



Food loss and waste : a systems approach with economic gain

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Growing and Protecting New Zealand



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Food losses				Food waste	
Farming industry	Postharvest	Food processing industry	Wholesaling Supermarkets	Food services	Domestic consumption

Supply side

Demand side

Loss in nutritional value

Global food losses and waste estimated at 1.3B tonnes p.a.

Commodity	Global food loss % p.a. (approx.)
Fruit & vegetables	45
Roots & tubers	45
Fish & seafood	35
Cereals	30
Oilseeds & pulses	20
Meat	29
Dairy products	15

Relative global food losses and waste

	Developed economies	Developing economies
Quantitative loss	670 m tonnes	630 m tonnes
Value loss	\$US680b	\$US310b
Percentage of production	~30%	25-40%

Value Chain Food Losses

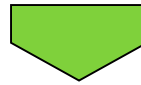
Developed
countries

Developing
countries

10%

Preharvest

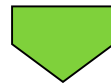
25-40%



5-20%

Harvest
Storage
Transport

30-50%



5-30%

Consumer

1-10%

Value Chain Food Losses

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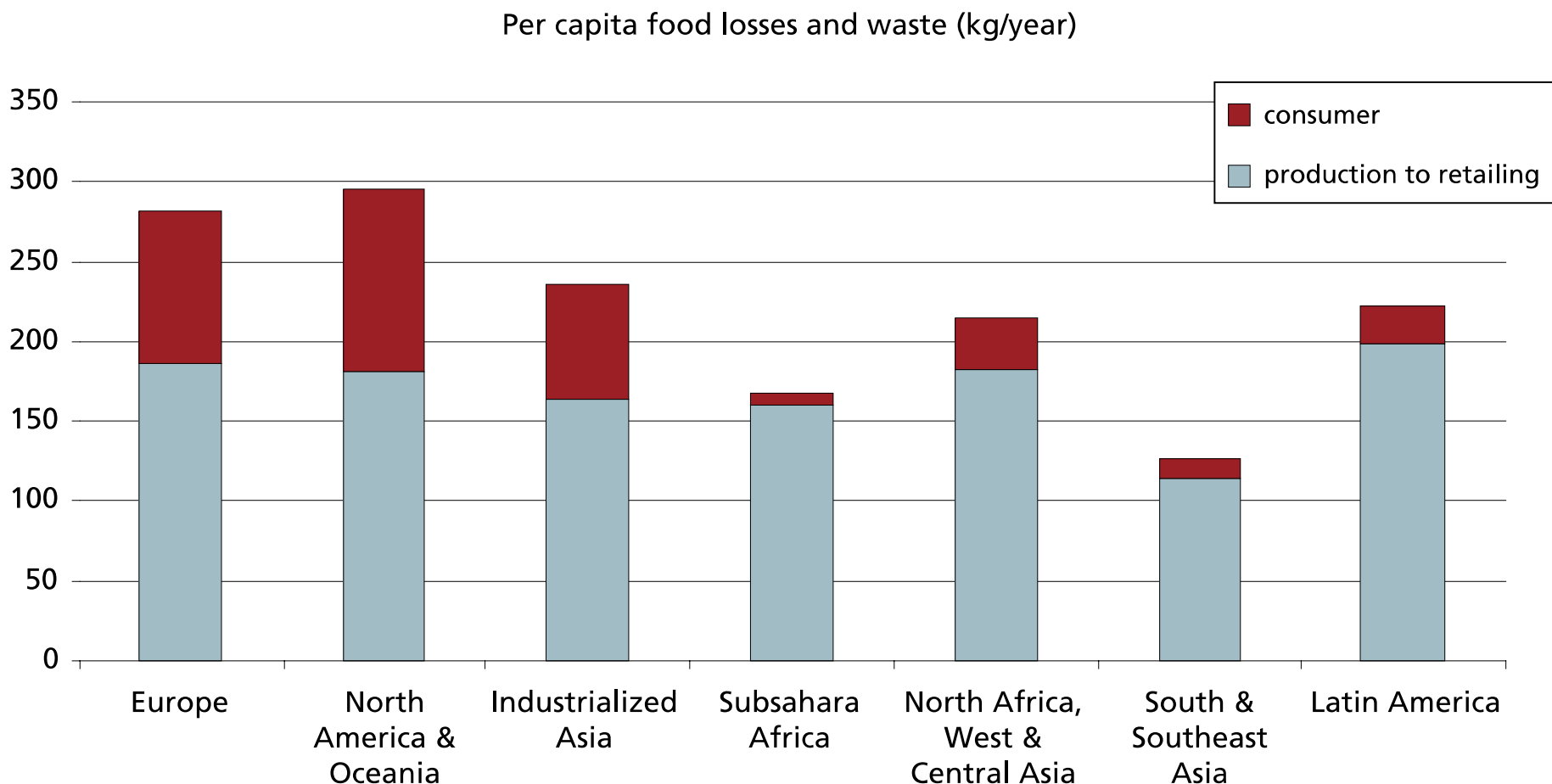
5-30%

Consumer

1-10%

Source: World Economic Forum, Driving Sustainable
Consumption, Value Chain Waste – Overview Briefing 2009

Per capita food losses and waste, at consumption and pre-consumption stages, in different regions



