Postharvest losses and value chain approach to loss reduction

35th International Vegetable Training Course

17 October, 2016

Shriniwas Gautam

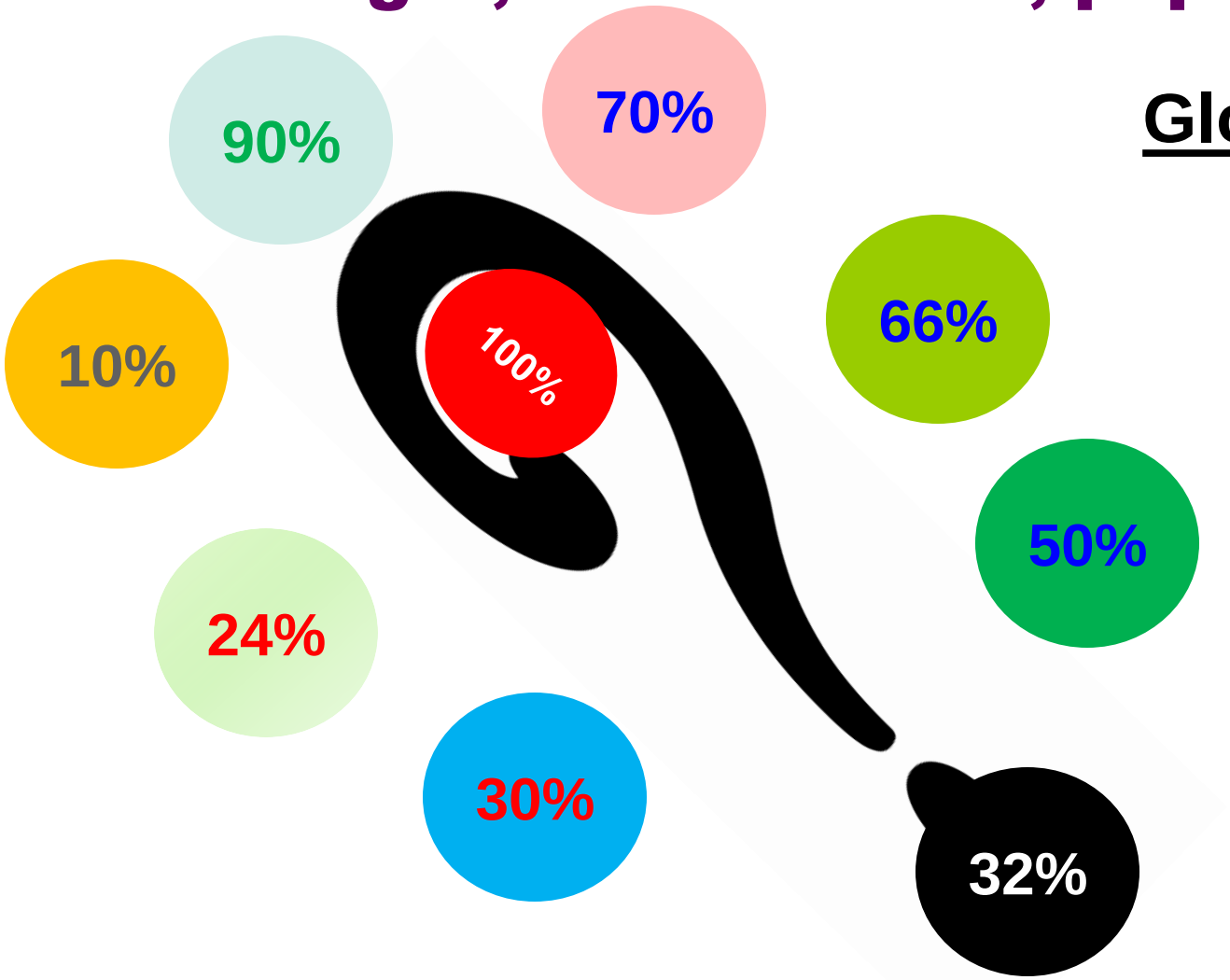
The World Vegetable Center
Thailand

Flow of presentation:

1. Overview of global population, food demand and supply
2. Distinguishing different kinds of food loss and waste
3. Global postharvest food loss / waste situation
4. Postharvest system, PH activities and Value chain approach

1. Global population, food demand and supply

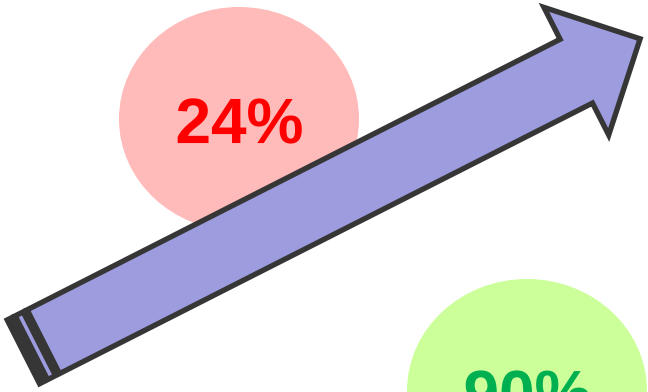
Global hunger, food demand, population



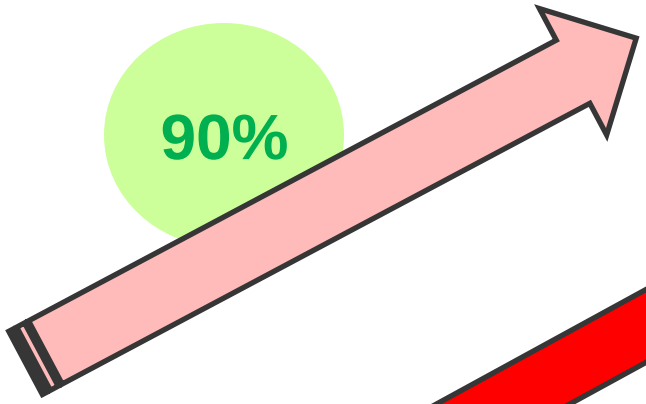
Global STATS

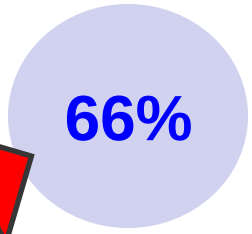
Growth and distribution of global population

Increase in current population by 2050

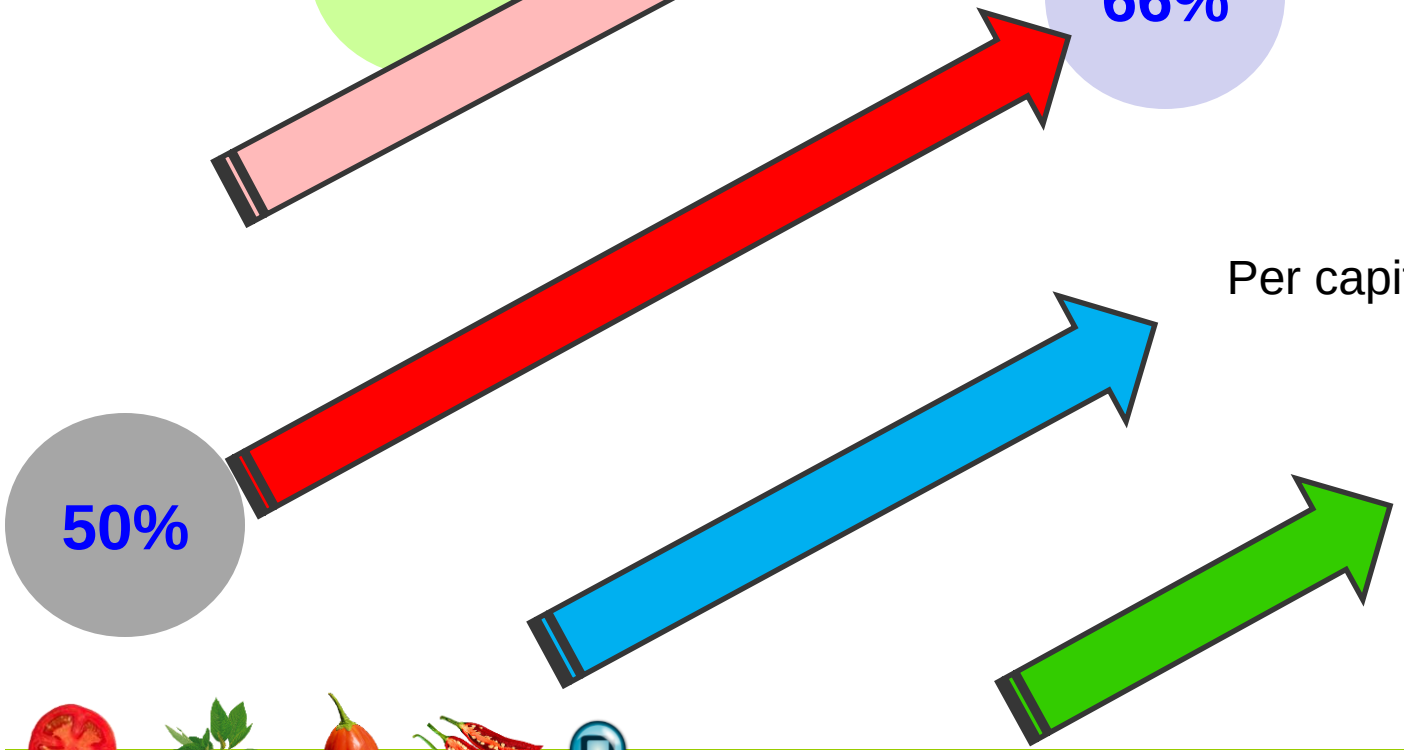


Increase will be concentrated in Africa and Asia.





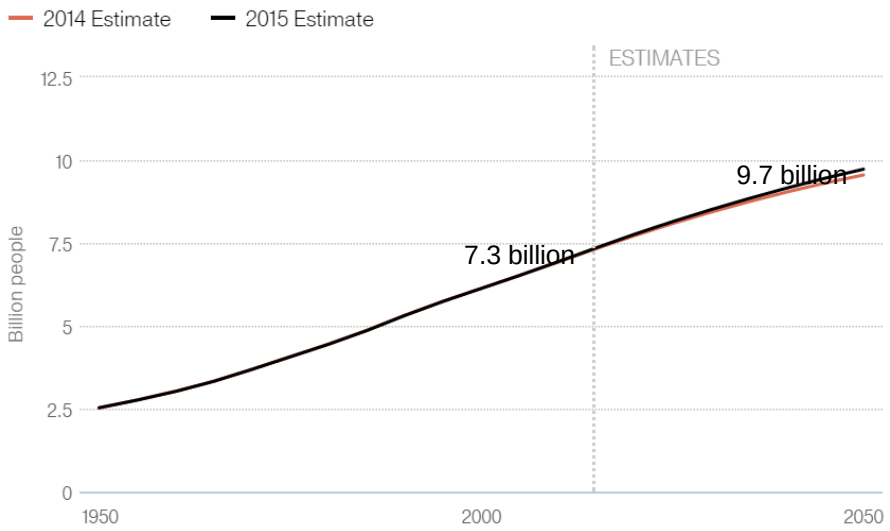
Global Urban population, 2050



Per capita income

Food demand (quality & quantity)

Global population, how much and where by 2050 ?

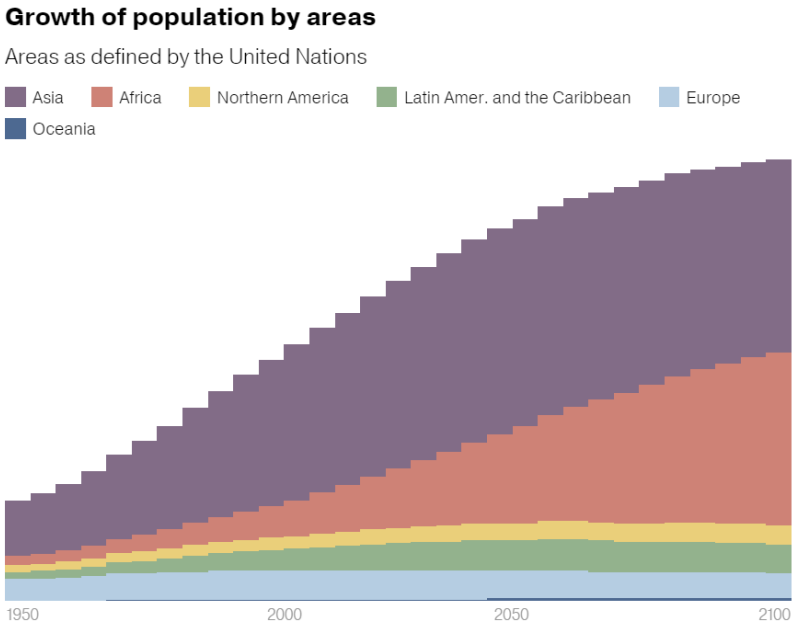


- 2014: 7.3 billion
- 2050: (9.4 to 10 billion) 80 percent chance
- By 2100, 11.2 billion

Date source: UN, figures National Geographic (July, 2015)

#	Country	Population (2016)	World Share	Fert. Rate	Med. Age	Urban Pop %
1	China	1,382,323,332	18.6 %	1.55	37	57.9 %
2	India	1,326,801,576	17.9 %	2.48	27	32.4 %
3	U.S.	324,118,787	4.4 %	1.89	38	82.7 %
4	Indonesia	260,581,100	3.5 %	2.5	28	54 %
5	Brazil	209,567,920	2.8 %	1.82	31	84.2 %
6	Pakistan	192,826,502	2.6 %	3.72	23	38.9 %
7	Nigeria	186,987,563	2.5 %	5.74	18	49 %
8	Bangladesh	162,910,864	2.2 %	2.23	26	34.9 %
9	Russia	143,439,832	1.9 %	1.66	39	73.2 %
10	Mexico	128,632,004	1.7 %	2.29	27	78.3 %

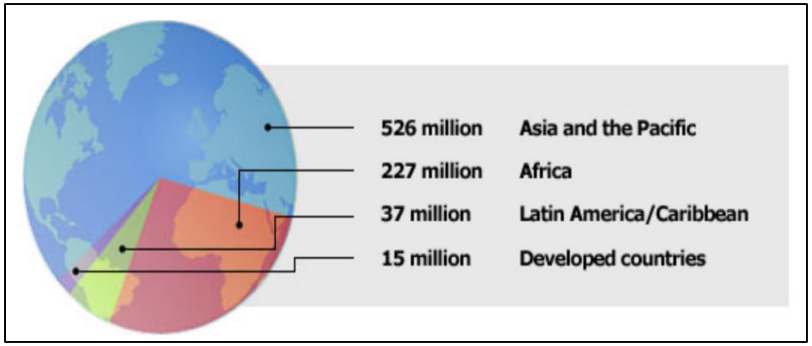
http://www.worldometers.info/



Global hunger

10%

Global hunger prevalence 805 million
(UN Sources)

