The University of Nottingham
UNITED KINGDOM · CHINA · MALAYSIA

CROPS FOR THE FUTURE RESEARCH CENTRE

Session 4
Food Supply-Quality, Sustainability & Meeting the Demand
Chair: Mr Azizi Meor Ngah

GLOBAL FOOD SECURITY FORUM

'Meeting Nutritional Needs'

7 - 8 July, 2014

Putrajaya Marriott Hotel, Malaysia

CONTENTS

SUSTAINABLE RESOURCING
&
PRODUCTION CONSTRAINTS FROM INDUSTRIAL POINT OF VIEW

Mr. Charlie Tan Chai Lin

SOURCING FOR INGREDIENTS SUPPLIER

- LOCAL
- OVERSEA

SPECIFICATION OF INGREDIENT

- QUALITY
- QUANTITY / YEAR

PRELIMINARY INSPECTION

- Preliminary Inspection of Potential Suppliers
- Criteria of suppliers : factory to meet our food safety & Halal requirement

PRELIMINARY INSPECTION

- Local farm produce- that we could contract with local contractor or directly with farmers.

SHORTAGE OF GREEN INGREDIENT

Curry leaves

Lemon Grass

Galangal

Black pepper

SHORTAGE OF IMPORTED INGREDIENT

Soy

Corn

Wheat

Milk powder

CONSTRAIN

- Other constrain that manufacturing plant encounter from time to time :
- Energy / Electricity supply
- Water rationing
- Work / Labour force
- Weather

REGULATION

- Local government regulation

REGULATION

- GMO issue of imported ingredient.
- Halal certification.
- Pest infestation of incoming ingredient.

- Finished goods

  Import regulation of countries of oversea buyer

CONSTRAIN

- Minimum order & quantity.
- Short shelf life

RELIABILITY OF INGREDIENT

- Un reliability of some oversea ingredient supplier
- Unfavorable weather condition

Thank You

Transforming the Supply Chain – unlocking opportunities through the Last Mile Connection

Dr Yee Chow Boi
Mars Foods Malaysia Sdn Bhd, Malaysia

Global Food Security Forum 2014
Putrajaya, Malaysia July 7-8 2014

- Cocoa update
- Supply & demand – Giant on a pinhead
- Transfer of technology and learnings
- Effective adoption - the Last Mile Connection
- Sustainable Cocoa: Farmers First

Cocoa Flow - from Farm to Products

Cocoa tree

Fresh cocoa beans

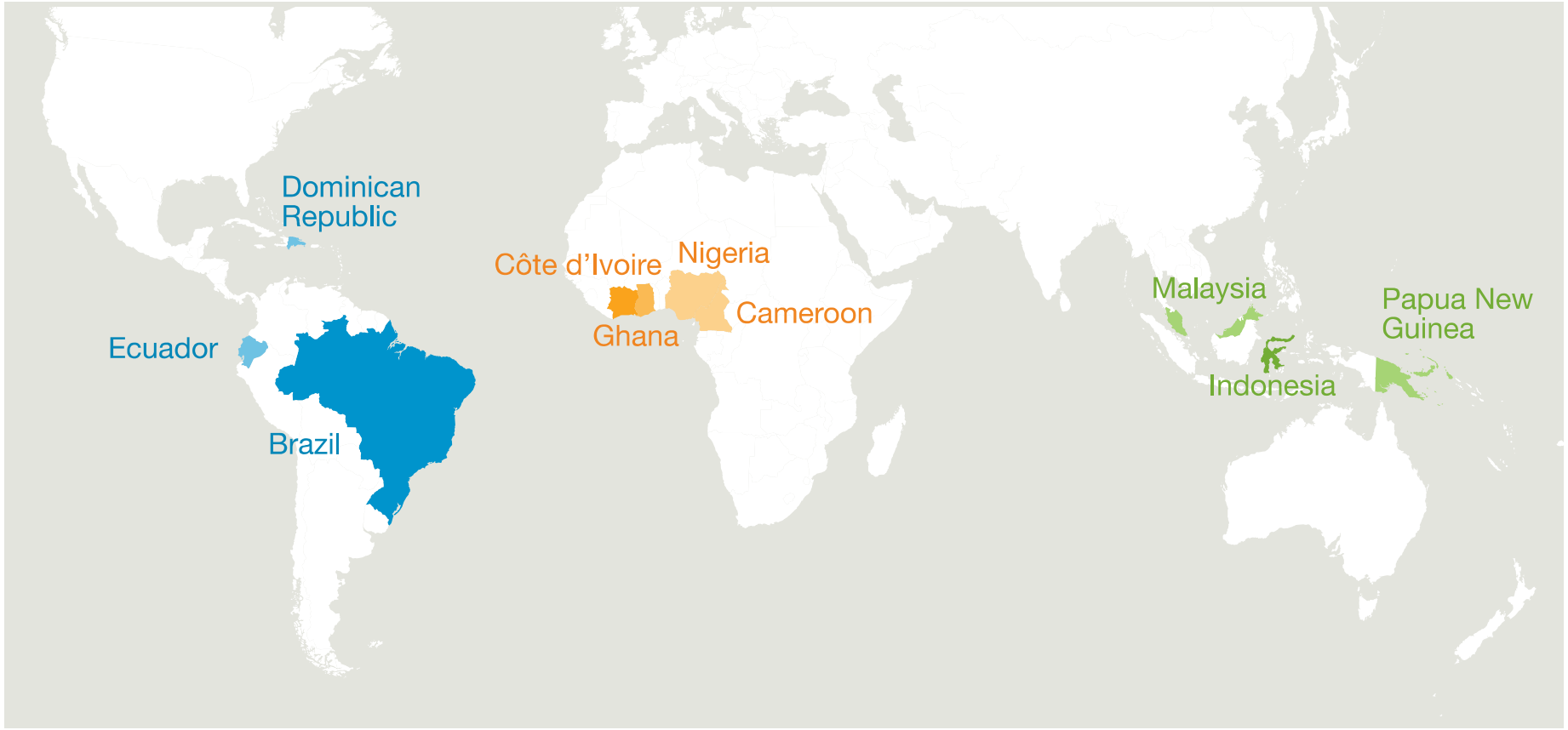
Box fermentation

Chocolates

Quality Beans

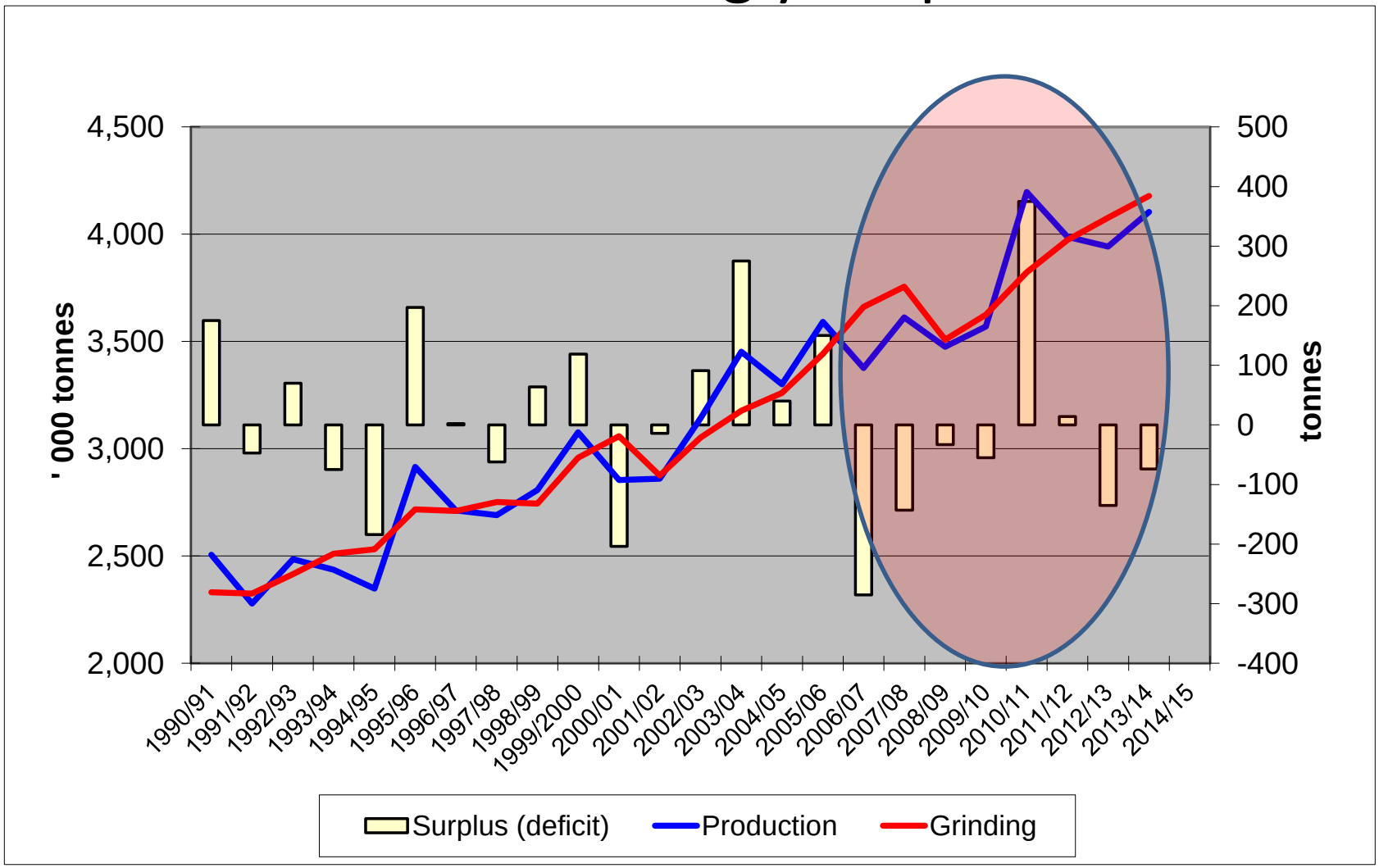
Sun drying

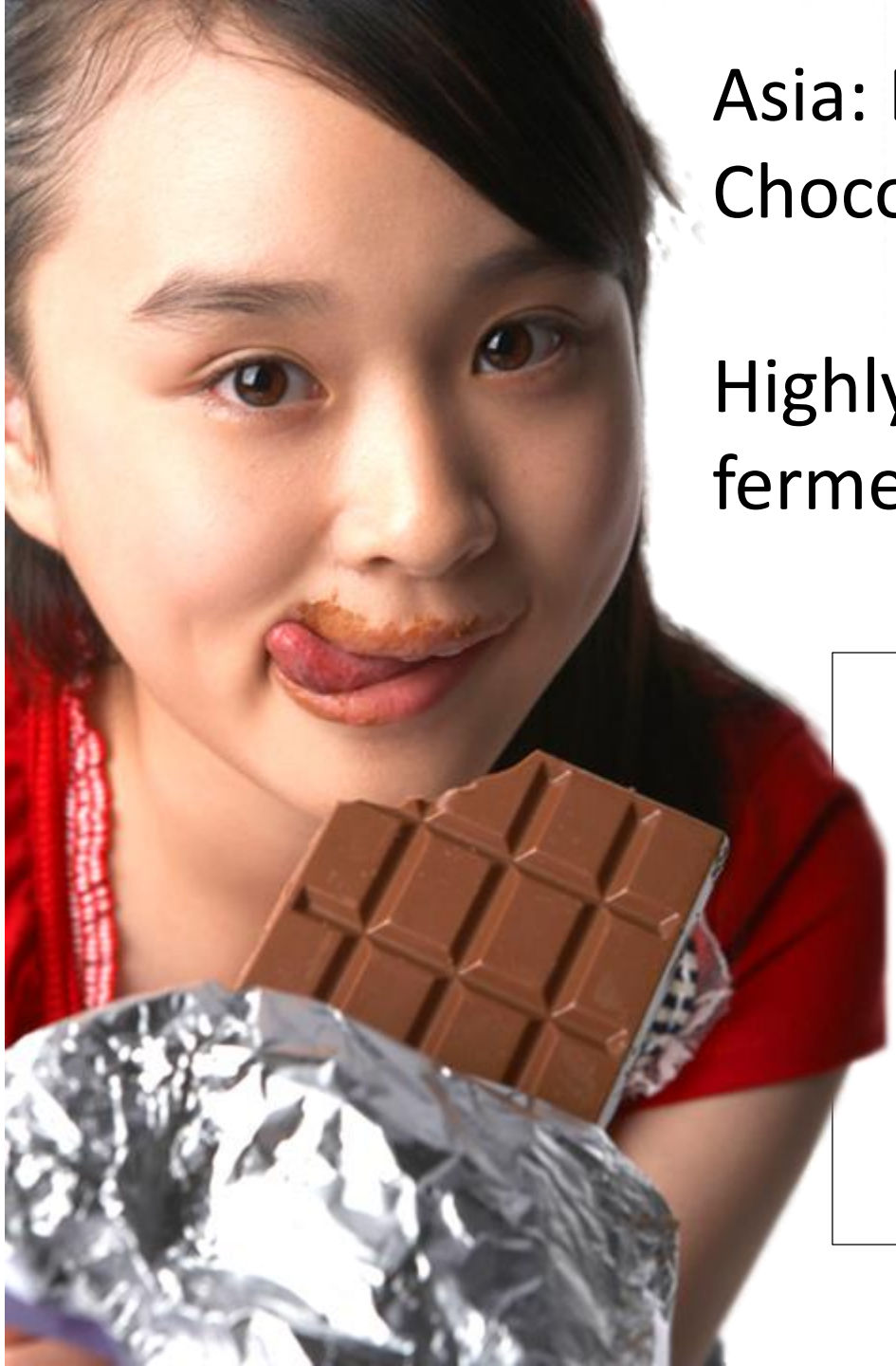
West Africa is nearly 70% of the world supply



Brazil	4%	Côte d'Ivoire	35%	Indonesia	14%
Ecuador	4%	Ghana	20%	PNG	1%
DR	1%	Cameroon/ Nigeria	12%	Malaysia	<1%
Total Americas	14%	Total Africa	68%	Total Asia	17%

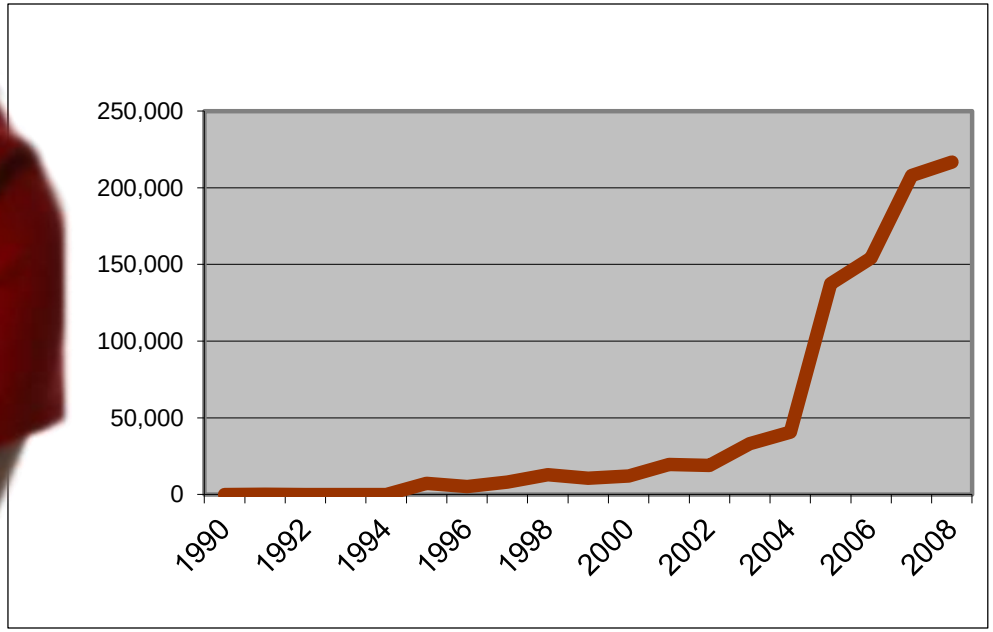
Global cocoa supply – deficits increasingly frequent



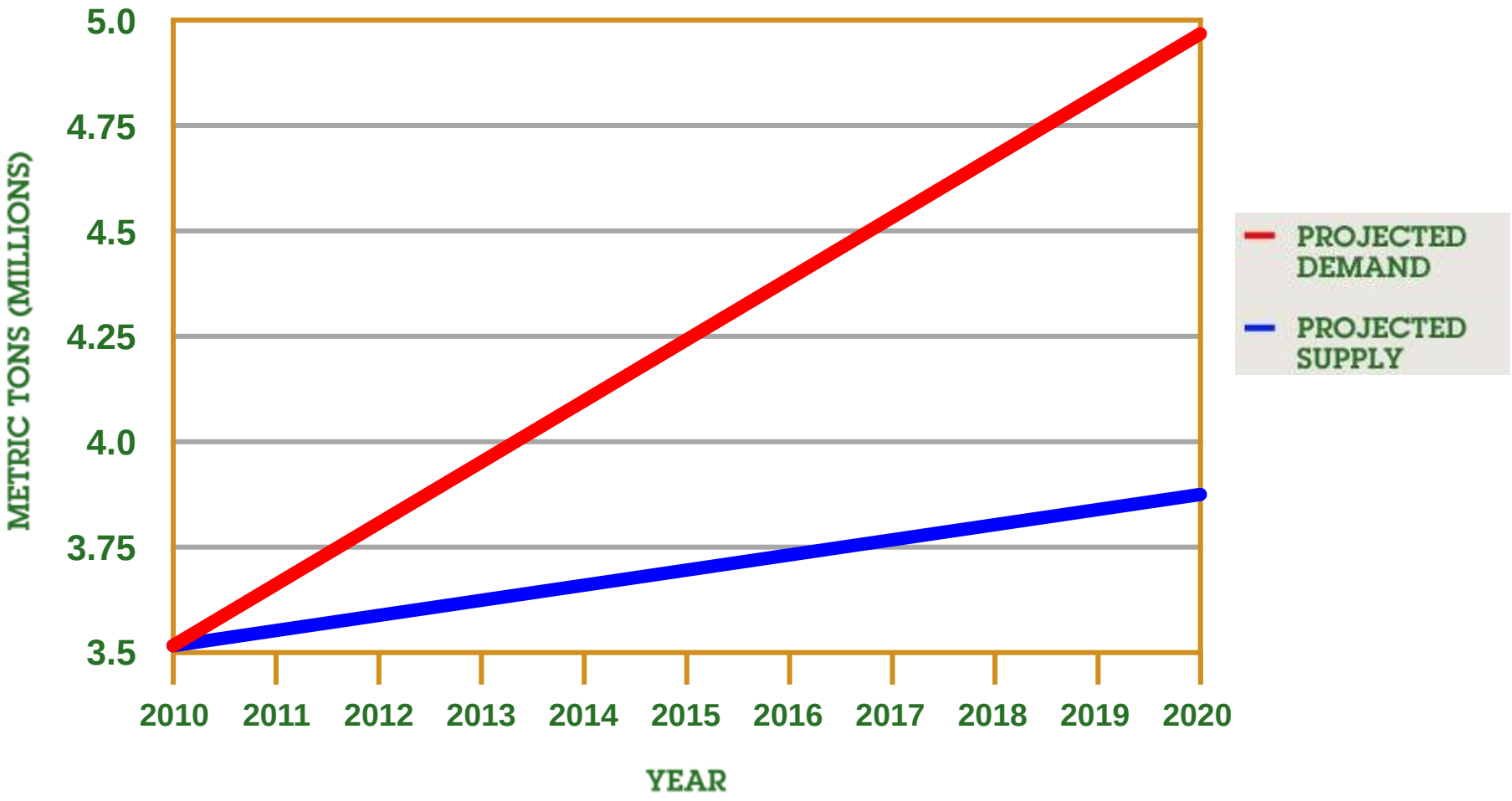


Asia: Double Digit Growth in Chocolate Consumption

Highly dependent on Africa for fermented quality cocoa beans



1 Million Ton Shortfall by 2020



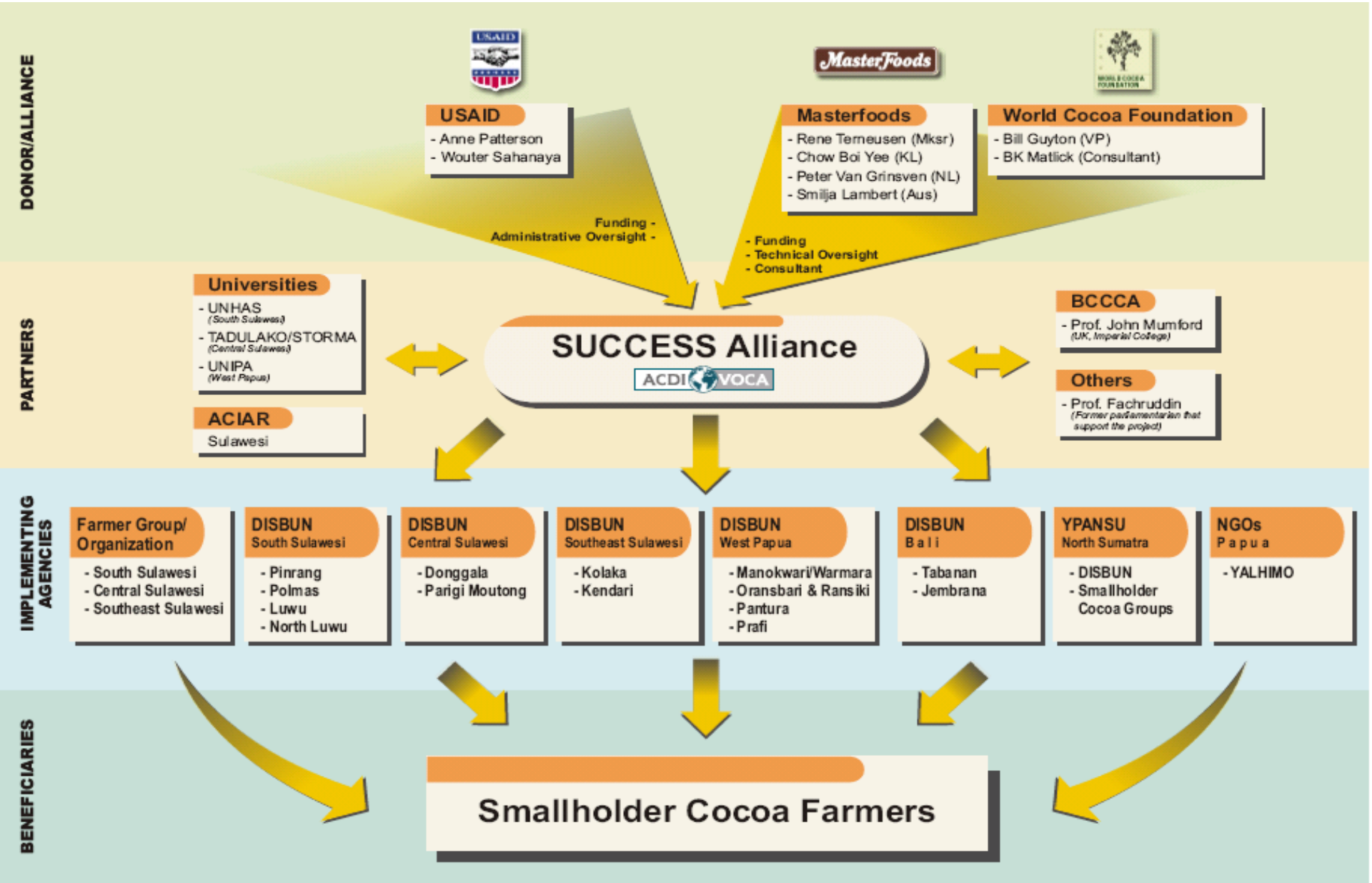
Cocoa in crisis –old trees, ageing farmers, low productivity

Indonesia Cocoa Production 1980-2013 ('000 tonnes)

700
600
500
400
300
200
100
0

80/81 82/83 84/85 86/87 88/89 90/91 92/93 94/95 96/97 98/99 00/01 02/03 04/05 06/07 08/09 10/11 12/13

SUCCESS ALLIANCE, Sulawesi - Collaboration with Funding Agency (USAID) to control Cocoa Pod Borer



Farmer Field School

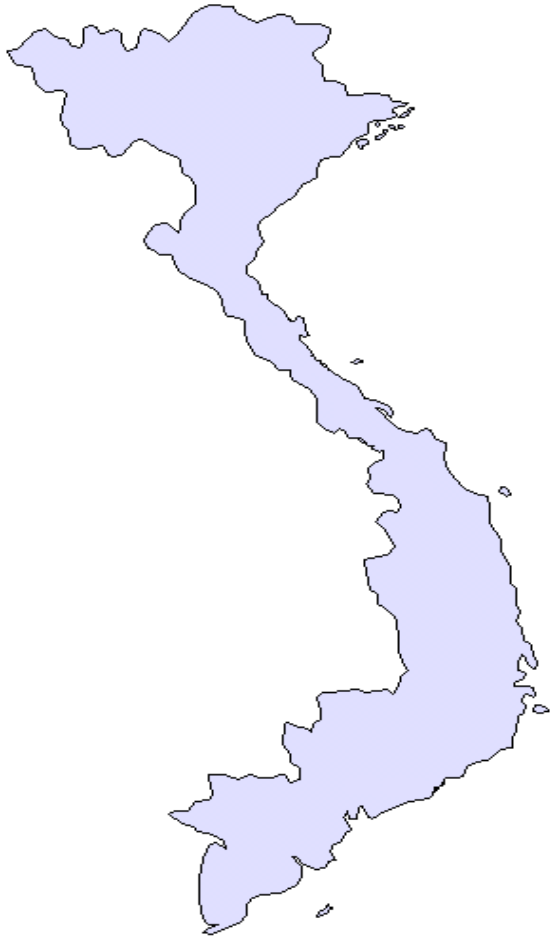
- 8 weekends training
- Demonstration plots
- Farmers clubs

Simple message - PsPSP

Farmers club

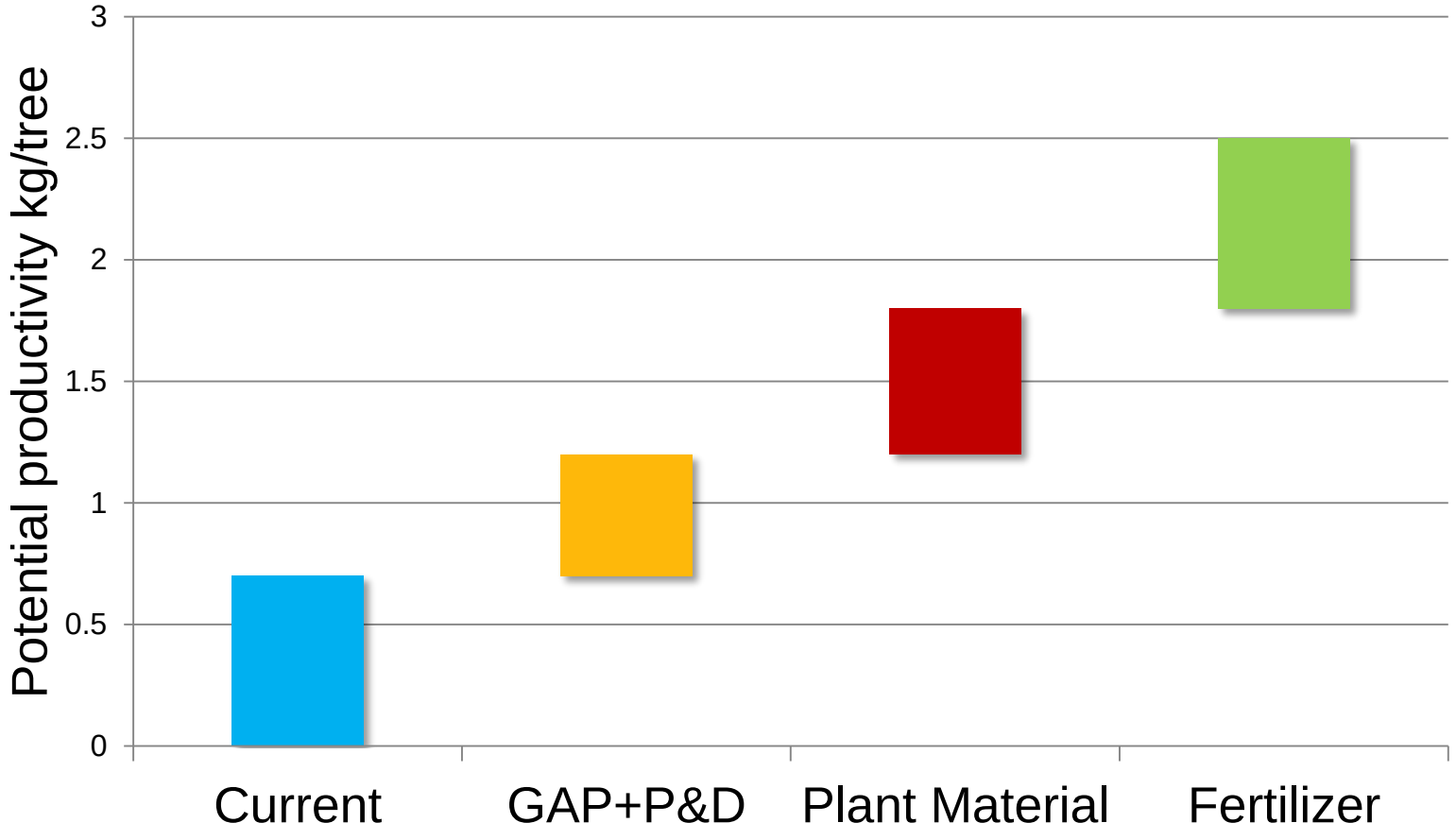
$6 mil over 6 years – trained 60,000 farmers & 1,000 extensionists

Vietnam New Origin



Group discussion – Farmers Field school, Vietnam

How to Triple Current Yield



As we scale up, focus on 3 key areas:

- Research Capability
- Transfer of Technology
  - Fertiliser
  - Pest & Disease Mgt
  - Good Agri Practices

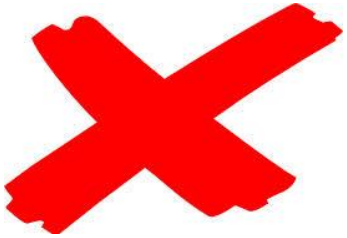
- Value chain
- Policy
  - Export standard
  - Post harvest processing

- Social compliant
- Environment compliant

- Policy: Nursery

Review on Assumptions

- Farmers learn and apply from field schools, neighbouring successful farms, and demonstration farms



- Farmers confused and unsure on practices and techniques

Transformation Program – Connecting The Last Mile

- Select only farmers committed to learn and implement
- Field Technicians competent experts on best cocoa practices.
- Field Technicians have good people skills
- Monthly visits to monitor, coach and guide on implementation of best practices.
- The 10:20:70 learning rule.

SWAT team

FARMER SURVEY IN APRIL 2014

Indicator	Before	After	Notes
Total number of mature trees	18,865	18,215	1 farmers cut down their trees.
Number of household have new planting	N/a	7/27	Total 1,400 new trees
Average yield (kg/tree)	0.457	1.125	
Highest Yield (kg/tree)	1.50	2.70	
Lowest Yield	0.20	0.45	
Average NPK application	250	480	Gr/tree/year
Highest NPK application	850	1,500	Gr/tree/year
Lowest NPK application	0	200	Gr/tree/year
Number of farmers applied manure	6	18	Earlier 2013, price of cocoa was low so priority was given to pepper.
Pruning	-3	+3	Significant improvement
Shade management	-3	+3	Significant improvement
P&D management	-3	+2	Good improvement

A Transformed Farm

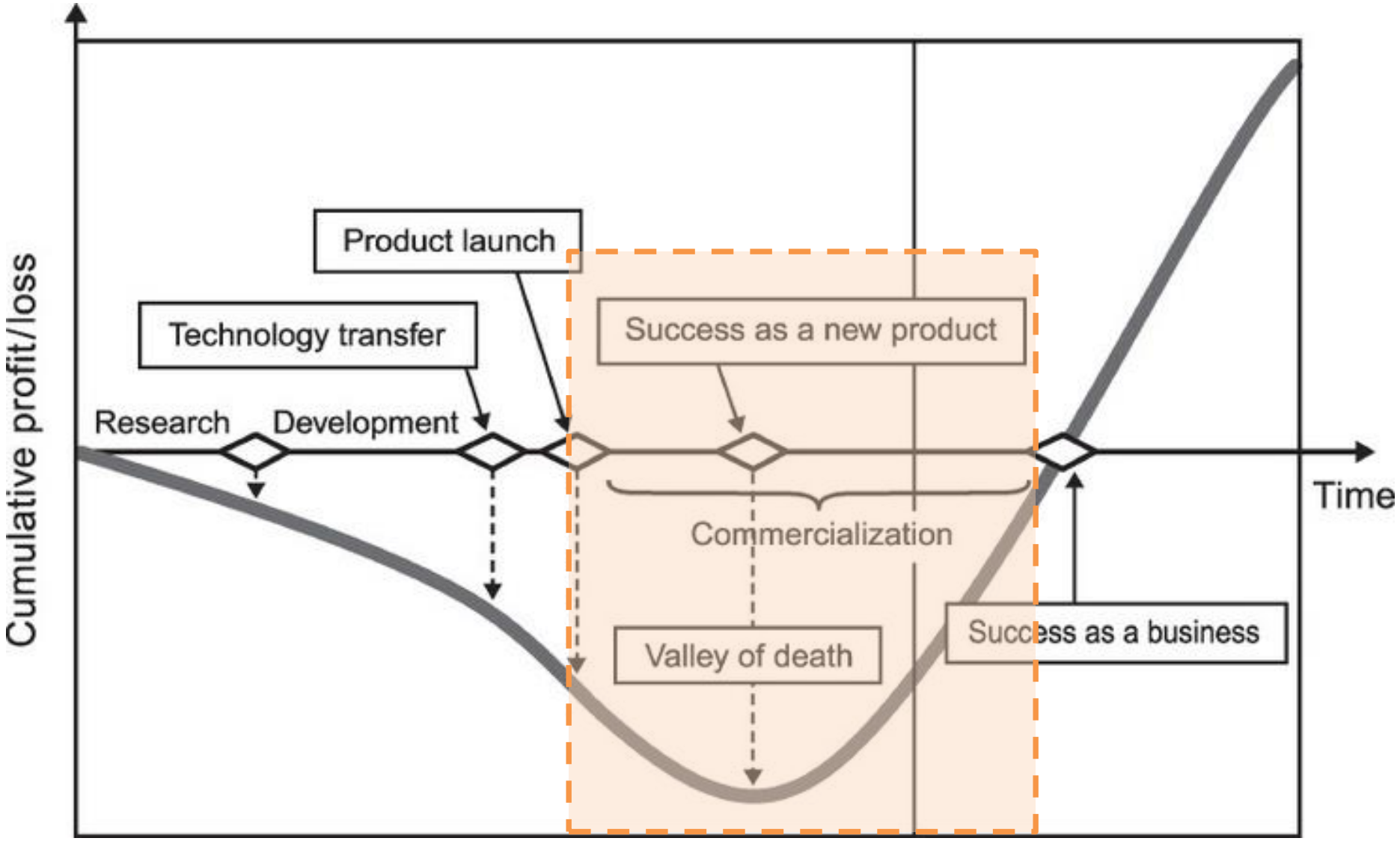
Transformation Program – The real thing

- Build trust and enthusiasm
- Stimulate innovations – irrigation, changing production months, trunk injection, bio-char
- Inclusiveness, adding value and be the touchstones of rural economy

Excellent extension is key to smallholders productivity

Valley of Death

(Osawa & Miyazaki, 2006)



MARS COCOA DEVELOPMENT CENTER

PUENTESPINA FARM, BRGY. MALAGOS
BAGUIO DISTRICT, DAVAO CITY
PHILIPPINES

In collaboration with: MARS incorporated, USDA, ACDI VOCA, CRS

Cocoa Development Centre – Demo plots & capacity training


Competencies in application, changing behaviour
Farmers First
Delivering Positive Change at Scale
MARS HYBRID TRIAL
Soluleme - North Luwu - South Sulawesi - Indonesia

The Contribution of Family Farmers to Food Provision

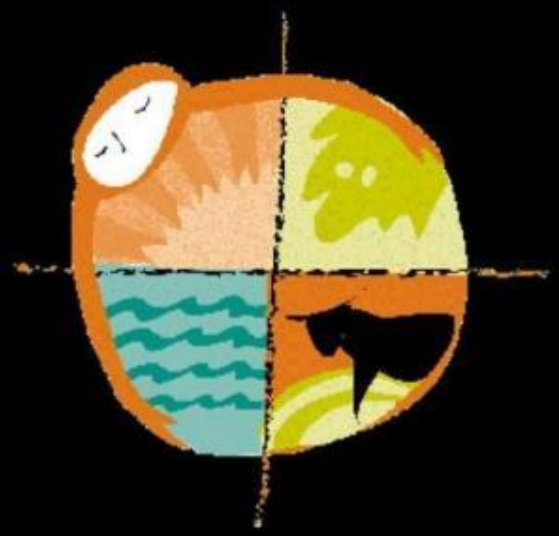
Global Food Security Forum 2014

“Meeting Nutritional Needs”

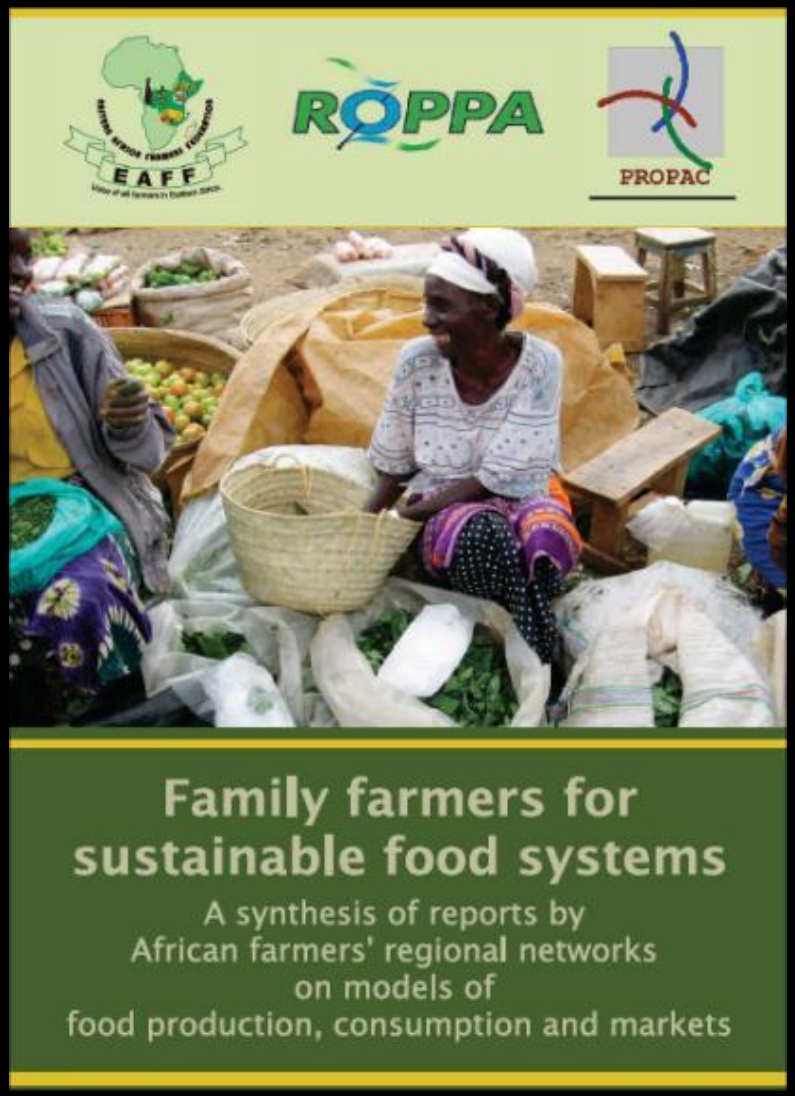
University of Nottingham | Crops for the Future Research Centre

Kuala Lumpur
Monday 7th July 2014

Patrick Mulvany
Food Ethics Council UK



Small-Scale Producers' Sustainable Food Systems



20 Years
La Via Campesina
International Peasant Movement

Defending Food Sovereignty

70% Food is Local

1. Les exploitations familiales contribuent significativement à l'alimentation des sénégalais

Les statistiques officielles sur certaines filières le confirment

(Source: ANSD, 2008: les déterminants de l'inflation au Sénégal)

30,7%
Produits importés de grande consommation

Céréales,
lait en poudre,
Beurres,
produits
manufacturés

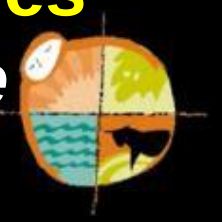
69,3%
Produits locaux

Céréales
Huiles de palme
et d'arachide
Poisson
Légumes
Viandes

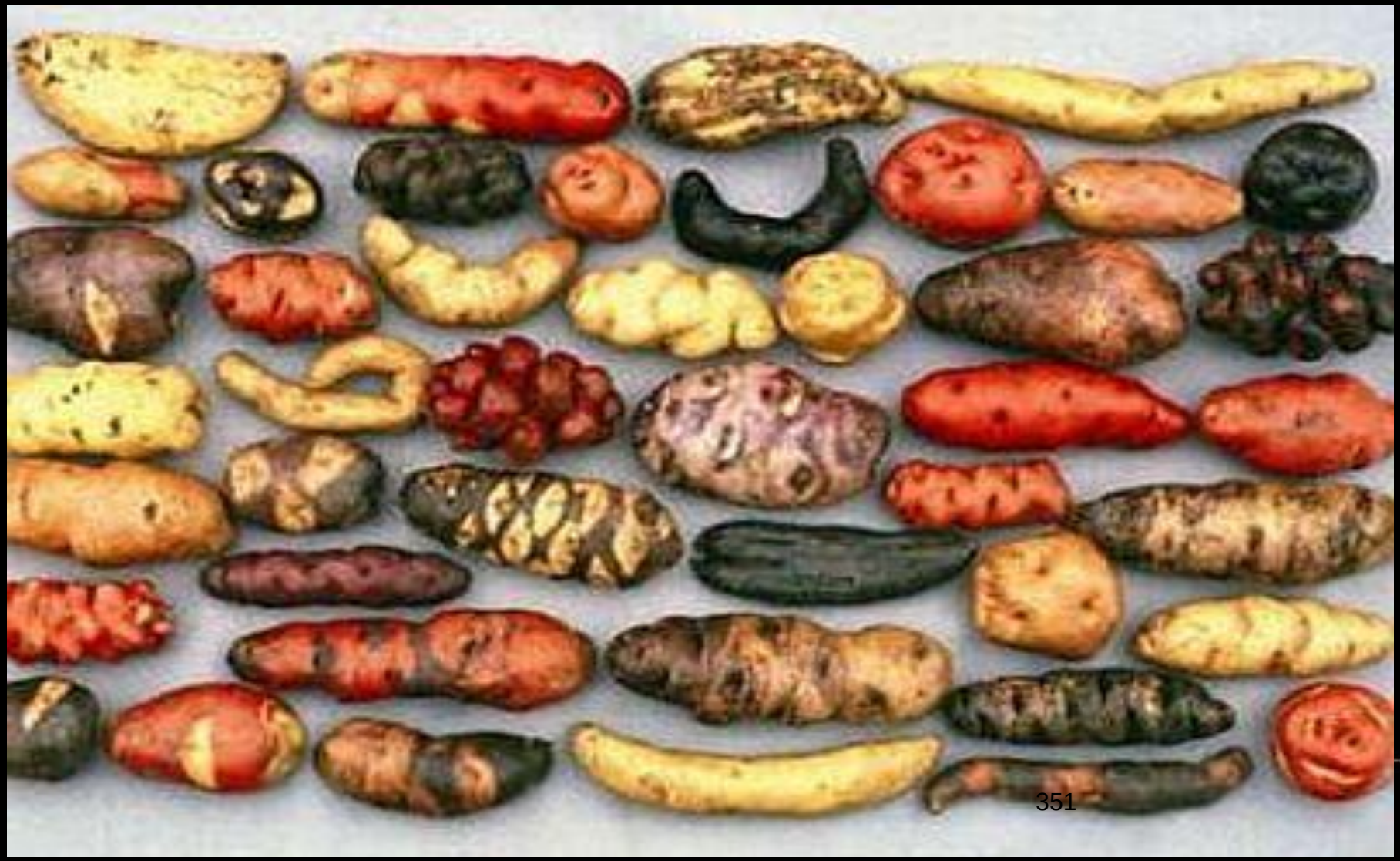
Most Seeds and Breeds are Local

UPOV, the Union for the Protection of New Plant Varieties (the WIPO-based intergovernmental body that oversees intellectual property related to plant varieties), reported that breeders had only "protected" 70,000 varieties in recent decades, [and that] ***farmers use, develop and adapt a diversity of one to two million varieties of crops.***

Industrial livestock production uses 5 species but ***local livestock keepers develop and use >7,000 breeds from 40 species of livestock***



Peoples Innovation: >5,000+ vars Potatoes



African Seed Fairs

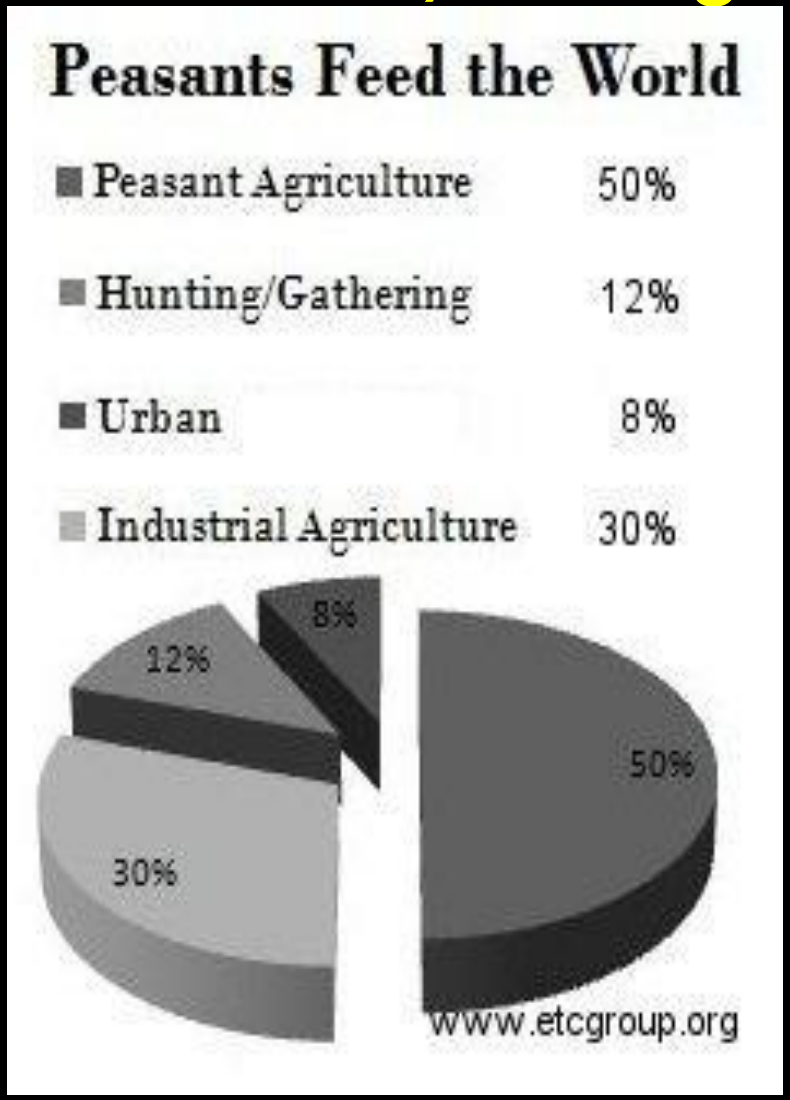
CROPPING

LIVESTOCK

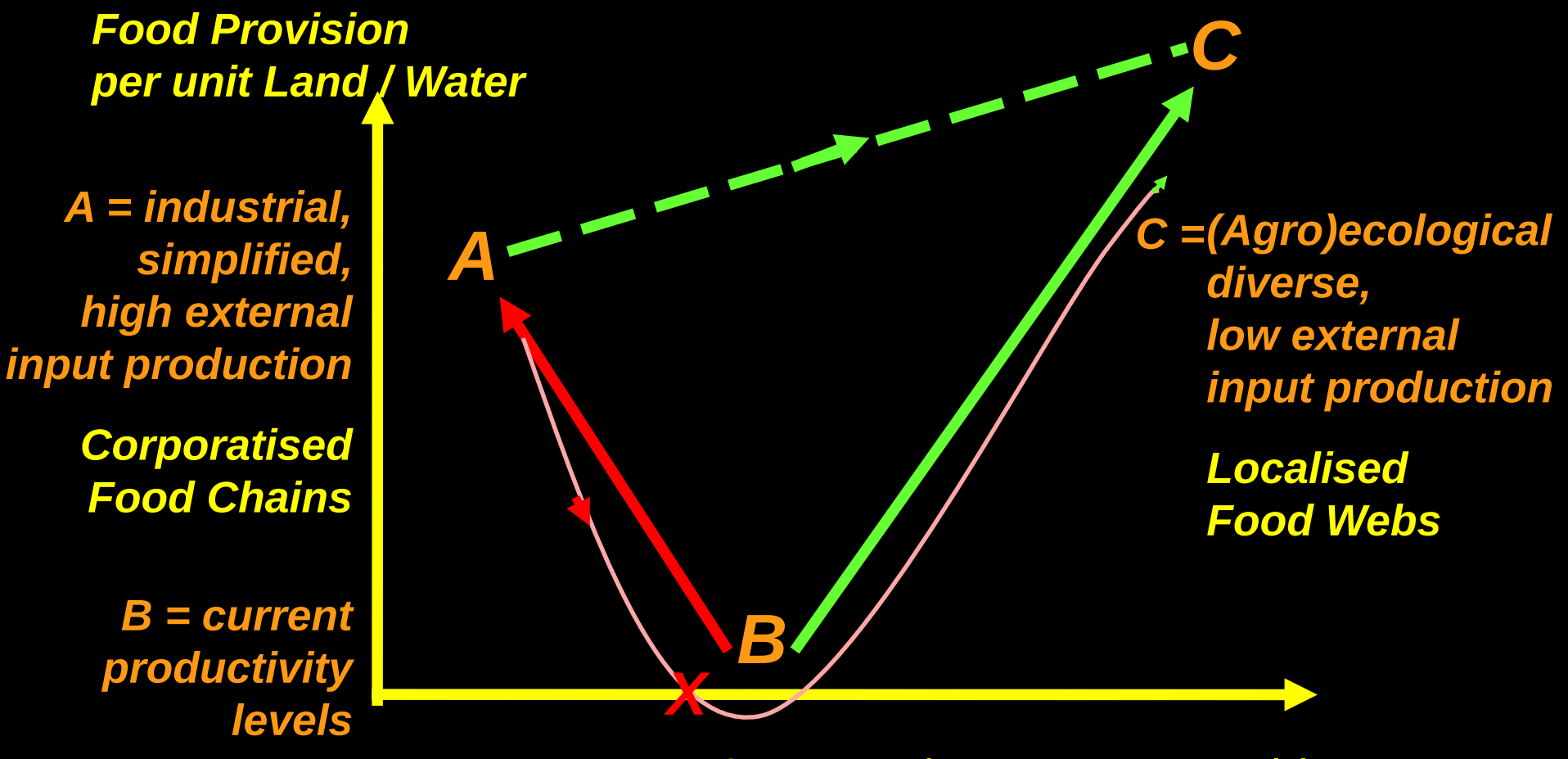
AQUATIC RESOURCES

ARTISANAL FISHING

Small-Scale Food Providers feed more than 70% of World's People; use more biodiverse, ecological practices

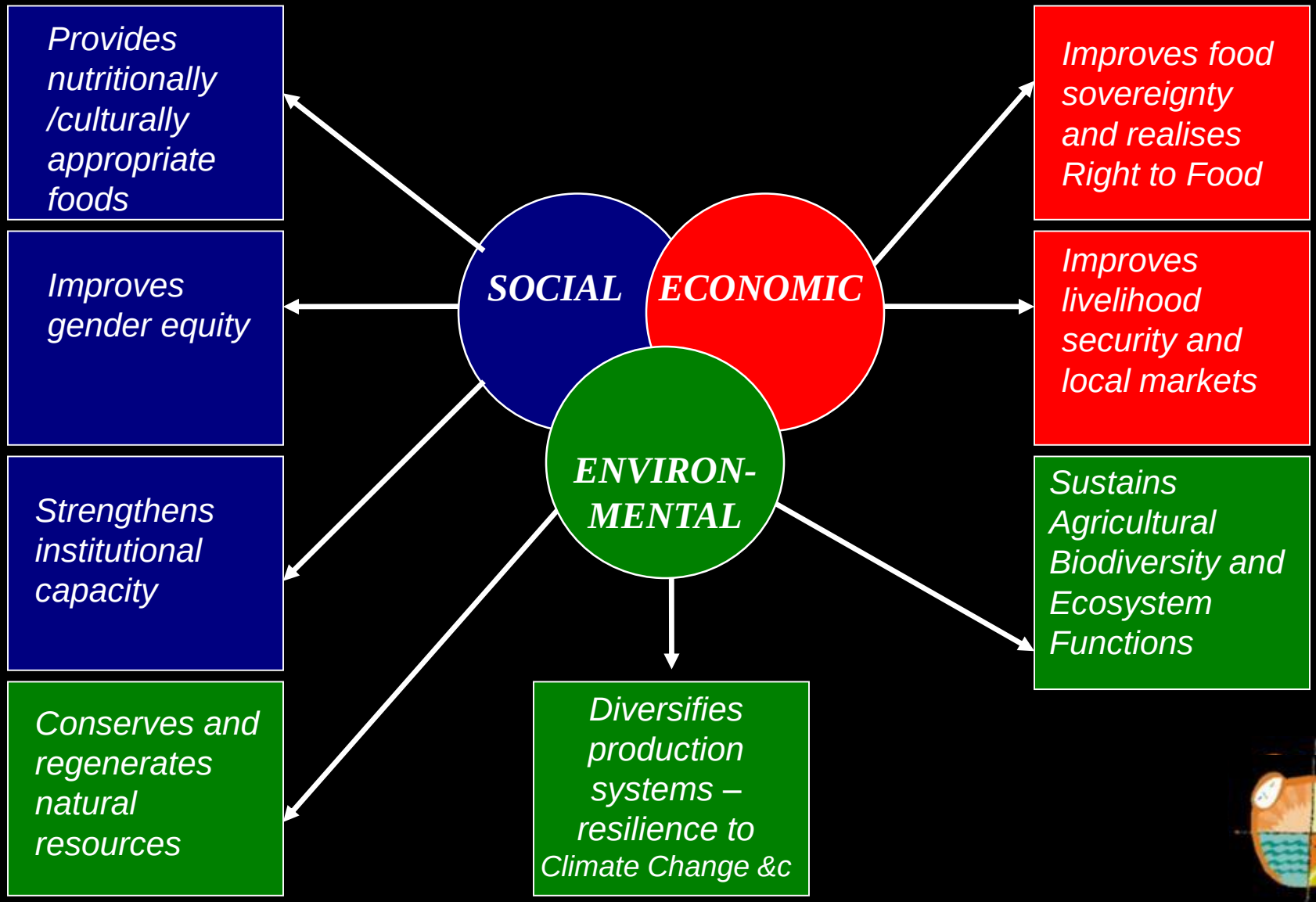


Improving Nutrition through Ecological Food Provision Methods



Low----------NUTRITION per AREA / WATER----------High
Low----------DIVERSITY / RESILIENCE ----------High
Low----------FOOD SOVEREIGNTY----------High
Low----------PEOPLE / LOCAL KNOWLEDGE----------High
High----------CARBON COST----------Low
High----------CORPORATE CONTROL----------Low

Multiple Benefits of Localised, Biodiverse, Resilient, Ecological Food Provision



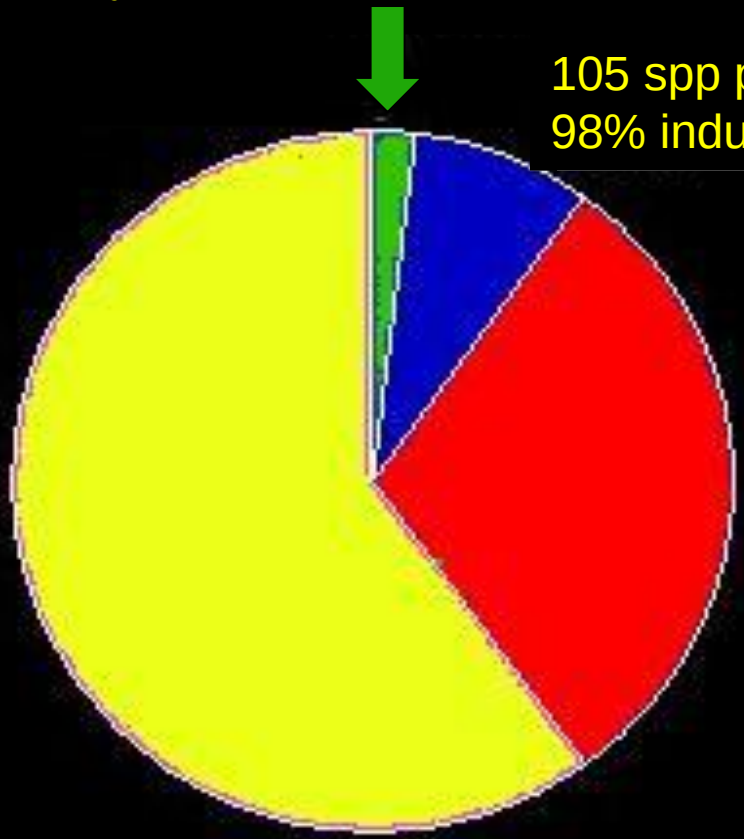
State of the World's Biodiversity for Food and Agriculture

has broad scope – both 'target' and 'associated' species

Cross-sectoral assessment – plants, animals, aquatic and soil organisms, pollinators etc. + associated ecosystem functions – using the ecosystem approach; and also social, legal, institutional issues

Industrial Food Chains use limited Agricultural Biodiversity

e.g. between 7,000 and 30,000 plant species are used in the food system, yet only a handful are recorded as providing most food. The majority of species, essential for food security and nutrition, are ‘invisible’.



105 spp provide
98% industrial food

4 spp
Maize, Rice
Wheat and Potatoes
provide
60% industrial food

12 spp provide
90% industrial food

Drivers of Loss of Agricultural Biodiversity

"*reduces access to nutritionally rich foods*"

- Industrial models of crop production, livestock factories and large-scale fisheries
- Laws that restrict access; intellectual property rights; criminalisation of defenders of diversity
- Corporate power to effect uniformity
- Private sector privileges and commercial contracts, driven by profit, blind to biodiversity
- Technologies that contaminate, disrupt the sustainable use of, restrict access to, and facilitate monopoly control over, agricultural biodiversity and its components

Three Agribusinesses Monopolise Industrial Seeds

Compliant with their Agrochemicals

World's Top 10 Seed Companies

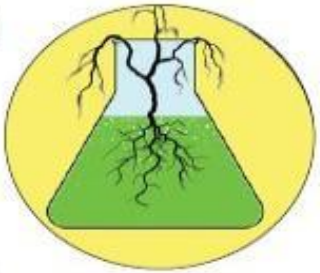
Source: ETC Group (reporting currencies converted to US$ using historical exchange rates)

Top 3 = 54%

Company (Headquarters)	Seed Sales 2009 (US$ million)	Market Share
1. Monsanto (USA)	7,297	27%
2. DuPont (Pioneer) (USA)	4,641	17%
3. Syngenta (Switzerland)	2,564	9%
4. Groupe Limagrain (France)	1,252	5%
5. Land O' Lakes/Winfield Solutions (USA)	1,100	4%
6. KWS AG (Germany)	997	4%
7. Bayer CropScience (Germany)	700	3%
8. Dow AgroSciences (USA)	635	2%
9. Sakata (Japan)	491	2%
10. DLF-Trifolium A/S (Denmark)	385	1%
Total Top 10	**20,062**	**64%**

Monsanto
DuPont
Syngenta

World's Top 10 Agrochemical Companies

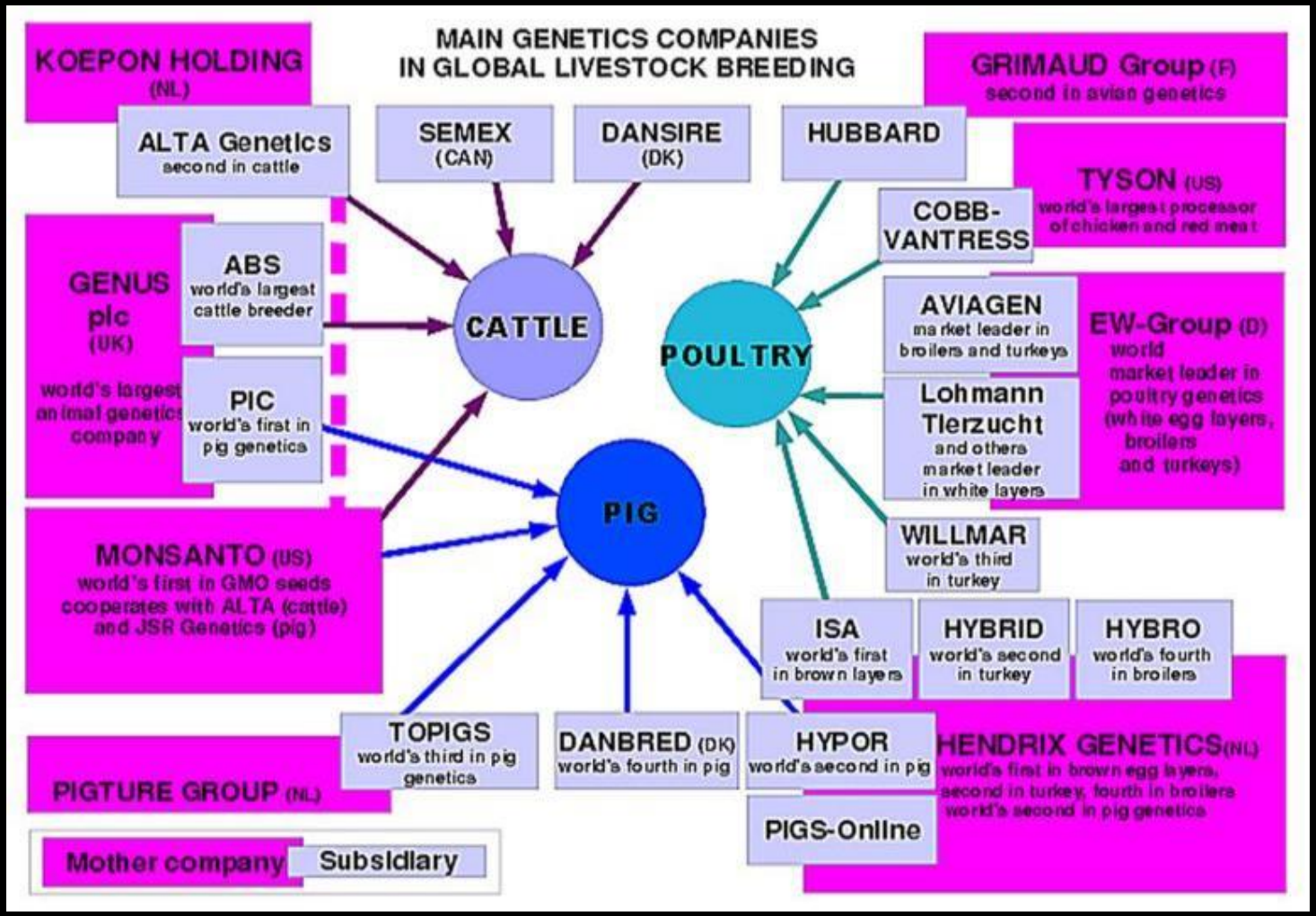


Sources: ETC Group (reporting currencies converted to US$ using historical exchange rates)

Rank / Company (Headquarters)	Agrochemical Sales, 2009 (US$ million)	Market Share
1. Syngenta (Switzerland)	8,491	19%
2. Bayer CropScience (Germany)	7,544	17%
3. BASF (Germany)	5,007	11%
4. Monsanto (USA)	4,427	10%
5. Dow AgroSciences (USA)	3,902	9%
6. DuPont (USA)	2,403	5%
7. Sumitomo Chemical (Japan)	2,374	5%
8. Nufarm (Australia)	2,082	5%
9. Makhteshim-Agan Industries (Israel)	2,042	5%
10. Arysta LifeScience (Japan)	1,196	3%
Total Top 10	**39,468**	**89%**

www.etcgroup.org

Eight Agribusinesses Monopolise Industrial Livestock Genetics



www.pastoralpeoples.org/docs/livestock_genetics_en.pdf

GM for drought tolerance - poor returns?

Drought-tolerant maize (Budget $47 million)

- *Variable maize yields but fewer empty cobs*

OR

Drought-proofed farms (Farmer knowledge)

- *Increase in total farm yields*
- *Drought no longer a problem*
- *Better soil fertility/biodiversity*
- *More water for people and livestock*

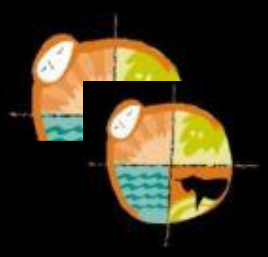
IAASTD found GM crops
did not help eradicate hunger

www.organicresearchcentre.com/manage/authincludes/article_uploads/feeding%20the%20world/juliawright-ftw2008.pdf

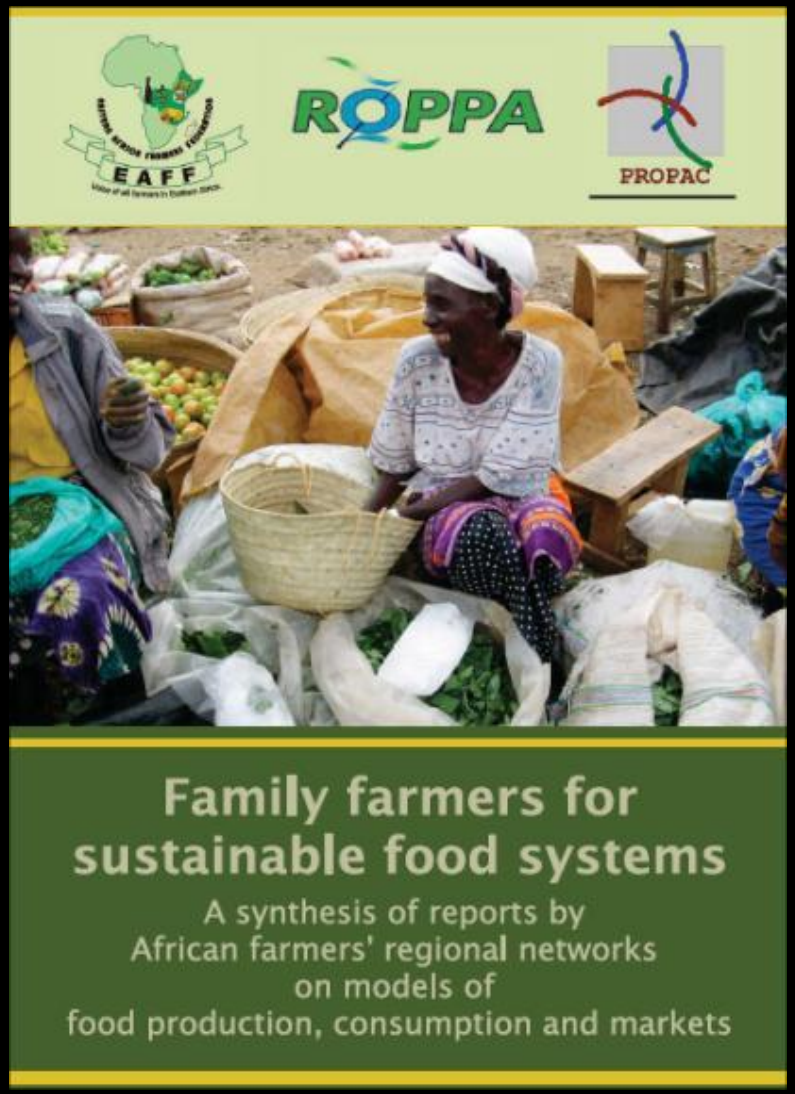
International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD)

IAASTD finds need to increase and strengthen Agricultural Knowledge, Science and Technology towards agroecological sciences to address environmental and productivity issues

(IAATSD Finding # 7. See www.iaastd.net)



Family Farmers for Sustainable Food Systems



2014
Year of Family Farming

Support family farmers' own investments for:

- ***Food:*** *realising food sovereignty*
- ***Social and Environmental sustainability:*** *strengthening autonomous organisation for biodiverse, ecological production*
- ***Livelihoods:*** *adding value, locally*

www.europafrica.info

Key findings: to sustain food provision and livelihoods – towards food sovereignty

- Invest in family farming / small-scale food production
- Guarantee rights of access to and control over productive resources
- Provide sources of credit, social protection measures and grain reserves
- Strengthen locally controlled food markets
- Support participatory research
- Include family farmers and small-scale food providers organisations in public policy at all levels up to the UN CFS
- Prioritise data collection about the informal and mostly ‘invisible’ production, processing and trade within the food system.

Food Sovereignty

1. ***Focuses on Food for People and the Right to Food, rather than export commodities***
2. ***Values Food Providers and respects their Rights, rather than squeezing them off the land***
3. ***Localises Food Systems, rather than promoting unfair global trade***
4. ***Puts Control Locally, rather than remote TNCs***
5. ***Builds Knowledge and Skills, rather than depending on alien technologies such as GM***
6. ***Works with Nature, rather than using methods that harm beneficial ecosystem functions, such as energy intensive monocultures and livestock factories.***

Who will feed us?

How small-scale food providers to Adequate Food' for the world

Patrick Mulvany argues that to secure the right to f paradigm and put food sovereignty first.

food ethics
The magazine of the Food Ethics Council

Despite the tireless efforts of negotiators since World War 2 to change the food system and agree a legal code and requirement to fulfil people's Human Rights in relation to food, the Right to Food for many hundreds of millions of people has been and continues to be undermined. In the last half of the past century, governments increasingly forgot the primary purpose of agriculture, including livestock production and fisheries – to feed their peoples adequately. This purpose was subverted to satisfy the avarice of those controlling industrial agriculture and the transformation, trading and sale of its products, seeking increasingly concentrated profit. The result: a dysfunctional food system with nearly a billion hungry, almost two billion obese and a reckless erosion of the resources and ecosystems upon which food production depend. Food security – the mantra of those concerned with the food dimensions of national security – effectively became a slogan in support of agribusinesses delivering edible commodities.[1]

Belatedly, in the 21st century, many assessments, forums and initiatives now formally recognise the inadequacy of this approach in terms of the provision of nutritious food as well as its sustainability.[2,3,4] But the measures policy makers propose – to re-engineer industrial production in collaboration with agribusiness corporations[5,7] – will do little to improve the adequacy of food provision. This requires tackling the root causes of the unsustainable industrial system – the corporate power of agribusinesses. It is left to those who currently provide food for most people in the world – small-scale food providers – to provide the solution: food sovereignty.[8]

A food sovereignty framework

Food sovereignty provides a framework for policy, practice and the governance of food that is effective, efficient and equitable. It was conceived by La Via Campesina twenty years ago and launched at the World Food Summit in 1996. Food sovereignty puts food and small-scale food providers at the centre of policy and practice. It is based on their wisdom, experience and skills in providing nutritious food and sustaining the ecosystems that produce food sustainably. Its proponents have identified the main causes of food insecurity and the processes and technologies which undermine small-scale food producers.

Food sovereignty provides the basis for highly productive, smaller-scale food production – using methods that are ecological, biodiverse and resilient to shocks. In realising food sovereignty, the Right to Food can be fulfilled through the provision, as locally as possible, of adequate nutritious food.

What is food sovereignty[9]?