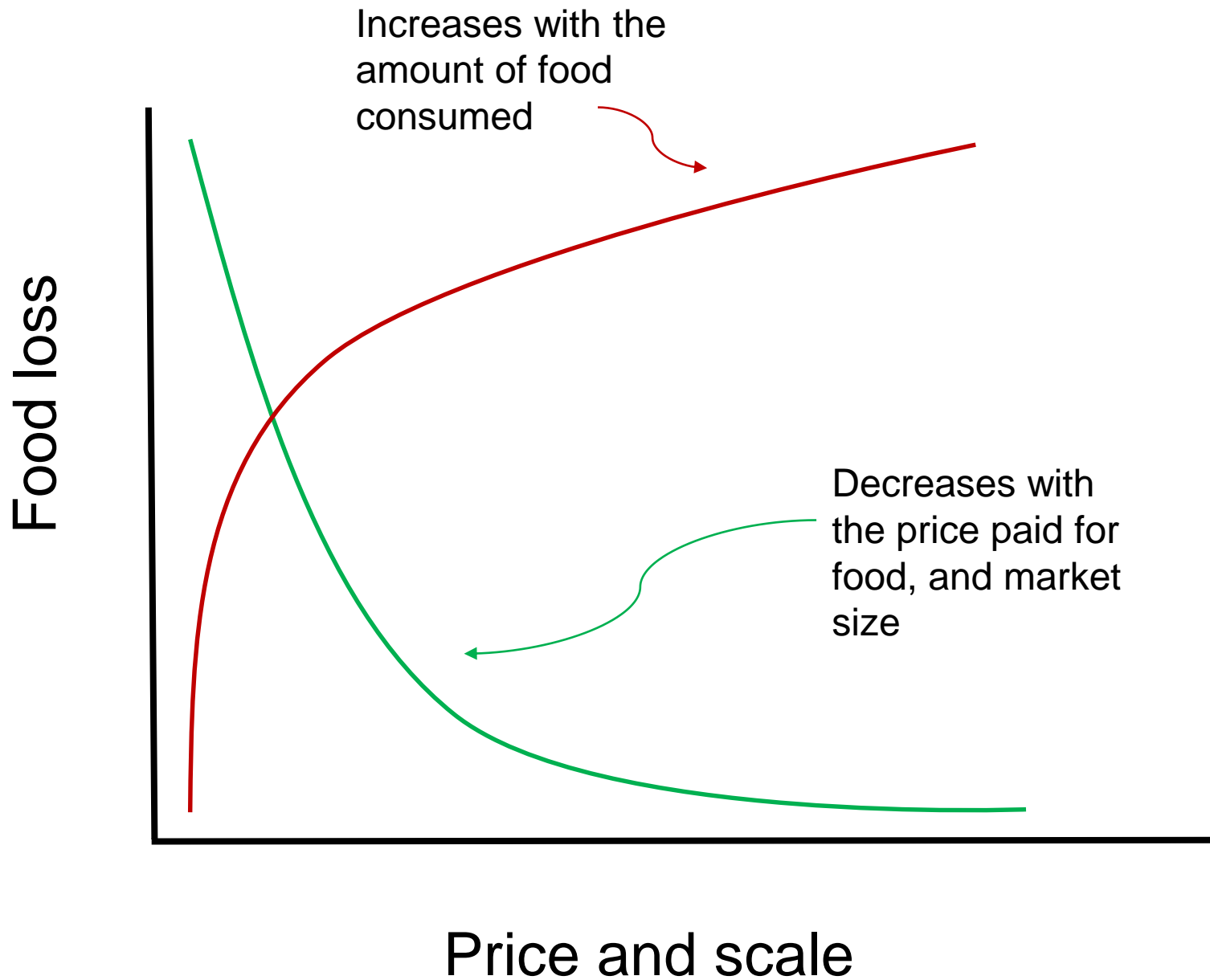
Some observations from economics....

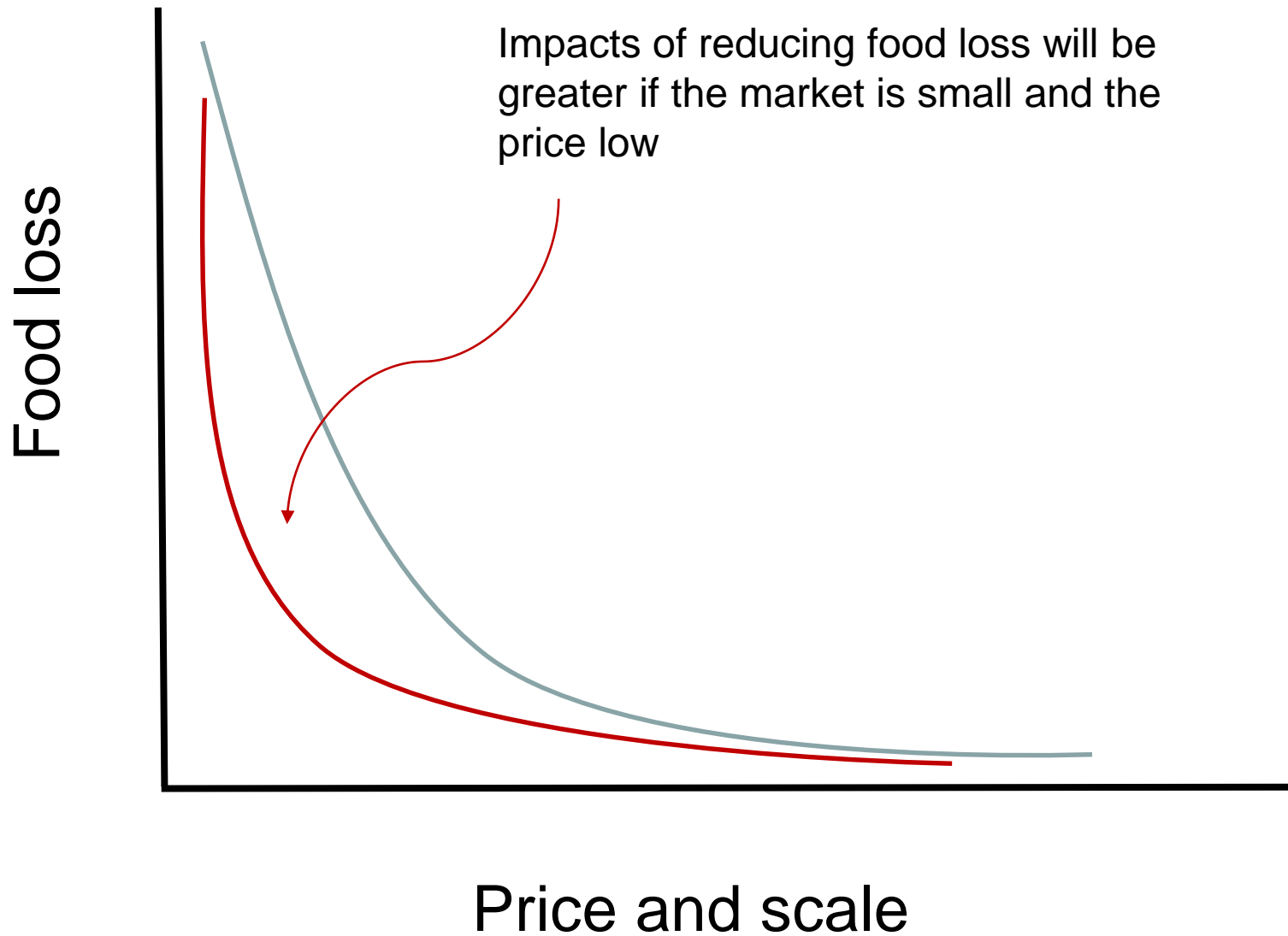
Food loss increases with:

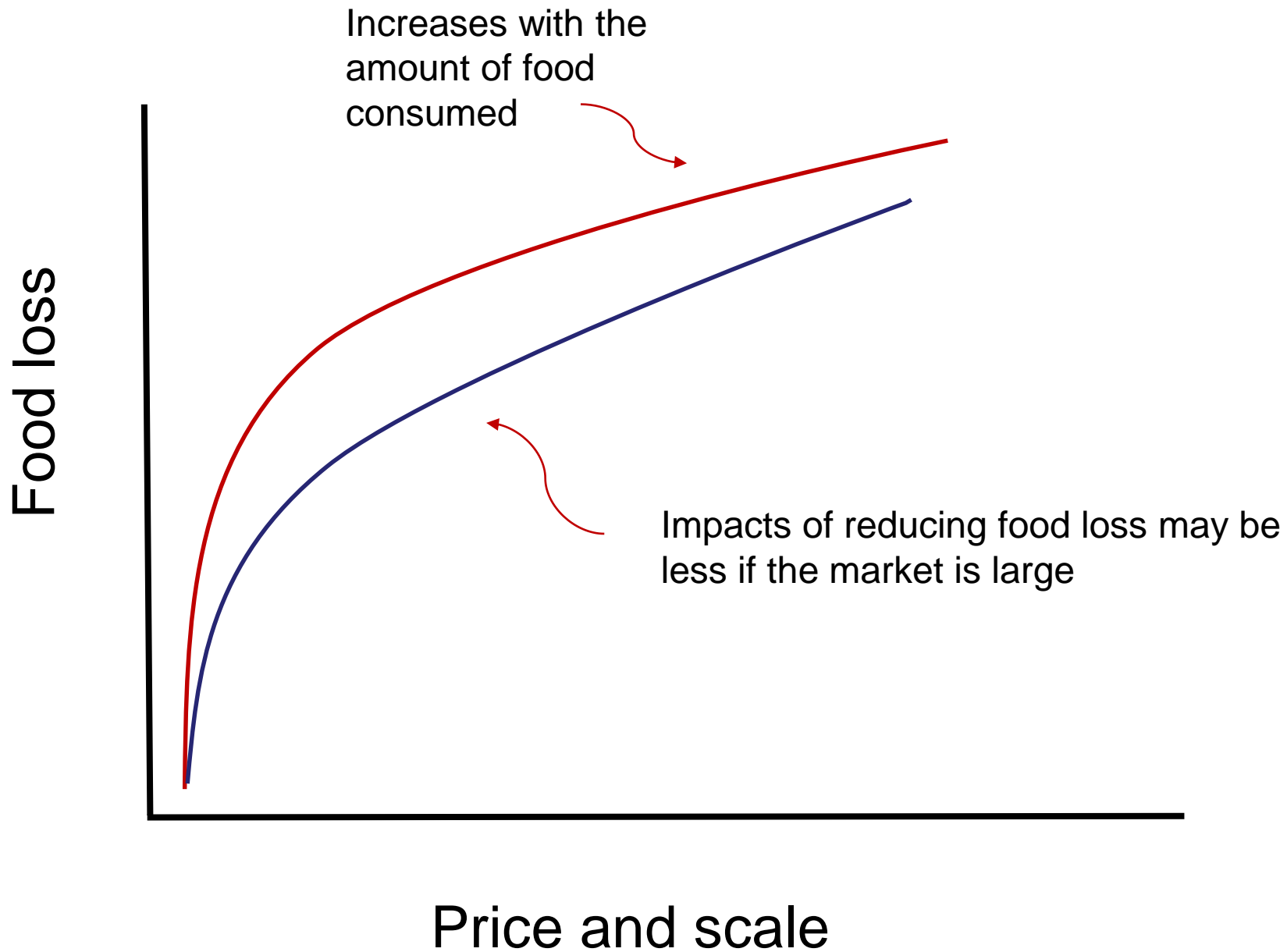
- the amount of food consumed
- the smaller the market
- the lower the food price

Food loss decreases with:

- the increased price of food
- the greater the market
- the less food is consumed







Thus there is less incentive for producers and suppliers to reduce food loss of low priced foods (commodities) than of high value foods.

However the impact of intervention may be just the opposite, and in terms of developing economies, intervention might have a larger impact.

So how should we approach the problem?

Two ways:

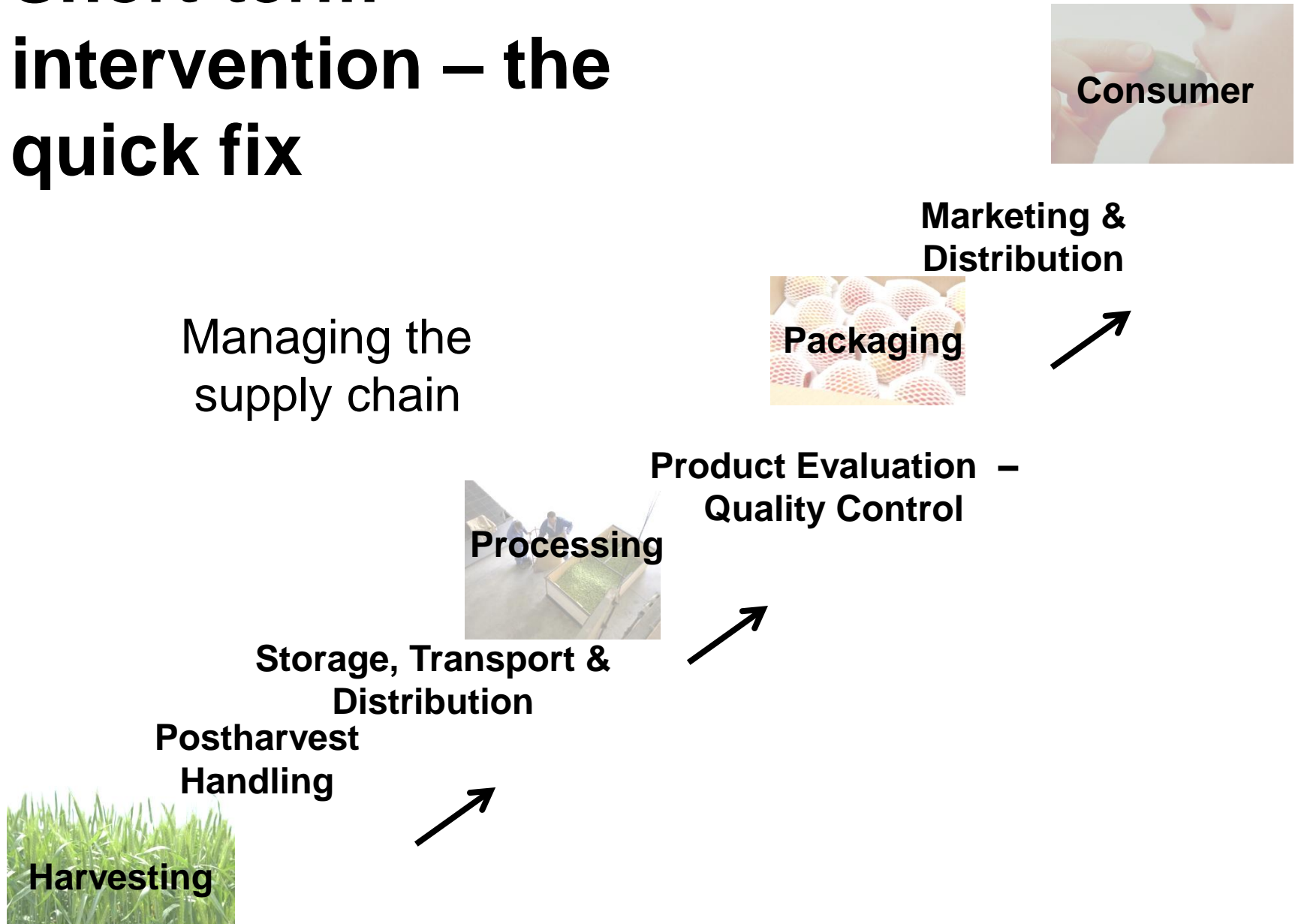
(1) **the quick fix**, solving problems in specific parts of the chain using science, technology - with transportability of developed country technology transforming developing practices.



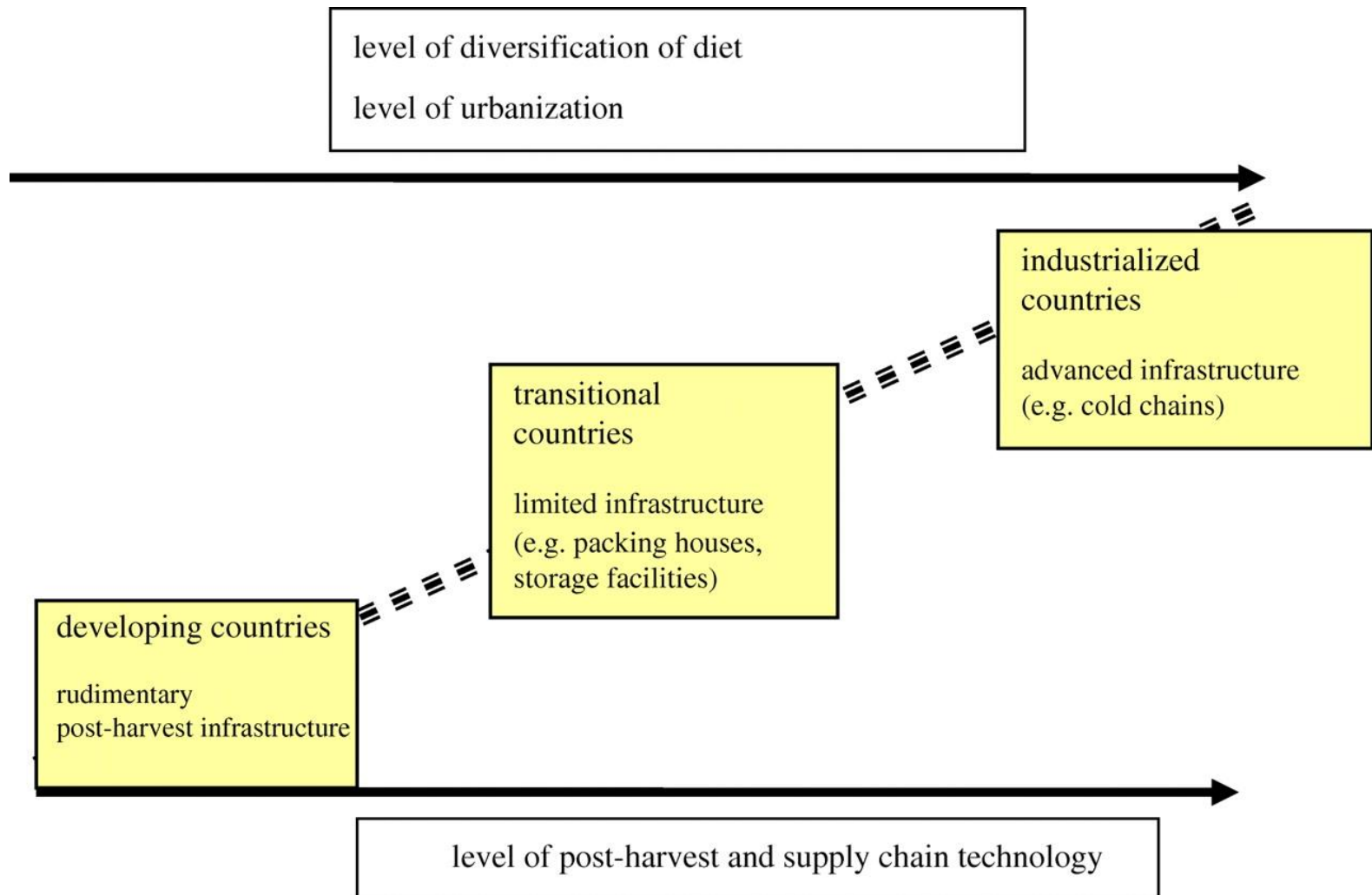
(2) **a more systemic approach** which tackles the whole supply chain, converting it to a value chain targeting high value products in export and domestic markets, thus providing economic gain



Short-term intervention – the quick fix

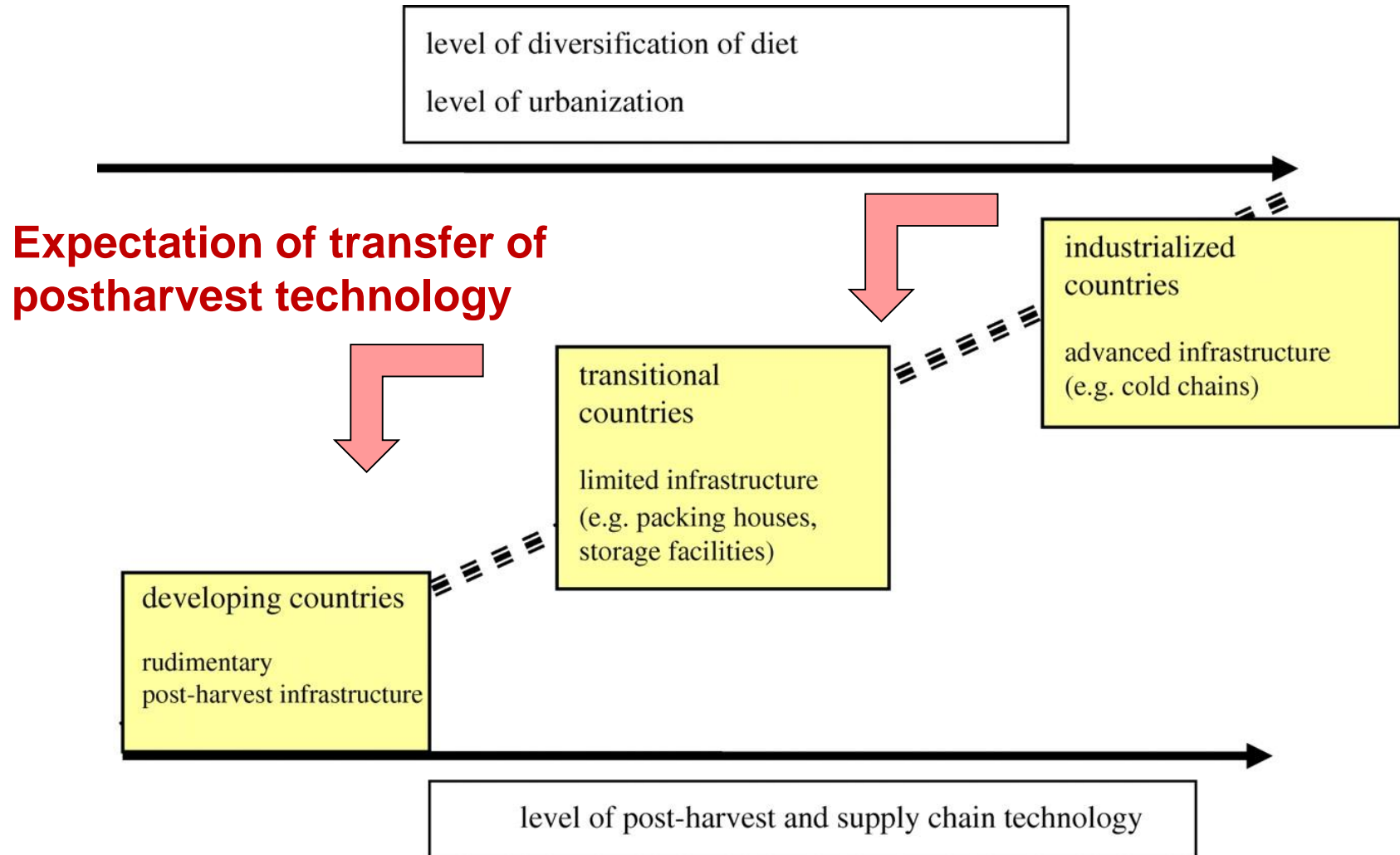


Schematic development of Food Supply Chains in relation to postharvest infrastructure



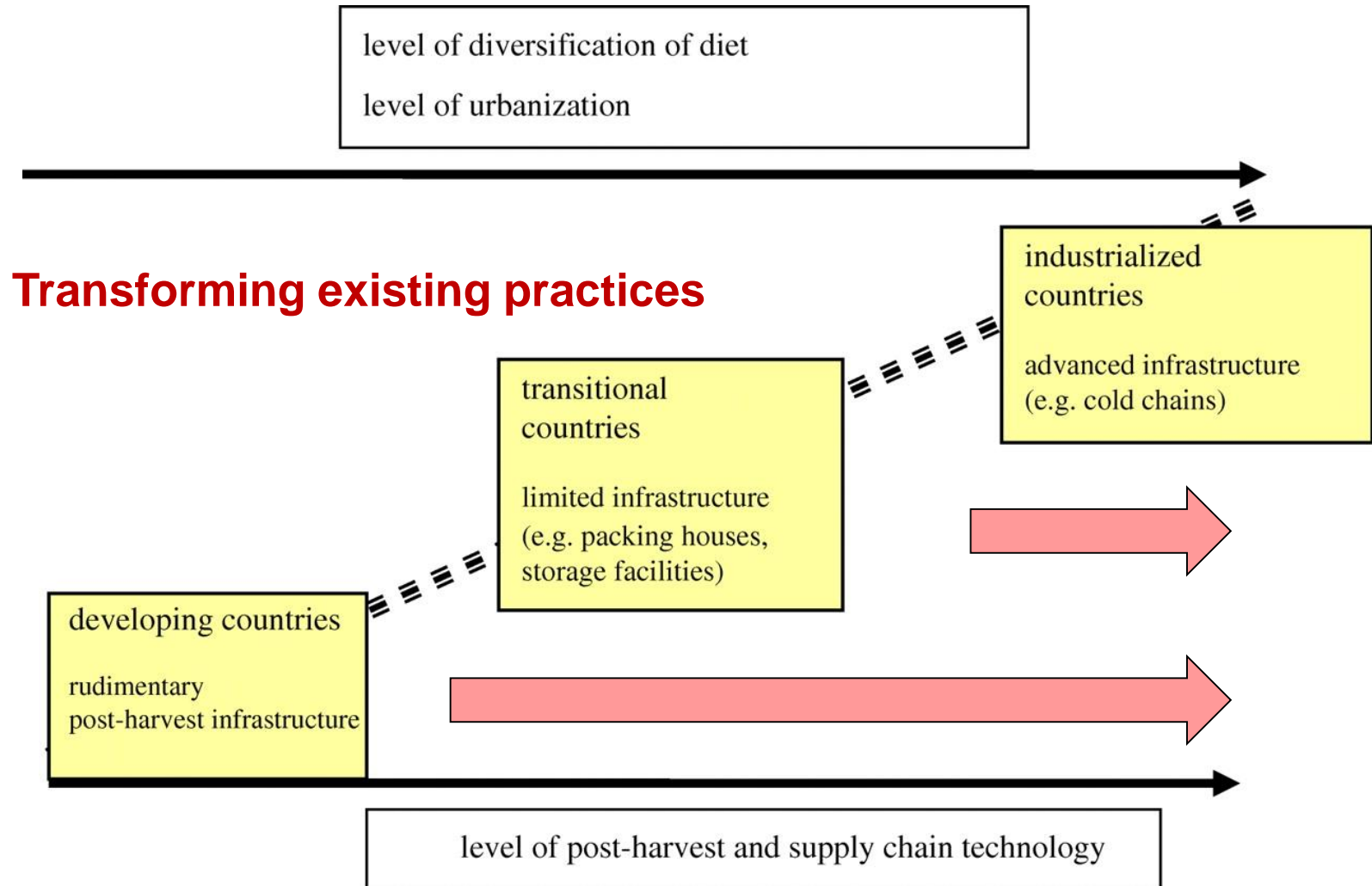
Parfitt J et al. Phil. Trans. R. Soc. B 2010;365:3065-3081

Schematic development of Food Supply Chains in relation to postharvest infrastructure



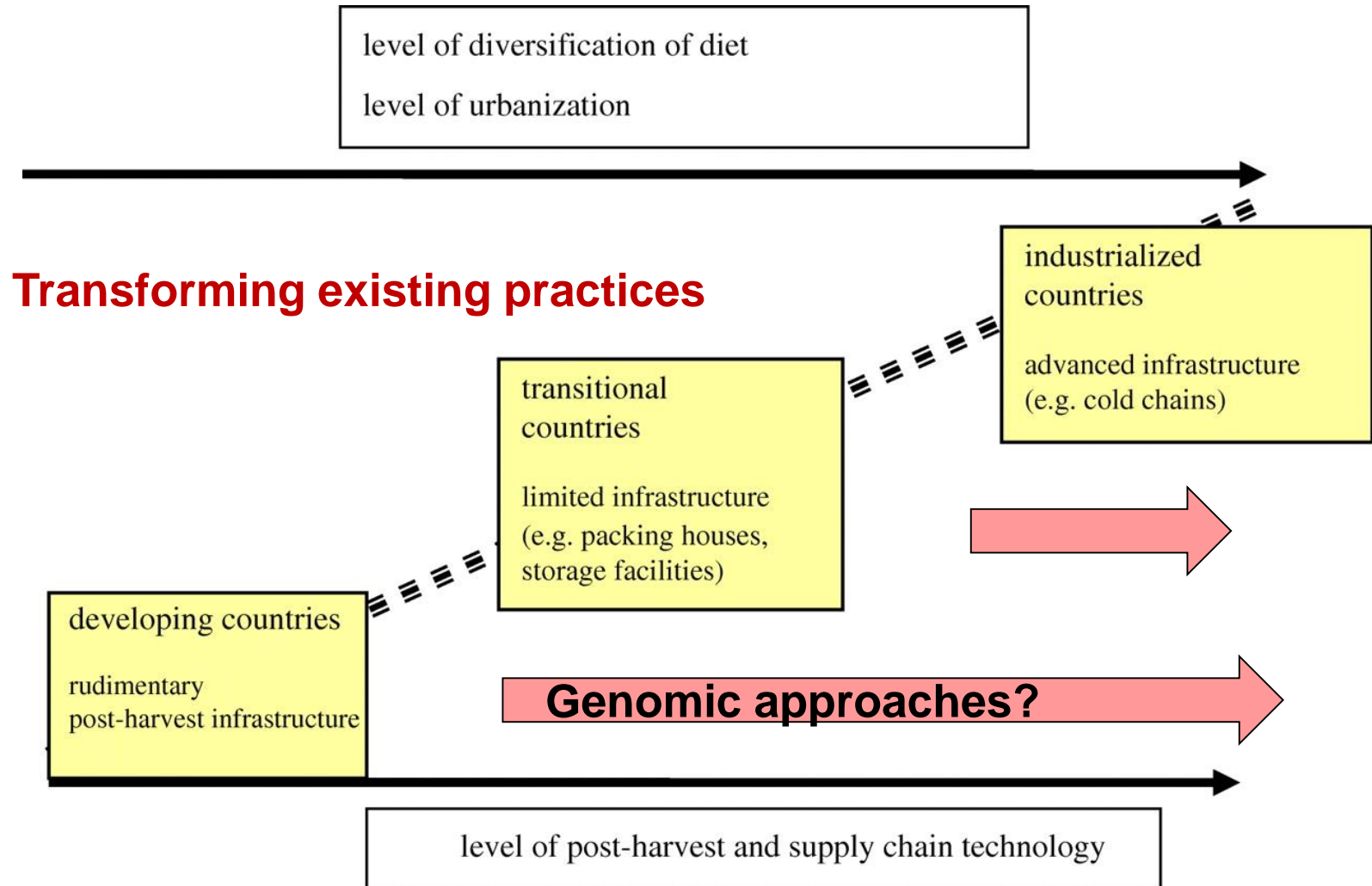
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Public-Private approaches: Ban on shark finning

It is illegal in New Zealand for a commercial fisher to remove the fins from any shark and discard the body of the shark at sea. This is a ban on wasteful behaviour.

The Ministry for Primary Industries (MPI) consulted with fisheries stakeholders and the public on a range of options for implementing a ban on shark finning.

Government and industry worked together to come up with a solution that effectively eliminates shark finning without undue impacts on fishing operations in the situation where shark finning does not occur and sharks are fully utilised.