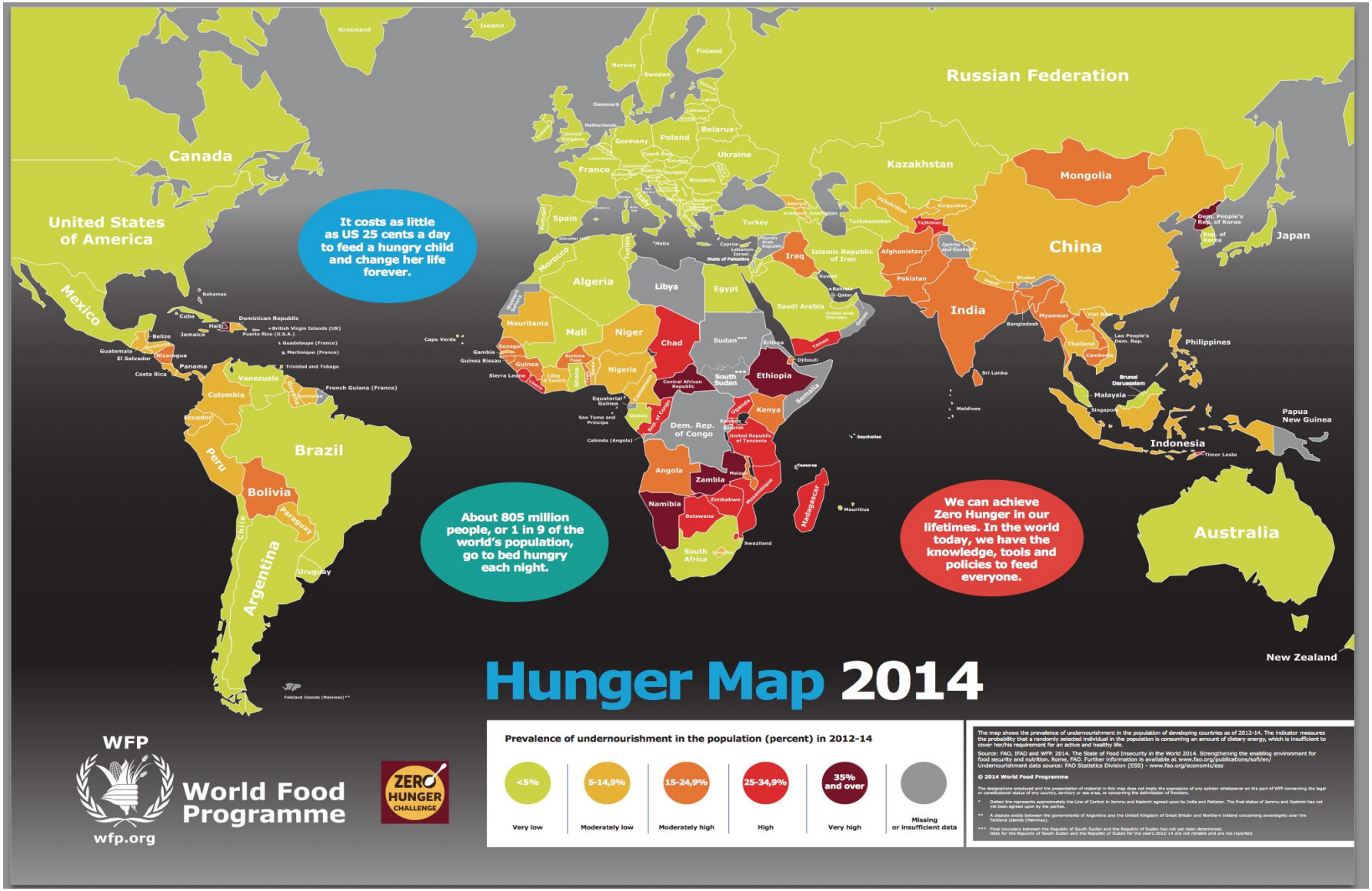


65%

65% of these in Asia, and Pacific

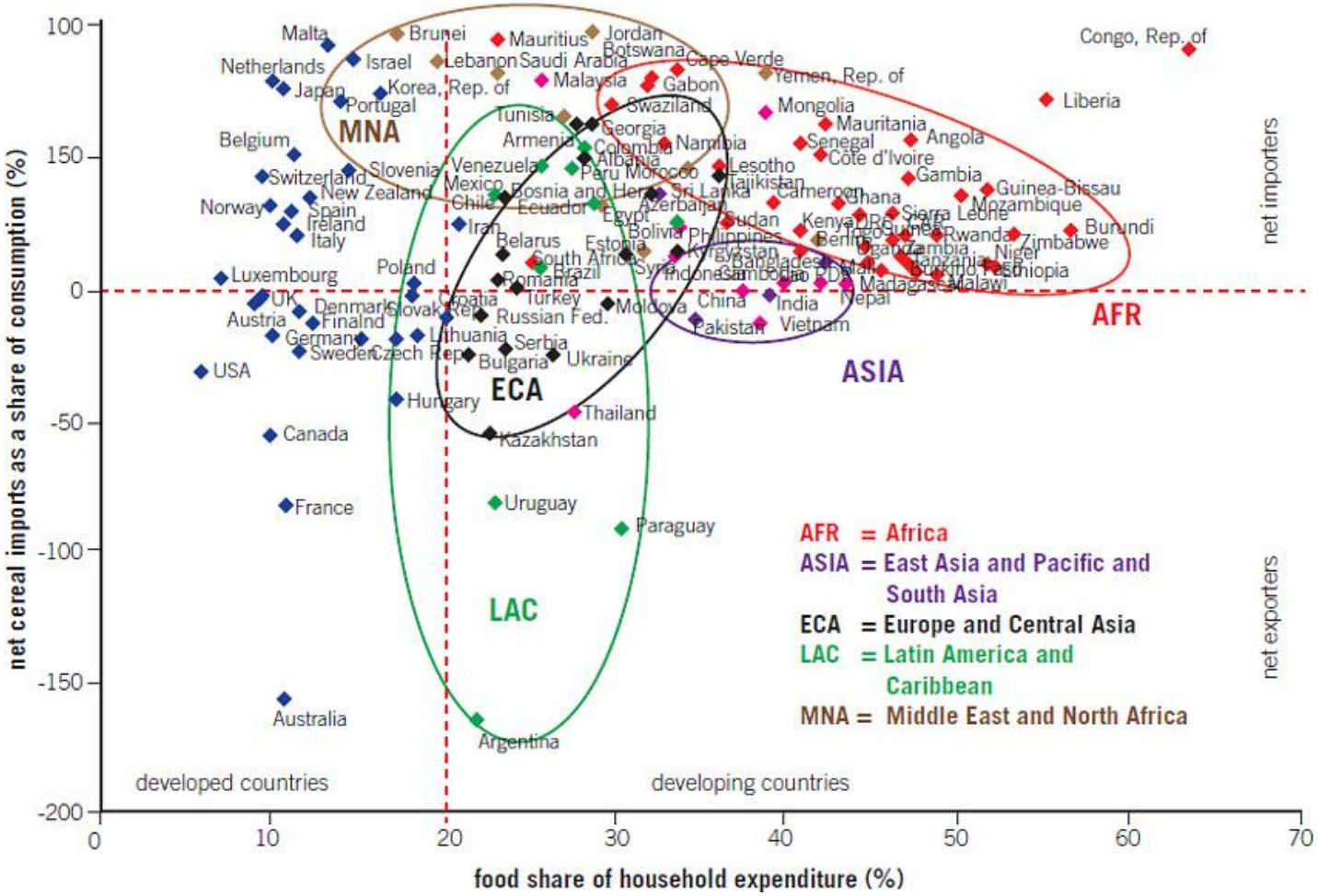
28%

28% of these in Africa



World Vegetable Center

Countries' Vulnerability to Global Food Price Shocks



Source: World Bank (2011) *Responding to Higher and More Volatile World Food Prices,* Development Committee Paper prepared by the Agriculture and Rural Development Department using data from FAOSTAT for net cereal imports as a share of consumption and the USDA for food share in household expenditures.

World Vegetable Center

Causes of global hunger/ food shortage

Not enough food produced?

Social and economic factors?

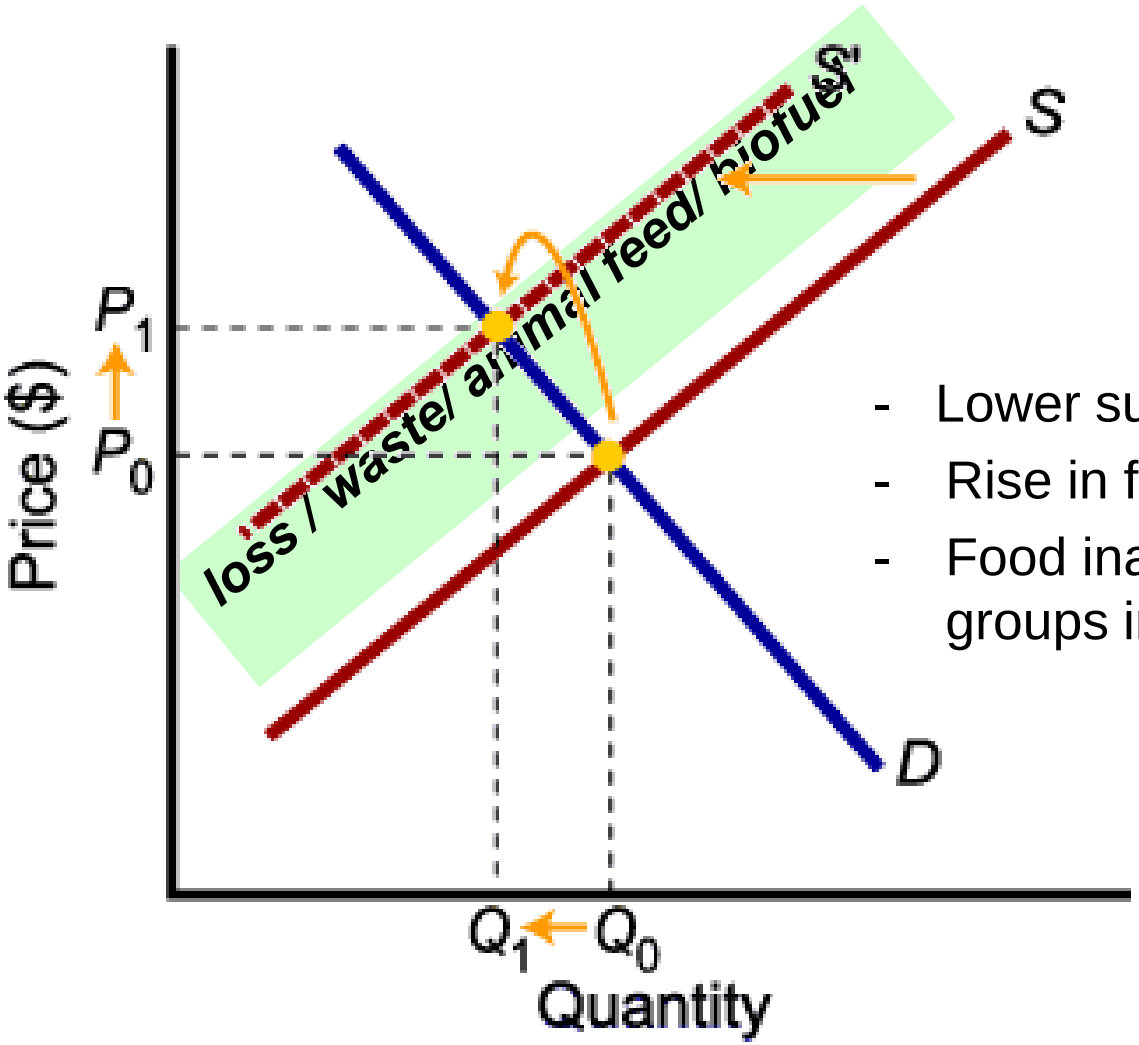
Nobel laureate Amarthya Sen (Sen, 1982)

Causes of food shortage/ hunger:

- Not scarcities of food per-se BUT other social and economic factors:
- Low wages/ unemployment/ poverty/ inequality/ rising food prices/ Poor food-distribution systems (alternative use, loss & waste)

Source: FAO, 2016

Law of demand



- Lower supply, excess demand
- Rise in food price
- Food inaccessible to certain groups in society.

Alternative uses and human food losses

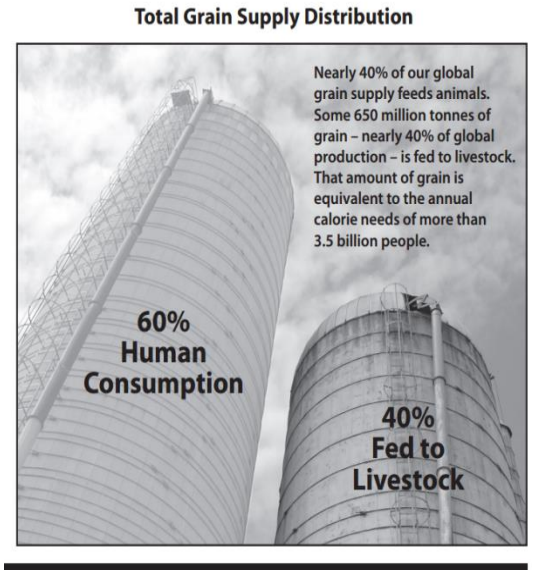
In reality: **Global food production > Global human food demand**

If so, why 805 million people go hungry ?

32% Of harvested food is lost or wasted

30% Of human food used for animal feed

10% of human food used in production of biofuels



Source: etc group, Nov, 2009): Who Will Feed Us?

