Impact of Reducing Food Loss and Waste: Lessons and Future Direction

APEC Expert Consultation 2016

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- July 18, 2016

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Structure

1. How did we get involved in the modelling of FLW reductions?
2. Data?
3. Type of modelling?
4. Initial findings?
5. Directions of research?
6. Importance of work and resources/data needs in future?

How did we get involved <-> Why are FLW problematic?

Economic perspective → we cannot afford it

Food security / hunger perspective → morally unacceptable

Climate perspective → careful with scarce resources

Academic contributions

Rutten *Agriculture & Food Security* 2013, **2**:13
http://www.agricultureandfoodsecurity.com/content/2/1/13

Agriculture & Food Security

RESEARCH Open Access

What economic theory tells us about the impacts of reducing food losses and/or waste: implications for research, policy and practice

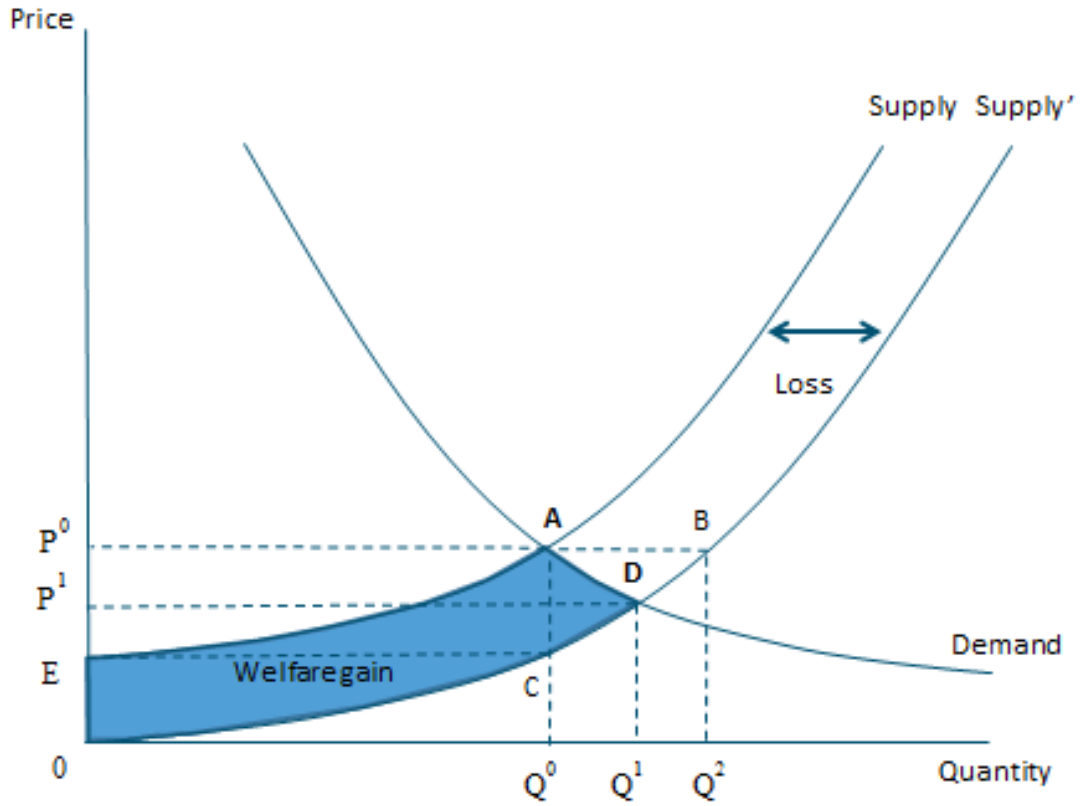
Martine M Rutten

Forthcoming: study on impacts of tackling agricultural food loss in MENA:

African Journal of Agricultural and Resource Economics (AfJARE)

Economic framework to analyse impacts

Reducing food loss in supply



Source: Rutten, M. (2013), Agriculture & Food Security 2:13

Impacts:

- Lower price
- Higher quantity
- Consumers gain
- Producers gain
- Total welfare rises

Actual impact: A → D ↔ Q0 → Q1 due to fall in prices

Factors of influence

- Demand and supply curves
- Extent of FLW (already small... Small shifts) & extent of avoidability
- Costs of measures to reduce FLW
- Feedback effects: scale of production and food prices : 'Ceteris Paribus' (all else remains the same): lower food price may induce:

  => Higher FLW

  => Demand elsewhere: biofuels, meat...
- Where do FLW occur in the supply chain? (where to focus)

Applied studies at LEI - Method

- Global economic simulation model: MAGNET
- Scenarios: “what if we were to reduce food losses and/or waste by x %?”
- Food loss reductions as productivity shocks (technical change)
- Food waste reductions as taste shocks (less waste => less food demand, savings spent on (other) goods and services so as to remain on budget)
- Impacts: wide variety of socio-economic indicators: production, inter-sectoral links, dietary composition, land-use, food prices, trade.
- Data: mostly FAO (2011), or country level data
- Case studies: MENA, EU, Ghana, SSA

