Post Harvest Loss reduction in developing countries

A contribution to food security

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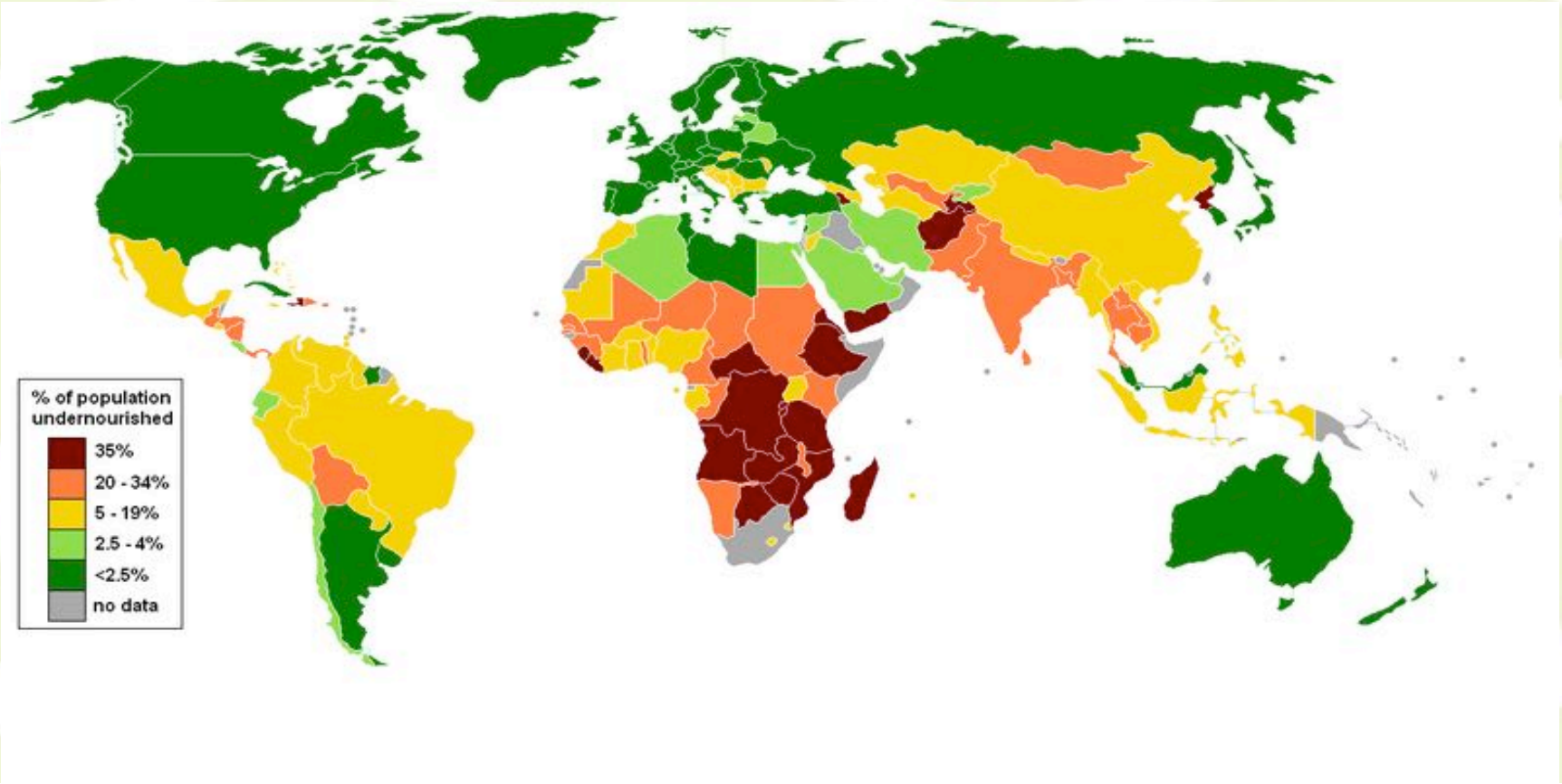
Status quo