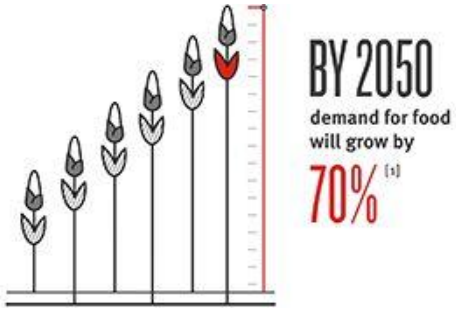
World Vegetable Center

1. Global food demand and supply

How much more we need to produce by 2050 (with current loss/ waste, and alternative use of human food) ?

70%

Global estimate:
increase in current food supply



100%

Developing countries estimate increase in the current food supply (production)

Can we do that? Not impossible but not easy either, what are the options?

- Video 1

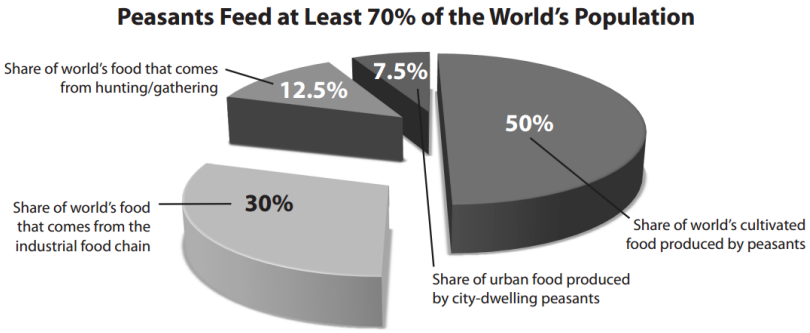
https://www.youtube.com/watch?v=IoCVrkcaH6Q

Potential Options to increase food supply

Option 1: Expansion of acreage for food production

- Possible but limited by scarcity of the accompanying production resources

- Seed, fertilizer, credit, water, good land
- Access / Afford ?



(Source: etc group, Nov, 2009): Who Will Feed Us?

- Environment and climate change problems associated with acreage expansion (deforestation, greenhouse gases etc.).

Drought: At least 330 million people are affected in India (source: BBC)

PHOTO: AFP/GETTY IMAGES

Area expansion has impact on environment

Ag. Activities contributed to:

• 24% of global greenhouse gas emission in 2010.

• 70% of the freshwater withdrawn from rivers, lakes, and aquifers.

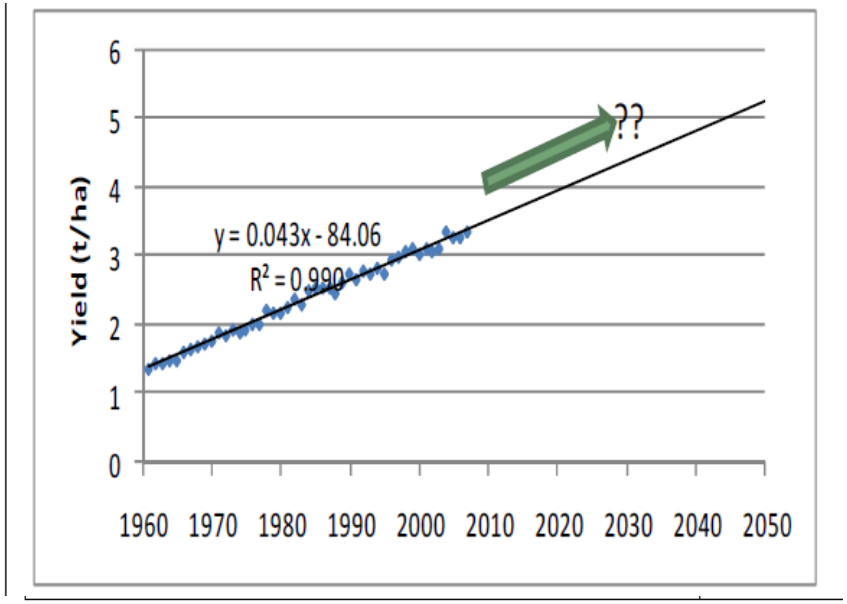
US drought 'worst for decades'
2 July 2014

US drought bakes cattle and crops
3 August 2012

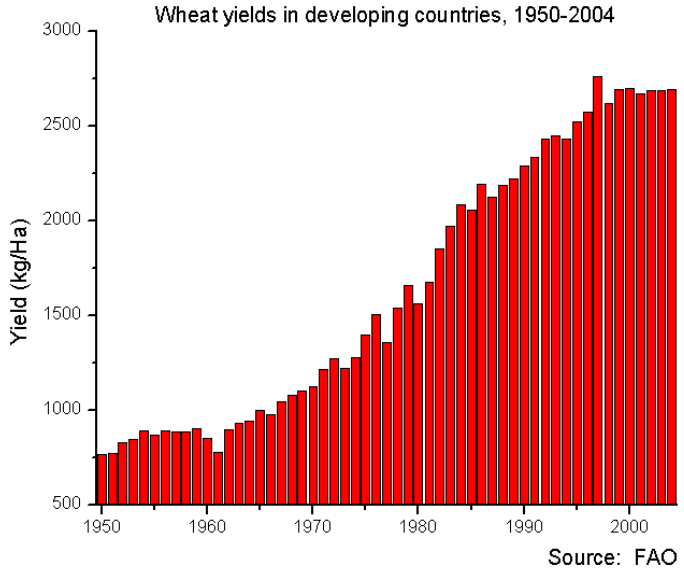
Source: BBC

World Vegetable Center

Option 2: Increasing agricultural productivity



Source: FAOSTAT. Wheat yields updated from Pardey et al. (2007).



- Global productivity trends 4 major crops in the last few decades not sufficient to increase the supply to meet the food demand by 2050 (Ray *et al.*, 2013).
- Four major food crops (maize, rice, wheat and soybean) that account for 2/3 of global agricultural calories

Option 3: Reducing food loss and waste

This is what we will focus on today

Opportunities with PHL/ W reduction:

- Saving can potentially feed more people
- Production resources don't go in vain **(e.g. 23% of total fertilizer use)**
- Lesser negative impacts to environment
  (e.g. PHL/ W account for 24% of total freshwater resources used in food crop production)
- Less pressure on acreage expansion
  (loss equivalent to 23% of total cropland area used)

2. Distinguishing food loss and waste

32% of the global food either lost or wasted
= 1.3 billion tones, 24% in global food calories

- Food waste in rich countries ≅ Net food production of S-Saharan Africa
  222 million tons ≅ 230 million tons

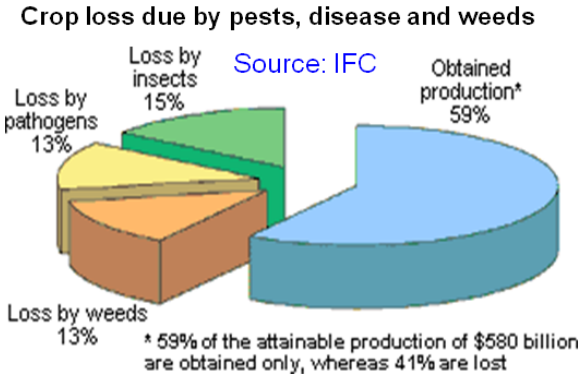





a. **Production Loss:** On the field, Loss of potential harvest

Natural causes

Bangladesh



Sri Lanka

Social and economic causes

Michigan Apple, Labor shortage

Bumper Cherry Crop Turns Sour
Unharvested, Under Government Program to Keep Prices Stable (WSJ, 2009)

An angry farmers dumps onions in Gujarat streets, 2016 India)

2. Distinguishing food loss and waste

b. Food waste: Consumers/ and big retailers: Buy too much, cook or serve too much, and do not store properly (do not eat within certain period **)**

- Leaf Miner : destroyed 80% of tomato
- Price: $1.20 to $40 for a basket

4o metric ton, one hour, last Wed of August

Quantity loss vs. quality loss

c. Postharvest Loss: Harvest - Retailers

- **Quantity loss**



Weight loss due to: Leakage in transportation, handling, moisture loss, not consumable can not be sold, not consumable

