Food Security

Team: Faraday

Mission

How can we contribute to food security by decreasing the loss and waste of food?

Background/Context

The United Nations Food and Agriculture Organization (FAO) estimates that approximately one-third of food produced for human consumption is lost or wasted globally.[1] This loss is estimated to be roughly at 1.3 billion tons per year. Considering the huge amount of resources used in food production and the high levels of greenhouse gas emitted in the process, finding solutions to minimizing the food losses and waste constitutes an urgent global challenge that requires innovative and multidisciplinary approaches.

The causes of food loss and waste are complex, diverse and often interrelated. A recent report by the High Level Panel of Experts on Food Security and Nutrition (HLPE) categorizes these causes along the three main levels or stages of the food supply chain[2]:

1. *Pre-harvest,* such as:
    - Poor agronomic and cultural practices (water/nutrient/pest management, pruning, staking/propping, etc.).
    - General lack of information on good production, harvest and post-harvest handling practices due to poor agricultural extension services, especially for smallholders.
    - Poor organization among farmers into groups/cooperatives/associations to access services and facilities or to pool their produce for better market access.

2. *Harvest and initial handling stage,* such as:
    - Poor harvesting techniques leading to spillage, mechanical injuries, heat injury.
    - Poor choice of containers and appropriate packaging materials
    - Lack of schemes that promote or facilitate utilization of unmarketable foods e.g. donation, cottage processing industries in production areas, farmers markets.
    - Lack of knowledge and capacity on good post-harvest handling practices and applicable technologies among the value chain actors (growers, traders, transporters).

3. *Storage*, such as:
    - Lack of proper storage facilities for shelf-stable foods such as grains resulting in losses from pest damage, fungal infection and contamination.
    - Lack of cold storage facilities for highly perishable commodities such as fruits, vegetables, fish, meat, dairy products.
    - Poor storage conditions; poor ventilation, sanitation, gas composition, lighting.

CERN Connection

Cooling technologies

Solar panels

Light-weight structures
Vacuum and insulation technologies
ICT

Society Connection
Changing the world by exploring ways to utilize different technologies to avoid the loss and waste of food, improving resource and energy efficiency, and the quality of life, particularly in the developing world.
Understanding the current state of the food production, storage and distribution industry with the view of developing low-cost solutions with broad social impact.

Explorative Questions
What are some of the leading causes of food waste and loss that can be addressed with CERN technologies?
What are some of the existing, yet perhaps high-cost, solutions to this problem?
What can we learn about food production and consumption practices and patterns that should be changed in order to improve the efficacy of the food supply chain?
How can we increase awareness (and change habits) among food producers and consumers regarding the waste of food?

Target Users
Farmers and food producers suffering from loss of food due to inadequate technologies.
Food consumers contributing to food waste.

Expected Outcome
A prototype that can be used along the food supply chain to mitigate food loss and waste.

Success Metrics
Concept is validated with a proof of concept prototype and tested with real users.
Positive societal impact of the solution is clearly demonstrated.

Research Plan
Examine the different causes of food loss and waste more closely to gain understanding about the possible solutions.
Explore different technologies available at CERN and in the consumer market (for example iCow; cryonic freezing and cooling of food).
Identify the areas with most potential impact to the food supply chain and benefit to end-users.
Develop some ideas and an action plan.

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[1] FAO (2011) Global Food Losses and Food Waste: Extent, Causes and Prevention, Rome.
[2] HLPE (2014) Food losses and waste in the context of sustainable food systems. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome.