Poultry India - 8th Knowledge Day
25th November 2014
Hyderabad

NOVUS®
SOLUTIONS SERVICE SUSTAINABILITY™

Future Trends of Food Production

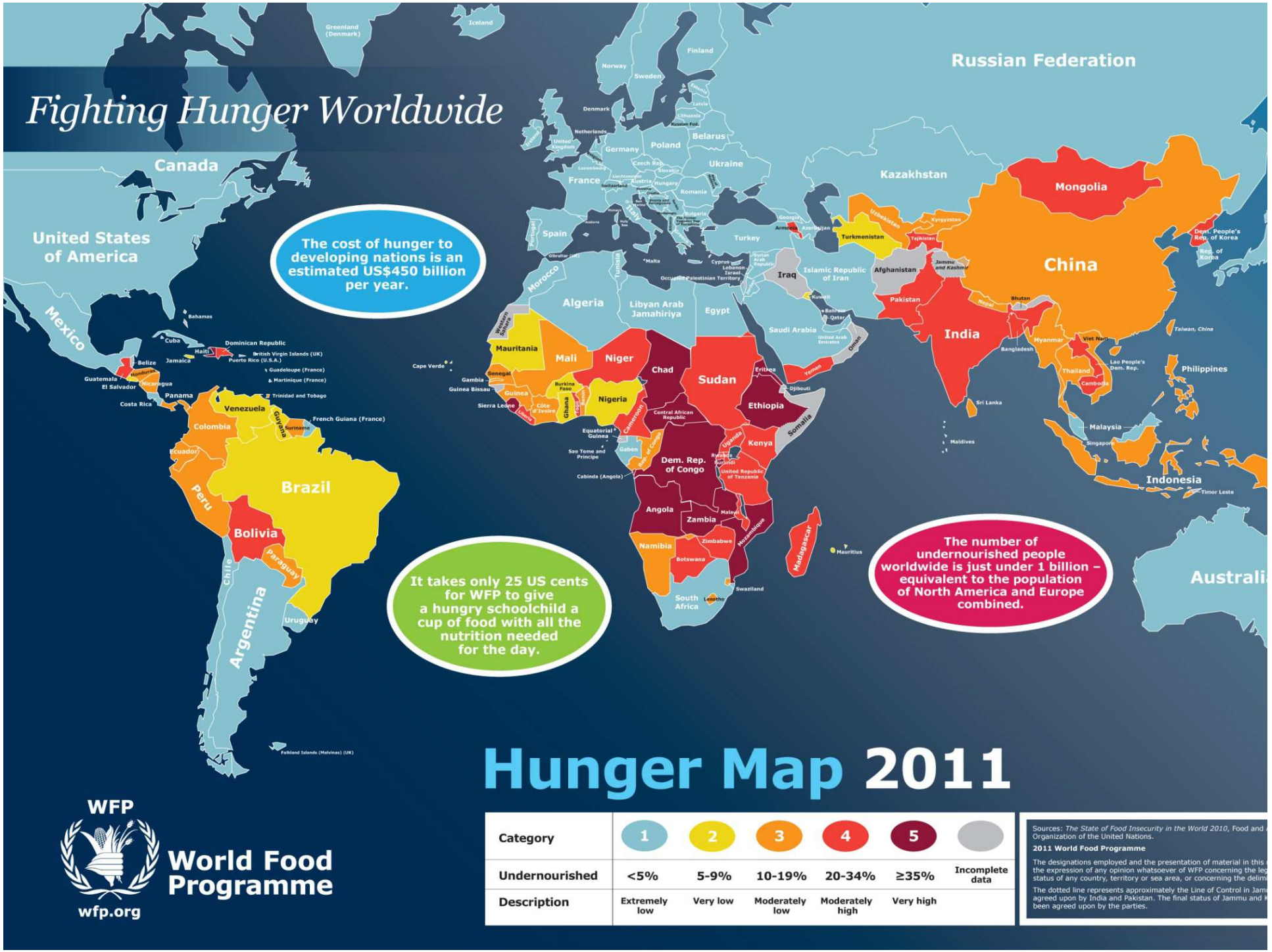
Stuart Court.
Manager, Technical Services
Asia Pacific
Novus International

SOLUTIONS SERVICE SUSTAINABILITY™

Factors &
Global Megatrends

Limited Resources=
Greater Need for Technology

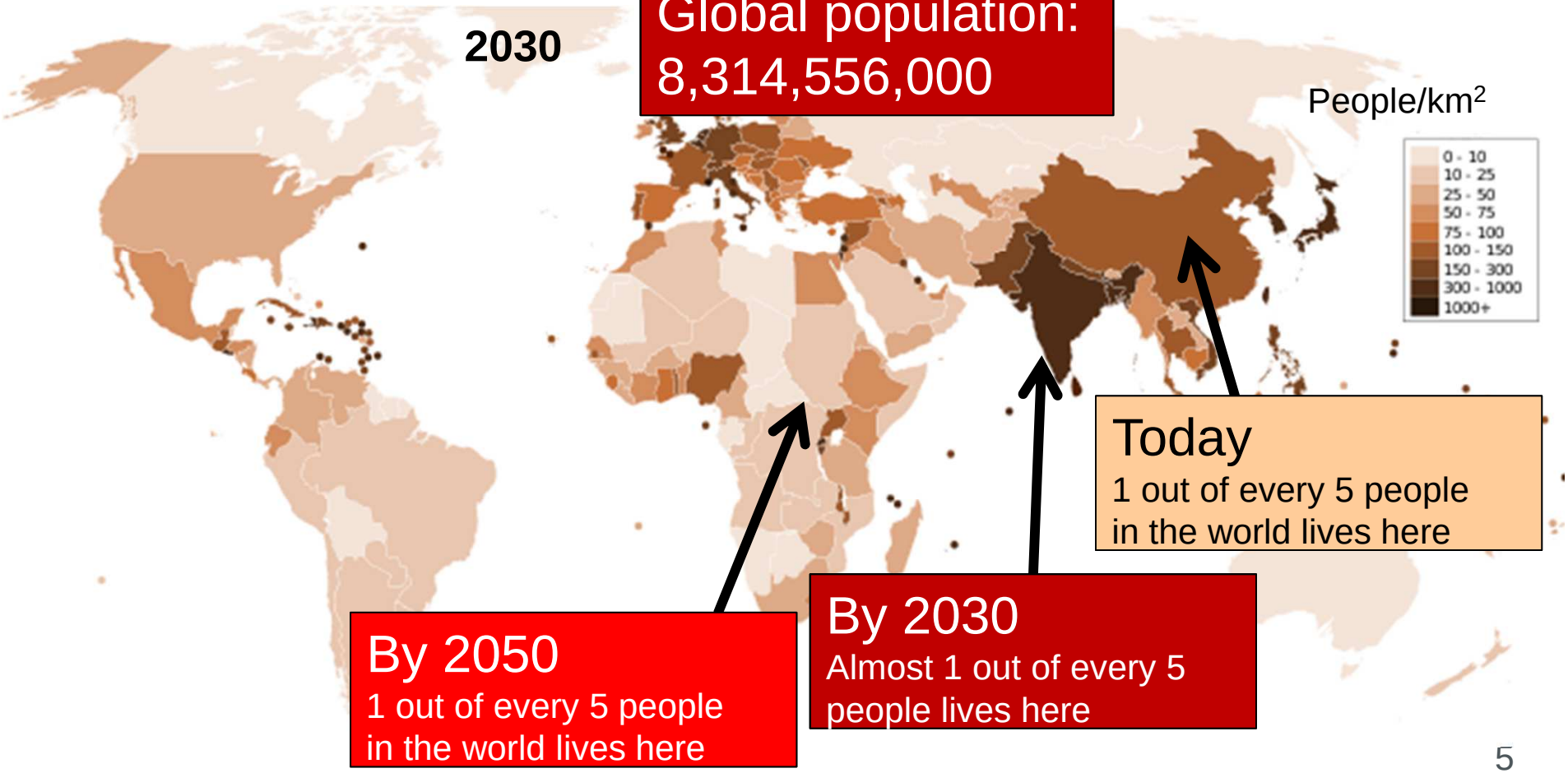
The U.N. projects world population will reach 9+ billion by 2050 and has called for a 100 percent increase in world food production. According to the U.N., this doubled food requirement must come from virtually the same land area as today.


Fighting Hunger Worldwide
The cost of hunger to developing nations is an estimated US$450 billion per year.
It takes only 25 US cents for WFP to give a hungry schoolchild a cup of food with all the nutrition needed for the day.
The number of undernourished people worldwide is just under 1 billion – equivalent to the population of North America and Europe combined.
Hunger Map 2011
WFP
World Food Programme
wfp.org
Category
1
2
3
4
5
Undernourished
<5%
5-9%
10-19%
20-34%
≥35%
Incomplete data
Description
Extremely low
Very low
Moderately low
Moderately high
Very high
Sources: The State of Food Insecurity in the World 2010, Food and Organization of the United Nations.
2011 World Food Programme
The designations employed and the presentation of material in this the expression of any opinion whatsoever of WFP concerning the leg status of any country, territory or sea area, or concerning the delim
The dotted line represents approximately the Line of Control in Jam agreed upon by India and Pakistan. The final status of Jammu and K been agreed upon by the parties.

People and distribution density trends…

Global population:
~7,131,293,056

Global population:
8,314,556,000



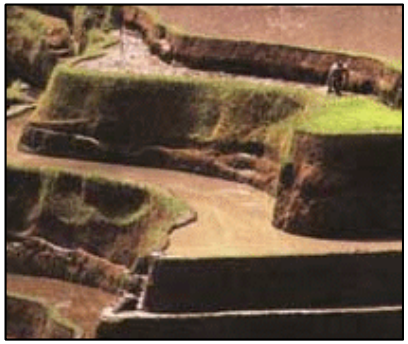
Source: US Census

Arable land available…

Global land area = ~13B hectares

Arable land peaked in the early 1990's and has been flat at around 1.4B hectares.

Current arable + permanent crop land = 1.54B hectares.



Today, arable + PC land per person = 0.20 hectares

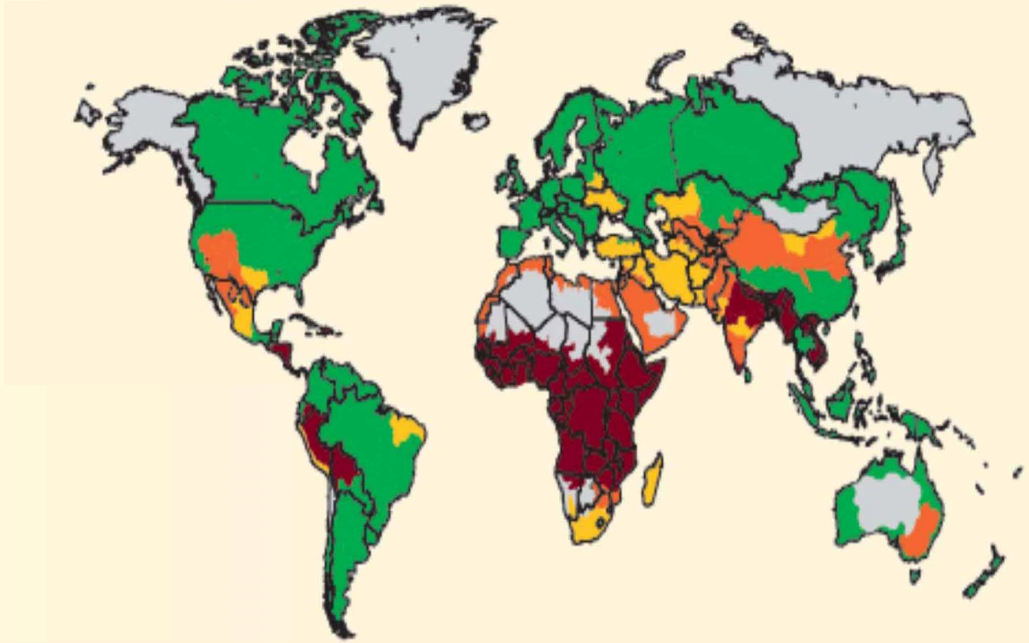
By 2050, this will decrease to 0.17 acres (22% less)

An area the size of the playing surface of a cricket field will have to support primary food production for 6 people.

Data Source: FAOSTAT

Water is a Scarce Resource

Increasing Water Scarcity



- Little or no water scarcity
- Approaching physical water scarcity
- Physical water scarcity
- Economic water scarcity
- Not estimated

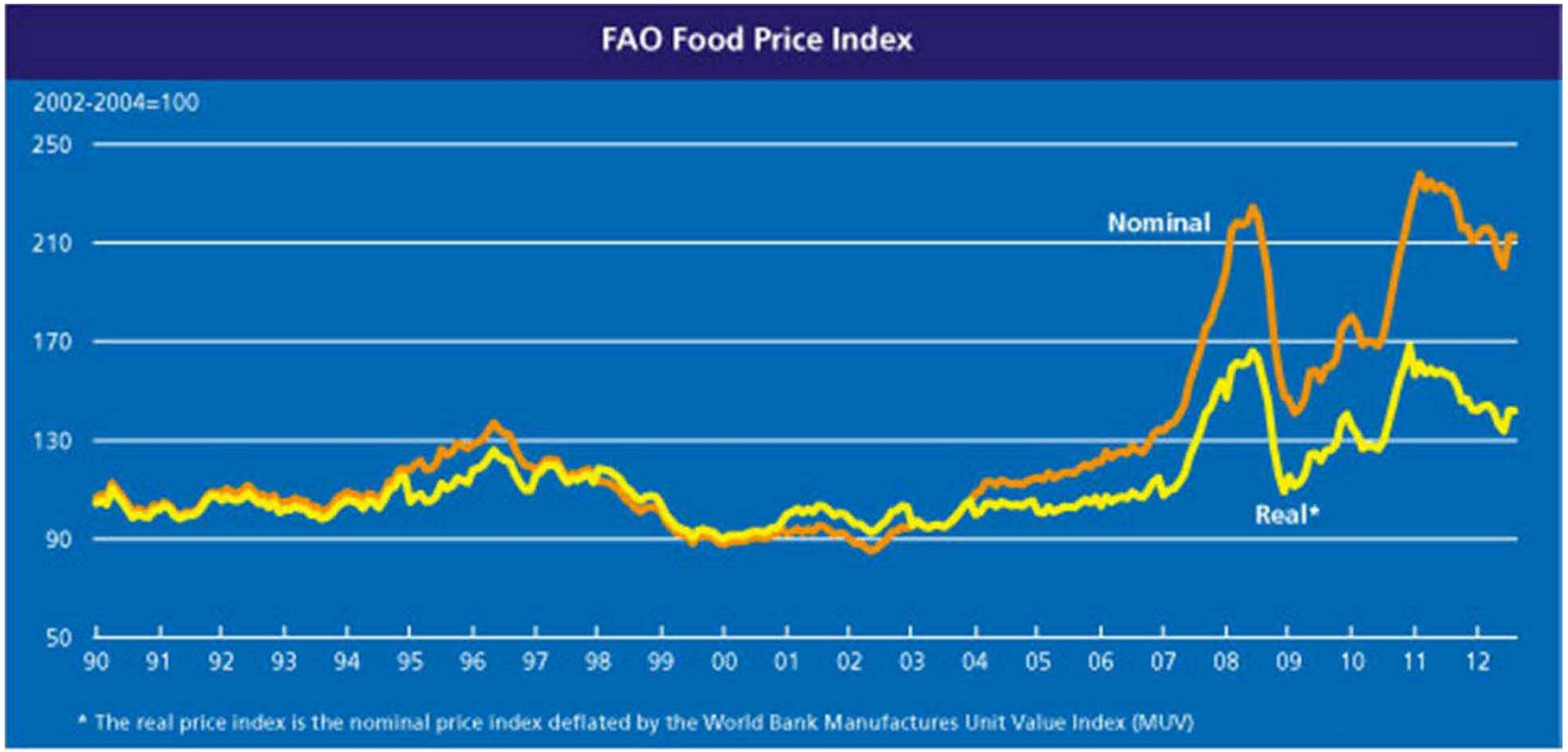
- Approximately 550bn cubic meters of water is wasted globally through the production of food that never reaches consumers due to waste
- The demand for water in food production could reach 10–13 trillion cubic meters by 2050
- This is 2.5 to 3.5 times greater than the total human use of fresh water today

Source: Based on Comprehensive Assessment of Water Management in Agriculture 2007.

Increased Wealth = Increased Demand

- **Middle class will triple to 1.2 billion by 2030 (World Bank)**
  - + 800 million over 2010
  - China will have the world's largest middle class
  - Africa's middle class also growing (WSJ Oct 12, 2011)

A New Era for Food Prices



Source: FAO, September 6, 2012

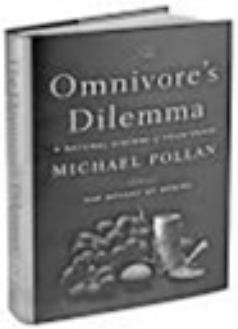
Global Megatrends:

Urbanisation | New Considerations for Agriculture

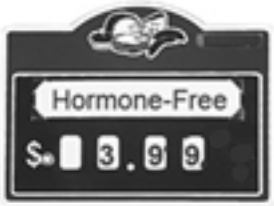
- By 2025, 70% of Global Population will Live in Urban Areas
- Evolving Supply Chain Requirements
- Diminishing Workforce in Agriculture Area
- Addressing Food Deserts
  - Access to Fresh, Wholesome Foods
- Access & Education About Health & Nutrition
  - India Now #1 Diabetic Population in the World!
- Backyard/Hobby Farming Growing Trend
- As Economies Mature and Urbanise, Consumers Awareness and Preferences Evolve

Our Reputation and Freedom to Operate are Being Challenged

High-Profile, Well-Constructed Mainstream Messaging…



Combined with Confusing Choices for Consumers…



Opens the Door to Targeted Regulatory Challenges…

Freedom of Choice

Choices being made in the developed world are limiting the choices available for the developing nations.

How will protein production evolve?

Reputation | Freedom to Operate | Talent | Innovation

Is taking the animals out of the food chain the answer??

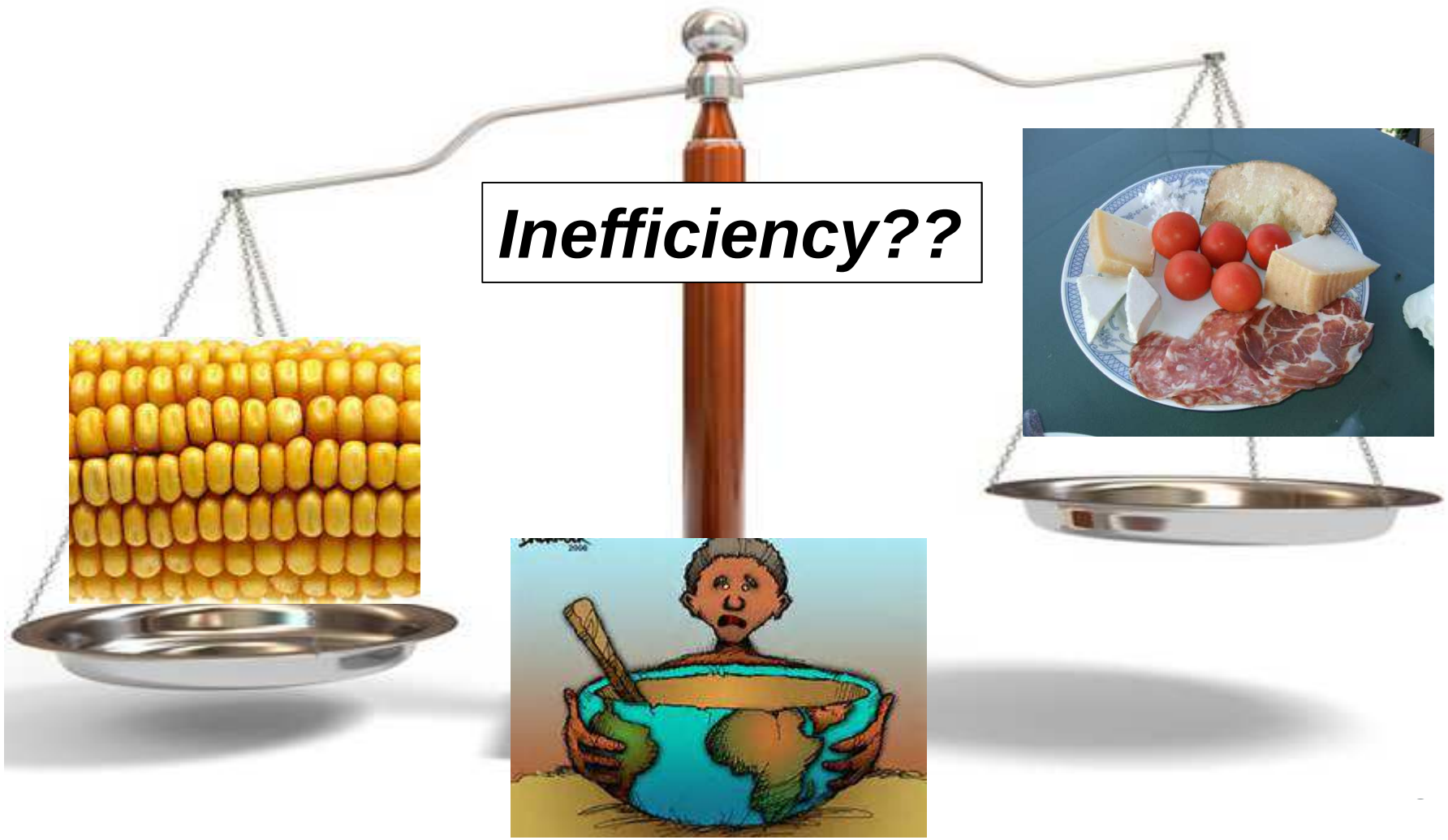
Tiny Farms (insects)

Lab-Grown Beef

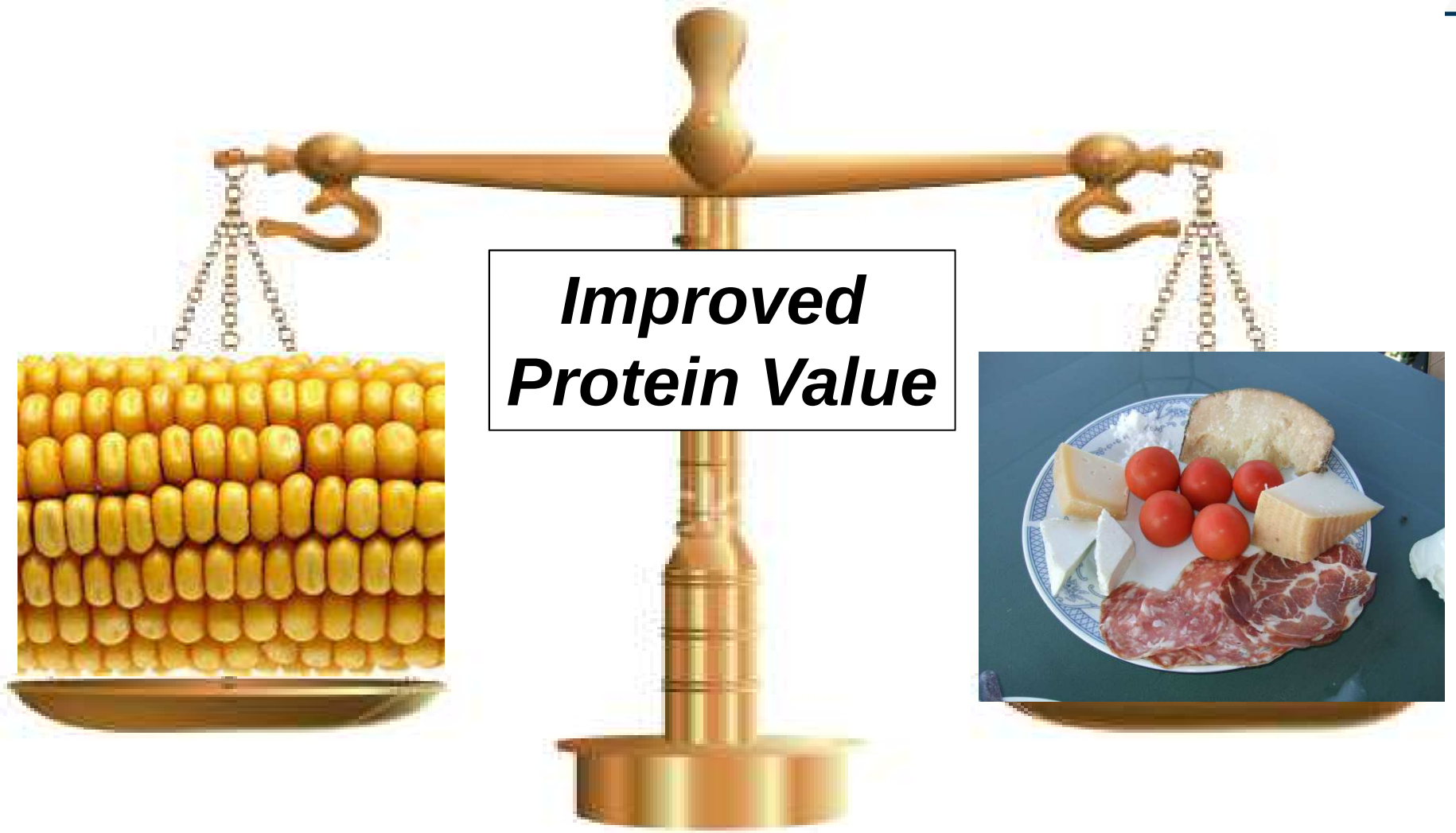
Hampton Creek Foods

Vegetable Eggs

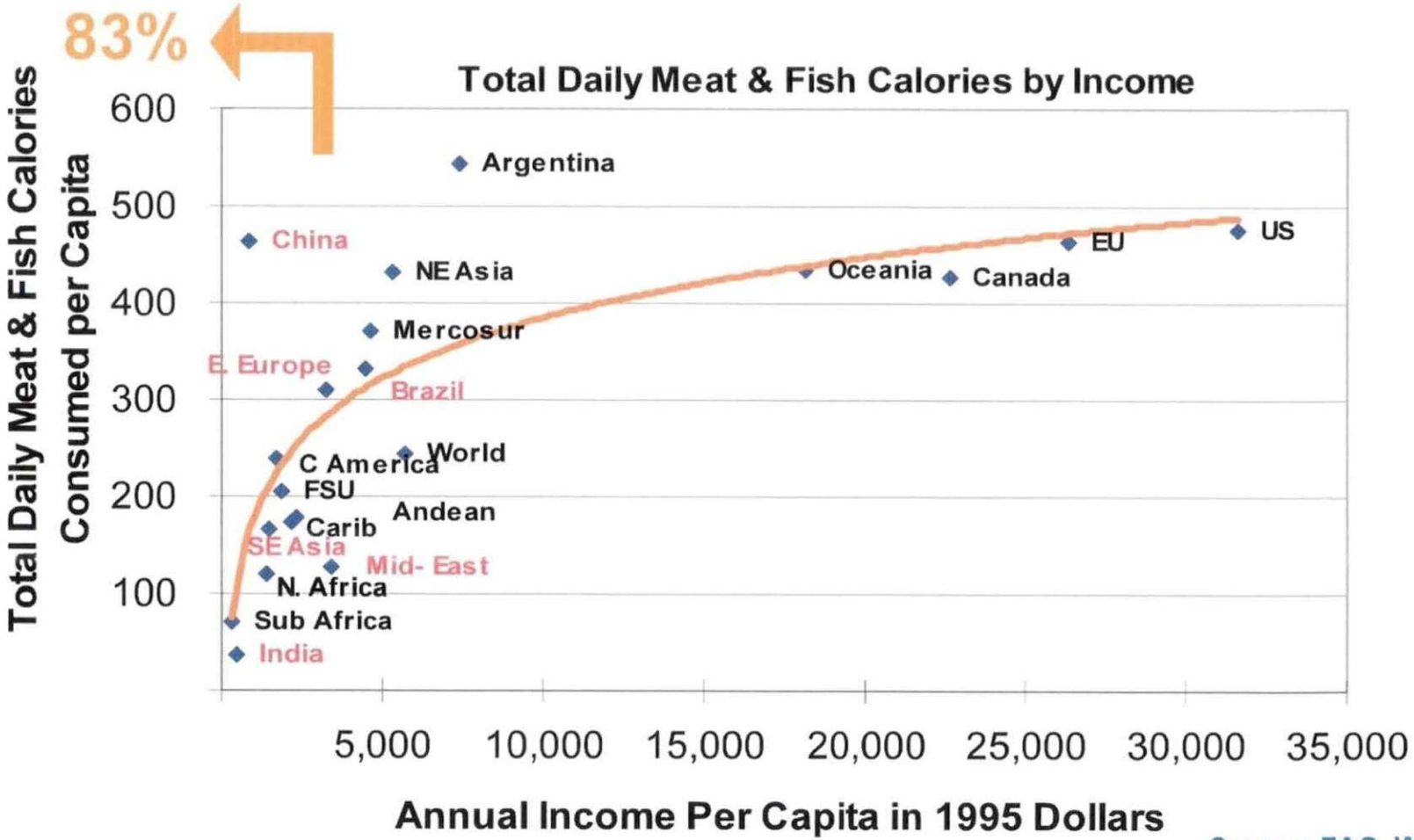
Feed Grains for animals vs. Food Grains for humans



Human Edible Food Inputs
Human Edible Food Outputs



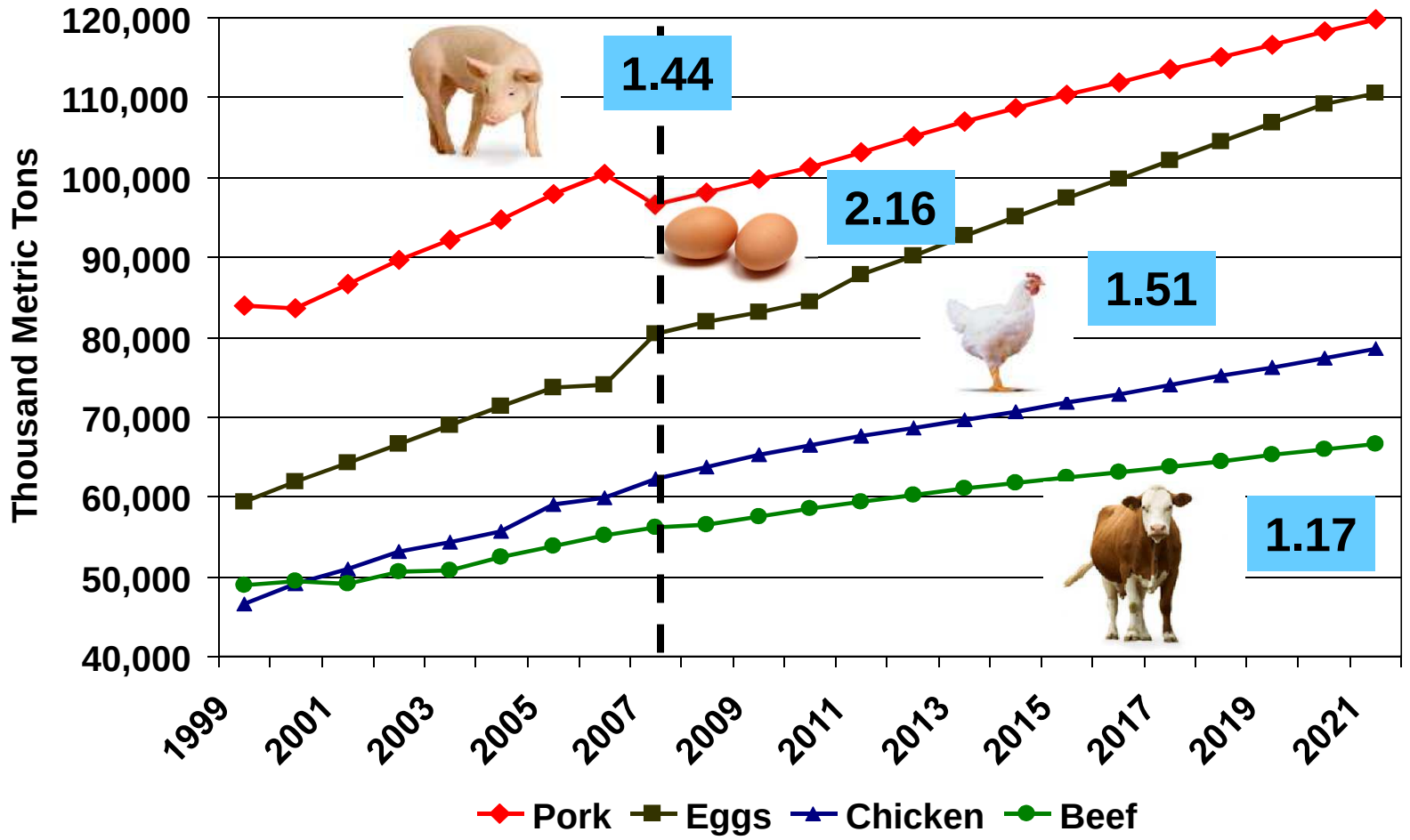
Protein Consumption Increases with Income especially at the low end.



Source: FAO, World Bank

Protein Production Outlook

Developing Economies are Driver



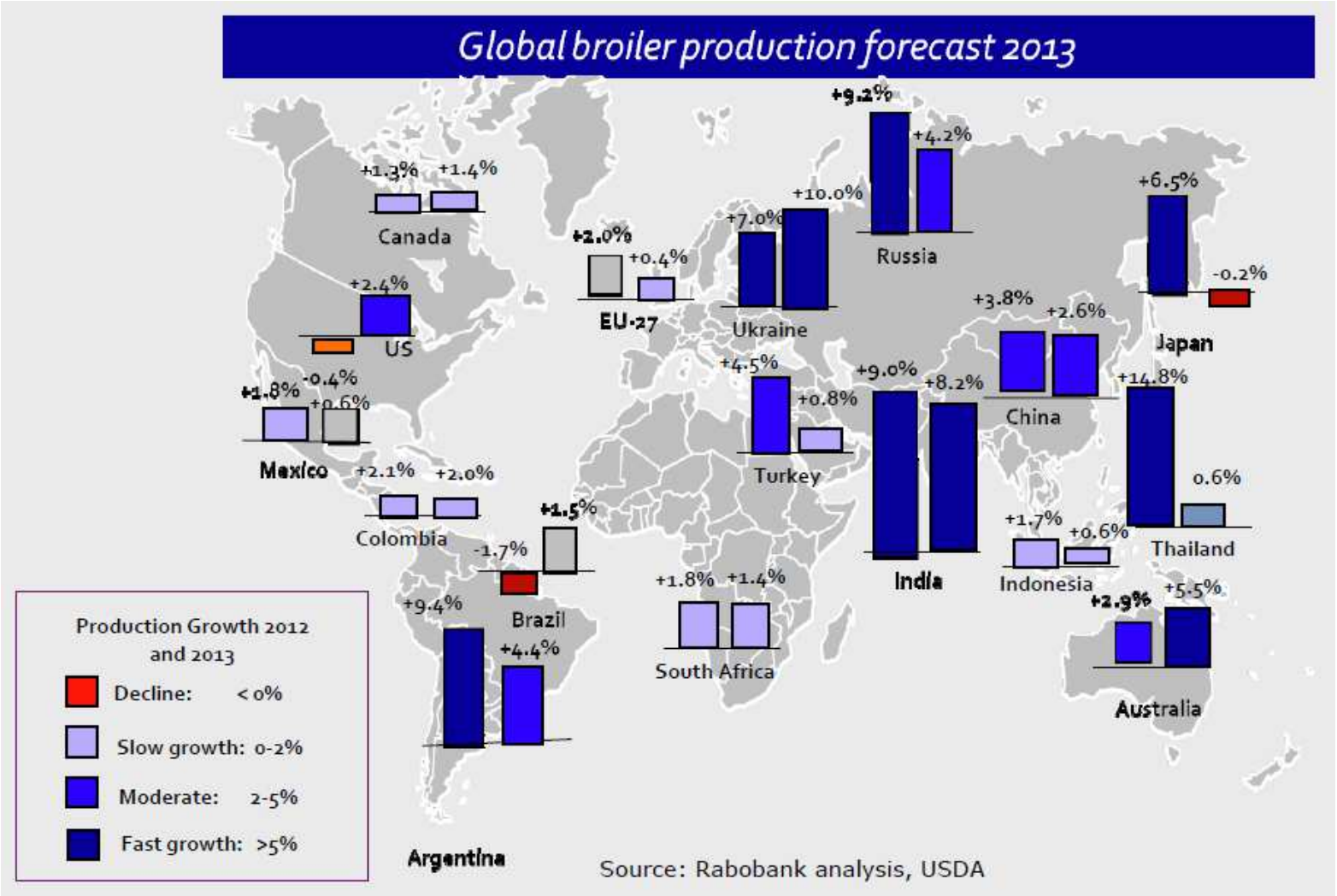
Source:2007 FAPRI. Based on global growth.

Poultry production leaders

TABLE 1: BROILER MEAT PRODUCTION IN SELECTED COUNTRIES						
	Production (x 1,000 metric tons, rtc)					
Country	2009	2010	2011	2012	2013 October	2013 April
United States	15,935	16,563	16,694	16,621	16,341	17,012
China	12,100	12,550	13,200	13,700	14,100	14,050
Brazil	11,023	12,312	12,863	12,645	13,005	12,835
EU-27	8,756	9,202	9,320	9,510	9,580	9,550
India	2,550	2,650	2,900	3,160	3,420	3,420
Mexico	2,781	2,822	2,906	2,958	2,950	2,975
Russia	2,060	2,310	2,575	2,830	2,850	2,950
Argentina	1,500	1,680	1,770	1,936	2,022	2,022
Turkey	1,250	1,430	1,614	1,687	1,700	1,700
Thailand	1,200	1,280	1,350	1,550	1,450	1,560
Indonesia	1,409	1,465	1,515	1,540	1,550	1,550
Others	13,048	13,629	14,104	14,637	14,575	14,986
Total	73,612	77,893	80,811	82,774	83,543	84,610

Source: USDA/FAS Livestock and Poultry: World Markets and Trade April 2013

Slowdown in poultry expansion in 2013, emerging markets keep lead



Growth in animal feed projected at 2.6% CAGR

NOVUS
SOLUTIONS SERVICE SUSTAINABILITY™

Global Animal Feed Production & Forecast 2011-2018 (Million Tons)

Region	2011	2012	2013	2014	2015	2016	2017	2018	CAGR% 2013 - 2018
North America	165.5	167.8	170.2	172.5	175.1	177.8	180.4	183.1	1.5
Europe	210.0	213.2	216.3	220.0	223.8	227.6	231.4	235.4	1.6
Asia	241.0	250.6	260.7	271.1	282.5	294.3	306.7	319.6	4.1
Row	132.5	135.8	139.2	142.7	146.5	150.8	155.2	159.7	2.7
Total	749.0	767.4	786.4	806.4	827.9	850.5	873.7	897.8	2.6

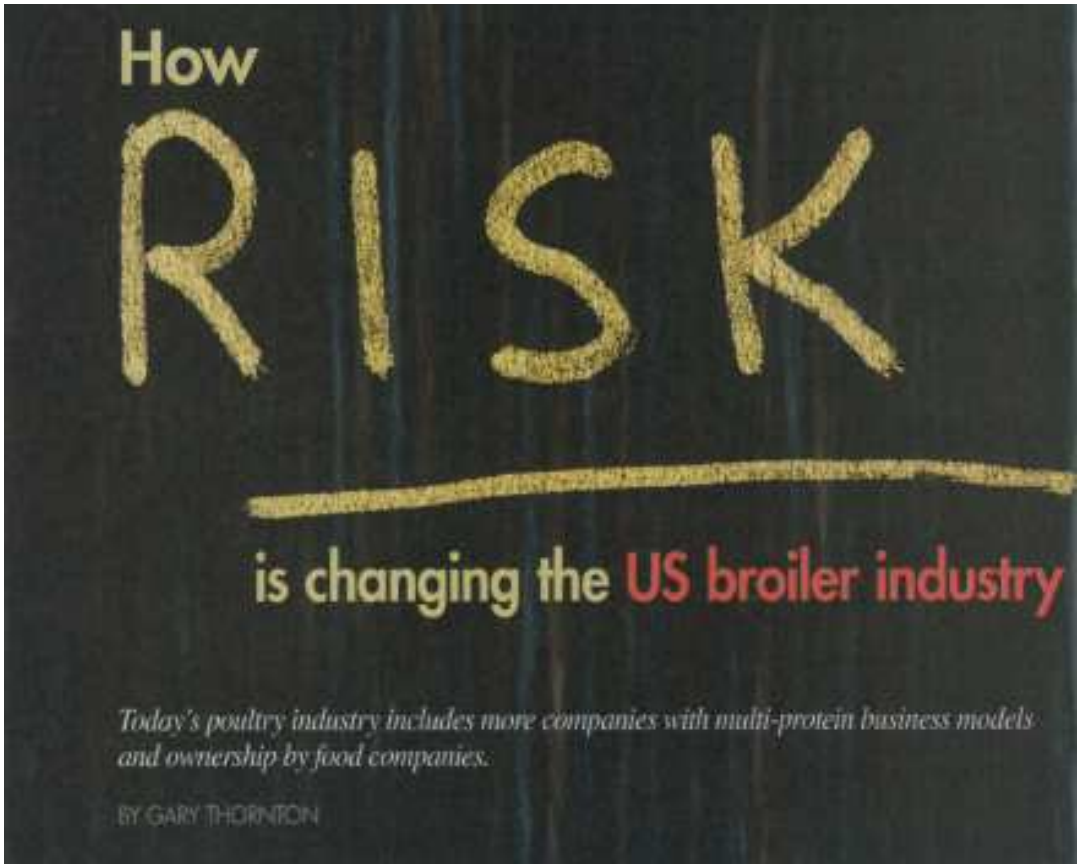
Source: Transparence Market Research International Feed, WattAgNet, ICIS, FAOSTAT

** Figures may not add up due to rounding off*

Efficiency, Efficiency, Efficiency . . . .

Proper conventional farming makes nutrition possible around the world.

Efficiency + Risk Resilience



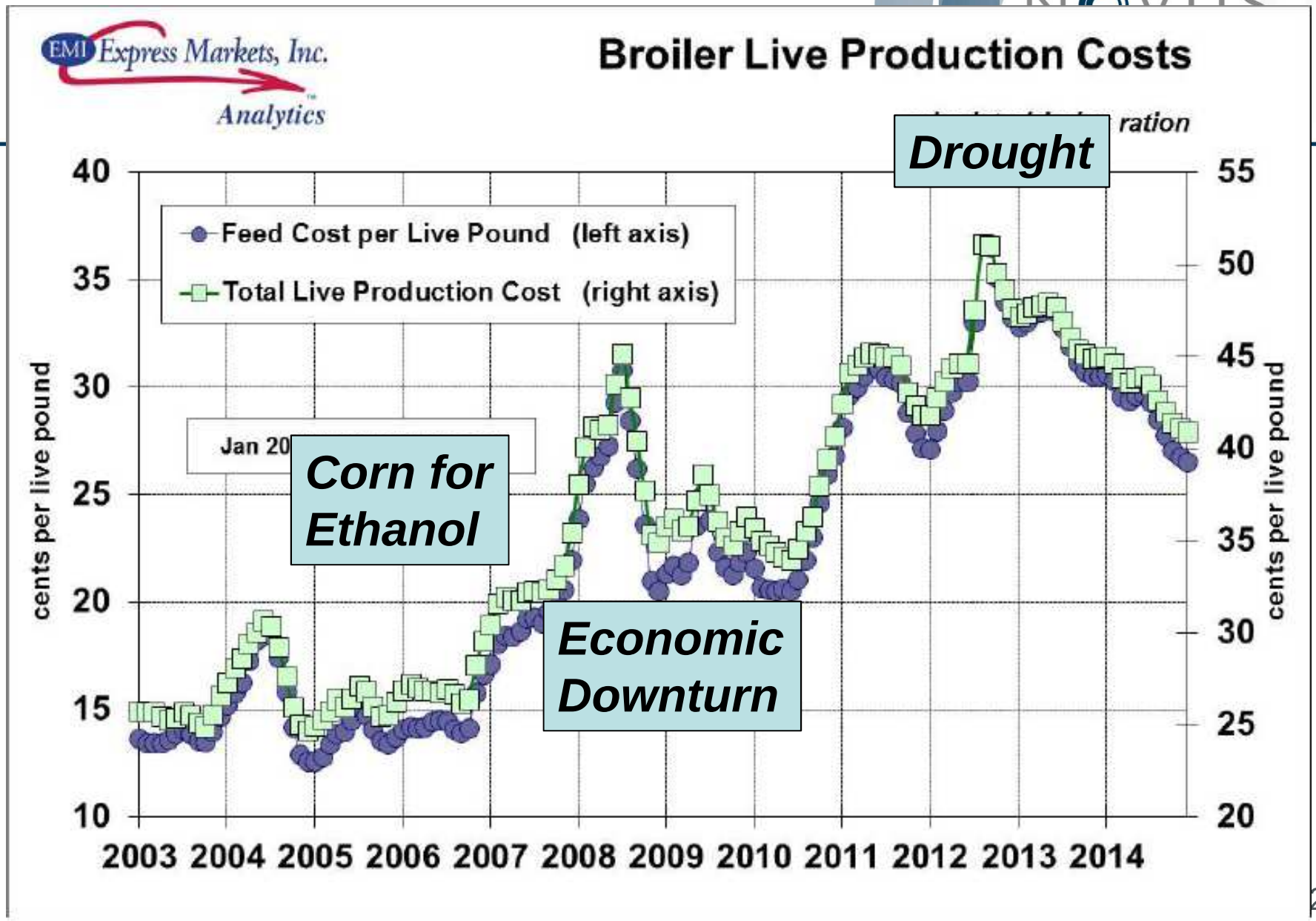
'Focusing on efficiency and competitiveness is important but if a company can't survive a risk event, competitiveness doesn't matter'

Risk's ability to degrade revenues and/or net worth

1. **Grain/Commodity Prices**
2. Trade interruptions/market access
3. Food Safety
4. Poultry Disease/Biosecurity/Welfare
5. Environmental regulations/liability
6. Supply Chain Vulnerability

Watt Poultry USA, NOV 2013

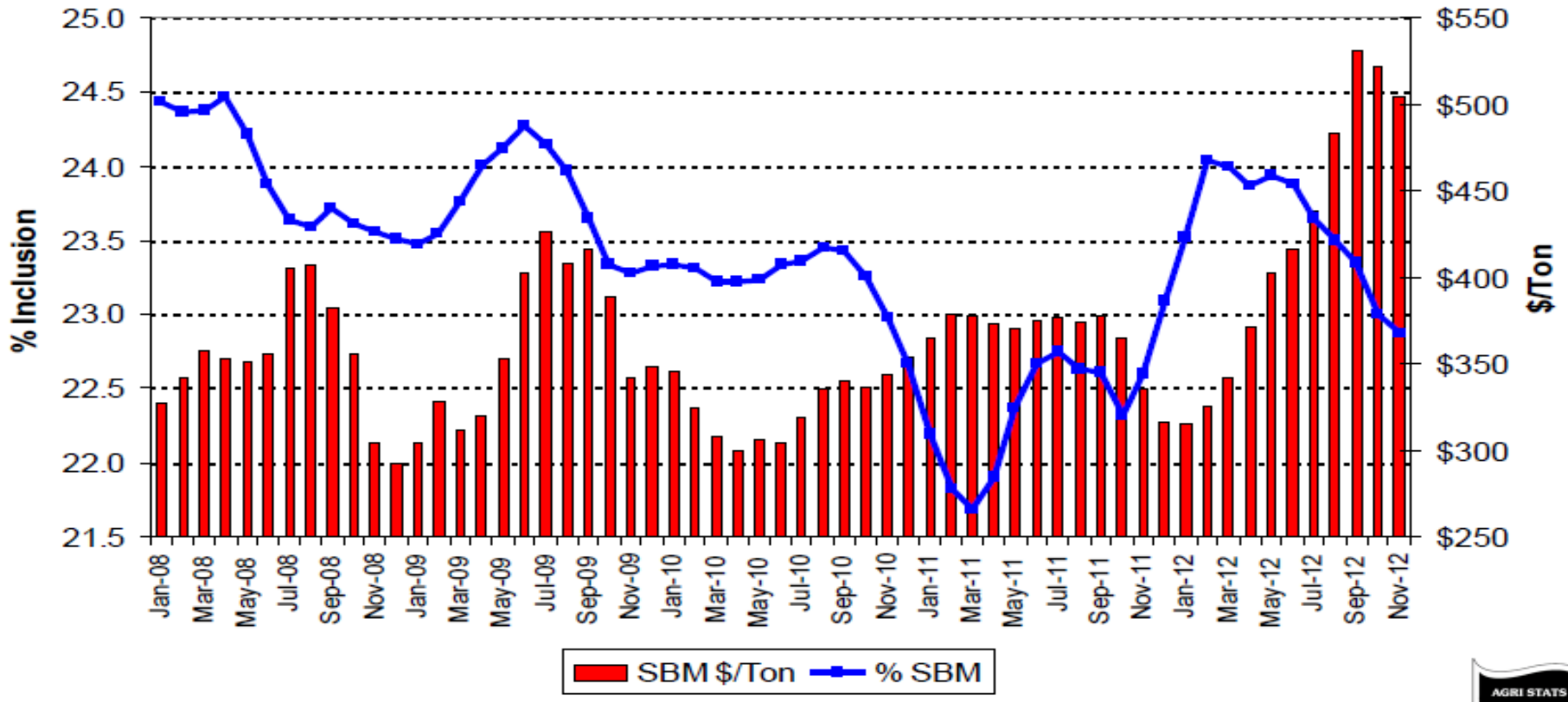
Degree of Control


EMI Express Markets, Inc.
Analytics
Broiler Live Production Costs
Drought
Feed Cost per Live Pound (left axis)
Total Live Production Cost (right axis)
Jan 20
Corn for Ethanol
Economic Downturn
cents per live pound
cents per live pound
40
35
30
25
20
15
10
55
50
45
40
35
30
25
20
2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014

High soybean meal prices have forced Nutritionists to consider alternatives

NOVUS
SOLUTIONS SERVICE SUSTAINABILITY™

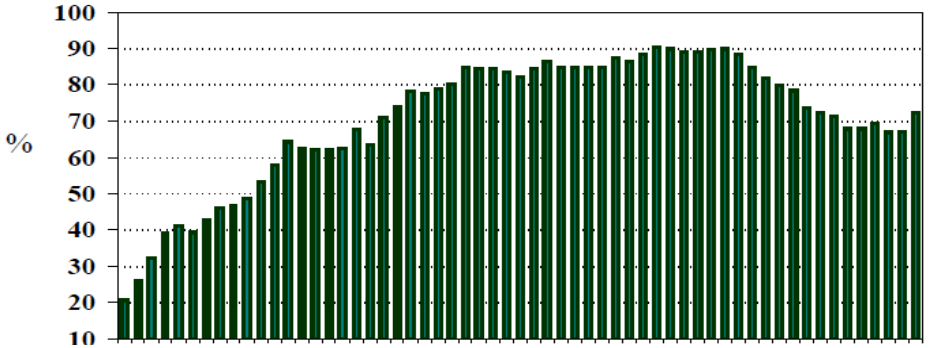
Broiler % SBM Inclusion vs. Price



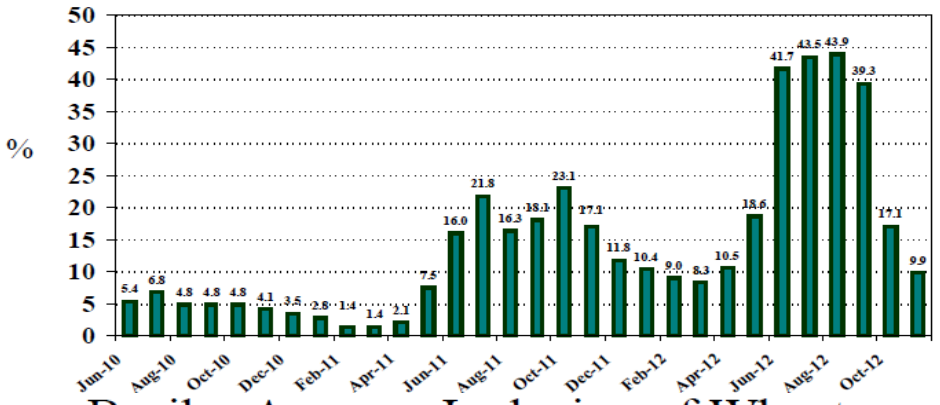
AGRI STATS

Use of DDGS

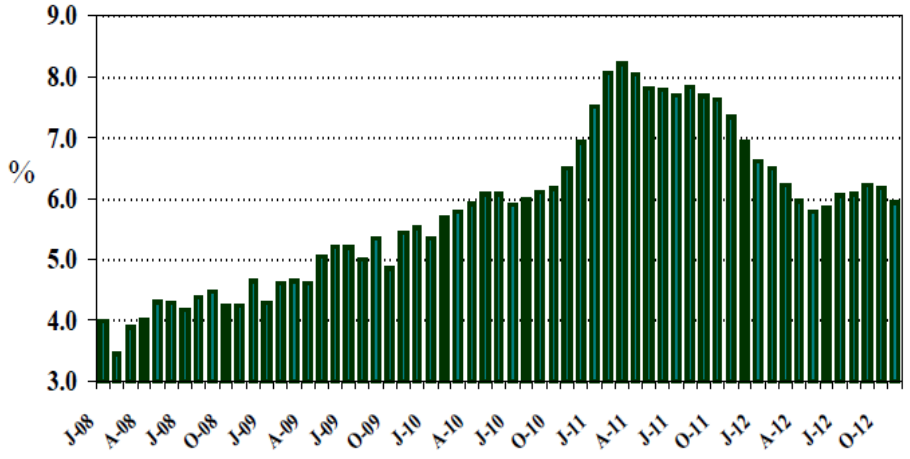
% Broiler Complexes Using DDGS



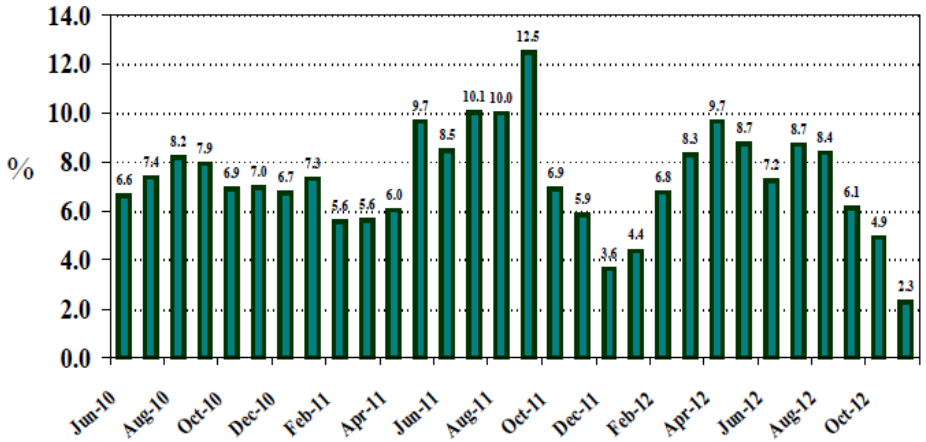
% Broiler Complexes Using Wheat



Broiler Average Inclusion of DDGS



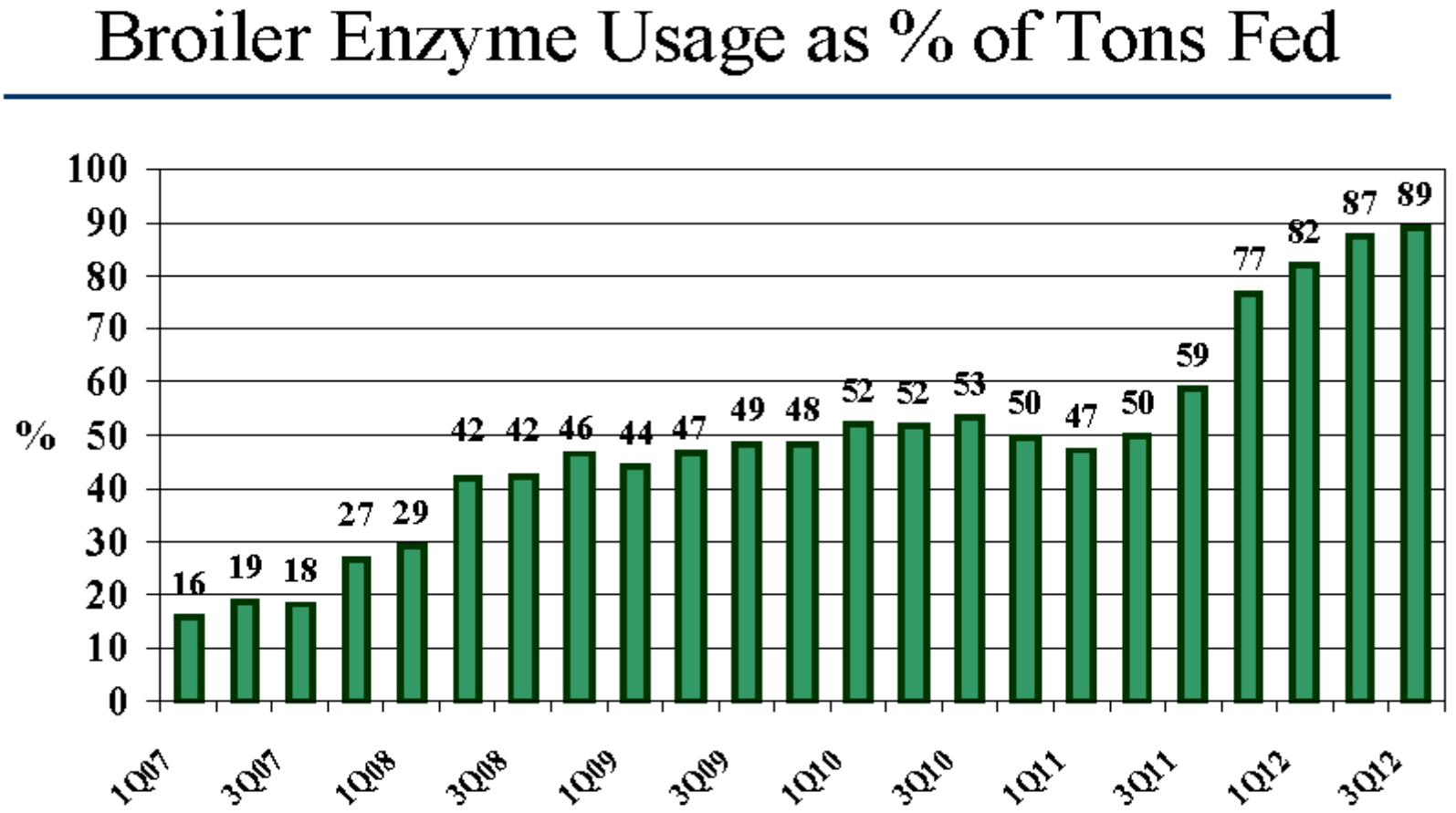
Broiler Average Inclusion of Wheat



Agility in ingredient valuation, procurement and formulation reduces risk . . . . .

- ***Feed Milling***
  - Purchasing knowledge
  - Storage capacity at feed mill
  - Feed milling capacity
  - Knowledgeable operators
- ***Nutritionist***
  - Knowledge of nutrient content and availability
  - Formulation on available nutrient basis
  - Ingredient variability
  - Enzymes to maximise value

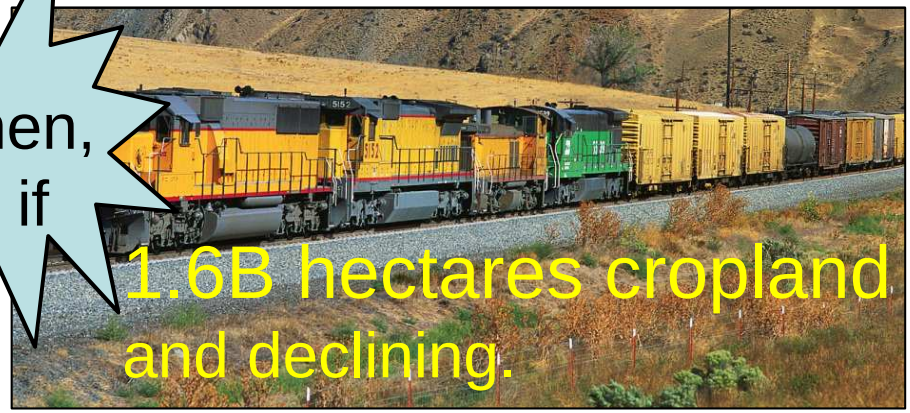
Enzyme use is standard: Ingredient flexibility & cost containment



In Dec '12 report only 16 complexes not using an NSP enzyme

Looking ahead….

When, not if



How many to come?
(9B quoted, but why would it stop)

Urbanisation
(city populations need more food, delivered)

Food consumption
(likely more meat)

How much land?
(will people starve to save a rainforest)

Other resources
(water, nutrients, capital)

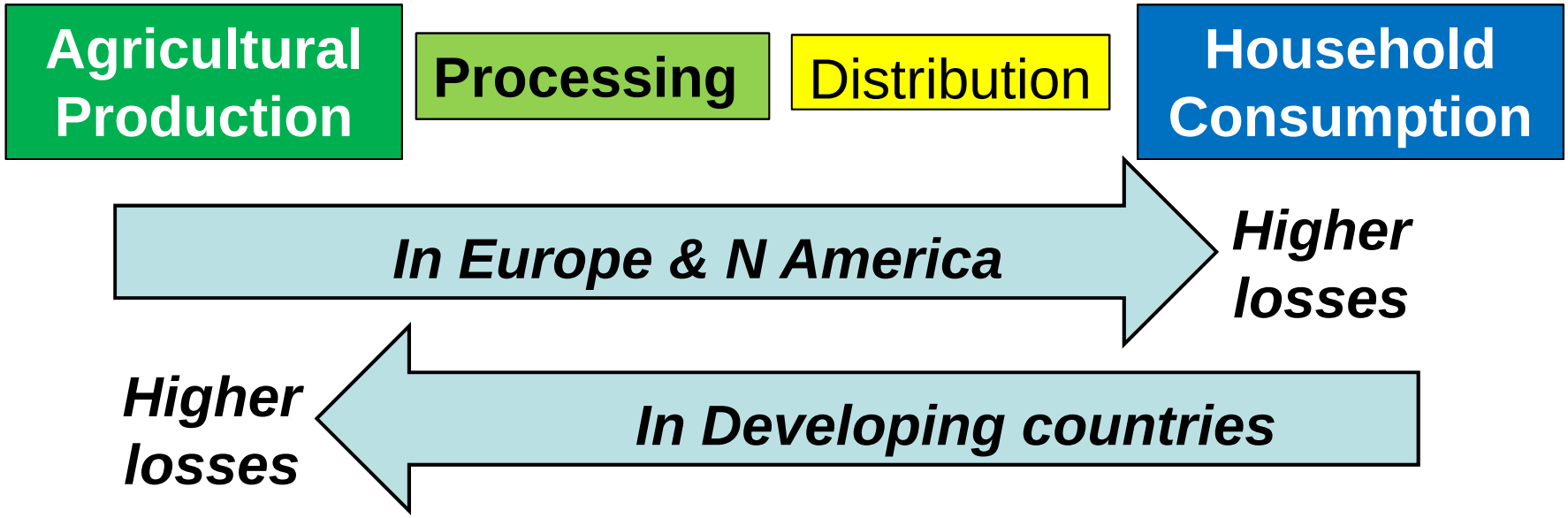
Farm Risk
(physical, financial, political)

Technology
(does it save or just allow more people)

Can provide more from the same land…

Studies have estimated that 33% of edible food produced is lost or wasted: equivalent to 1.3 B tons/year.
Enough to solve the food problems of the growing population for 50 years.

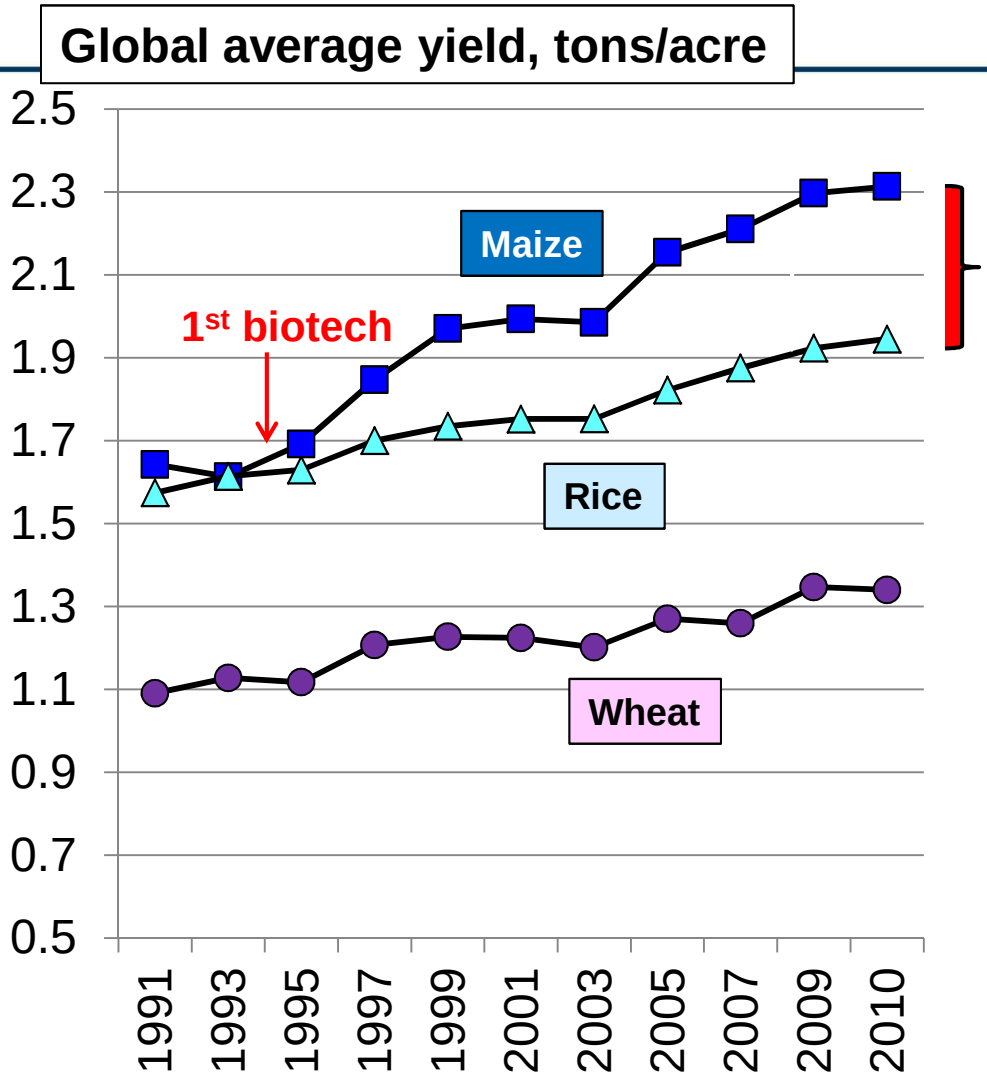
Loss and waste occurs along the chain



Addressing production and some processing could impact 60% of the loss

Data source: FAO; USDA;

Biotech has been demonstrated to prevent loss due to pests…



Indicator of the impact due to biotech on a world scale

The difference due to biotech corn alone is equivalent to the production on 30 M hectare/year

Much more can be achieved in agronomy, post-harvest, and even impacting processing.

Data Source: FAOSTAT

The demand for animal protein is increasing and we need to ensure maximum conversion…

- Feed quality has improved
- Conversion efficiency higher
  - Nutrient matching, additives, health….
- Further improvement by use of biotech
  - Enzymes (fermentation or plant derived)
  - Improved feed ingredients

Perhaps we have not done more due to social beliefs and regulatory limitations, and perhaps to a lack of understanding of the importance of the role of agriculture in feeding the future.

Take home messages for livestock production . . . .

- Single – Protein Models will evolve to Multi-Protein Models; Food Companies; Investment entities (P. Aho)
- Complexity of the business will increase requiring increased focus on areas for which you have the greatest control
- Risk Management will be a company-wide approach to effectively manage risks is a way that enables sustainable, long-term growth.

Evolving Consumer Perceptions and Demands: Controllable Risks

NOVUS SOLUTIONS SERVICE SUSTAINABILITY™

Addressing Complex Challenges and Issues

Food Quality

- Disease Prevention & Control
- Traceability

Animal Well-Being

- Optimized Health
- Efficiency to Production

Improvements in Information Technology

Production

- Organic/Natural/Conventional
- Waste Reduction
- Feed Costs

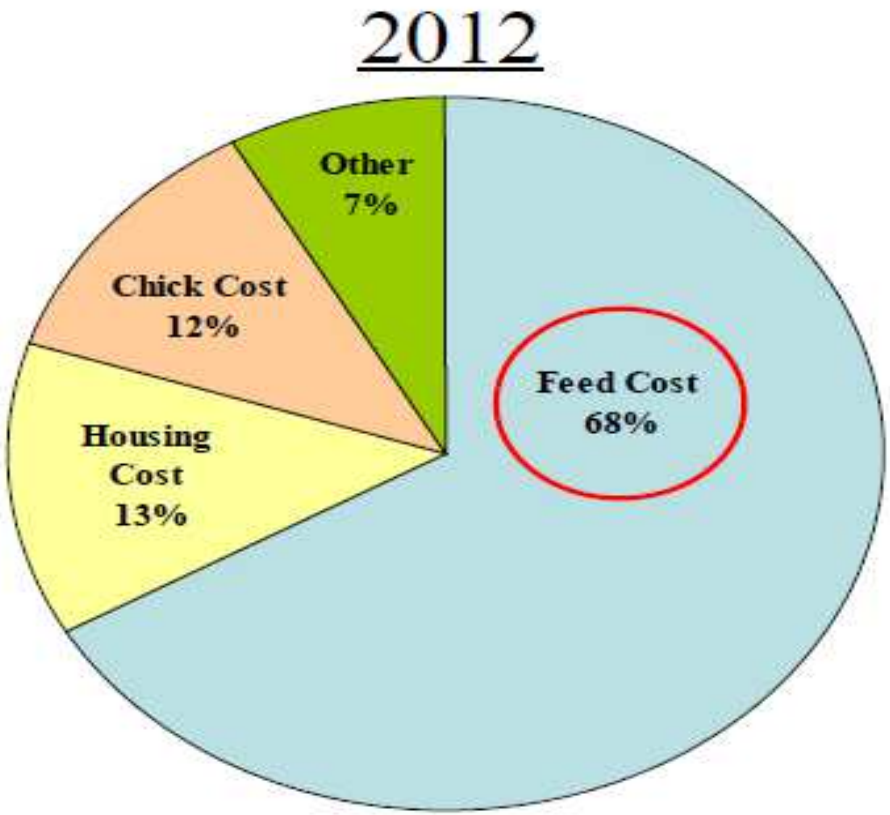
Environment

- Best Management Practices
- Land Availability/Urbanization
- Water

Controlling Feed Cost is King!!!

NOVUS
SOLUTIONS SERVICE SUSTAINABILITY™

Broiler Cost of Production



AGRI STATS

In the face of big challenges . . . . . .

‘. . survival of the fittest ***depends as much on cooperation*** as it does on a competition between self interests’ . . .

David Brooks, NY Times

. . .our success & survival will depend on how well we cooperate

Thank You!

ขอบคุณ

მადლობა

Obrigado

Merci

谢谢

धन्यवाद

mulţumesc

Благодаря ви

Gracias

有難う

Asante sana

cảm ơn lắm