- **Quality loss**


Price drop:
Visual damage, Non-visual:
Nutritional/ food safety

- Video 2

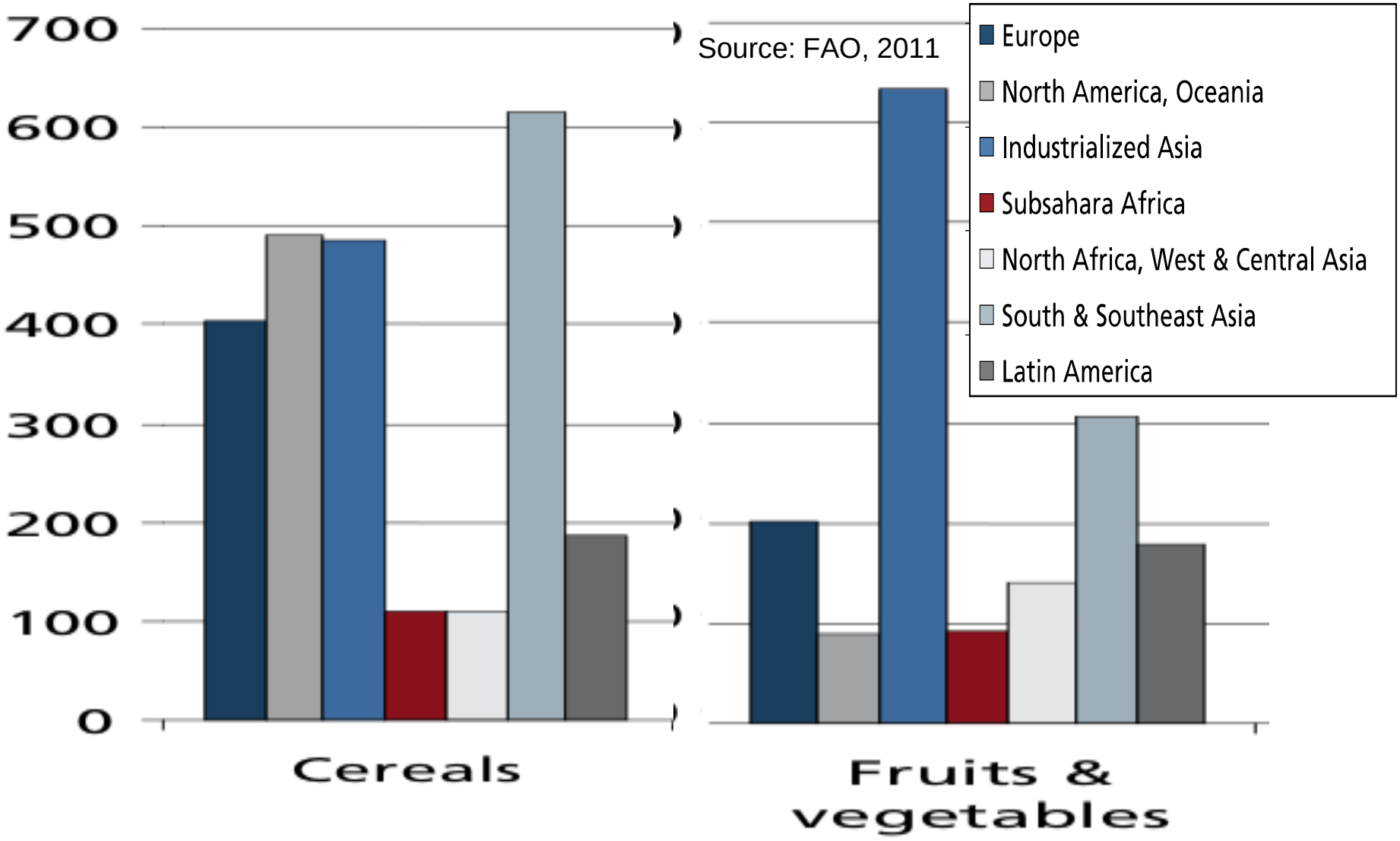
- https://www.youtube.com/watch?v=Md3ddmtja6s

Video 2a

https://www.youtube.com/watch?v=8mjd95U1_yM

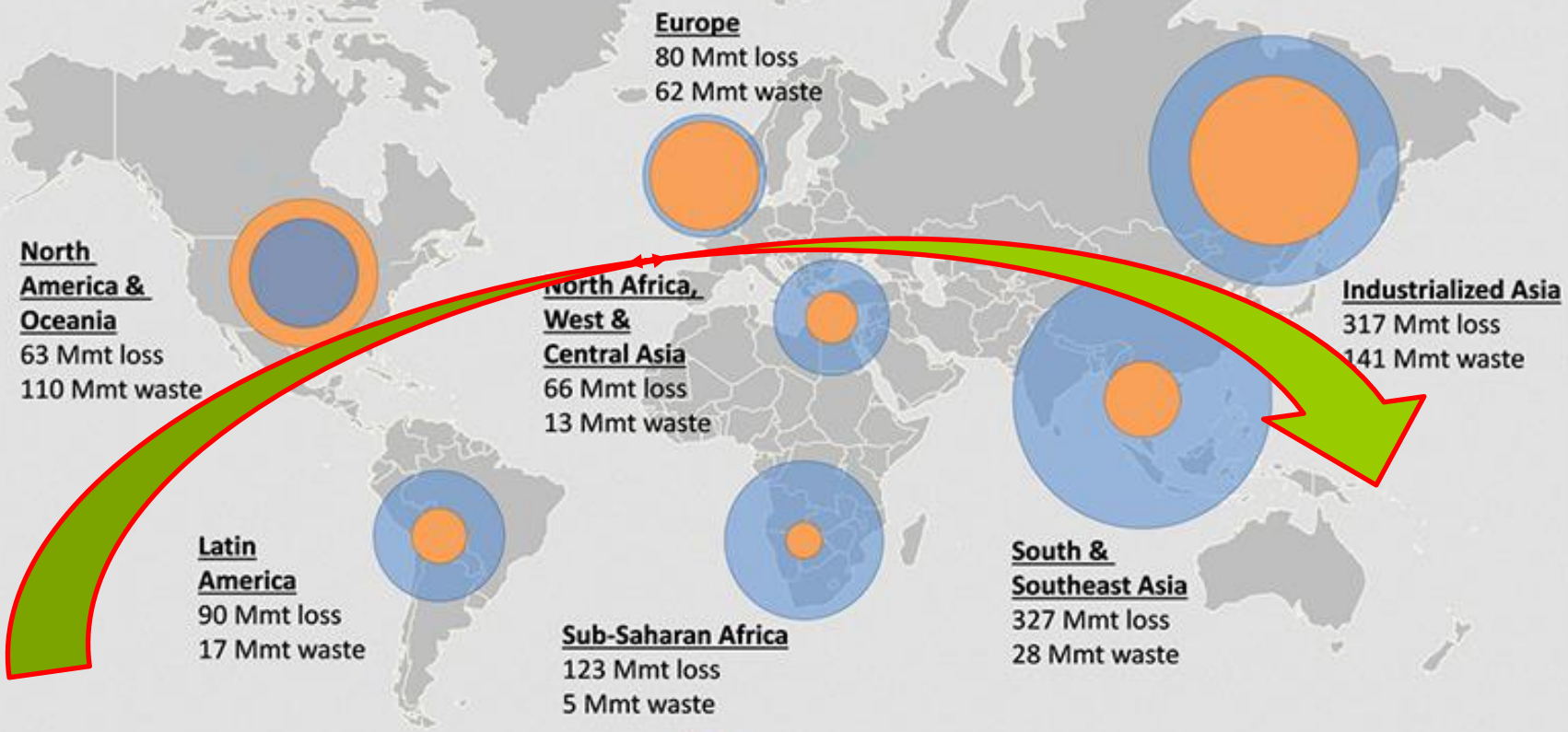
3. Global food loss and waste situation

Production volume for regions (million tons)



Food waste and food loss around the world, millions of metric tons[1]

Unlike consumer driven waste in the developed world, over 90% of all wastage in developing Asia and Africa occurs during production, postharvest, processing, and distribution



Mmt = million metric tonnes
Source: (1) FAO "Global Food Losses and Food Waste," 2011; Dalberg analysis

Food Waste: Example Britain (Source: Guardians)

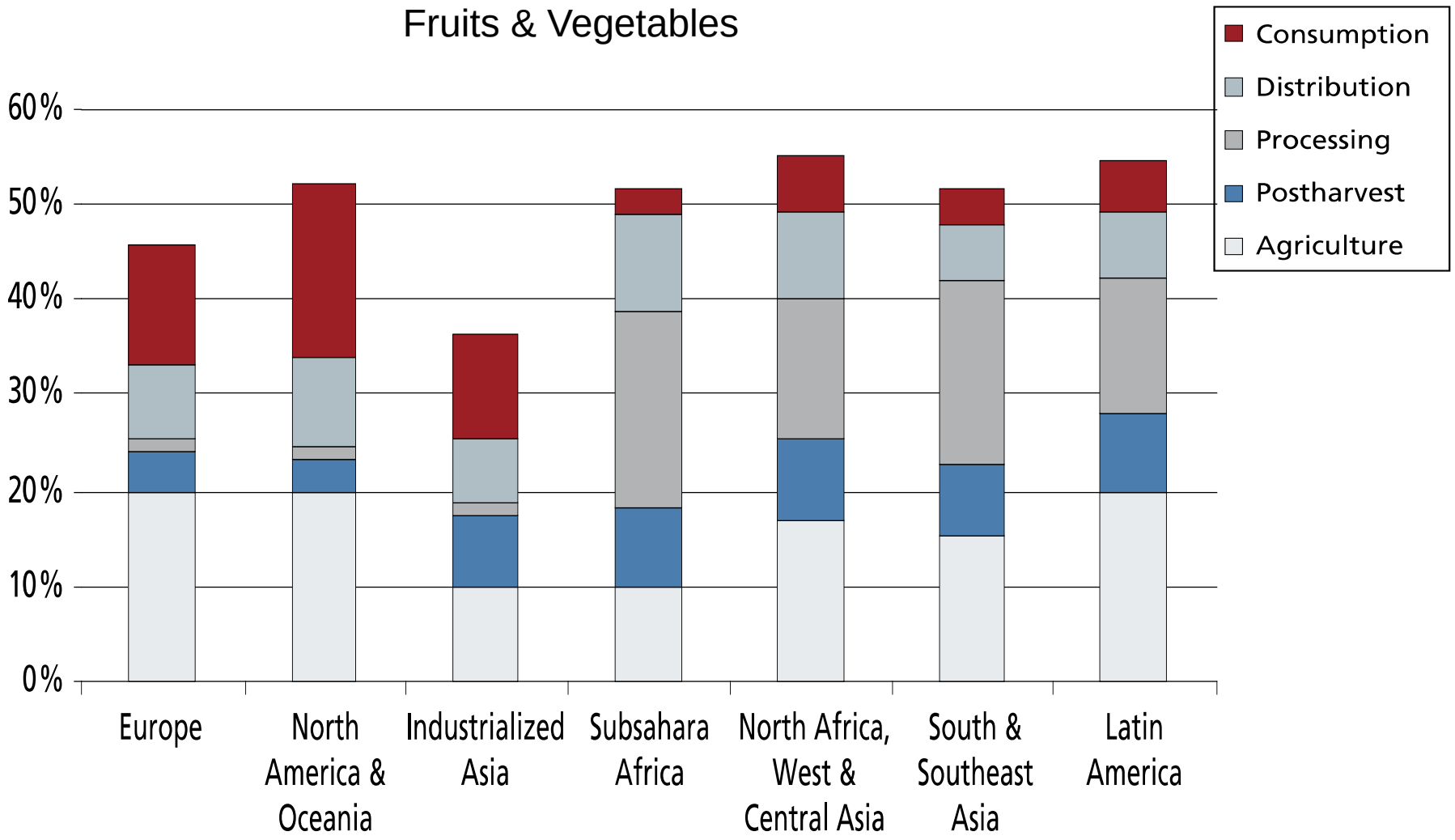
*Value of wasted (food & drink):
60-pounds/ families in a month

*Area to produce wasted food & drink:
91% of Wales (8000 sq. miles)

Buy if you can save / use

Cook/ Serve amount that you can eat

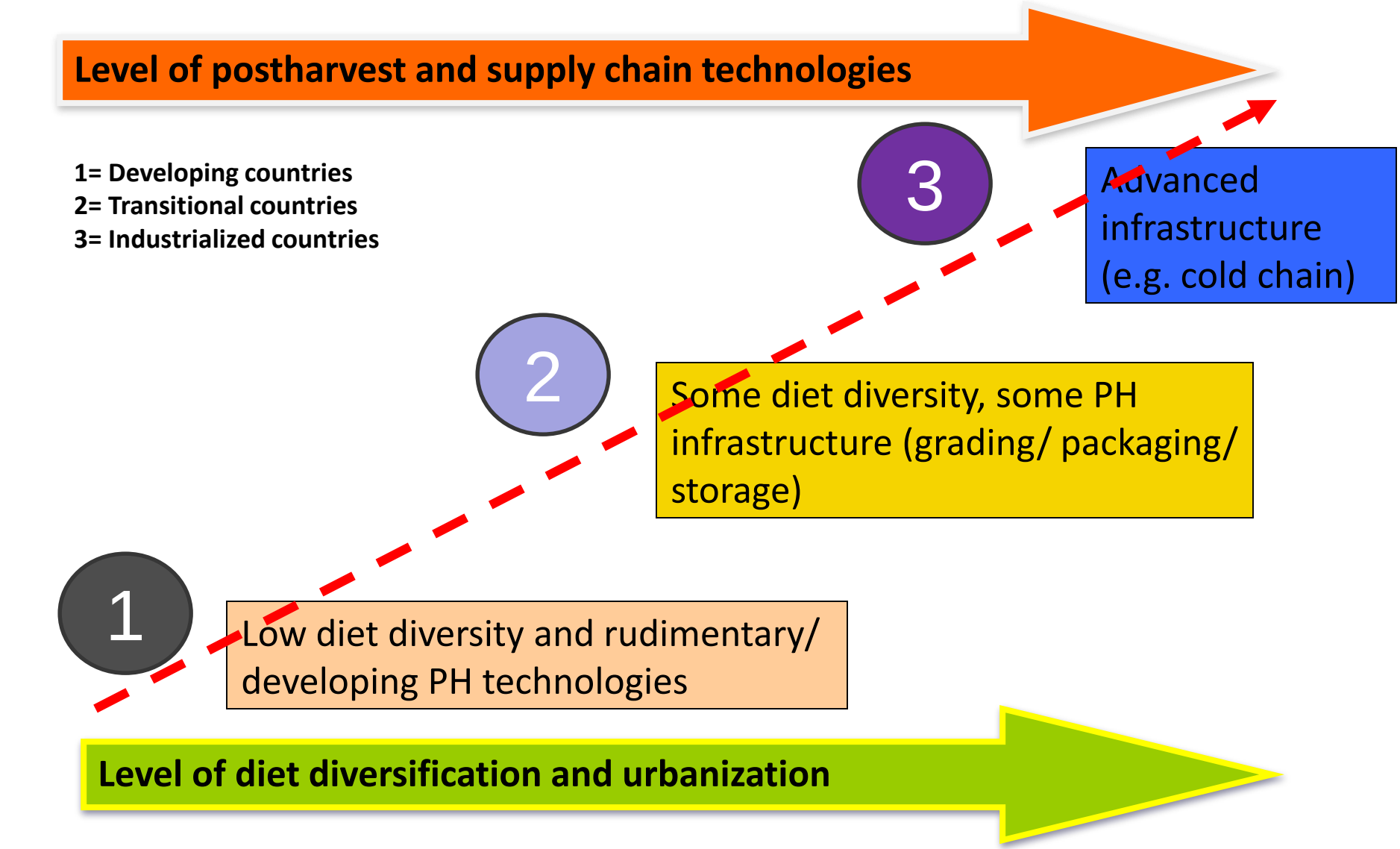
Loss and waste of vegetables and fruits (% of production)



Source: FAO, 2011)

World Vegetable Center

Stage of PH technology & Countries



(Adopted Parfitt et al., 2010)

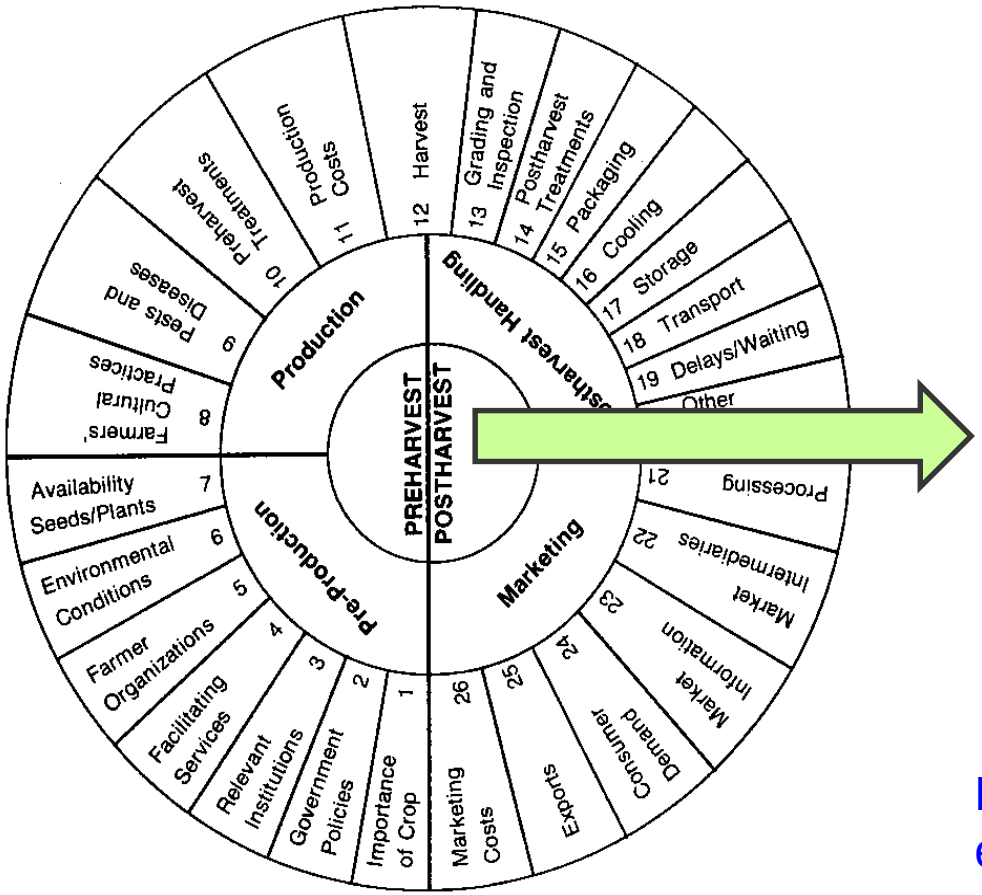
World Vegetable Center

4. Postharvest system, PH activities and Value chain approach






Commodity system and PH activities



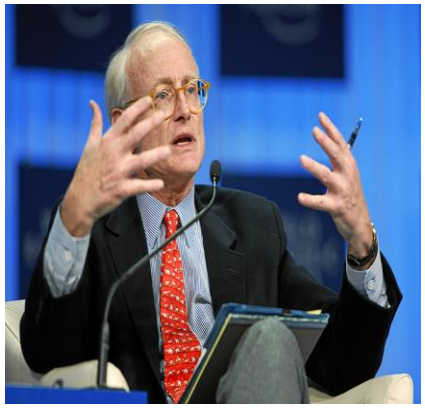
PH activities:

- Technical activities: grading, packaging, storage etc.
- Economic activities: marketing, admin and management etc.

Reduction in PH Loss improves efficiency of the commodity system

Figure: Agriculture Commodity System (pre and postharvest activities)
Source: Adapted from La Gra *et al.,*1990; PEF, 2013)

What is Value Chain (VC) Approach?