- The seventh part (ca. 950 m) of humanity is suffering from hunger and malnourishment
- Global PHL amount to one third (1.3 bn t annually)
- In developing countries 10% - 70% of harvested foodstuffs are lost

Percentage of undernourished people



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Definitions

- **Post Harvest Technology:** technical procedure of work steps between harvest and consumption of agricultural products

- **Post Harvest Losses:** quantitative and qualitative losses of food and byproducts in the sector specified above

- **Food Waste:** Food items rejected by traders or thrown away by consumers

Objectives of PH-Technology

- **Food security** (supply of safe, non-hazardous food)
- **Reduction of losses** between harvest and consumption or processing
- **Preservation of quality** (appearance, texture, taste, nutritional value)

Spheres of action for PH-Technology

- Conditioning
- Preservation
- Transport
- Storage
- Processing

Fluent transition to food technology

PHL related Categories

- Bulk/weight loss → quantitative loss
- Downgrading → qualitative loss
- Edibility
- Nutrient providing ingredients
- Sensory characteristics
- Contamination (pathogenic, toxic)

PHL in developing countries

- Deficient harvest technology
- Antiquated processing
- Erroneous handling
- Inappropriate transport
- Improper storage
- Insufficient infrastructure
- Unsatisfactory marketing possibilities

Causes for Losses

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Additional causes

- High-yielding varieties are more sensitive to pests
- Lack of capacities for big yield increase
- Changing cycles of crop growth
- Climate change (adverse weather conditions)

Extent of PHL

- Globally → about one third
- Industrialised countries → 5% -15% (except food waste)
- Developing countries → 10% -70% product depending (in extrem cases even more)
- Maximum losses with fruits, vegetables, milk and meat

Percentage of PHL for perishable commodities in developing countries

Roots & Tubers	potatoes	5 – 40
	sweet potatoes	35 - 95
	yam	10 - 60
	maniok	10 - 25
Vegetables	onions	16 - 35
	tomatoes	5 - 50
	plantain	35 - 100
	cabbage	37
	cauliflower	49
	salad	62
Fruits	banana	20 - 80
	pawpaw	40 - 100
	avocado	43
	peach, abricot	28
	citrus fruits	23 - 33
	raisins	20 - 95
	apples	14

Loss Assessment

An assessment is quite complicated, as losses:

- are driven by a multitude of influencing factors
- are fluctuating regionally and seasonally
- appear on different levels (local, regional)
- are strongly product-dependent

- There is no universally valid assessment methodology for all situations and products up to now
- Existing data are mostly based on rough estimates

Socio-economic Relevance

- The cost-effectiveness of investment for post harvest research is not inferior to that in the production sector (Goletti & Wolff 1999)
- Loss reduction is more sustainable than increased productivity
- Positive influence on the health situation
- The creation of employment opportunities reduces urban migration
- Generation of additional income by value-added products

Strategies of loss reduction

- **„Classical“ approach**: isolated action for improvement in singular sectors of the post harvest chain, rarely sustainable
- **Integrated approach**: systemic, consideration of the entire value chain, identification of „hot spots“ and analysis of options to intervene, preferably value-adding processing activities close to the production areas
- **Additional option:** inclusion of digital applications to enhance efficiency of interventions

Strategies of loss reduction

- **Additional option:** inclusion of digital applications to enhance efficiency of interventions

Your ideas?

RELOAD - Project

- Reduction of Post Harvest Losses and Value Addition in East African Food Value Chains
- Development of a german-african network for system – related research to reduce PHL
- 16 partner institutions from 4 countries – 7 subprojects
- Promotion of small/medium processing enterprises for the value-addition of agricultural products

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Cooperating partners

- **4** academic institutions from Germany
- **6** universities from Ethiopia, Kenya and Uganda, national agricultural research institutes and SMEs
- **ICIPE**: International Centre of Insect Physiology and Ecology, Nairobi

Structure

- **7** subprojects
- **4** related to the most important commodities in the respective countries
- **3** product- and country-comprehensive (economic, technical and social aspects)

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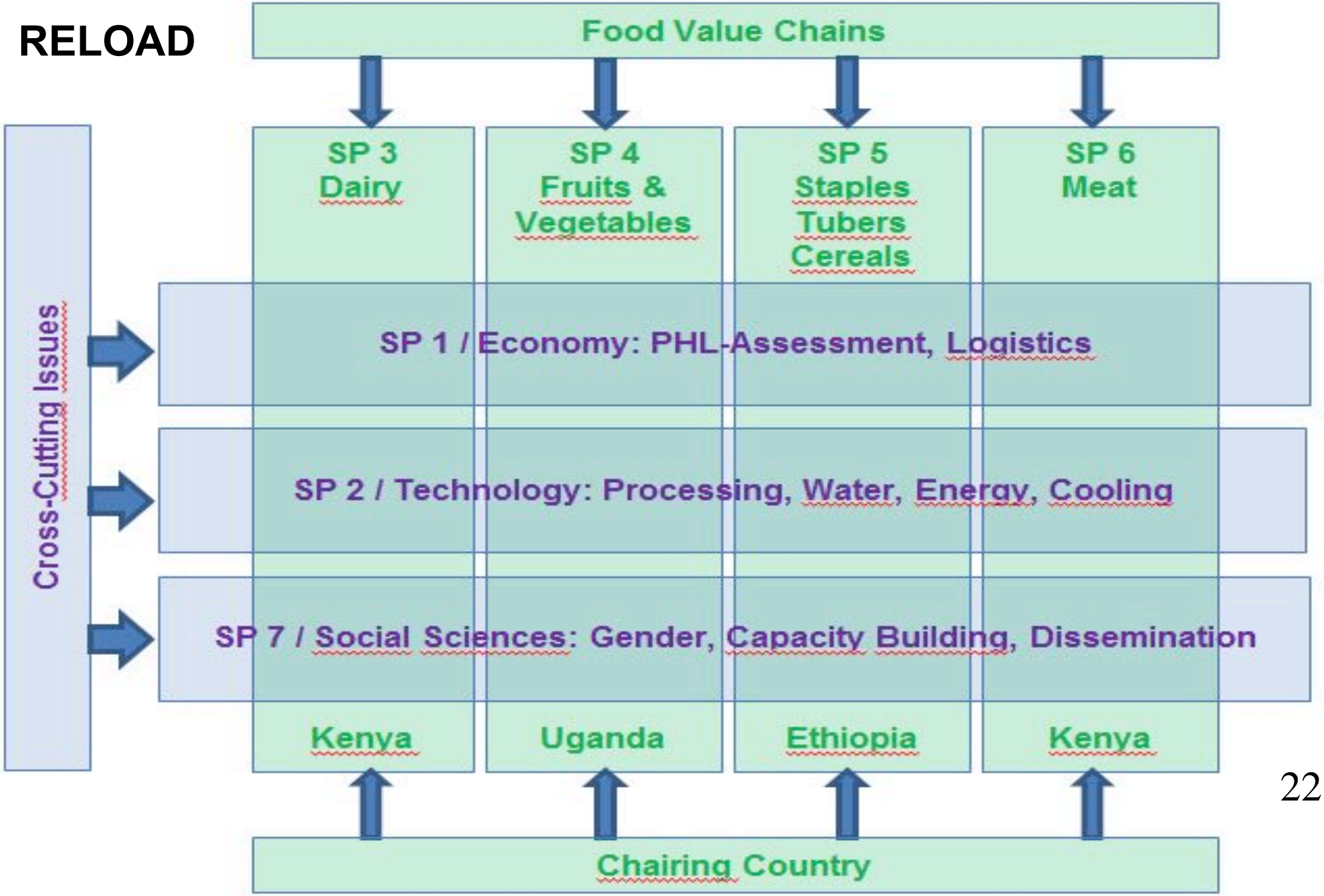