Data

FAO (2011): global FLW percentages by region

Estimated/assumed waste percentages for each commodity group in each step of the FSC for **Europe incl. Russia.**

	Agricultural production	Postharvest handling and storage	Processing and packaging	Distribution: Supermarket Retail	Consumption
Cereals	2%	4%	0.5%, 10%	2%	25%
Roots and tubers	20%	9%	15%	7%	17%
Oilseeds and pulses	10%	1%	5%	1%	4%
Fruits and vegetables	20%	5%	2%	10%	19%
Meat	3.1%	0.7%	5%	4%	11%
Fish and seafood	9.4%	0.5%	6%	9%	11%
Milk	3.5%	0.5%	1.2%	0.5%	7%

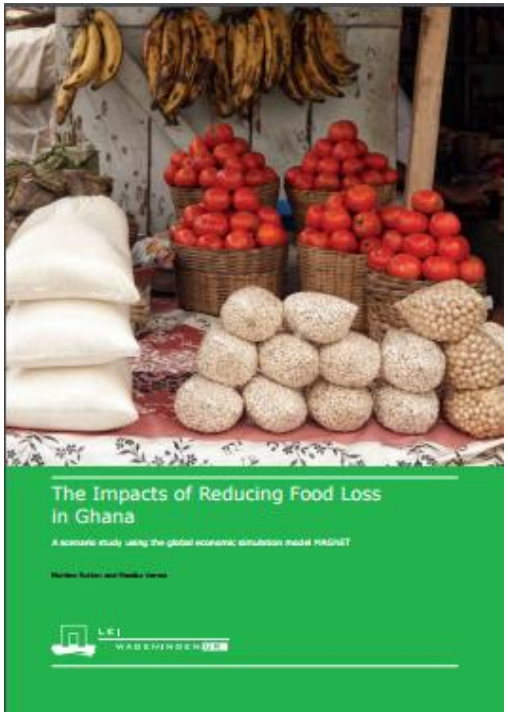
Food loss: the decrease in edible food mass throughout the part of the supply chain that specifically leads to edible food for human consumption and takes place at the production, post-harvest and processing stages.

Food waste: food loss occurring at the end of the FSC in the retail and final consumption stages (Parfitt, Barthel and Macnaughton, 2010).

Case Studies

2014

2014



2015

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Reducing EU household & retail food waste by 2020 (50% scenario)

EC project with BIO Intelligence Service:

1. EU households better off – 23 euro per capita per year

2. EU land use savings

Vegetables and fruits: 15% of land use saved (high waste percentage)

Dairy: 17%, red & white meat: 17% (strong links with live animal and feed sectors)

3. Economy: some gain some lose Resources *move out* of agri-food sectors into manufacturing and services

- EU agri-food production fall by 4.4% compared to what was projected in 2020

4. Small but positive impacts on food security in SSA

=> better to focus on other policies (improved market access, investment climate)

5. Healthy diet scenario performs better

Triples land use savings, slightly better impact on food security SSA

Impacts of reducing EU FLW on SSA

FAO project focussing on price (transmission) effects

- 50% EU FLW reductions by 2020 in *all* segments of the food supply chain

Outcomes:

- Market prices for primary producers decrease in EU (< 8%) and SSA (< 0.8%)
- Transmission < 100% percent: trade taxes, transport costs, trade & consumption shares
- Stages in EU food supply chain that matter most:
    - final consumption: a relatively high percentage of food is wasted
    - primary agricultural production: relatively large impact on rest of chain
- SSA on aggregate is worse off (negligible fraction of GDP):
    - producers as sellers to the EU lose out from lower food prices
    - producers as buyers of intermediate agri-food inputs from the EU benefit
    - consumers of food commodities from the EU benefit.

Impacts of reducing food losses in Ghana

Project for NL Min. of Economic Affairs on 50% food loss reductions in the chain (paddy, maize, veg, fruits & nuts, oil seeds, fish) **by 2025**

- producers gain from lower unit costs and increased production
- consumers gain from lower food prices, wage labourers may lose income

Gross Domestic Product

+0.8%

Welfare

+19USD per capita

Calorie Intake

+29KCal per capita

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Broadly speaking...

Kind of Analysis possible: Economic, Environmental and Health impacts

Kind of Results:

- Consumers often gain from lower prices, may loose from lower incomes (wage labour)
- Producers gain from increased sales but lose due to lower prices
- Impacts vary over agents (producers v/s consumers) and sectors (economy wide links through factor markets)
- Impacts are often localized
- For the economy as a whole the impacts are not often very big... Ag-food is small share of economies
    - Hypothesis: Impacts may be more discernible for certain population groups

Issues that need addressing

Modelling FLW as resultant of food system

- Overstate benefits (not accounting for cost, reducing FW doesn't come free), Understate benefit (not accounting for recycle – waste stream): Net?
- From "what if" target reductions to modelling FLW as endogenous activities in food system
- Model impacts of policies or other measures to reduce FLW (e.g. taxes, subsidies)

Household level detail

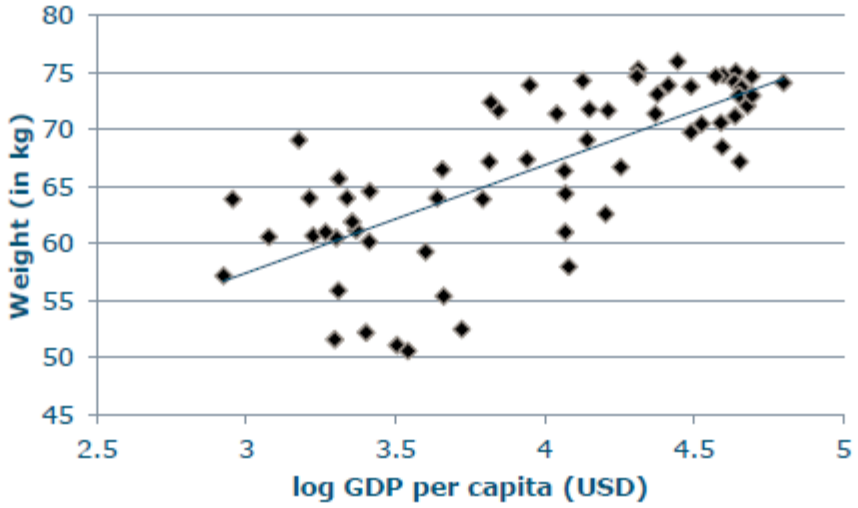
- Household decomposition (certain population groups are more vulnerable)
- Account for factors affecting loss: role of food prices, income

Ongoing work…

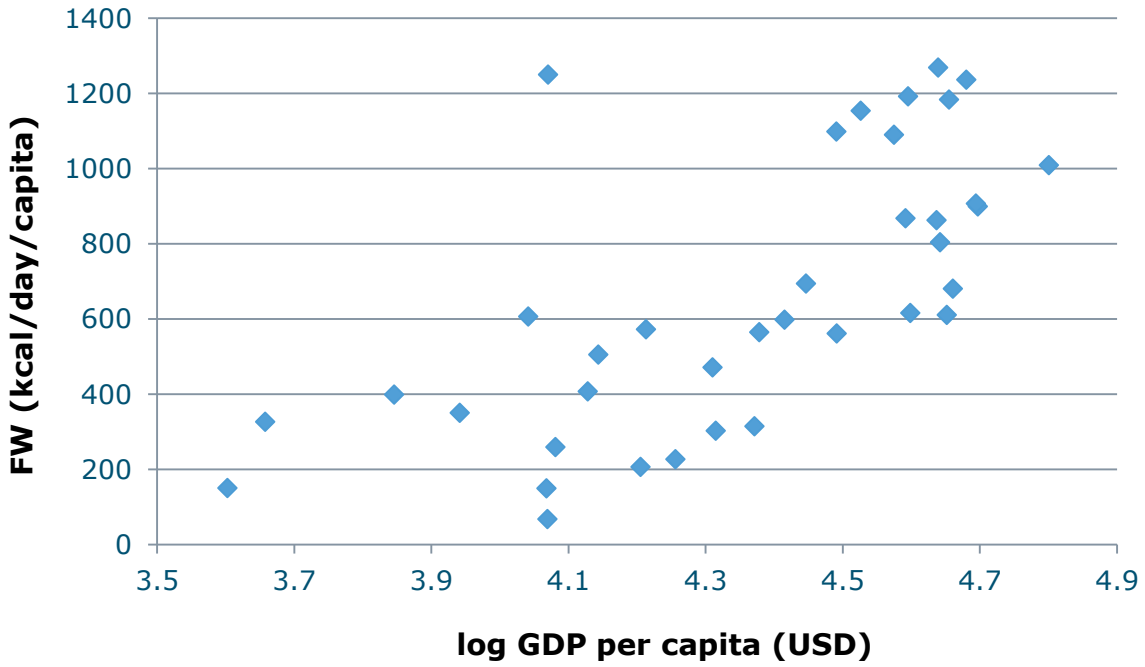
- Data (the Revealed Preference analogue)

$$Food\ Intake = Energy\ Expenditure$$
$$Energy\ Expenditure\ = Physical\ Activity\ Level * BMR$$
$$BMR = 12.36825\ Body\ Weight + 724.4$$

Hall et al. 2009. PLoS One



- $Food\ Waste\ = Food\ Available\ - Food\ Intake$
- Graph on relationship between wasted calories and income



Marginal propensity to Waste, to correct for food consumption

- Capturing intra country distribution: households within a country...
  - Could use calorie intake distribution around average per capita
  - use aggregation properties of demand functions

All this on consumer waste...

- What about supply side of waste?
  - Use existing approaches (Irfanoglu et al. 2014: cost of reducing waste; Britz et al. 2014, Adrian Leip: waste stream)
  - Find collaborators

SUStainable Food And Nutrition Security: Current Ongoing Project

- micro-level modelling of nutrient intakes, habitual dietary patterns and preferences of individual consumers

- macro-level modelling of food demand and supply in the context of economic, environmental and demographic changes on various time-scales (short to long term) and for multiple regions in and beyond EU

- Micro-macro linkages, Integrated assessment

Achterbosch 2015. GFS Conference Ithaca.

Thank you!

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