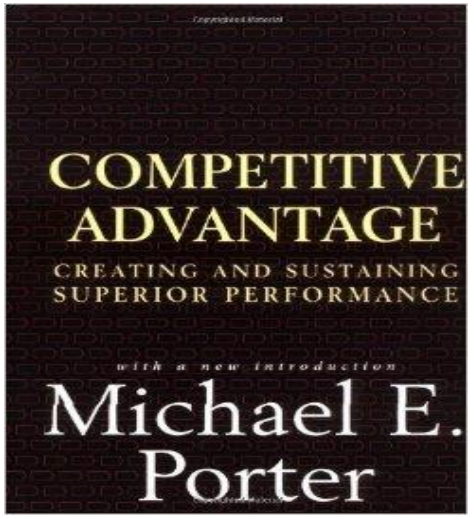


- Value Chain: Internal processes or activities a company performs *"to design, produce, market, deliver and support its product."*

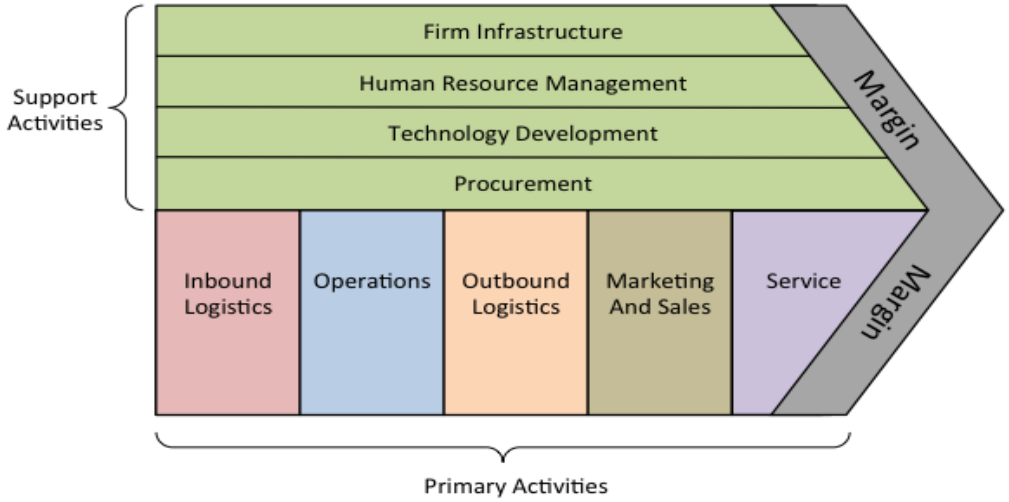
A Company to stay in business must meet two criteria:

(1) Must supply what customers value

(2) Must survive the competition (Price)



Porter's Value Chain Model



Alternative strategies for Competitive Advantage

- Key concept in understanding VC approach is CA

" An advantage over competitors (greater sales or margins and/ or retain more customers than its competition)"

Competitive Scope	Competitive Advantage Strateties: Lower cost	Competitive Advantage Strateties: Differentiation
Broad Target (industry-wide)	Cost Leadership (economies of scale in production and marketing)	Differentiation leadership (product distinct from those of competitors
Narrow Target (segmentation)	Cost focus	Differentiation focus

Position relative to competitors (based on Porter, 1985)

Value Chain vs Supply chain

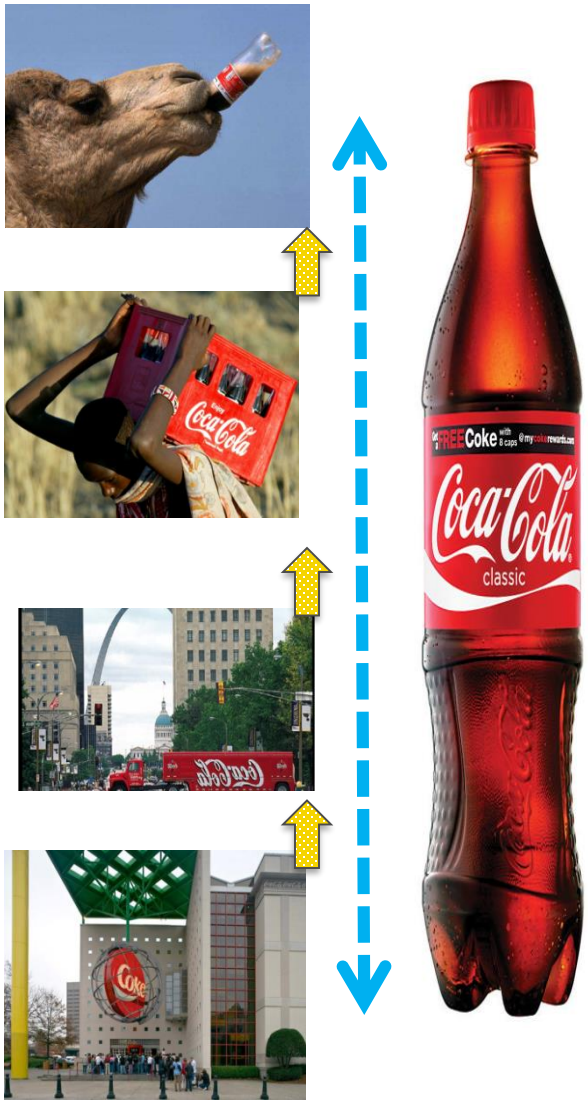
Farm

Consumer

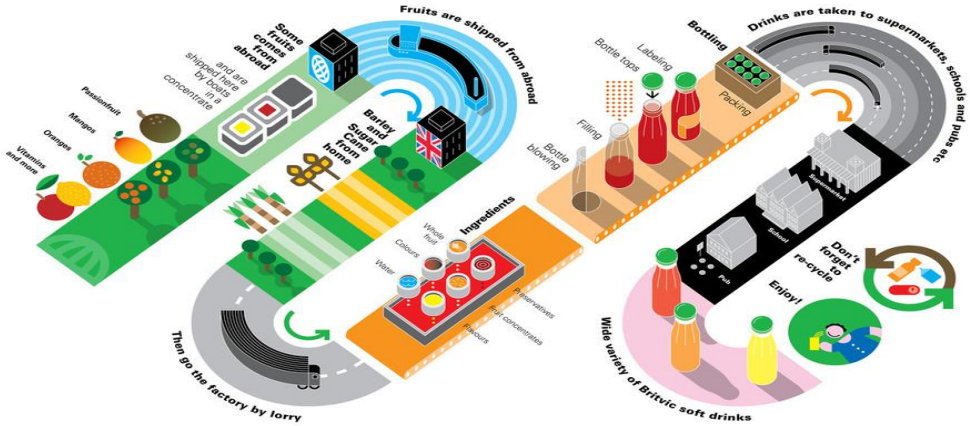
Factory

Consumer

Value Chain or Supply Chain (Images collected from Google)



- Manufactured/ Uniform products
- Non perishable (generally)
- Marketing and sale
- Warehousing
- Bulk transportation
- Short Chains (95% domestic)



Source: nonprofit.causecast.org (web)

World Vegetable Center

Value Chain vs. Supply Chain

Aspects	Supply Chain Management	Value Chain Management
Focus	Cost/ price/ Time	Value/ quality
Product	Commodity (Present the good for sale)	Differentiated products (offer product market will pay for)
Relationship	Supply Push (Market push approach)	Demand pull (Market pull approach)
Organizational structure	Independent	Interdependent
Philosophy	Self optimization	Chain optimization
Communication	Little	Extensive
Objective	To reduce: # links, reduce friction (Reduce cost/ time to market.	Maximize gross revenue and sustain it over time.

Why VC being popular in agriculture?

VC modified and used in o*ther areas including Int. dev.*

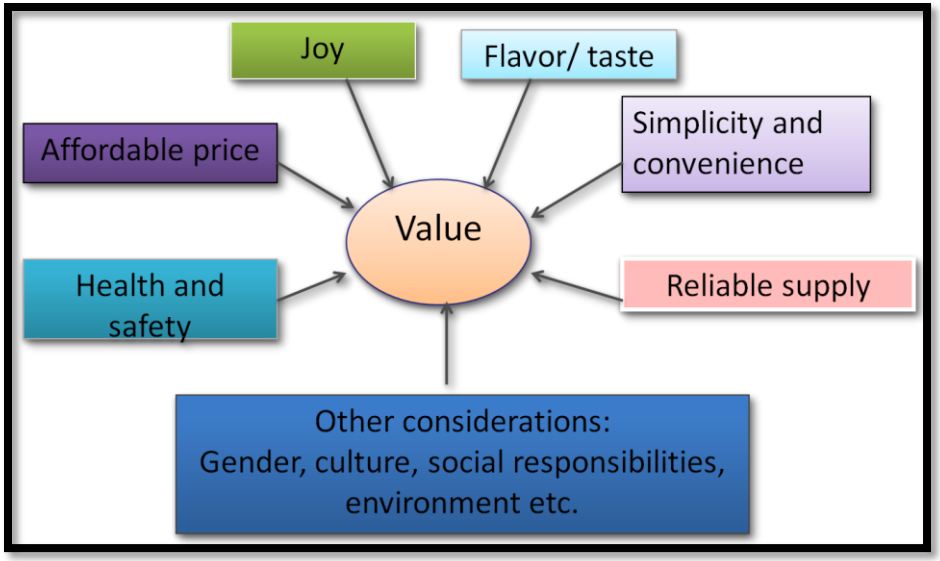
1. Farming as a business rather than a way of life	→	***Competition and competitive advantage, margin, value addition are important considerations***
2. VCA assesses potential to apply/adopt knowledge and technology	→	***Based on available resources, capacities, infrastructure, and raw materials and need of the stakeholders.***
3. VCA pays attention to both direct and indirect effects	→	***Economic: Poverty reduction, employment*** ***Social: Gender , linkages among beneficiaries*** ***Other: Food safety and nutrition, environment***