Food Value Chains
SP 3
Dairy
SP 4
Fruits &
Vegetables
SP 5
Staples
Tubers
Cereals
SP 6
Meat
Cross-Cutting Issues
SP 1 / Economy: PHL-Assessment, Logistics
SP 2 / Technology: Processing, Water, Energy, Cooling
SP 7 / Social Sciences: Gender, Capacity Building, Dissemination
Kenya
Uganda
Ethiopia
Kenya
Chairing Country

Innovative Research Approach

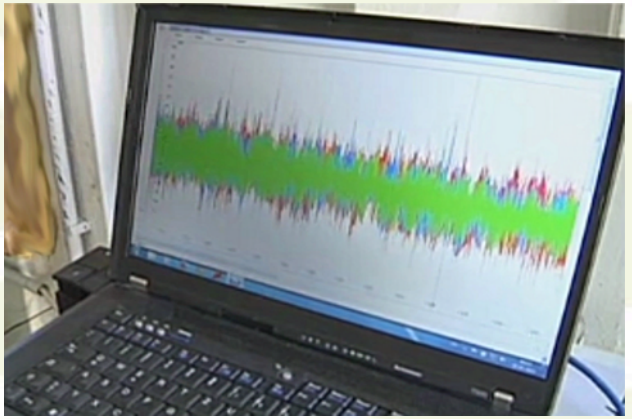
- Identification of potential problem spheres in a systemic context
- Analysis of the precise problem
- Prevention instead of reaction

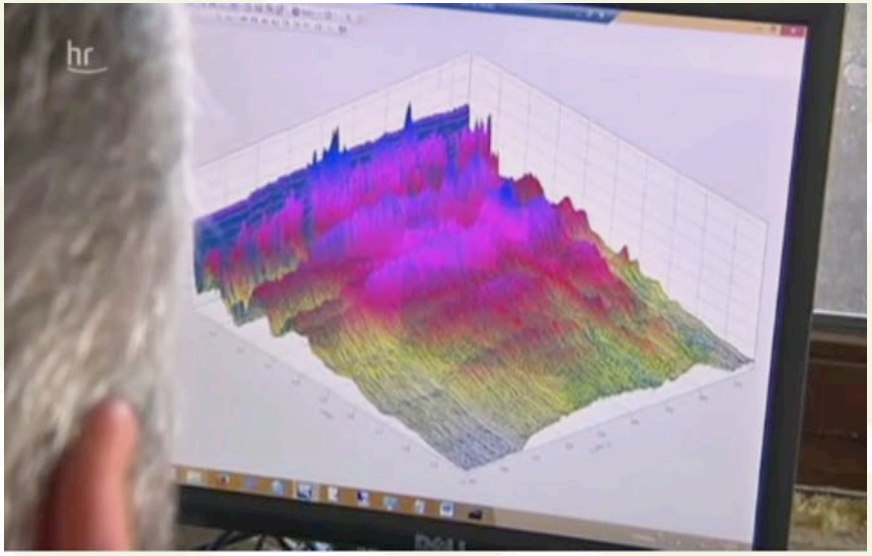
Methods of computer-based prediction and prevention

- Acoustic pest detection in storage
- Storage with sensor based humidity control
- Sensor controlled solar drying
- Electronic bee hive health and swarm control

Acoustic pest detection in storage

Acoustic fingerprinting of postharvest insect pests at bulk storage of grains – early warning system by sound profile for identification of different species





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REDUCING LOSSES
ADDING VALUE

