Innovations in Measuring Food Loss and Waste along the Value Chain

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* This presentation represents my own personal views and not the views of the World Bank and of the Board of Director. All results presented are from Delgado, L; Schuster, M, and Torero, M; (2017). Reality of Food Losses a New Measurement Methodology.

Key facts

- Reducing food loss and waste can contribute to food security and sustainability
- Our lack of clear knowledge about the real magnitude of food loss and waste is a major barrier to addressing the problem
- Estimates of global magnitude varies widely from 27% (1 Billion Tons) to 32% (1.3 Billion Tons) of all food produced in the world
- There are significant differences across studies at the commodity group and commodity level

FLW as policy priority

- FLW is global problem

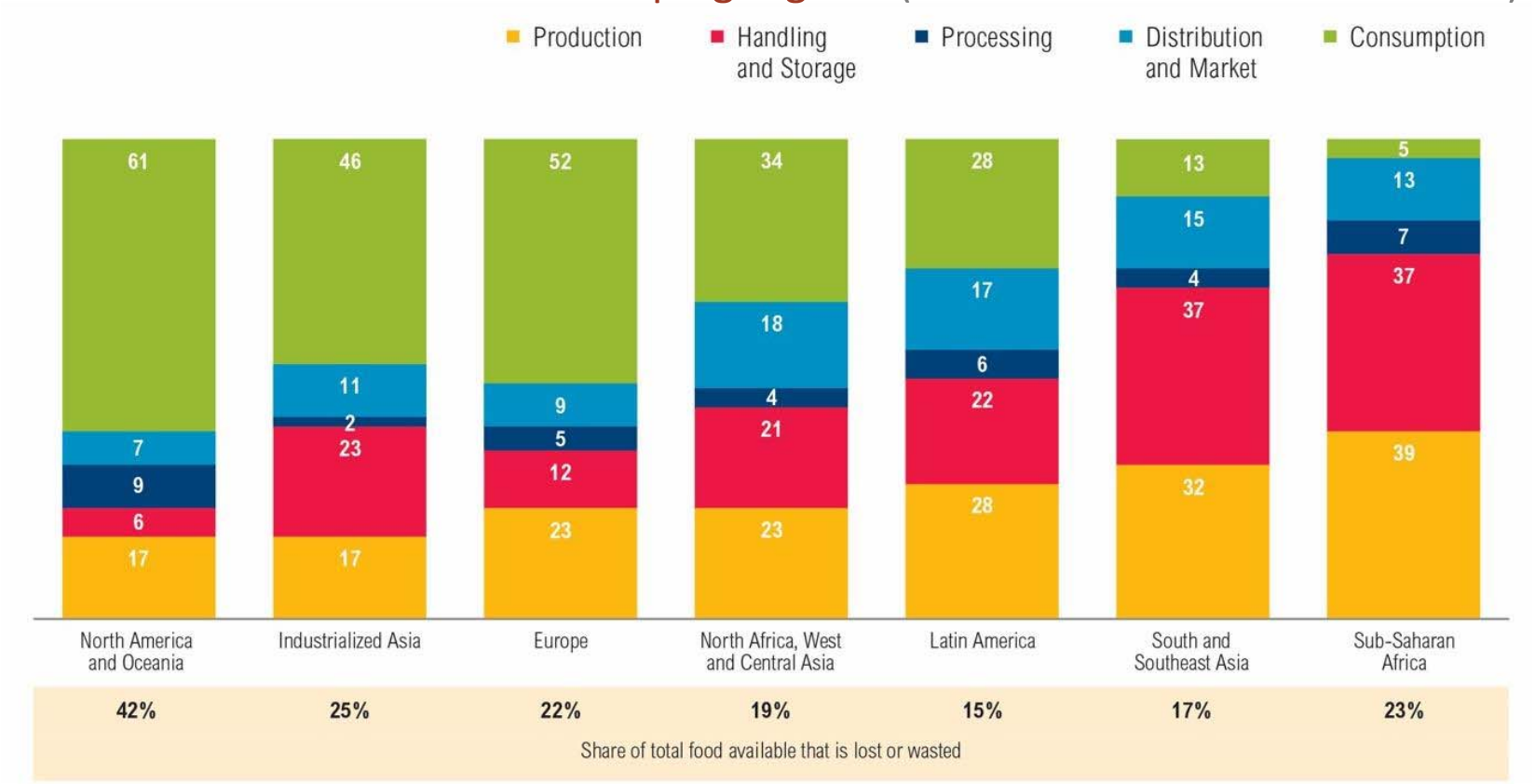
- Focus on: reduction as a top priority at global, regional and national levels

  - *Coordination and consensus on coherent terminology and definition, systematic framework for measurement and reporting*

What are the magnitudes?

Diagnosis: Where?

Food loss and waste occurs more 'near the fork' in developed regions and more 'near the farm' in developing regions (Percent of kcal lost and wasted)



Note: Number may not sum to 100 due to rounding.

Source: WRI analysis based on FAO. 2011. *Global food losses and food waste—extent, causes and prevention.* Rome: UN FAO.

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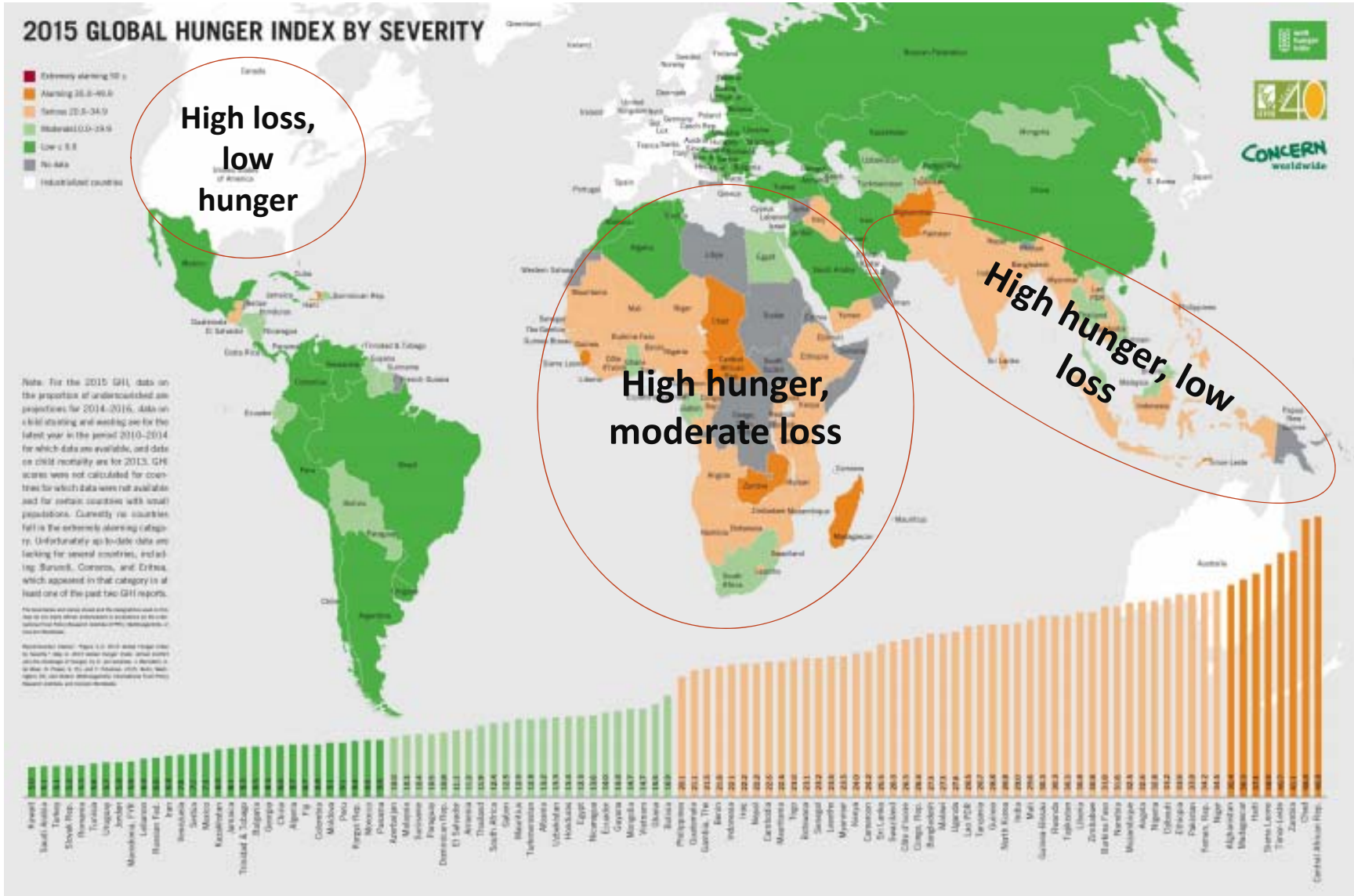
Are today's hungry people in areas where losses are high?



Can we feed the hungry in 2050 by reducing loss and waste?

Population at Risk of Hunger in 2050

Region	Million People				% Change from baseline		
	Baseline	Reduced losses, developing world (6% by 2025)	Reduced losses, global (10% by 2030)	Faster productivity growth, no change in losses (.4% crops, .2% livestock)	Reduced losses, developing world	Reduced losses, global	Faster productivity growth, no change in losses
East Asia and Pacific	126	118	116	115	-6.3	-7.5	-8.6
Europe and Central Asia	38	37	37	37	-2.9	-3.7	-4.1
LAC	48	45	44	44	-6.0	-7.7	-8.6
MENA	38	37	36	36	-3.9	-4.9	-5.8
South Asia	162	138	134	131	-15.3	-17.6	-19.2
SS Africa	137	116	112	108	-15.8	-18.6	-21.2
Developing	509	452	442	434	-11.2	-13.1	-14.7
Developed	59	56	55	55	-4.7	-6.1	-6.9
World	568	508	497	489	-10.5	-12.4	-13.9

Calculations from IFPRI IMPACT Model version 3. Source: Rosegrant et al., 2015. Returns to Investment in Reducing Postharvest Food Losses and Increasing Agricultural Productivity Growth. Food security and nutrition assessment paper. Copenhagen Consensus Center.