5. Demand driven not supply driven: very important one

Please buy me

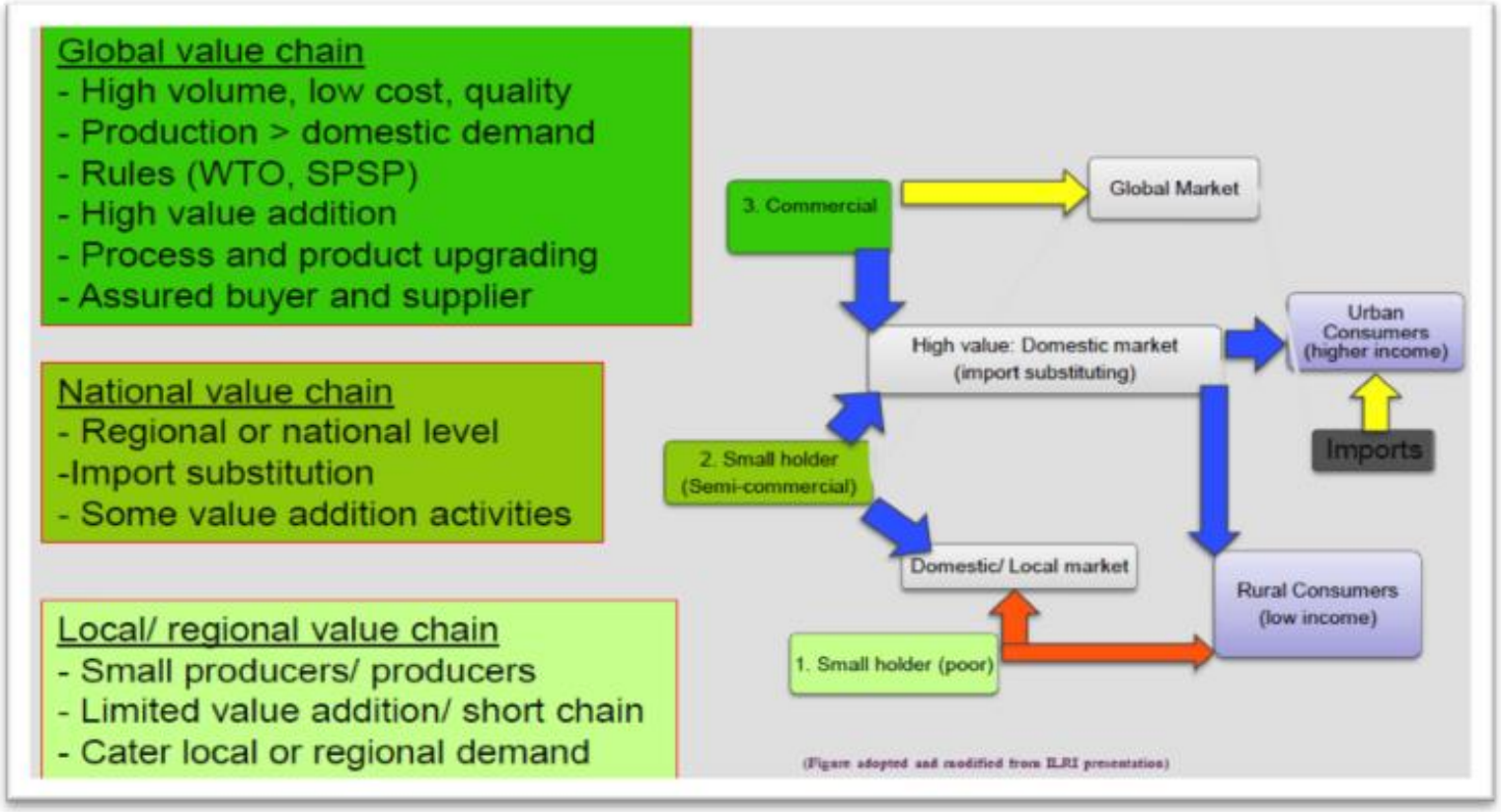
I want to buy you

- ***End markets are the starting point of the value chain analysis.***
- Understand what customers' value



***W**hich market (domestic or international)*

- Study the market, identify the customers, decide the product you want to produce etc.
- ***Design project to improve the value chain***
- ***Be clear how you can be competitively positioned***



World Vegetable Center

WorldVeg approach

1. Structured Surveys of VC actors, FGDs at farmers' level.

2. Quality assessment along the VC

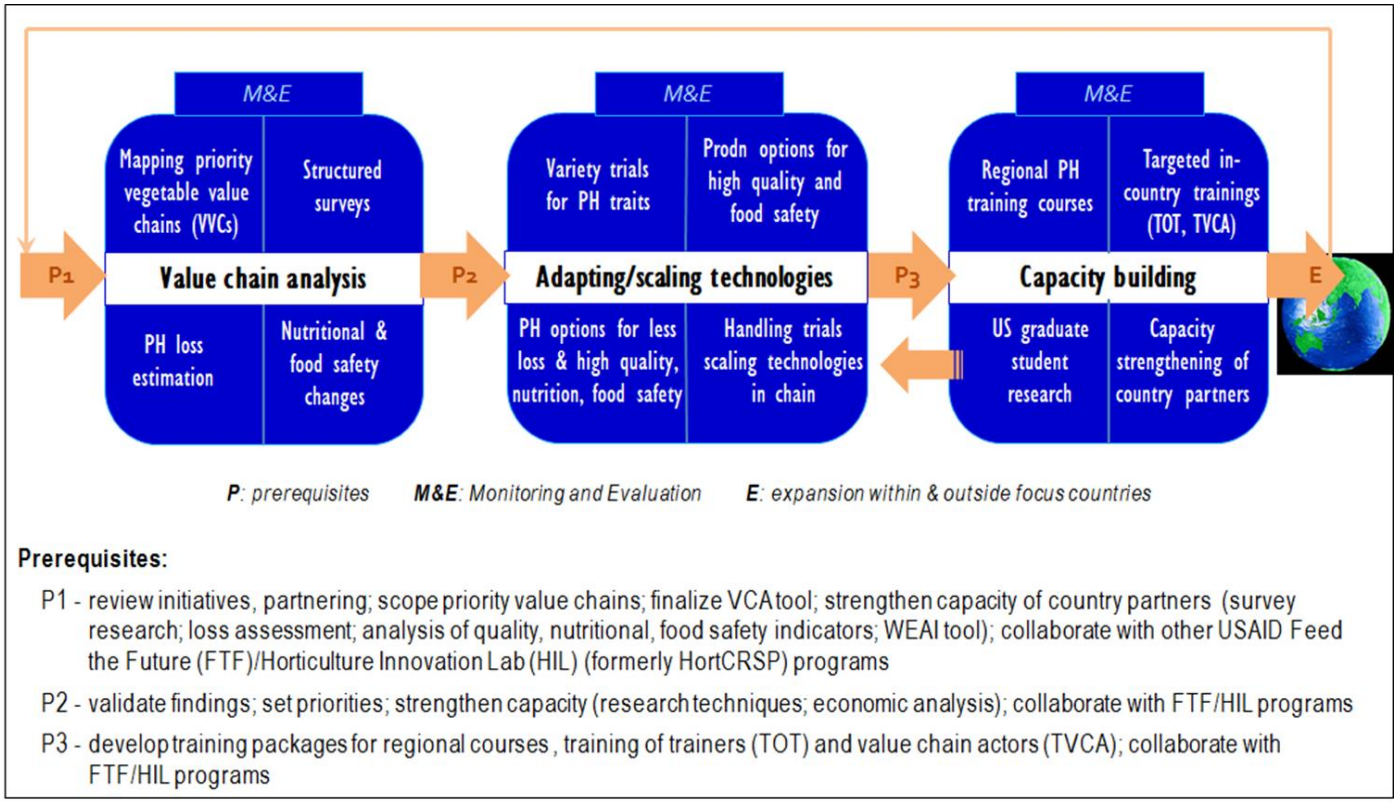
Extent of PH Loss along the chain (tomato)

3. Know the current PH practices

4. Test/ adopt new technologies/ practices

Based on the value chain analysis develop an project implementation approach

- World Vegetable Center approach



- And don't forget project evaluation: what worked and what did not?

Postharvest Loss Calculation

1. Farmer harvested 100 kg of tomato (H = 100 kg)
2. 1 kg had insect damage (can not be sold) (L1 = 1 kg)
3. 2 Kg was used for home consumption (C = 2 kg)
4. Total that reached market was 94 kg (L2 = ? kg)
5. 1 kg produce had some damage (bruises and pressure damage) but still could be sold at reduced price (L3 = 1 kg)
6. Price of good tomato (P1 = 50 Baht/ kg)
7. Price of quality damaged tomato (P2 = 20 Baht/ Kg)
8. What is the total monetary value of postharvest loss ???

Formula:

Post harvest weight loss = (P1 * L2)	= 150 Baht
Postharvest quality loss = (L3) (P1 – P2)	= 30 Baht
Total postharvest loss	= 180 Baht

- Video 3

- https://www.youtube.com/watch?v=kotp43vuy94

Take Away of this Session

Source: The Rockefeller Foundation

1. Up to 50% loss of horticultural crops in developing countries.

2. 90% percent of loss/wastage from within the VC.

3. Directly impacts poor producers: lower income, reduced food availability, increased price, and decreased nutritional content.

4. PH interventions (technology / practices can help reduce PH loss)

5. VC approach to PH loss is an effective but need to follow basic steps to plan, implement and evaluate the projects.

Enjoy IVTC Module 2, Register, Keep in touch with IVTC and fellow participants