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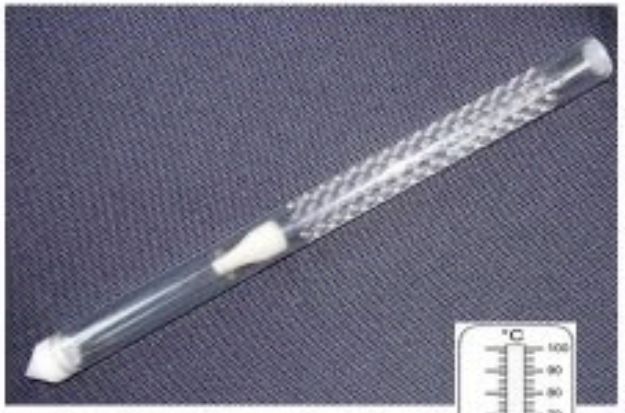
Detection of insect pests

beetle and moth traps



temperature monitoring of the substrate

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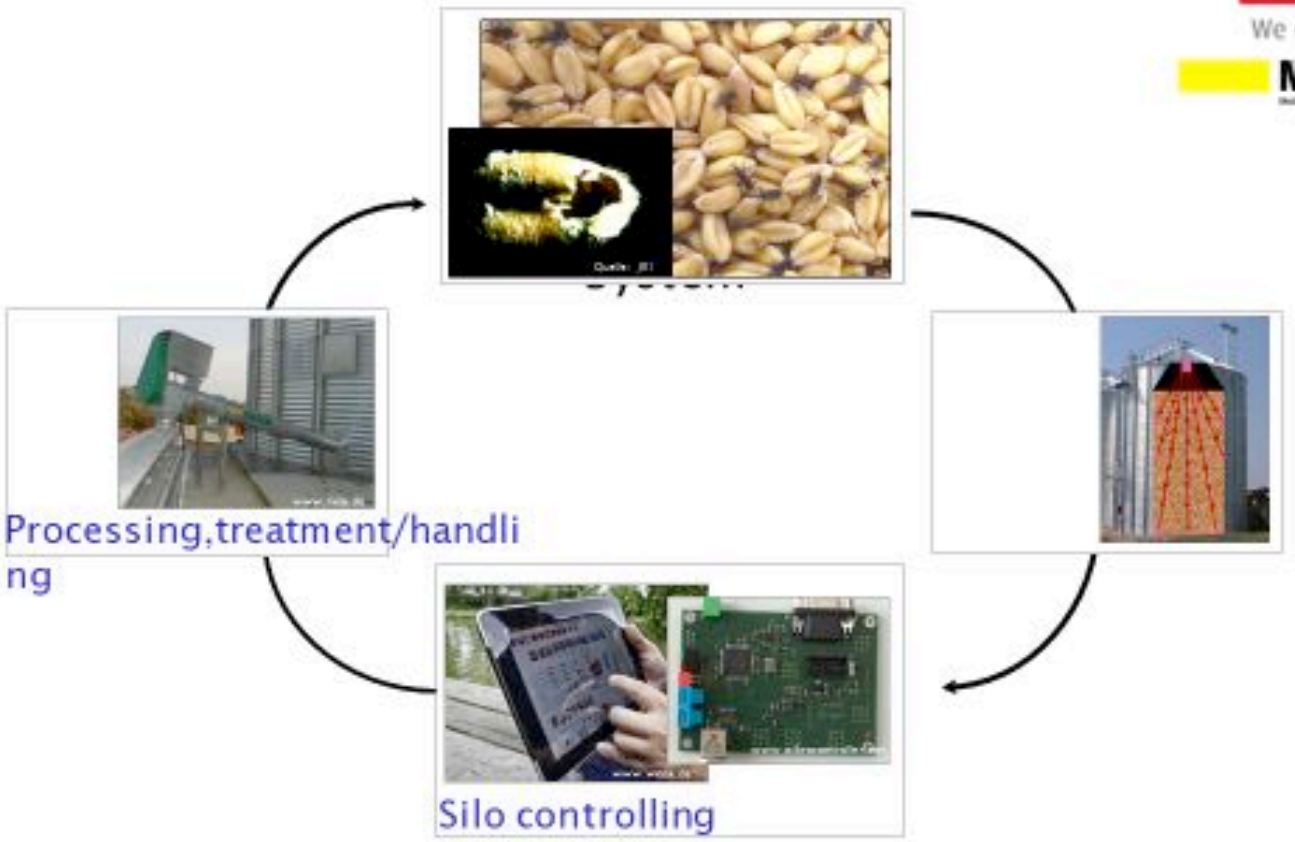
Acoustic detection of storage pests in silos



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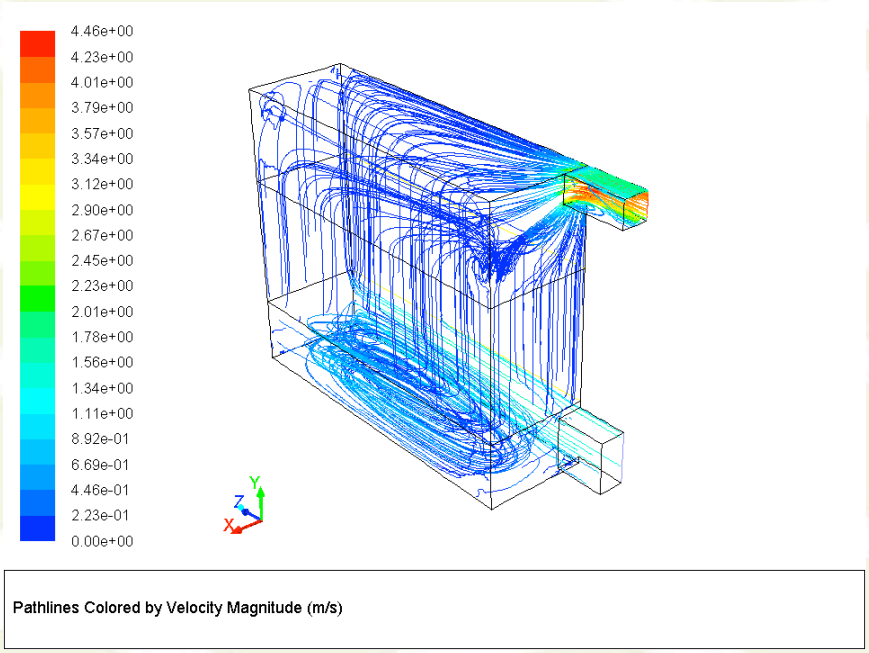
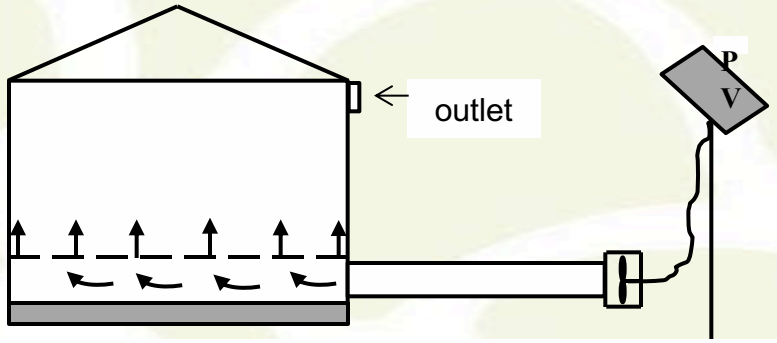
Sweet potatoe storage



Modify a traditional African mudhouse to a sophisticated in-bin storage for roots, tubers and cobs



