Challenges for Reducing Food Losses and Waste

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World’s Population Trends

World’s Population

Year

2050
2030
2010
1990
1970
1950

Millions

0 2000 4000 6000 8000 10000

Developed
Developing

Population Growth

% growth/year


World
China
India
US
Brazil
Indonesia

Source: UN Population Division
Malthus Revisited?
Malthus Revisited?

Thomas
R. Malthus
1766-1834

“The power of population is so superior to the power of the Earth to produce subsistence for man, that premature death must in some shape or other visit the human race.”
The “Perfect World”

FOOD
Increase in demand by 60% by 2050 (FAO)

ENERGY
Demand increase by 50% by 2050 (IEA)

WATER
Increase in demand by 30% by 2050 (IFPRI)

Climate Change

Increase in demand by 60% by 2050 (FAO)
Forecast for 2050

• Food production will have to grow 60% - 70% by 2050;
• The consumption of meat is expected to rise from 32 to 52 kg / capita / year;
• Food versus fuel dispute raw materials (bioenergy demand is expected to increase 100% by 2050);
• Climate change brings new challenges for production;
• Land scarcity (prices skyrocketing) and water (+ 100%) (currently 36% of world population is living in areas without water availability)
Commitments for 2030

- Rio + 20
- Zero Hunger Challenge
- COP 21
- SDG 2030 (2015)
Undernourishment

World: People Undernourished (Number and Prevalence)

Source: FAOSTAT
Undernourishment: New FAO Estimate

Source: SOFI 2020
World: Food and Non-Food Productions Index (1961=100)
## Food Supply Forecast

Yield (ton/ha) growth (% per year)

<table>
<thead>
<tr>
<th></th>
<th>Developed</th>
<th>Developing</th>
<th>All Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wheat</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.06</td>
<td>1.30</td>
<td>1.17</td>
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<tr>
<td><strong>Rice</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.53</td>
<td>1.08</td>
<td>1.05</td>
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<tr>
<td><strong>Maize</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.84</td>
<td>1.36</td>
<td>1.03</td>
</tr>
</tbody>
</table>

Source: Chang & Zepeda, 2003
China: Growth in Agricultural Production

World: Food Supply

China: Grain Production

Source: World Bank
China

19% of World’s Population
7% of World’s Arable Land
6.5% of World’s Water Resources
Only 50% of territory useful for agro production

China: Food Deficit (in Kcal/ capita/day)
Brazil and China: Poverty US$1.9 day/capita PPP (%)

Source: World Bank
Food Consumption in China

China Composition of Daily Diet

Domestic Supply, 2018

- Wheat domestic supply: 139,090 thousand tonnes
- Maize domestic supply: 268,816 thousand tonnes
- Barley domestic supply: 4,196 thousand tonnes
- Rice domestic supply: 215,825 thousand tonnes
- Vegetable oils domestic supply: 33,113 thousand tonnes
- Meat domestic supply: 92,145 thousand tonnes
- Bovine meat domestic supply: 8,696 thousand tonnes
- Pigmear meat domestic supply: 57,464 thousand tonnes
- Poultry meat domestic supply: 19,245 thousand tonnes
- Fish and seafood domestic supply: 66,872 thousand tonnes
- Eggs domestic supply: 36,920 thousand tonnes
- Milk domestic supply: 37,887 thousand tonnes
- Vegetables domestic supply: 641,341 thousand tonnes
- Starchy roots domestic supply: 213,836 thousand tonnes
- Sugarcrops domestic supply: 123,774 thousand tonnes
- Fruits domestic supply: 123,774 thousand tonnes

Source: Food Balance Sheets
China: Nutrition Indicators

China: Prevalence of Undernutrition

China: Prevalence of Obesity in the Adult Population

Seesaw effect
Western consumption habits are not limited only to the intake of food, but the whole process of acquisition, processing and consumption, reproducing the effects downstream of waste in supermarkets, packaging and portions, without regarding the distances covered for transporting food from the outside of the producing regions.
Source: Food Prices and the Welfare of Poor Consumers - Ethan Ligon
Giannini Foundation, University of California, Berkeley, October 10, 2008
Forecast of Demand for Food 2050

Let’s produce more! More with Less!