Food sovereignty is the right of people to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems. It:

1. Focuses on food for people and the Right to Food, rather than export commodities
2. Values food providers and respects their Rights, rather than squeezing them off the land
3. Localises food systems, rather than promoting unfair global trade
4. Puts control locally, rather than having power vested in remote Transnational Corporations
5. Builds knowledge and skills, rather than depending on alien technologies such as GM and compliant agrochemicals
6. Works with nature, rather than using methods such as energy intensive monocultures and industrial livestock factories that harm beneficial ecosystem functions

Complex food webs

Food sovereignty supports small-scale food providers who produce the food eaten by most people in the world, largely using biodiverse and ecological methods. An estimated 70% of the global population (nearly 5 billion) are fed with food provided locally, mostly by small-scale farming, gardening, fishing or herding. It is estimated that there are around 2 - 3 billion people in rural, coastal and urban areas who are engaged in food provision to some degree. Predominantly, it is women who provide and process food from their gardens or smallholdings, looking after livestock and preparing fish.

A further 1.7 - 2.7 billion people are engaged in local food webs, including markets and trade. Small-scale food providers operate within complex food webs, where food is provided to households from many sources both locally and from other locations, including through formal and informal markets. It is estimated that of the 70% of the food provided through these food webs, some 35- 50% comes from farms; 15-20% from urban agriculture and gardens; 10-15% from hunting and gathering; and 5-10% from fishing.[10]

Who Should Feed Us?

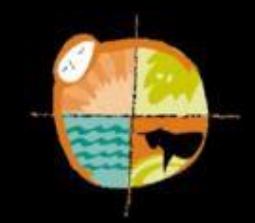
Industrial Food Chains

that use 70% of agricultural resources to feed 30% of the people

or

Peasant Food Webs

that use 30% of agricultural resources to feed 70% of the people



www.foodethicscouncil.org

Thank You!

Further info:

europafrica.info

foodsovereignty.org

ag-transition.org

www.ukfg.org.uk

ukabc.org

www.foodethicscouncil.org

@kamayoq

Patrick Mulvany

patrickmulvany@clara.co.uk

Food Supply – Quality, Sustainability and meeting the Demand

Animal production
- Improving feed conversion efficiencies

Professor Julian Wiseman

Introduction

Animal products important part of the food chain

- **With increasing prosperity people demand more of them.**
- **Cited as a contributory factor to food security 'perfect storm'**
  - **Surely if no animal products, more human food available ?**

  - **What about:**
    - **Nutritional requirements for diverse diets**
      - **Essentiality of nutrients only from animal products**
        - » **Vitamins, minerals, amino acids, essential fatty acids**
    - **40% of world land surface is broadly grassland**
      - **Much not suitable for arable use.**

Introduction

Use of livestock must be part of the food security research agenda

- **Core research activities:**
  - **Large animal research**
    - **Combination of experimental + farm facilities.**

- **Key focus**
  - **Efficient use of resources in livestock production / husbandry.**
    - **Efficient conversion of feed materials to animal products**
      - **Use of co-products of other processes**
      - **Molecular basis of efficient animal growth.**

Feed efficiency

- Major objectives

- 1. Individual Animal
  - Efficiency of producing meat, milk or eggs
    - How many kilos of feed per kilo of product

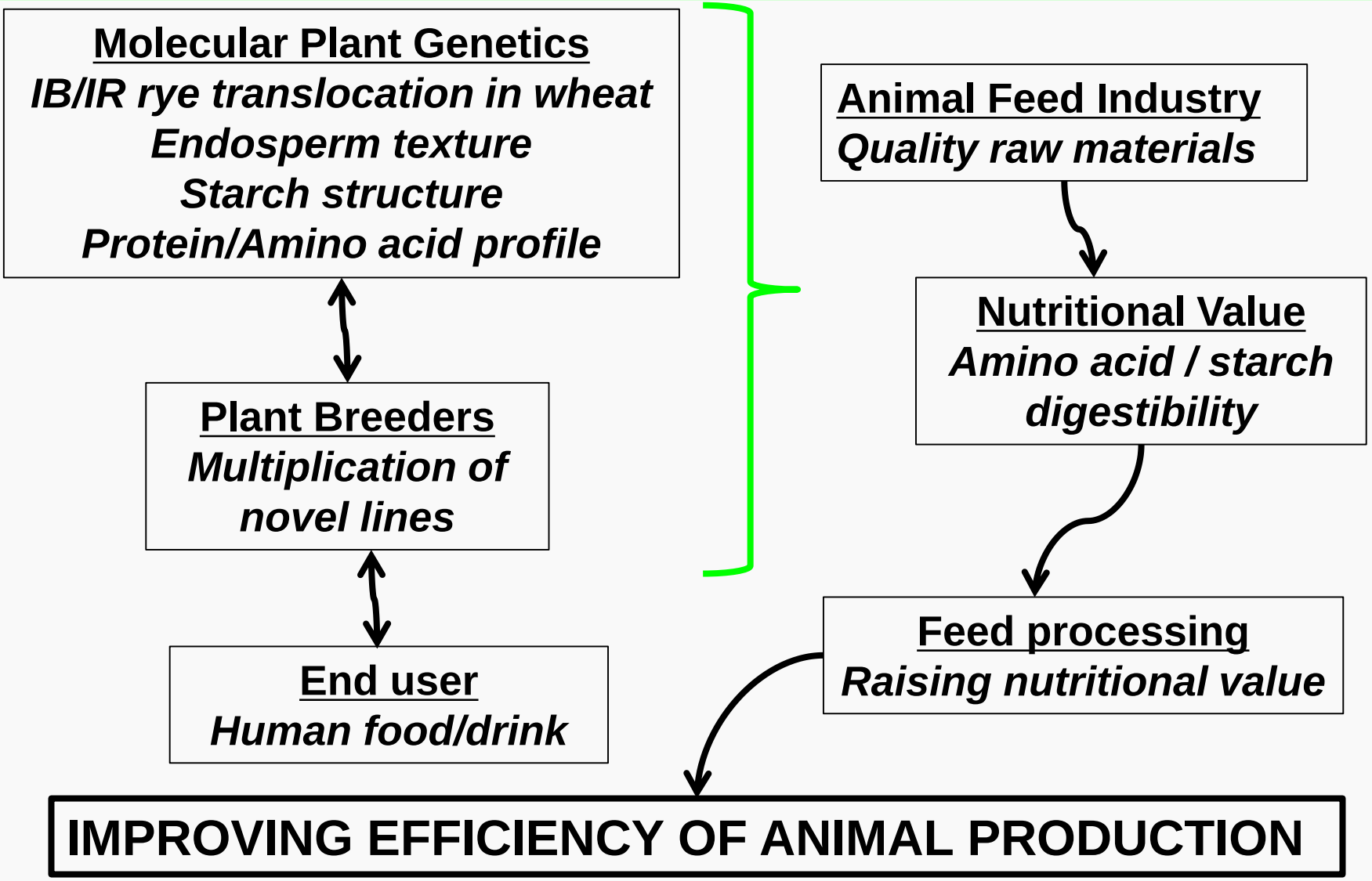
- 2. System
    - Reproduction, health

- 3. Minimising environmental impact
  - The more nitrogen retained from diet, the less released

What are the current drivers?

- Human population growth
  - Increase in consumption of animal products
- Feeding animals
  - Efficiency
- Environmental impact / sustainability
  - 26% reduction in UK Pig Industry greenhouse gas emissions.
    - Biggest contributing factors:
      - Reliance on imported soya
      - Greater GLOBAL interest in food and other co-products
        - » Food waste…..

Animals eat plants



Which plants and where? Competition for resources ?

PIG DIET	
INTENSIVE (Western European)	
Barley **Wheat** **Wheat Bran** **Soya Bean Meal** **Fish Meal** **Mineral/Vitamin/amino acids**	

Which plants and where? Competition for resources ?

PIG DIET	
INTENSIVE (Western European)	**EXTENSIVE (Rural Asia)**
Barley Wheat Wheat Bran Soya Bean Meal Fish Meal Mineral/Vitamin/amino acids	Vegetable crop residues Fermented rice hulls Water hyacinths Banana stems Sweet potatoes

Problems (more Rural Asia)

- Low quality feed (low digestibility, anti-nutritive factors)
- Seasonality of supply
- Limited and variable output / pig, chicken

Solutions

- Food storage / processing
- Import grains / proteins – expensive
- Import concentrate mix to supplement local diet

'Extensive' solutions

Copra meal (reasonable protein content)

- **Co product of coconut processing**
- **Widely available in the tropics**

	A	B	C
Copra Meal		50	
Fish Meal	-	10	-
Soyabean Meal	7.5	13	13
Maize	20.5	5	20.5
Rice Bran		17	
Premix	5	5	3.97

'Extensive' solutions

Copra meal (reasonable protein content)

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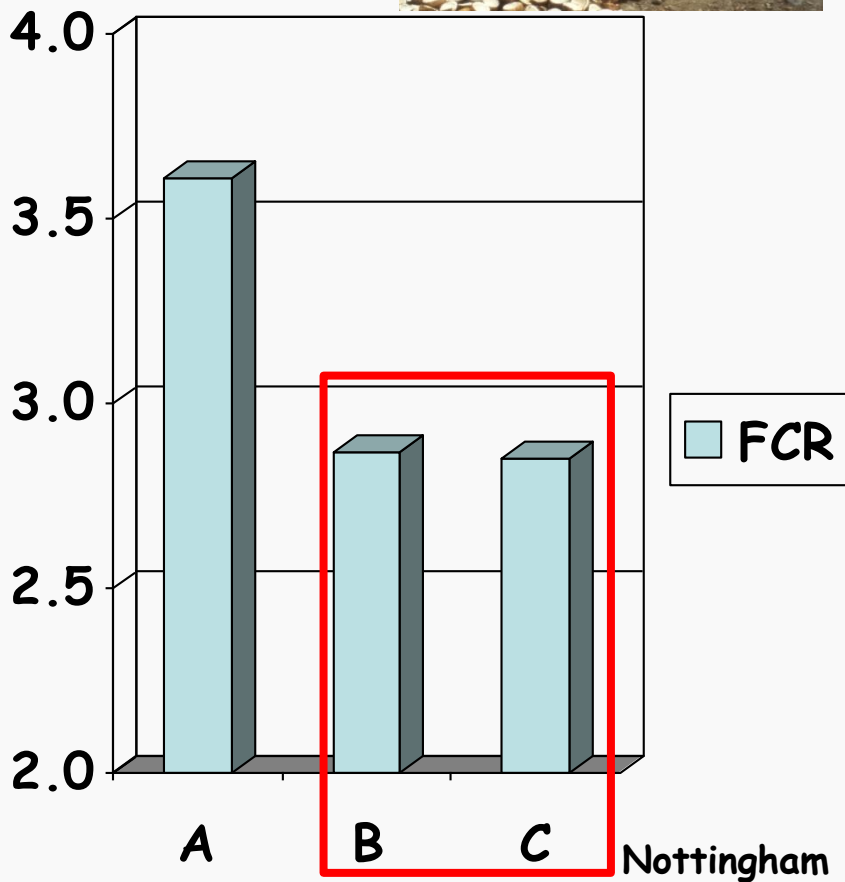
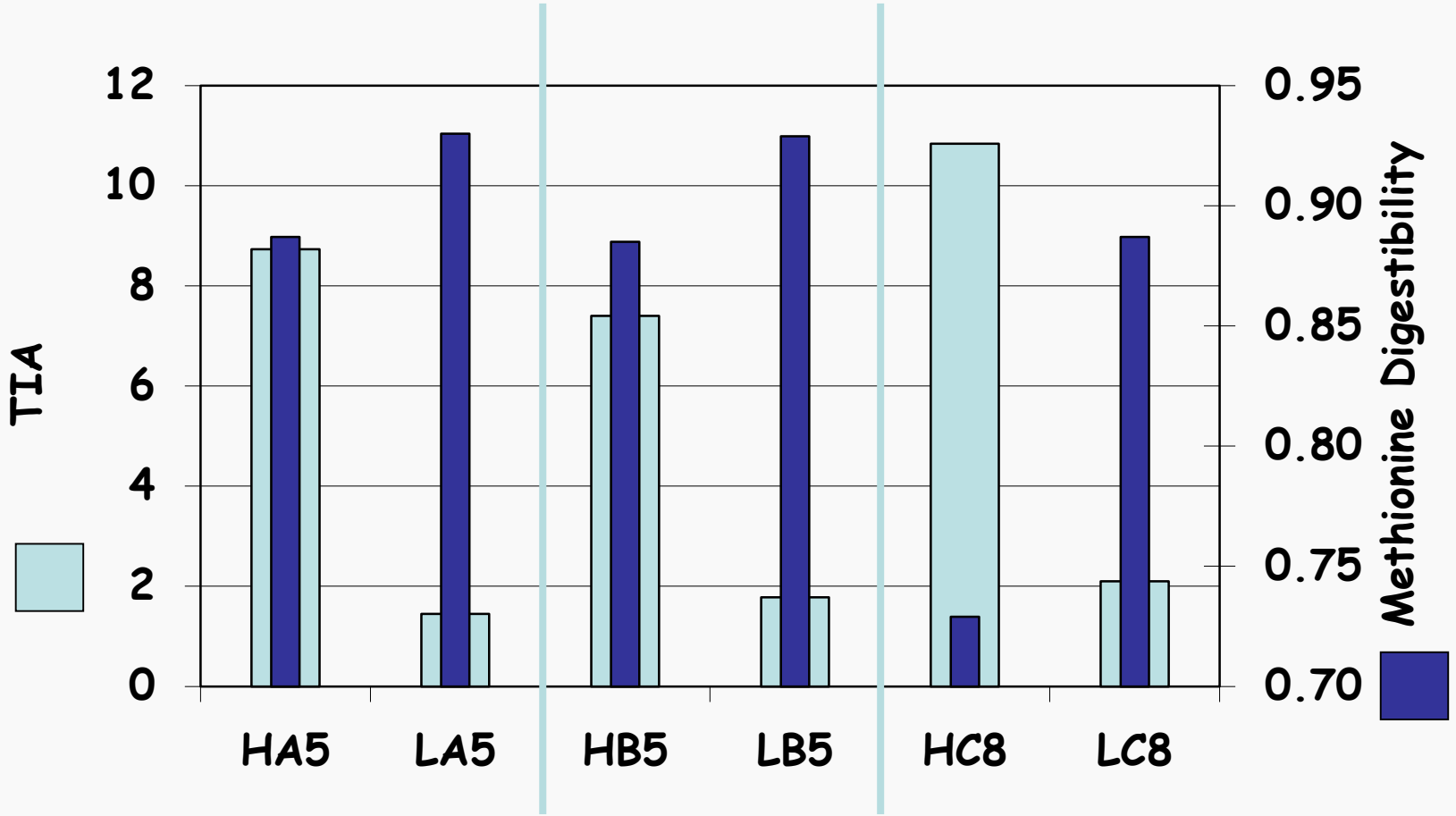
	A	B	C
Copra Meal		50	
Fish Meal	-	10	-
Soyabean Meal	7.5	13	13
Maize	20.5	5	20.5
Rice Bran		17	
LYSINE	-	-	0.64
METHIONINE	-	-	0.24
THREONINE	-	-	0.15
Premix	5	5	3.97



Plant secondary metabolites

- Most plants contain them
  - As a deterrent to predation
  - Many compromise digestibility
    - Lowering nutritional value
  - Good example: trypsin inhibitors
    - Reduce protein digestion
    - Technological solution is heat treatment
      - Denatures inhibitors

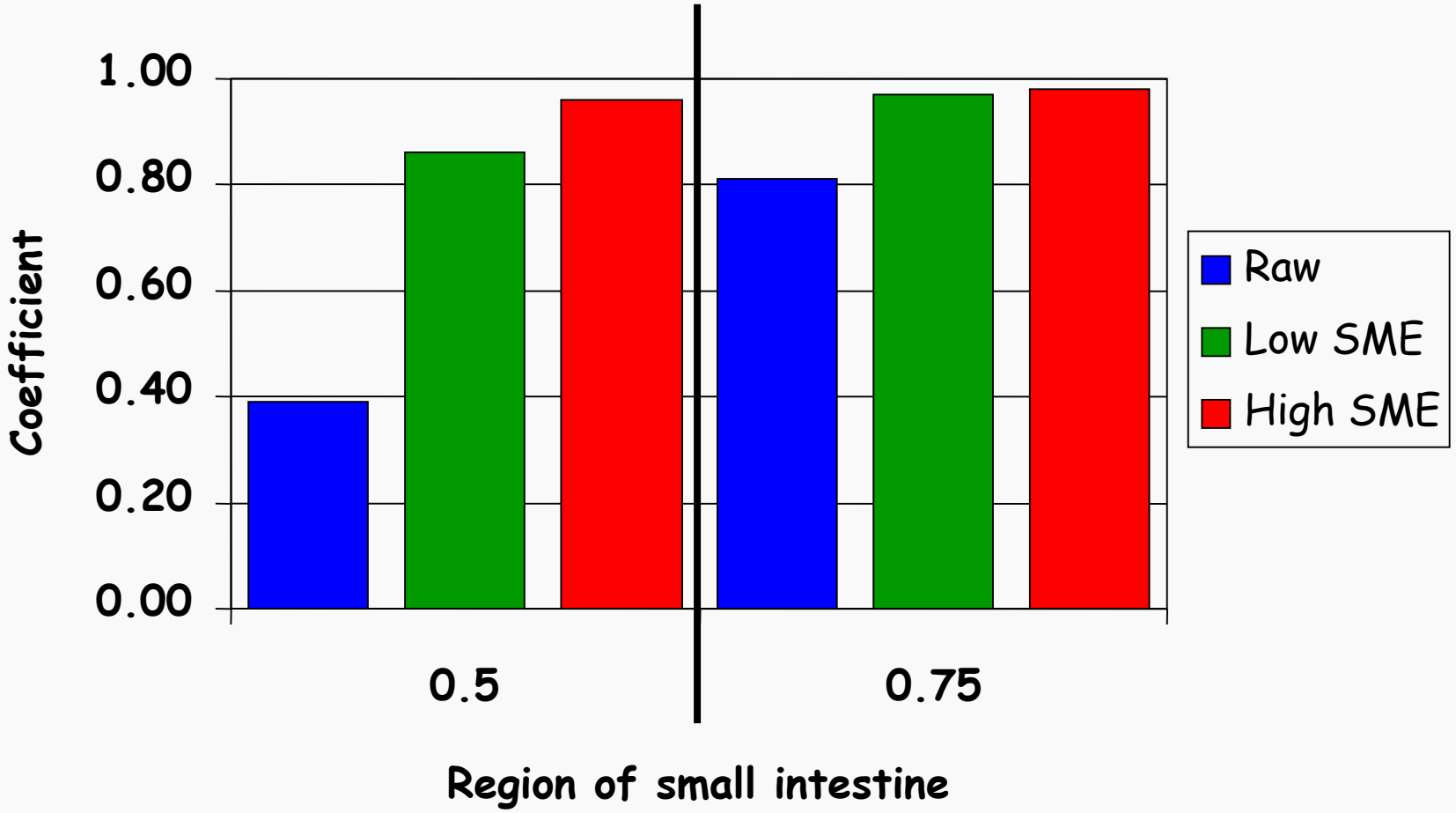
Plant improvement: breeding out TIA
Near isogenic lines of peas



Lines LOW in TIA have HIGHER levels of Methionine Digestibility

Joint with BBSRC John Innes Institute

Effect of extruding conditions on apparent starch digestibility



Plant alternatives

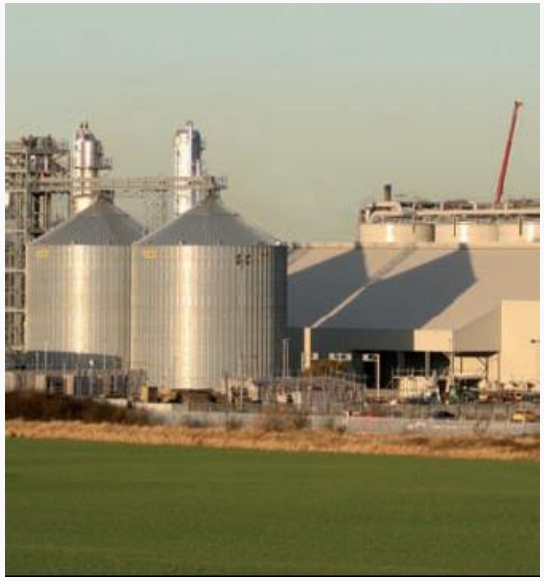
Reliance on primary raw materials

- **This CAN be criticised**
  - **Competition between humans and animals for food / feed**
  - **Solutions**
    - » **Plant co-products from primary processing.**

Animals eat plant co-products

The UK Renewable Energy Strategy

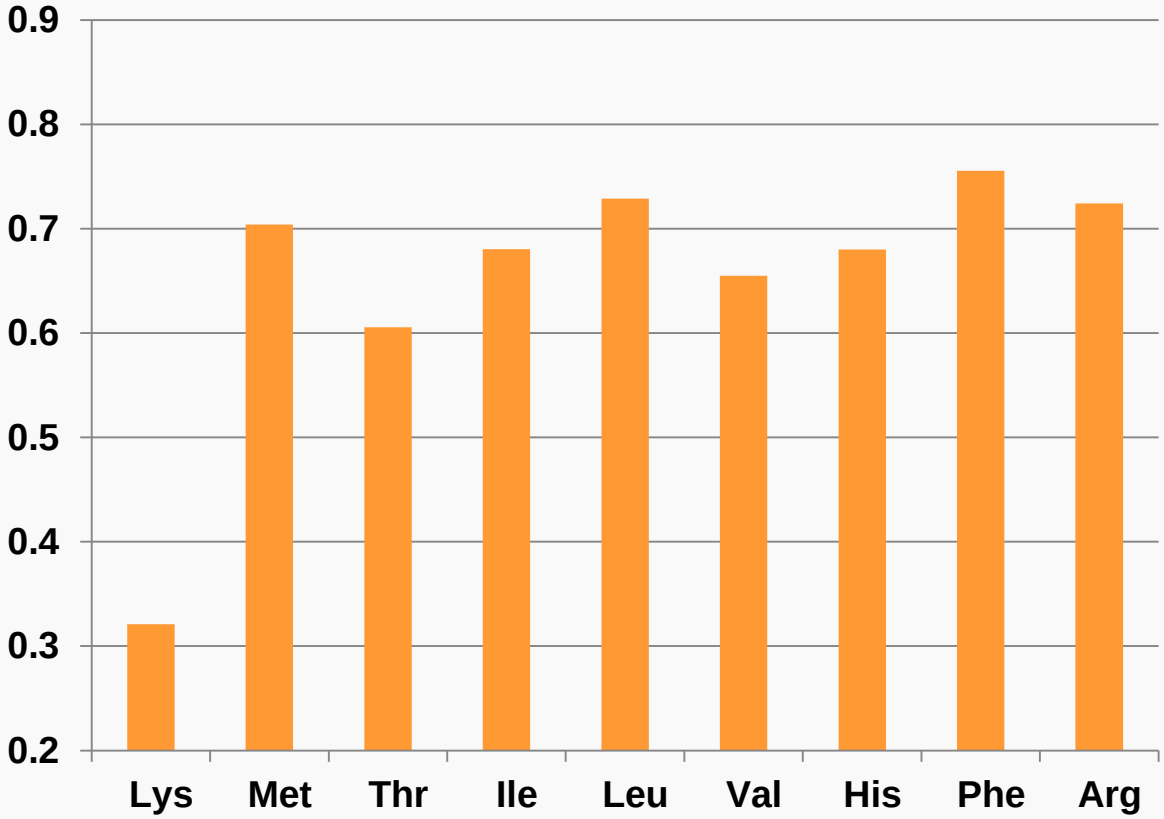
15% of our energy from renewable sources - by 2020



~1m T co-product p.a.

From bioethanol production

Nutritional value of co-product
Amino acid digestibility



Not good !
Particularly LYS
- Essential amino acid

Problems: High fibre, excessive heat during processing
Solutions : Exogenous enzymes, controlled processing

Conclusions.

Improving biological efficiency of animals still an important goal

- **Continued improvement in feed efficiency**
  - **Diet**
  - **Systems:**
    - **Reproduction, genetics, health, environment**
  - **Plant breeding**

Resource use efficiency will become increasingly important.

- **Technological interventions to improve nutritional value**

Thank you for your attention