Avoided loss can help feed the hungry…

…but will not do the full job and costs money.

Even with lower food prices, many poor people will be hungry.

Access matters! Feeding programs, food stamps, and special distribution networks must improve access.

School feeding program in Kibera slums, Nairobi, Kenya GPE/ Deepa Srikantaiah, 2012. Flickr

What about middle and high income countries?

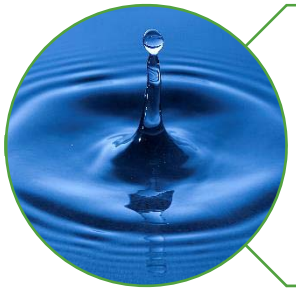
Poverty: Income inequality
Access: Food deserts
Skills: Food preparation

This photo **by Amy Toensing** illustrates the *National Geographic Magazine* article by Tracie McMillan [The New Face of Hunger]

What role for reduced waste?

Prices: Modest
Food stamps: Major, but not enough
Special distribution: Food pantries, kitchens: important, innovations appearing

The circular economy focuses attention on environmental aspects of waste and loss



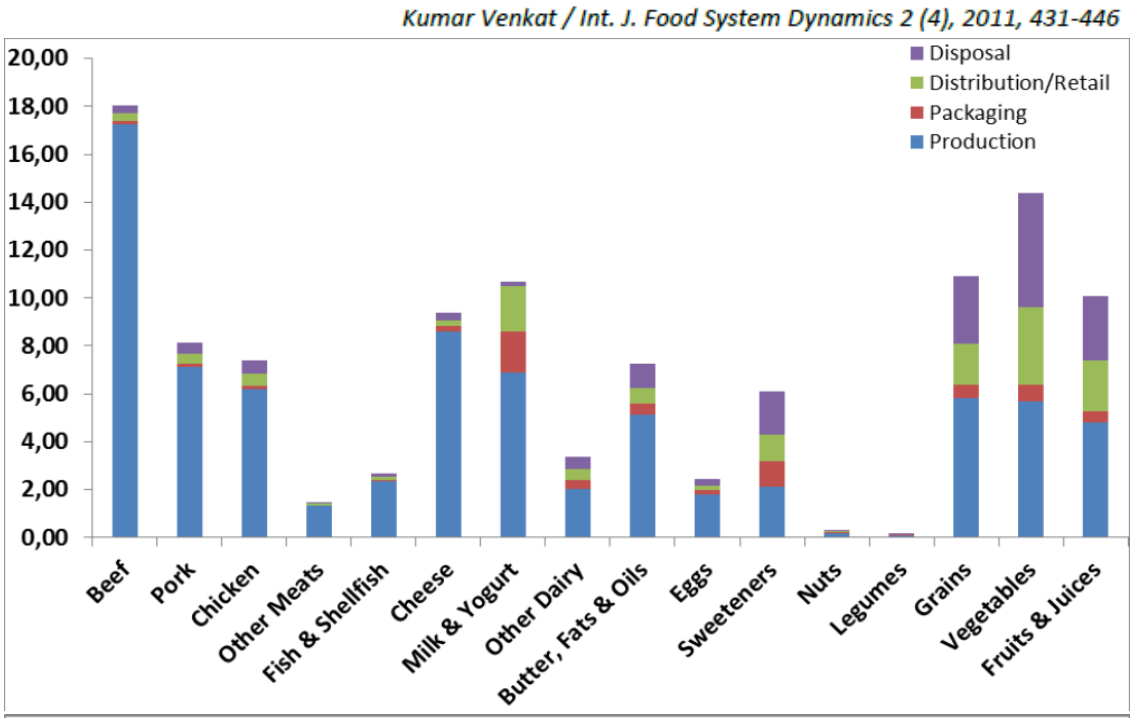
Resources used in production (environmental externalities, such as water)

Environmental footprint of disposal

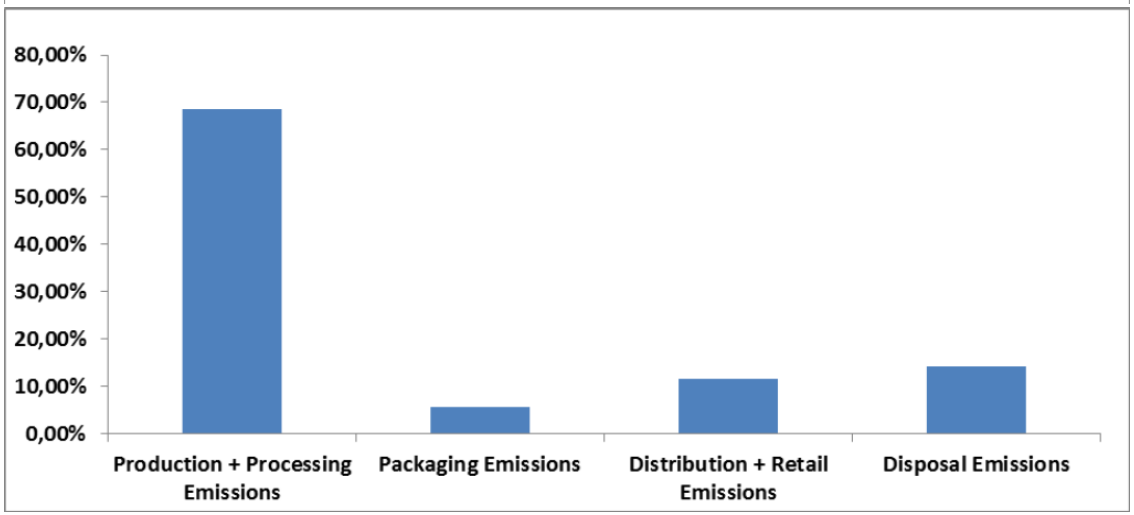
Greenhouse gas emissions from production, marketing, disposal

Greenhouse gas and climate change

US national GHG emission from avoidable food waste in 2009 (MMT CO2e/year)



Components of US national GHG emissions from avoidable food waste in 2009



These emissions are equivalent to **2% of net US GHG emissions for 2009** based on the national emissions inventory published in the US Environment Protection Agency (EPA, 2011)

Combined attention to hunger and environment warrants sustained attention to loss and waste, not episodic preoccupation then neglect

The "want not" and "warm not" agendas complement each other

- The combination of food security and environmental management should underpin action

Action requires multiple interventions:

- Good measurement: how much, how, where
- Increased investment in multi-purpose infrastructure
- Increased investment in agricultural research, particularly climate smart technologies
- Targeted assistance to the poor and hungry
- Innovation in the retail and hospitality sectors
- Price incentives—taxes and subsidies—to reduce loss and waste and encourage adoption of climate smart agriculture
- Awareness and behavior change by producers and consumers

What are the current methods?

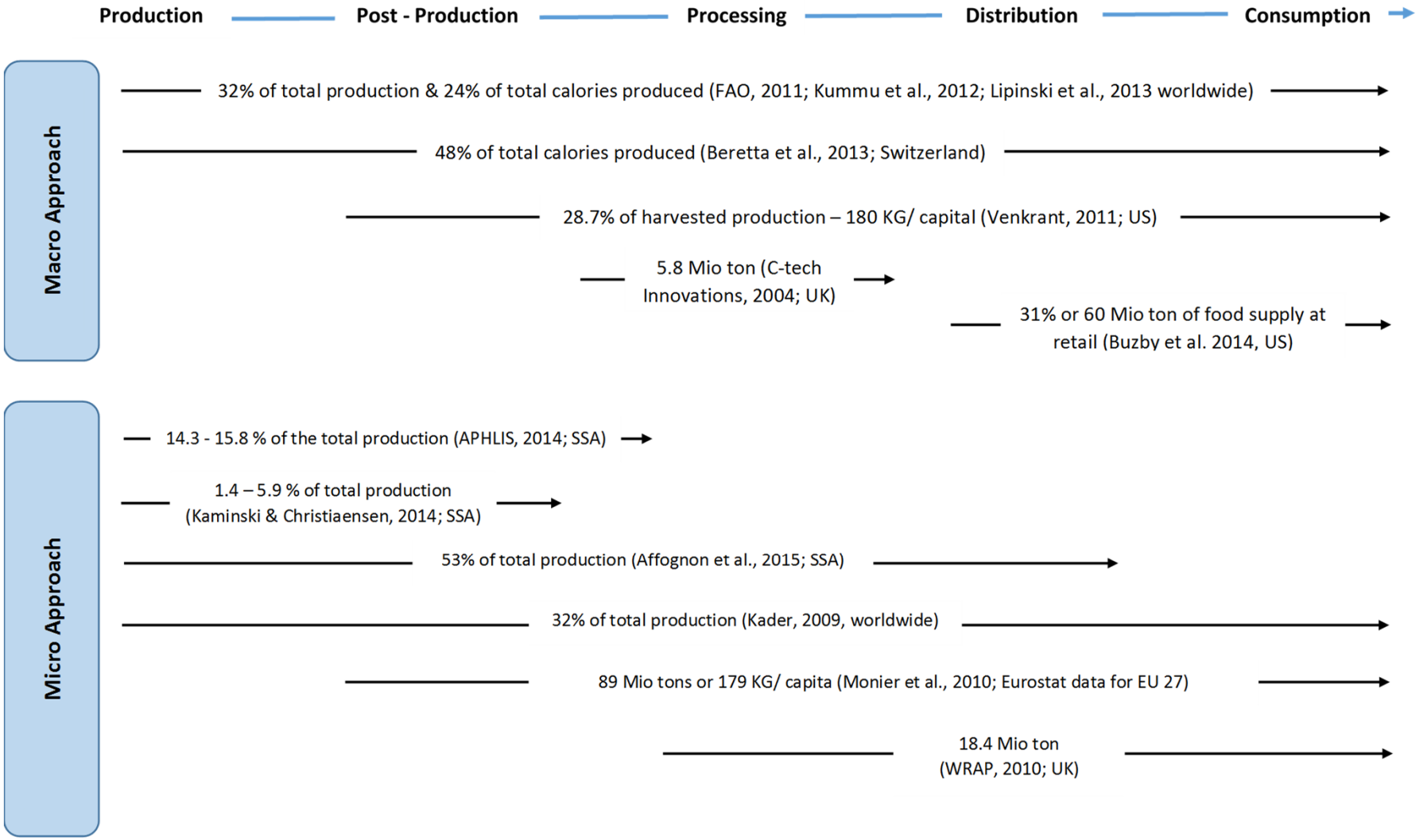
FWL estimation methodologies

	DATA & METHODS	PROS	CONS
Macro approach	**Data:** National or regional aggregated statistics **Methods:** • Mass- and energy balances: comparison of raw material input and produced output	• Cheap and straightforward implementation • Representative for large region and good comparability	• High requirements on data quantity, quality and standardized collection methodologies • Not representative for specific regional units • No distinction between: ○ VC stages where loss occurs ○ Natural and unnatural loss ○ Edible and non-edible loss