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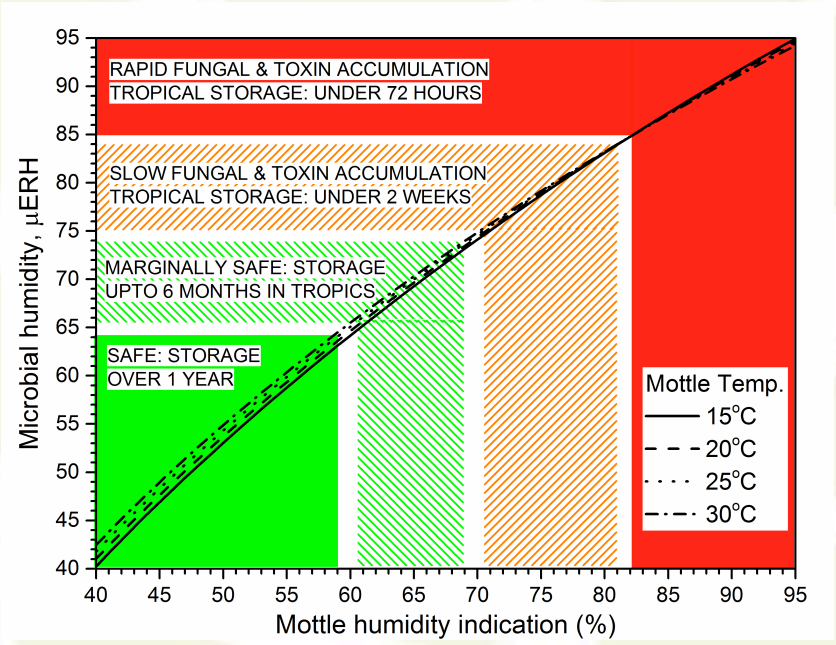
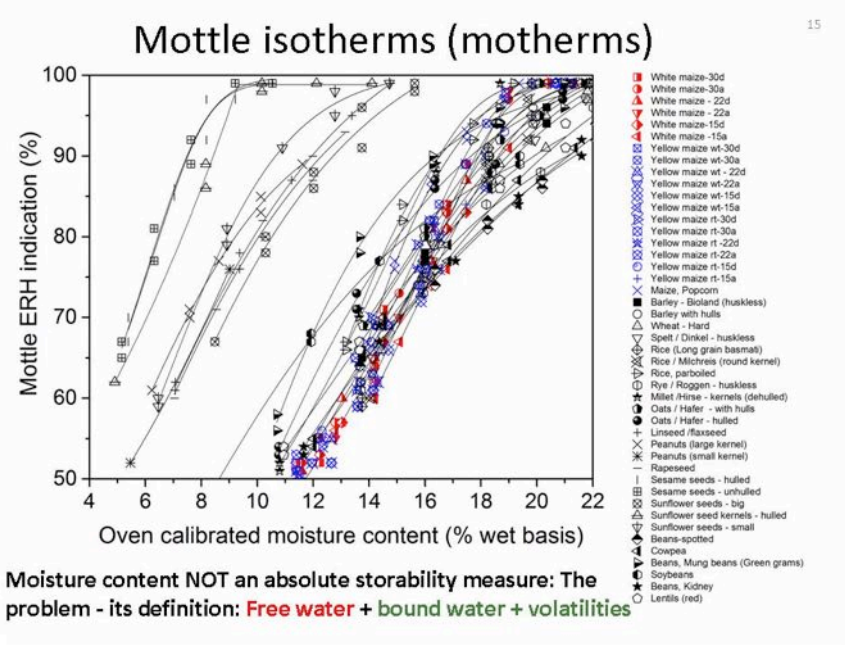
Moisture meter:

Mottles
moisture-test-bottles





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Conclusions

- The reduction of PHL is a substantial contribution to food security with strong socio-economic development potential
- There is a considerable shortcoming in the perception of post harvest deficiencies
- Innovative system-related research is necessary (considering the entire value chain)

Information / Contact

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Thanks for your attentiveness