• Dissemination of new technologies (biotechnologies, nanotechnologies, GMO etc.);
• Investment in technology and education;
• Intensification of land use;
• New areas with potential for farming;
• Food 2.0.
Food Supply Forecast to 2050
Let’s reduce the Food Losses and Waste! Less is More!

• Whereas the losses and waste account for 30% of everything that is produced for human consumption, 50% reduction in waste would solve 25% of the supply problem for 2050;

• Agriculture accounts for 12-14% of greenhouse gas emissions, reaching 30% if we consider the whole chain of agribusiness and the conversion of new areas for production;

• The emissions produced by world’s FLW corresponds to all gas emissions produced in the United States today;

• The annual consumption of clean water to produce what is wasted represent 230 km³ or equivalent to all the water that runs annually by the Volga River

• The area required for the production of what is lost or wasted is 1.4 billion ha or 30% of the arable land;

• The direct annual cost of FLW (excluding fishing) is $ 750 billion (approx. 20% of Germany’s GDP).
Committee on World Food Security

http://www.fao.org/3/a-i3901e.pdf
**Definitions**

**Food Losses**

- Weight loss or nutritional value losses in primary products intended for human consumption.
- Occurs in the initial phase of production (in the field), in transport or storage.
- Is due to problems in the production process or any price changes

**Food Waste**

- Appropriate food for human consumption that is discarded.
- Occurs during marketing, catering or household consumption.
- Is due to poor planning or sales forecast (expiration date) or even the lack of consumer awareness

**unintentional**

**intentional ?!**
Methodological Problems

• Losses: “normal” versus “abnormal”;
• Year of data selection (mostly in 2009)
• Conversion from weight to energy
• Quality: Conversion loss of the product price to energy
• Edible parts?

Researchers’ Bias:
  – Comparison of different production systems
  – Different Food Crops
  – Most references based on case studies
  – Old literature
  – Discard based on weight
Traditional Approach on Food Supply Chain

“Beer Distribution Game”

• Starts with small passing stocks
• Local information but no general consumption information
• Purchase orders cannot be canceled
• 2 weeks for processing an order + 2 weeks for delivery
“Beer Distribution Game”

Purchase Orders over 50 weeks

Results:

Oscillation and amplification of purchase orders, high inventories, high costs and losses
Inventory Decisions by Economic Agents

Inventory will be pushed to:

**Previous links in the chain (Upstream)**

When you have:
- High perishable products;
- Inaccurate information on demand;
- Demand for specialties.

**Back links in the chain (Downstream)**

When you have:
- Long-term productive process;
- Uncertainties in supply;
- Delays in purchasing decisions;
- Long transportation period.
FLW by Chain Link and Region

(millions of tons year)

Source: Save Food
Comparing FLW

Source: HLPE, 2014
Europe: Losses and Waste in the Wheat and Rye Value Chains

Source: SIK Food Balance Sheets (Swedish Institute for Food and Biotechnology (SIK))
How to reduce FLW?
A Sustainable Way to Reduce FLW

Food Prevention
Food Redistribution

Animal Feed
Industrial Recycling
Renewable Energy
Compost
incineration
Disposal

Food
Non-food
Food Security & Global FLW

There are linkages between people in need and abundance of food, but no direct and simple solutions.
Campaigns against FLW
Des Glaneuses
Jean François Millet, 1857

See also: Agnes Varda (2000) Le Gleneur et la Glaneuse
vimeo.com/37089032
Conclusions

• Considering the mean values and the methodological shortcomings of the research we don’t know exactly how much are the FLW;

• The collection of food wasted is the best alternative to fight FLW in the short term and is one that does not interfere in the economic system.

• Approaching the productivity gains in different environments (resistant varieties to hydro deficiency) is the more immediate task that might increase productivity itself;

• Rural Technical Assistance, Food Technology and Nutrition, Consumer’s Education will reduce FLW and improve the utilization of the food that was lost and wasted before.

• Governments and public authorities can induce these changes by altering relative prices through taxation or subsidy policies of products, financing of new technologies and capacity building.