FWL estimation methodologies

	DATA & METHODS	PROS	CONS
Micro approach	**Data:** data on a sample of value chain actors, often collected ad-hoc **Methods:** • Questionnaires and interviews • Food loss and waste diary • Direct measurement, through weighing or volume assessment • Scanning	• Commodity, climatic zone and context specific • Detailed, fully relevant and VC stage specific data • Insights into causes and prevention possibilities	• Costly and time consuming • Representativeness highly sensitive to sampling choices • Sensitive to the estimation timing • Estimates are often not comparable, and cannot be generalized • Same estimation method can often not be applied to all VC stages

Estimation of FWL



All loss and waste is reported per year

What is the problem?

What are we measuring?

Confusion in the definition

quantity *versus* quality

Weight, caloric, nutritional and/or economic loss

Inclusion/ exclusion of different loss dimensions

In percentage of total, harvested or potential production

natural *versus* unnatural

edible *versus* inedible

real loss *versus* re-use

Avoidable, possibily avoidable and unavoidable

What are we measuring? Quantity vs quality

‘The decrease in mass of food’

versus

‘The decrease of quality attributes of food linked to a degradation of the product (nutrition, micro-nutrient, aspect…)

What are we measuring?
Weight, caloric, nutritional and/ or economic loss

Weight: Decreased food mass

Caloric loss: food loss in terms of calories (in the calculation of FLW

it gives a greater “weight” to food loss of energy-dense foods)

Nutritional loss: food quantity might be preserved as expressed in mass, but this does not necessarily means that proteins quality and nutrients are equally preserved.

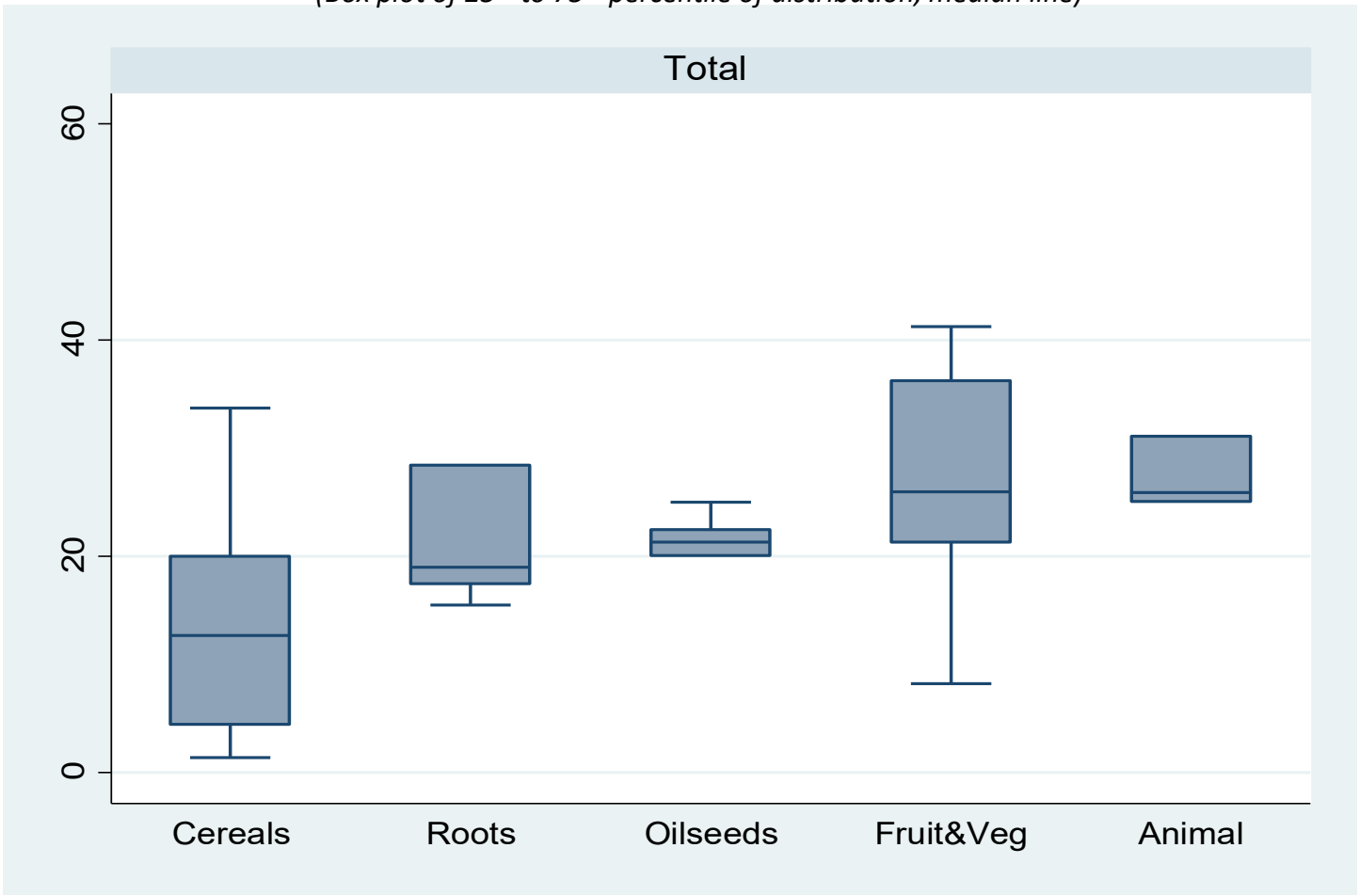
Economic loss: foregone income opportunity of producers or middlemen, due to decreased mass or quality

Diagnosis: How much?

Literature review shows wide variation

Percent of reported postharvest losses by commodity

(Box plot of 25th to 75th percentile of distribution, median line)



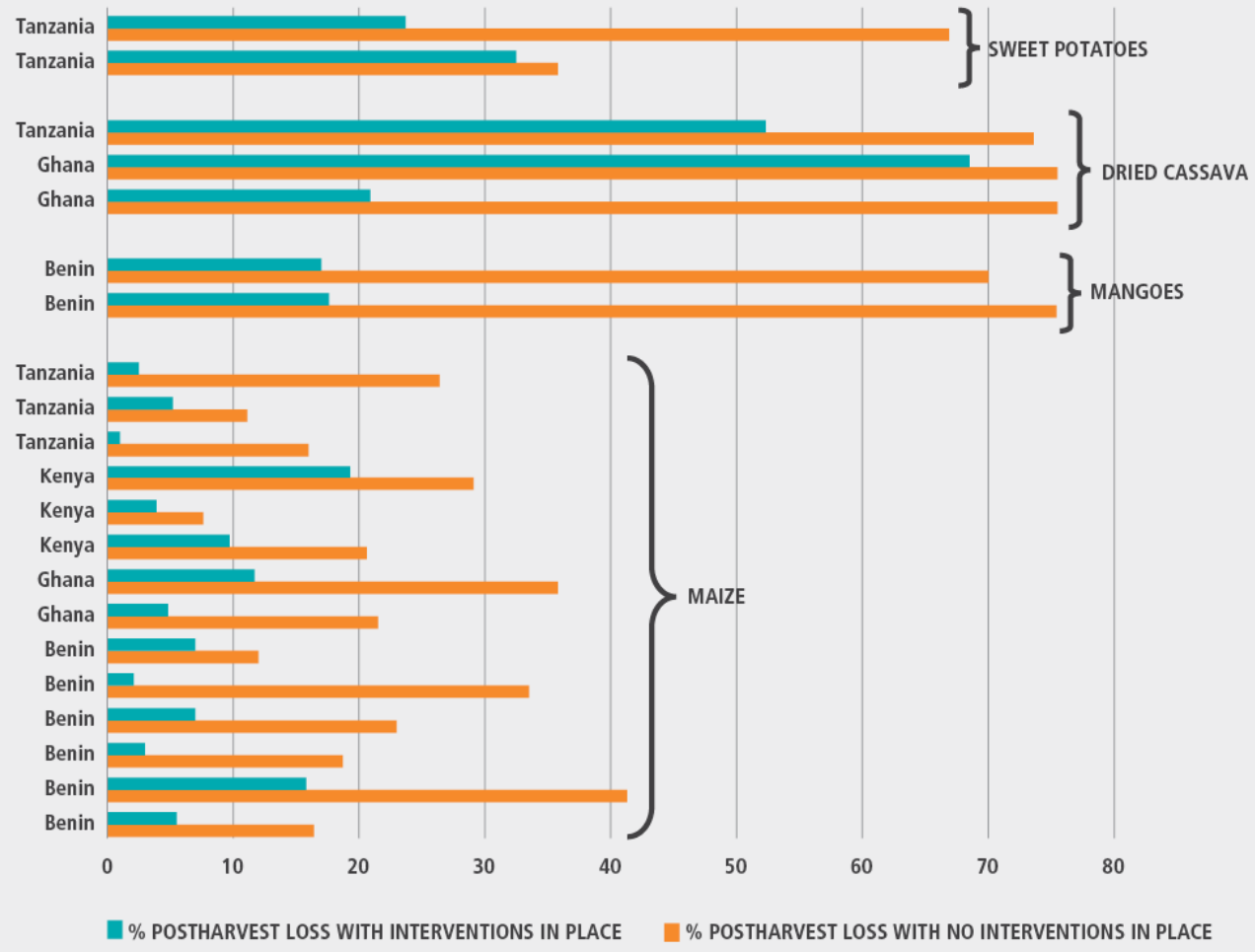
Source: Rosegrant et al., 2015. Returns to Investment in Reducing Postharvest Food Losses and Increasing Agricultural Productivity Growth. Food security and nutrition assessment paper. Copenhagen Consensus Center.

Range of post-harvest losses by commodity

Commodity	Country	Author	% PHL - Maximum (no intervention in place)	Weights (wi)	% PHL - Minimum (with interventions in place)
Maize	Benin	Borgemeister et al. (1998)	16.40	0.09	5.50
	Benin	Meikle et al. (1998)	41.30	0.10	15.80
	Benin	Schneider et al. (2004)	18.70	0.18	3.00
	Benin	Meikle et al. (2002)	23.00	0.08	7.00
	Benin	Affognon et al. (2000)	33.50	0.04	2.10
	Benin	Adda, Borgemeister, Biliwa, and Aboe (1997)	12.00	0.44	7.00
	Ghana	Compton & Sherrington (1999)	21.50	0.05	4.80
	Ghana	Ofosu (1987)	35.90	0.06	11.70
	Kenya	Mutambuki and Ngatia (2012)	20.60	0.02	9.70
	Kenya	Komen, Mutoko, Wanyama, Rono, and Mose (2006)	7.60	0.01	3.90
	Kenya	Mutambuki and Ngatia (2006)	29.10	0.41	19.30
	Tanzania	Makundi et al. (2010)	16.00	0.44	1.00
	Tanzania	Golob and Hodges (1982)	11.10	0.01	5.20
	Tanzania	Golob and Boag (1985)	26.40	0.00	2.50
Mango	Benin	Vayssie`res, Korie, and Ayegnon (2009)	75.40	0.01	17.60
	Benin	Vayssie`res, Korie, Coulibaly, Temple, and Boueyi (2008)	70.00	0.00	17.00
Dried cassava	Ghana	Chijindu, Boateng, Ayertey, Cudjoe, and Okonkwo (2008)	75.50	0.19	20.90
	Ghana	Isah, Ayertey, Ukeh, and Umoetok (2012)	75.50	0.03	68.50
	Tanzania	Hodges, Meik, & Denton 1985	73.60	0.00	52.30
Sweet potato	Tanzania	Rees et al. (2003)	35.80	0.01	32.50
	Tanzania	Tomlins et al. (2007)	66.90	0.00	23.70

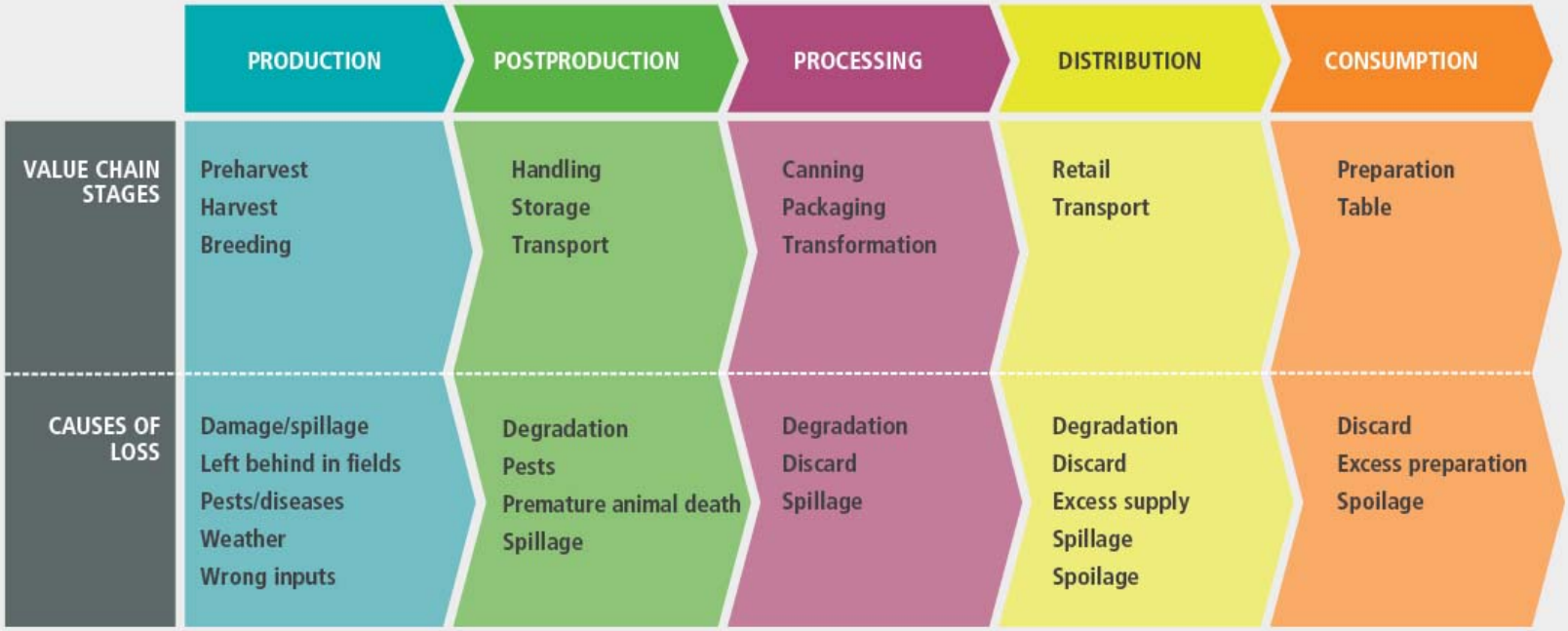
Source: Affognon et.al. (2014).

Range of post-harvest losses by commodity



What we need to know?

Food loss and waste across the value chain

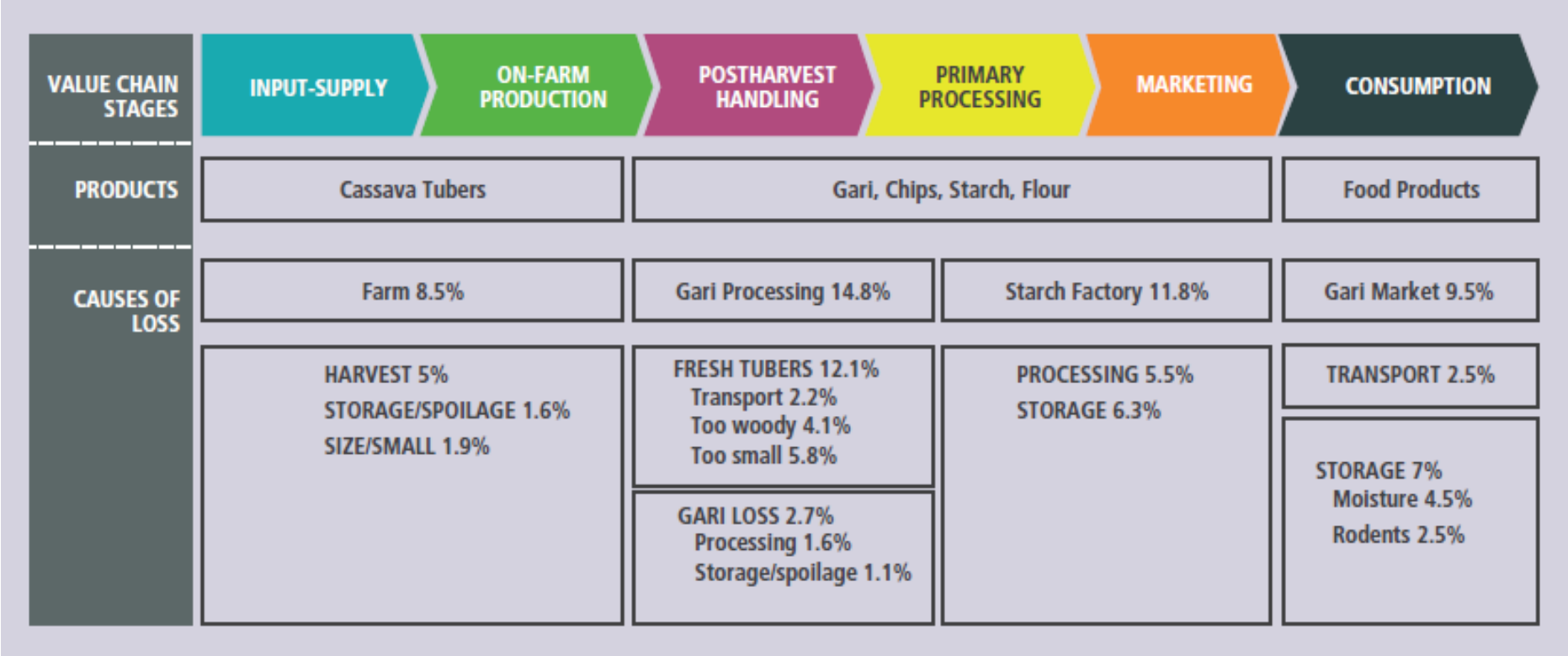


Remedies

Infrastructure | New technology | Policy | Regulation | Education

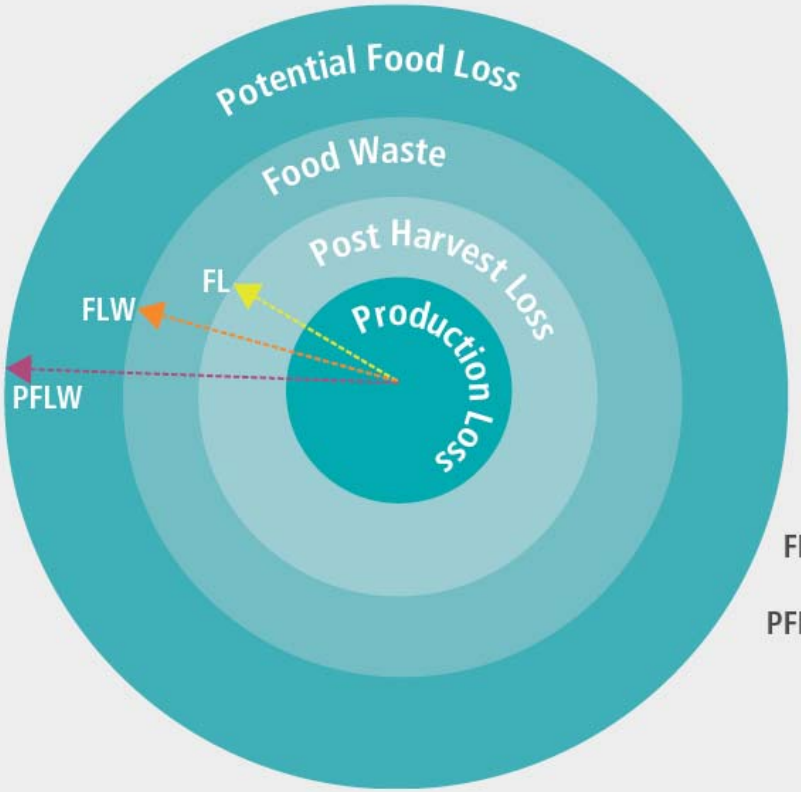
Source: IFPRI Global Food Policy Report, Schuster and Torero (2016)

Food losses in the Nigerian cassava value chain



Bringing economics to the concept of Loss and waste across the value chain?

Not only accounting, but also opportunity cost



FL ---▶ FOOD LOSS: Unintentional reductions in food quantity or quality before consumption, including postharvest losses.

FLW ---▶ FOOD LOSS + FOOD WASTE: Deliberately discarded food that is fit for human consumption

PFLW ---▶ FOOD LOSS + FOOD WASTE + POTENTIAL FOOD LOSS: Crops lost before harvest to pests and disease or left in the field, crops lost due to poor harvesting techniques or sharp price drops, or food that was not produced because of a lack of appropriate agricultural inputs

Methodology proposed

Our proposal

- **Value chain concept**
  - We will collect information through representative surveys among farmers, middlemen, wholesale buyers, and processors.
  - The methodology takes into account the presence of multiple agents across the value chain, which complicates attribution of any potential loss to a specific node in the value chain.
- **What we measure**
  - The methodology distinguishes FLW that are due physical quantities from those due to quality and value.
- **Minimizing measurement error**
  - 3 methods

Three methods

- **Self-reported method**

- **Category method** (based on the evaluation of a crop and the classification of that crop into quality categories. The method builds on the 'Visual Scale Method', developed by Compton and Sherington (1999) to rapidly estimate quantitative and qualitative grain loss)

- **Attribute method** (based on the evaluation of a crop according to inferior visual, tactile, and olfactory product characteristics)

- **Price Method**: The 'price method' (P-method) is based on the reasoning that higher (lower) values of a commodity reflect higher (lower) quality. A decrease in price, all else equal, is thus a proxy for a deterioration in quality.

Category Method

$$WeightLoss_p = \sum_{i=1}^{5} C_i * QC_{iPH} + (Q_{Prod} - Q_{PH})$$

$$ValueLoss_p = \sum_{i=1}^{I} (\bar{P}_{ideal} - \bar{P}_{Ci}) * QC_{iPH} + (V_{Prod} - V_{PH})$$

where c_i is the damage coefficient for category *i*, $\bar{p}_{ideal}$ is the sample average sales price for an ideal product, $\bar{p}_{Ci}$ is the sample average sales price for a product in category *i,* and QC_{iPH} is the quantity in each category after post-harvest. Q_{PH} and V_{PH} are respectively the quantity and value of all produce after post-harvest, while Q_{Prod} and V_{Prod} are the quantity and value of all produce after production
Average across the low and high season

Attribute Method

$$WeightLoss_p = \sum_{j=1}^{J} a_j * Q_{PH} + (Q_{Prod} - Q_{PH})$$

$$ValueLoss_p = \sum_{j=1}^{J} \overline{Pa_j} * Q_{PH} + (V_{Prod} - V_{PH})$$

where a_j is the share of product affected by attribute j, and $\overline{pa}_j$ is the average price punishment for an inferior product attribute at sale. As before, Q_{PH} and V_{PH} are respectively the quantity and value of all produce after post-harvest, while Q_{Prod} and V_{Prod} are the quantity and value of all produce after production.

Price method

$$ValueLoss_p = V_{ideal} - V_{PH}$$

$$WeightLoss_p = \frac{ValueLoss_p}{\bar{P}_{ideal}}$$

where V_{ideal} is obtained by the multiplying the farmers' production by the average ideal sales' price; V_{PH} is the total value of the farmers' production after post-harvest, as assessed by the farmer himself

		Ecuador: potato				Peru: potato				Guatemala : beans				Guatemala : maize			
		S	C	A	P	S	C	A	P	S	C	A	P	S	C	A	P
	Nb of observations	*286*				*355*				*431*				*884*			
	Kg lost	1,498	5,926	4,982	4,146	3,548	9,216	11,523	7,998	7.47	16.01	24.79	26.59	55.67	137.74	194.93	178.73
Producer	% of total production that is lost	**8.11%**	**12.82%**	**12.17%**	**11.84%**	**9.38%**	**15.99%**	**19.62%**	**19.84%**	**9.77%**	**12.80%**	**19.67%**	**16.72%**	**9.84%**	**14.58%**	**20.46%**	**14.10%**
	Value lost (USD)	269	1,543	1,007	990	454	2,116	2,202	1,805	8	26	33	38	18.37	58.07	54.72	75.93
	% of value of total production that is lost	**6.22%**	**13.78%**	**10.03%**	**11.84%**	**5.58%**	**16.73%**	**16.13%**	**19.84%**	**7.72%**	**12.95%**	**17.97%**	**16.72%**	**7.72%**	**14.76%**	**13.45%**	**14.10%**
	Nb of observations	*176*				*81*				*162*				*151*			
	Kg lost	20.96	11.90	63.65	26.89	2.05	1.39	5.78	5.57	0.05	0.06	0.05	0.05	0.20	0.19	0.15	0.14
Middlemen	% of total purchase that is lost	**1.70%**	**0.91%**	**1.77%**	**1.52%**	**1.22%**	**1.60%**	**3.72%**	**2.05%**	**0.63%**	**0.66%**	**0.58%**	**0.57%**	**0.63%**	**0.66%**	**0.58%**	**0.57%**
	Value lost (USD)	232	284	685	518	515	490	1,261	2,694	4.11	3.75	3.80	3.24	3.88	3.30	2.34	2.47
	% of value of total purchase that is lost	**1.36%**	**1.65%**	**1.55%**	**1.91%**	**1.34%**	**1.49%**	**2.89%**	**2.83%**	**0.78%**	**0.67%**	**0.67%**	**0.62%**	**0.78%**	**0.67%**	**0.67%**	**0.62%**
	Nb of observations	*146*				*152*				*120*				*104*			
	Kg lost	0.83	0.83^	0.83^	0.83^	0.06	0.06^	0.06^	0.06^	0.05	0.05^	0.05^	0.05^	0.54	0.54^	0.54^	0.54^
Wholesaler	% of total purchase that is lost	**2.45%**	**2.45%^**	**2.45%^**	**2.45%^**	**2.27%**	**2.27%^**	**2.27%^**	**2.27%^**	**2.94%**	**2.94%^**	**2.94%^**	**2.94%^**	**2.94%**	**2.94%^**	**2.94%^**	**2.94%^**
	Value lost (USD)	15	14.59^	14.59^	14.59^	41.06	41.06^	41.06^	41.06^	3.73	3.73^	3.73^	3.73^	0.52	0.52^	0.52^	0.52^
	% of value of total purchase that is lost	**2.27%**	**2.27%^**	**2.27%^**	**2.27%^**	**3.31%**	**3.31%^**	**3.31%^**	**3.31%^**	**3.42%**	**3.42%^**	**3.42%^**	**3.42%^**	**3.42%**	**3.42%^**	**3.42%^**	**3.42%^**
Entire value chain	% of total production that is lost	**11.50%**	**16.18%**	**16.39%**	**15.80%**	**12.87%**	**19.86%**	**25.62%**	**24.17%**	**13.34%**	**16.40%**	**23.19%**	**20.23%**	**13.41%**	**18.18%**	**23.98%**	**17.61%**
	% of value of total production that is lost	**9.86%**	**17.71%**	**13.85%**	**16.02%**	**10.23%**	**21.53%**	**22.32%**	**25.97%**	**11.93%**	**17.05%**	**22.06%**	**20.76%**	**11.93%**	**18.85%**	**17.55%**	**18.14%**

