moisture** are the two most significant parameters that determine the safe storage period of grain
- Immature and broken/damaged kernels, un-cleaned grain with foreign material has relatively shorter safe storage period
- Safe storage period is cumulative

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Sanitation

Seal all cracks, clean away all grain and debris, maintain the area around the bin

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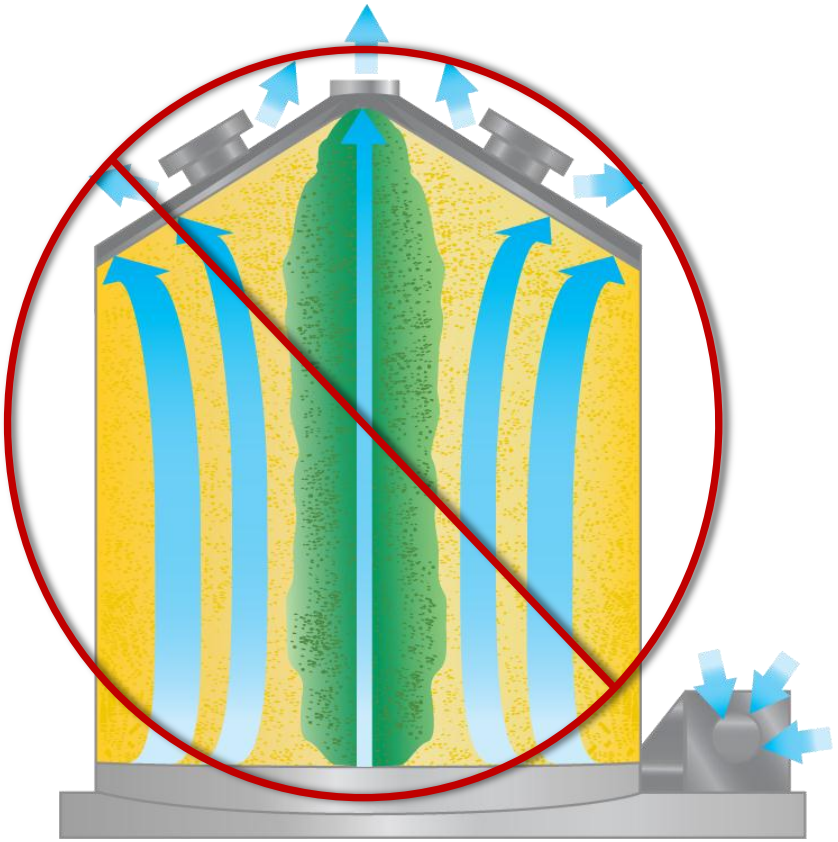

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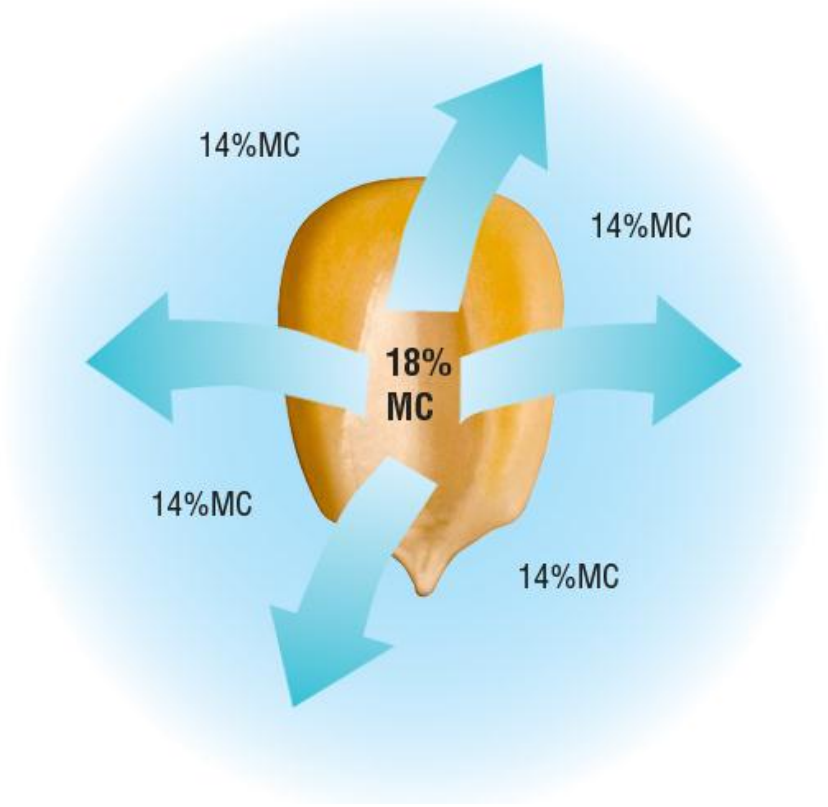
Equilibrium Moisture Content (EMC)

An important concept when drying with natural air, aerating without shrink, and re-hydrating



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Safe Storage of Pulses (in Days)

Temp in °C	Moisture Content (%)				
	12	14	15	18	21
25	31	16	7	4	2
20	55	28	13	7	4
15	100	50	20	12	6
10	200	95	38	20	21
5	370	175	70	39	30

(Whatley, 2015)

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Summary

- For long term storage pulses should be dried to <14% moisture content and cooled to <15^{0}C Temp
- To prevent spoilage, green seeds, dockage, & foreign material should be removed prior to storage
- Pulses respire (breathe) in storage which raises seed moisture and temperature requiring regular monitoring and automated aeration
- Effective grain management practices and regular monitoring ensure safe storage of pulses at a high commercial grade, optimum quality, and with minimum spoilage risk

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Thank you!

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