		Ecuador: potato				Peru: potato				Guatemala : beans				Guatemala : maize				Honduras : beans				Honduras : maize				Ethiopia: teff			
		S	C	A	P	S	C	A	P	S	C	A	P	S	C	A	P	S	C	A	P	S	C	A	P	S	C	A	P
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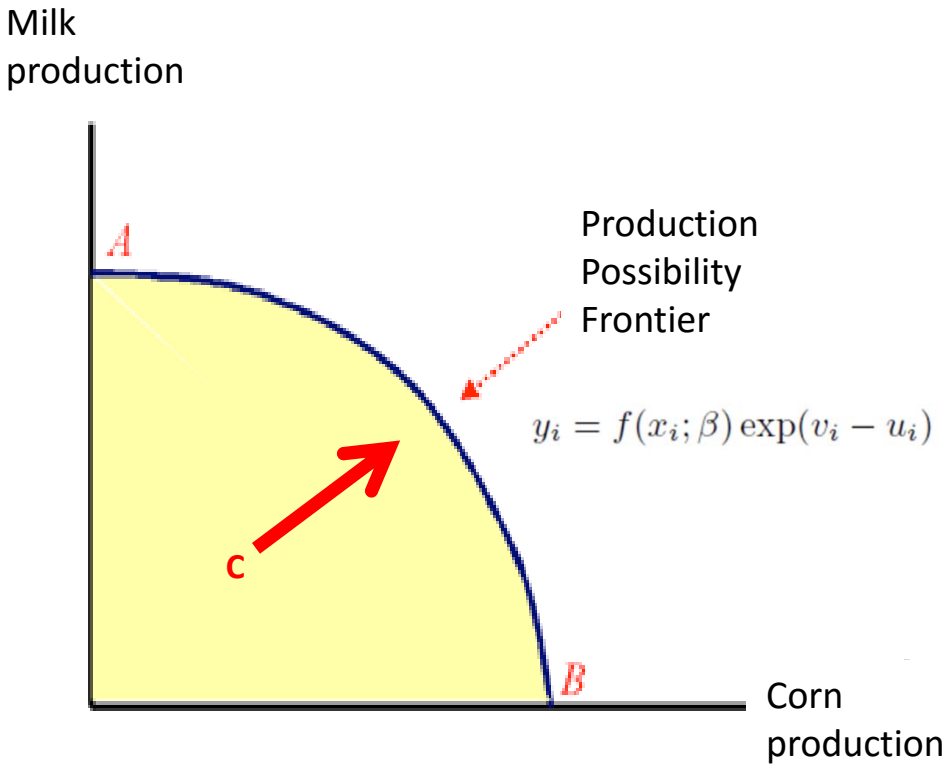
	Kg lost	1,498	5,926	4,982	4,146	3,548	9,216	11,523	7,998	7.47	16.01	24.79	26.59	55.67	137.74	194.93	178.73	26.47	66.96	114.16	129.69	78.61	186.08	198.19	284.26	27.35	57.02	281.41	47.59
	% of total production that is lost	8.11%	12.82%	12.17%	11.84%	9.38%	15.99%	19.62%	19.84%	9.77%	12.80%	19.67%	16.72%	9.84%	14.58%	20.46%	14.10%	6.25%	13.27%	19.77%	17.39%	9.95%	16.69%	15.95%	17.41%	6.86%	8.67%	19.76%	8.69%
	Value lost (USD)	269	1,543	1,007	990	454	2,116	2,202	1,805	8	26	33	38	18.37	58.07	54.72	75.93	19	74	90	117	23.30	65.43	65.19	99.12	40.24	97.98	91.03	73.91
	% of value of total production that is lost	6.22%	13.78%	10.03%	11.84%	5.58%	16.73%	16.13%	19.84%	7.72%	12.95%	17.97%	16.72%	7.72%	14.76%	13.45%	14.10%	5.23%	15.34%	17.56%	17.39%	8.87%	16.64%	15.41%	17.41%	6.26%	9.49%	9.02%	8.69%
Middlemen	*Nb of observations*	*176*				*81*				*162*				*151*				*225*				*121*				-			
	Kg lost	20.96	11.90	63.65	26.89	2.05	1.39	5.78	5.57	0.05	0.06	0.05	0.05	0.20	0.19	0.15	0.14	0.28	0.19	0.43	0.42	0.31	0.42	0.53	0.46				
	% of total purchase that is lost	1.70%	0.91%	1.77%	1.52%	1.22%	1.60%	3.72%	2.05%	0.63%	0.66%	0.58%	0.57%	0.63%	0.66%	0.58%	0.57%	0.74%	0.55%	0.93%	1.57%	0.60%	0.59%	0.29%	0.65%				
	Value lost (USD)	232	284	685	518	515	490	1,261	2,694	4.11	3.75	3.80	3.24	3.88	3.30	2.34	2.47	9.51	14.06	21.85	22.68	7.78	5.77	8.99	8.83				
	% of value of total purchase that is lost	1.36%	1.65%	1.55%	1.91%	1.34%	1.49%	2.89%	2.83%	0.78%	0.67%	0.67%	0.62%	0.78%	0.67%	0.67%	0.62%	0.45%	1.08%	1.58%	1.83%	0.63%	0.41%	0.31%	0.72%				
Wholesaler	*Nb of observations*	*146*				*152*				*120*				*104*				*121*				*118*				-			
	Kg lost	0.83	0.83^	0.83^	0.83^	0.06	0.06^	0.06^	0.06^	0.05	0.05^	0.05^	0.05^	0.54	0.54^	0.54^	0.54^	0.05	0.05^	0.05^	0.05^	0.47	0.47^	0.47^	0.47^				
	% of total purchase that is lost	2.45%	2.45%^	2.45%^	2.45%^	2.27%	2.27%^	2.27%^	2.27%^	2.94%	2.94%^	2.94%^	2.94%^	2.94%	2.94%^	2.94%^	2.94%^	3.67%	3.67%^	3.67%^	3.67%^	3.97%	3.97%^	3.97%^	3.97%^				
	Value lost (USD)	15	14.59^	14.59^	14.59^	41.06	41.06^	41.06^	41.06^	3.73	3.73^	3.73^	3.73^	0.52	0.52^	0.52^	0.52^	1.18	1.18^	1.18^	1.18^	7.62	7.62^	7.62^	7.62^				
	% of value of total purchase that is lost	2.27%	2.27%^	2.27%^	2.27%^	3.31%	3.31%^	3.31%^	3.31%^	3.42%	3.42%^	3.42%^	3.42%^	3.42%	3.42%^	3.42%^	3.42%^	1.96%	1.96%^	1.96%^	1.96%^	3.92%	3.92%^	3.92%^	3.92%^				
Entire value chain	% of total production that is lost	11.50%	16.18%	16.39%	15.80%	12.87%	19.86%	25.62%	24.17%	13.34%	16.40%	23.19%	20.23%	13.41%	18.18%	23.98%	17.61%	8.95%	17.49%	24.37%	22.63%	14.52%	21.25%	20.21%	22.03%	6.86%	8.67%	19.76%	8.69%
	% of value of total production that is lost	9.86%	17.71%	13.85%	16.02%	10.23%	21.53%	22.32%	25.97%	11.93%	17.05%	22.06%	20.76%	11.93%	18.85%	17.55%	18.14%	7.65%	18.39%	21.11%	21.18%	13.42%	20.98%	19.64%	22.06%	6.26%	9.49%	9.02%	8.69%

Major problems identified

- **Weather related issues**
- **Lack of knowledge of available technology**
  - Pests
  - Plagues
- **Mechanization and access to infrastructure**
- **Price incentives by setting up standards**

The way forward: bringing economics to the measurement of FLW

The concept of (stochastic) profit frontier

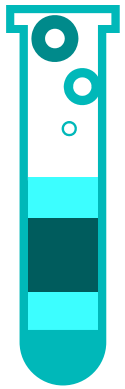


- This approach is based on a simple economic concept: the Production Possibility Frontier (PPF).
- All the possible production combinations are found within the PPF.
- Outside of the boundary are combinations which are not achievable under current conditions
- The efficient use of resources is along the boundary.

Necessary ingredients

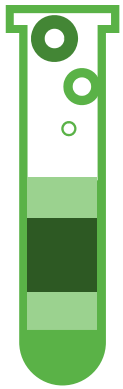
To construct an effective agricultural typology

Agro-ecological data



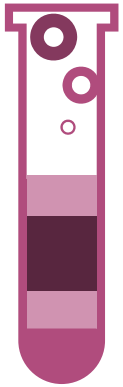
GIS data on land use to establish the heterogeneity in local agro-ecological conditions.

Farm level data



Household survey data to characterize how farmers operate under local agro-ecological and market conditions..

Accessibility data



GIS data on road infrastructure, topography, inland water, etc. to determine local access to markets.

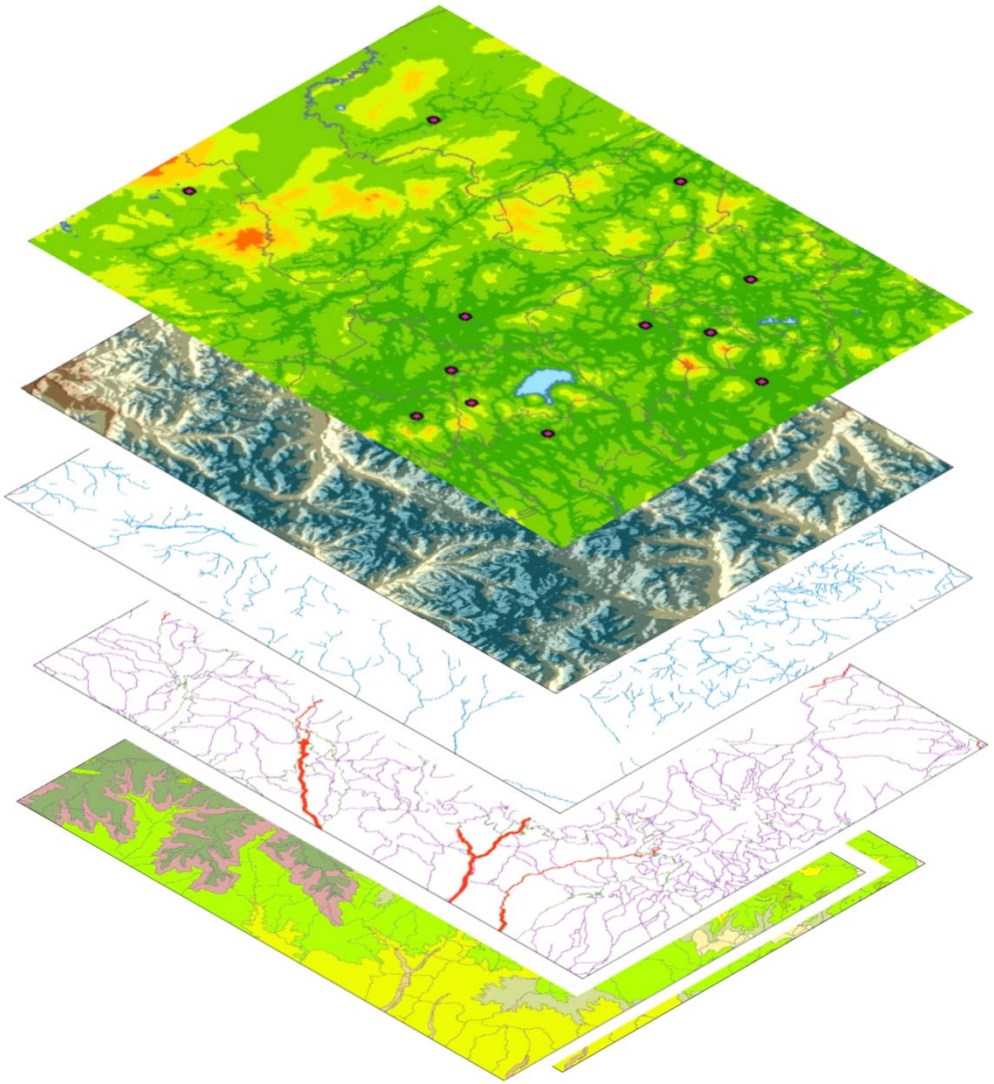
Accessibility

Altitude

Water bodies

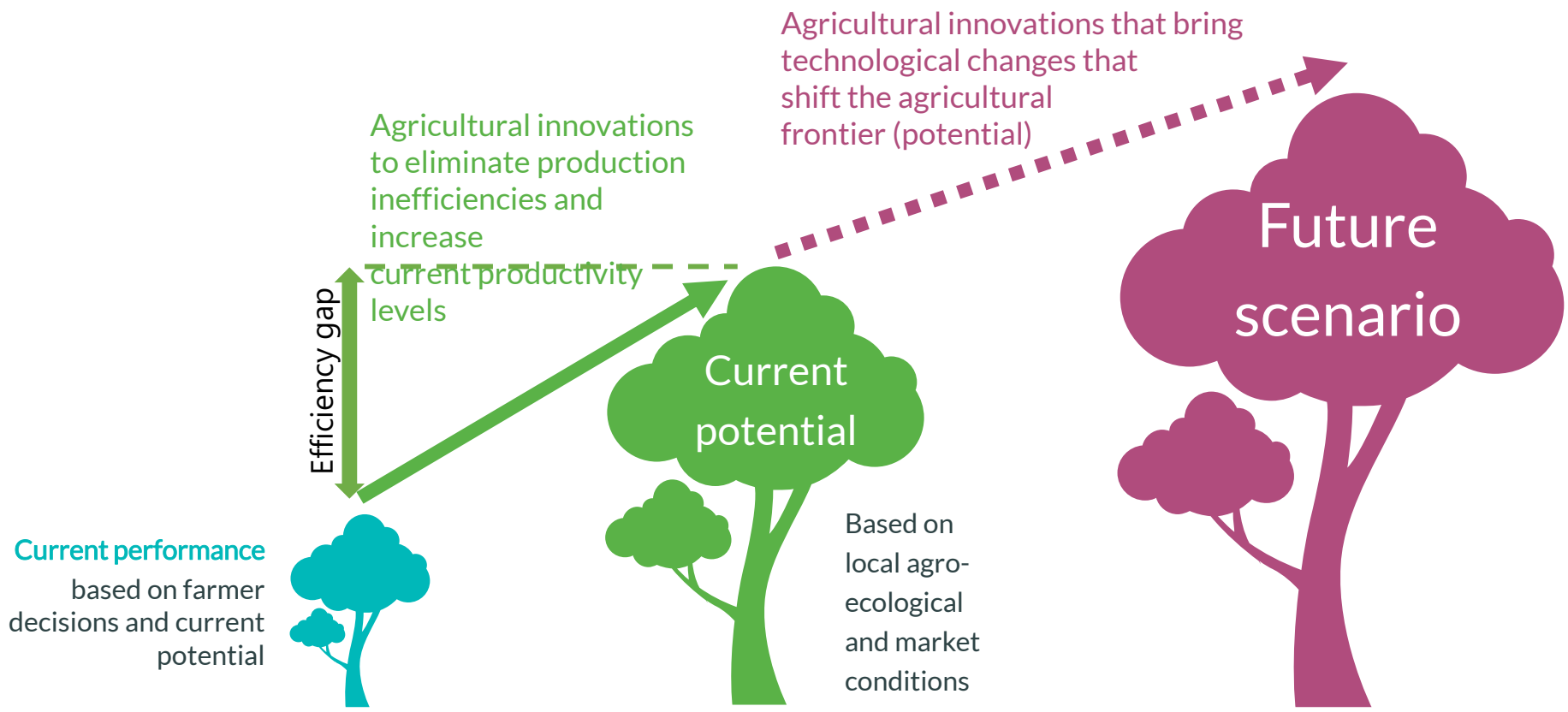
Roads

Land use



Approach

An intuitive explanation of the methodology



Household level estimation

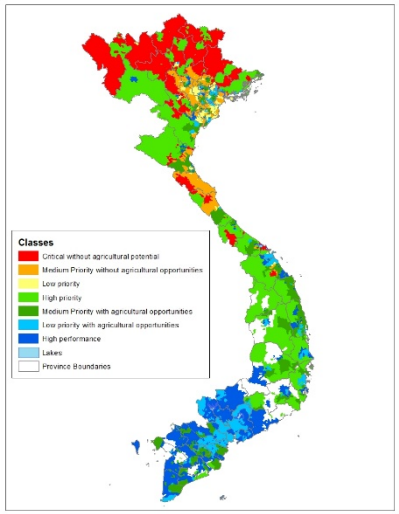
Output and input prices, farm profits, farm and household characteristics, GIS data, accessibility data

Coefficients from stochastic profit frontier estimation

Regional extrapolation with GIS data at the regional level, census data

Construct typology map using regional estimates

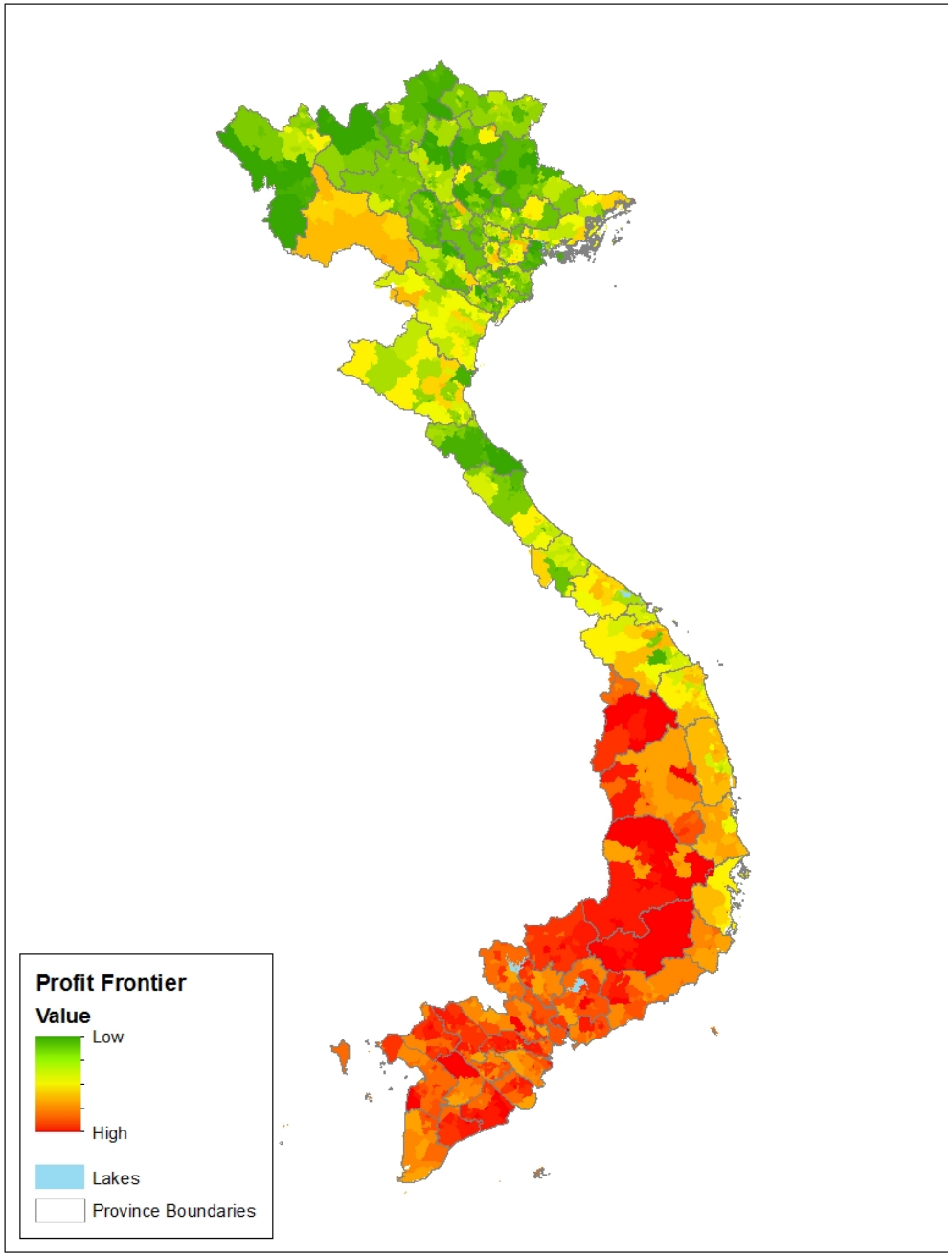
Empirical strategy

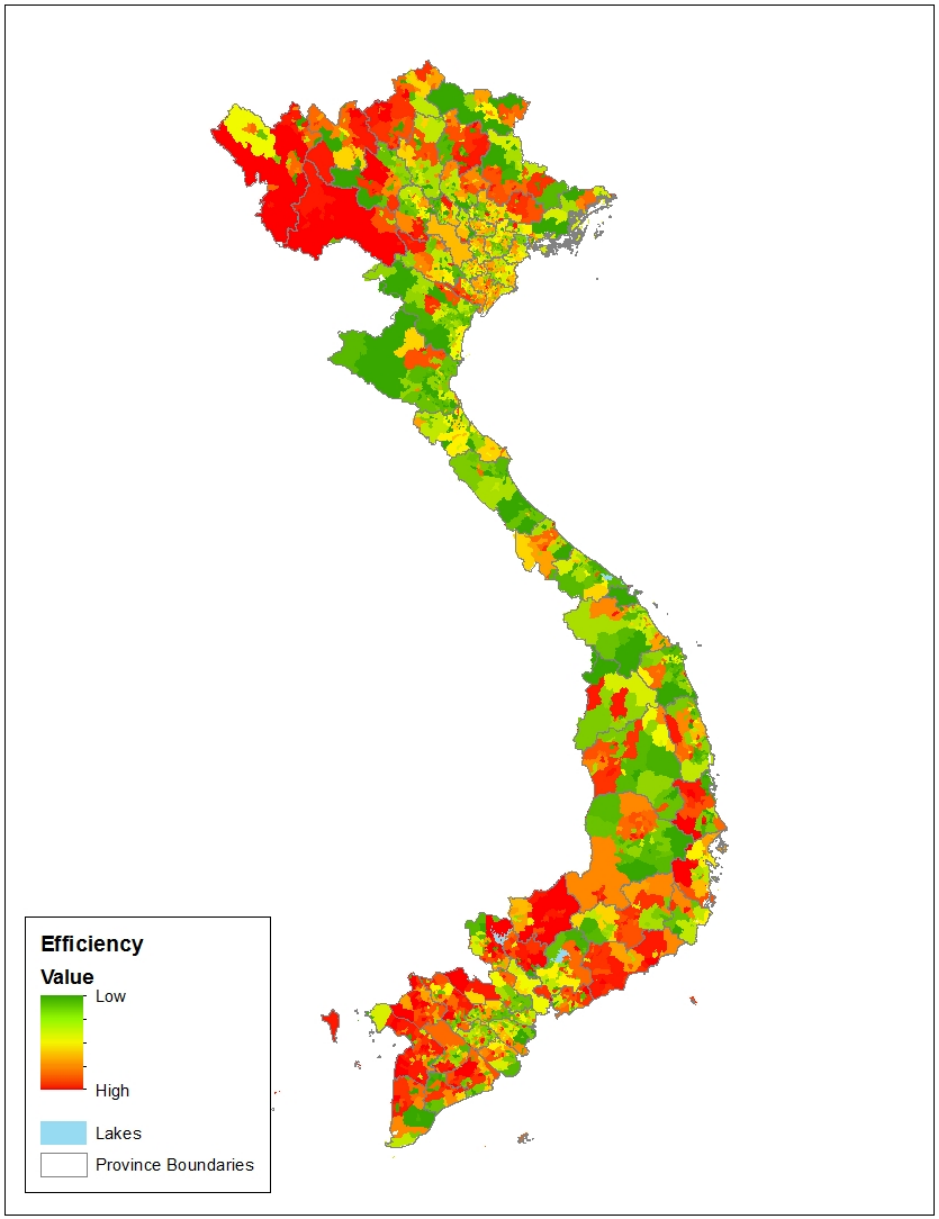


Agricultural potential

Where are the best opportunities?

- Areas with higher agricultural potential are shown in darker red.
- There is a clear North / South divide, with the South concentrating more high potential areas.

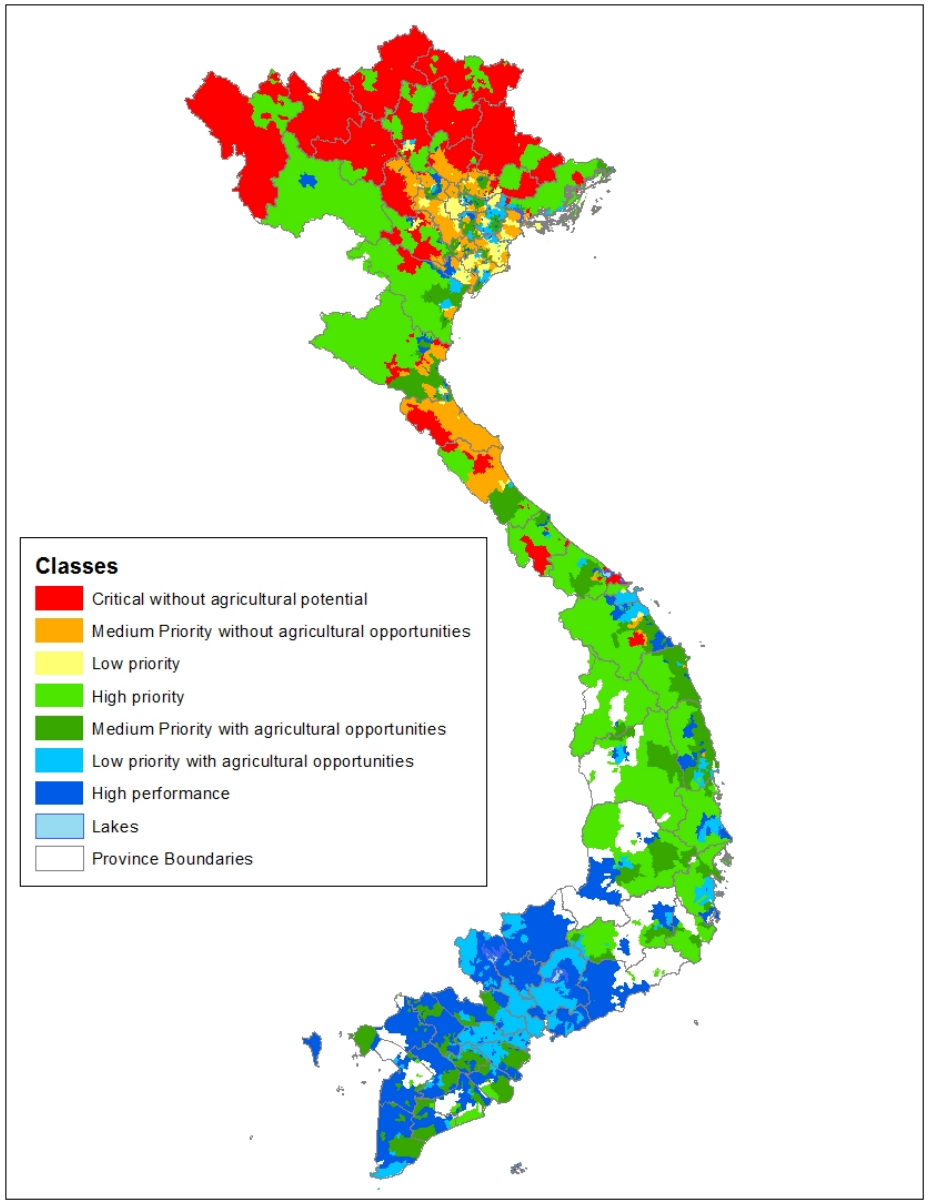




Agricultural efficiency

How far is each area from its potential

- Darker red areas show areas with higher efficiency (closer to performing at their maximum potential).
- Agricultural efficiency is lower near the large urban centers, due to higher opportunity costs for labor and land.
- High efficiency levels in the North can be associated with intensive development efforts in the region, and the need to operate closer to the farm frontier given the high poverty rates and low agricultural potential.



We can simplify the typology to obtain broader categories

The way forward: Interventions to reduce FLW targeting the real problem

An RCT intervention with 3 arms

- **Treatment 1**: *Government plays a role*

  Seeds+fertilizer+ extension packages

- **Treatment 2**: *Markets resolve the problem*

  Price incentive if comply with conditions on attributes

- **Treatment 3**: control

Final Remarks

The way forward

- Reducing Food Loss and Waste (FLW) can contribute to food security and sustainability and reach the SDGs, especially SDG 12
- Concrete targets at regional and country levels are needed
- Addressing FLW requires a common understanding of the concept
- We need a better measurement and better understanding of the causes and market failures that contribute to them
- Micro-, meso- and macro-level causes need to be addressed

The way forward

- For smallholders, the public sector can address some of the market failures such as access to infrastructure and storage facilities
- The private sector also has a role to play, particularly when reducing FLW can generate profits
- For developed countries, the focus should be on waste
- For developing countries, the focus should be on food loss and potential food loss; they should also leapfrog in policies to reduce waste

Technical Platform on the Measurement and Reduction of Food Loss and Waste

The G20 agriculture ministers highlighted the extent of food loss and waste (FLW) as "a global problem of enormous economic, environmental and societal significance" and encouraged all G20 members to strengthen their collective efforts to reduce FLW.

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