Multiple benefits



The systems-wide approach

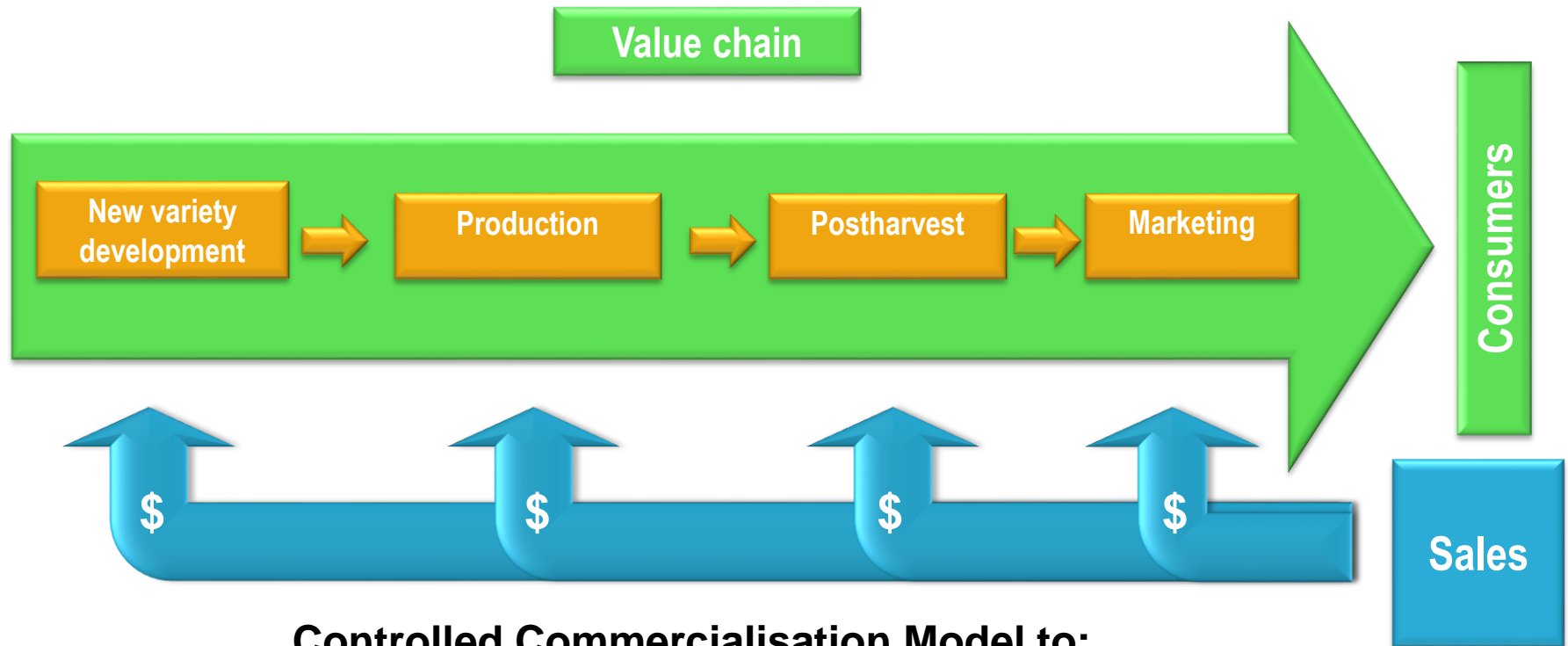
The core of a more systems-wide approach is to increase the efficiency of the supply chain with regard to food loss and waste, and in doing so, create greater economic value. **This is unlikely to be done effectively without public-private partnerships**

The systems-wide approach

A multi-dimensional systems approach to food loss and waste should be able to achieve:

1. a high value product chain,
2. reduction of on-farm and at-harvest loss and so optimising producer profits
3. optimisation of technology from harvest to the consumer to minimise waste with consequent profit gains
4. raising and maintaining the nutritional value and supply of food products as commodities
5. development of new industries in extracting value from waste material

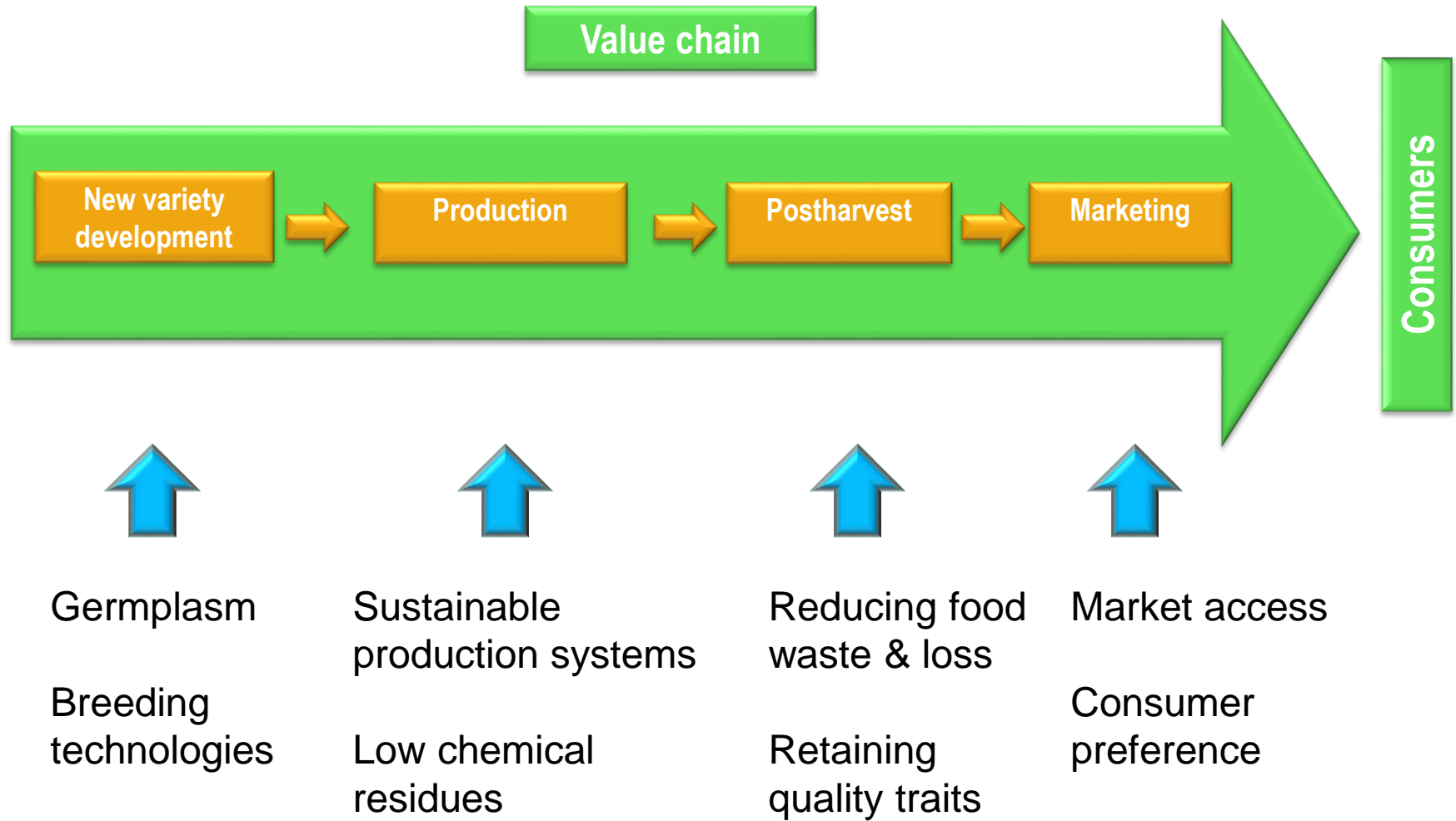
Value Chain: enhancing commercial value



Controlled Commercialisation Model to:

- IP protection (e.g. plant varieties)– competitive advantage
- Provide premium returns to the value chain

Value chain: input of science-based agricultural services



A large school of fish, possibly sea bream, swimming in clear, shallow water over a sandy bottom. The fish are mostly light brown and orange, with some darker individuals. They are densely packed in the center and spread out towards the edges of the frame. The water is a clear, light greenish-blue, and the sandy bottom is visible at the bottom of the image.

**Reducing loss
and
increasing value**

“Post-harvest losses in small-scale fisheries can be among the highest for all the commodities in the entire food production system. **Fish losses caused by spoilage** are estimated at 10 to 12 million tonnes per year, accounting for around 10 percent of the total production from capture fisheries and aquaculture”

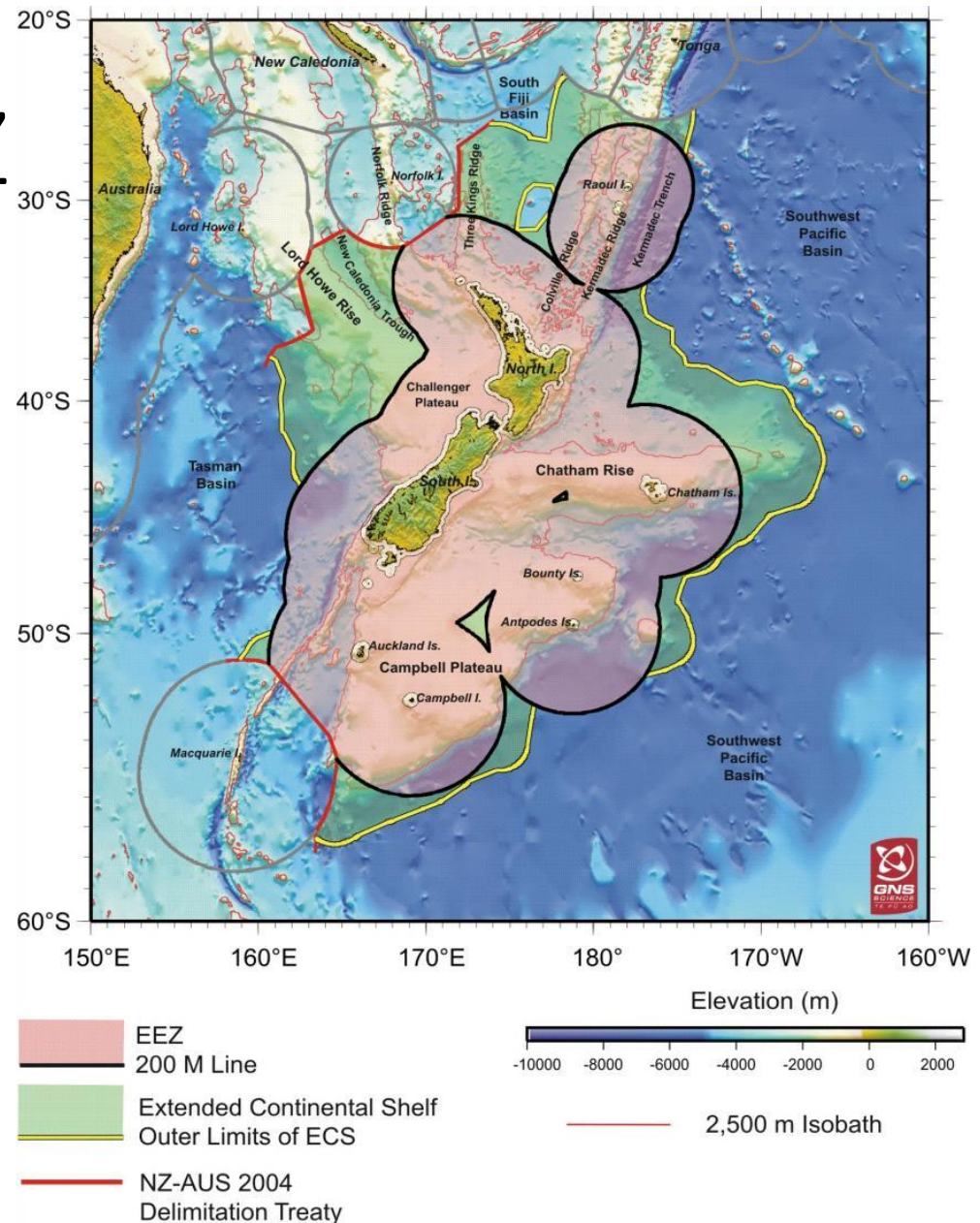
“**Physical loss** also results from the discarding of bycatch.”



New Zealand Commercial Fisheries

New Zealand's EEZ

- EEZ & Territorial Sea
 - 4.4 million km²
(world's 5th largest)
 - 15 times land mass
 - 72% below 1000 m
- Coastline: 15,000 km
- 16,000+ marine species
- 1,300 fish species



The outer limits of the New Zealand ECS north of New Zealand are subject to the delimitation of boundaries with Fiji, Tonga and France in respect of New Caledonia

New Zealand has a quota management system (QMS) used to manage resources – there is a wide range of QMS species



In most New Zealand fisheries, around 90% of the catch comprises valued commercial species. These include target species, as well as other valued species as bycatch.

Strict reporting and catch balancing procedures apply to all quota species. All quota species, including those taken as bycatch, must be landed and reported against the appropriate catch limits



In addition, new harvest technology is reducing bycatch and increasing the proportion of undamaged, low-stressed fish, which provide a higher value fresh product



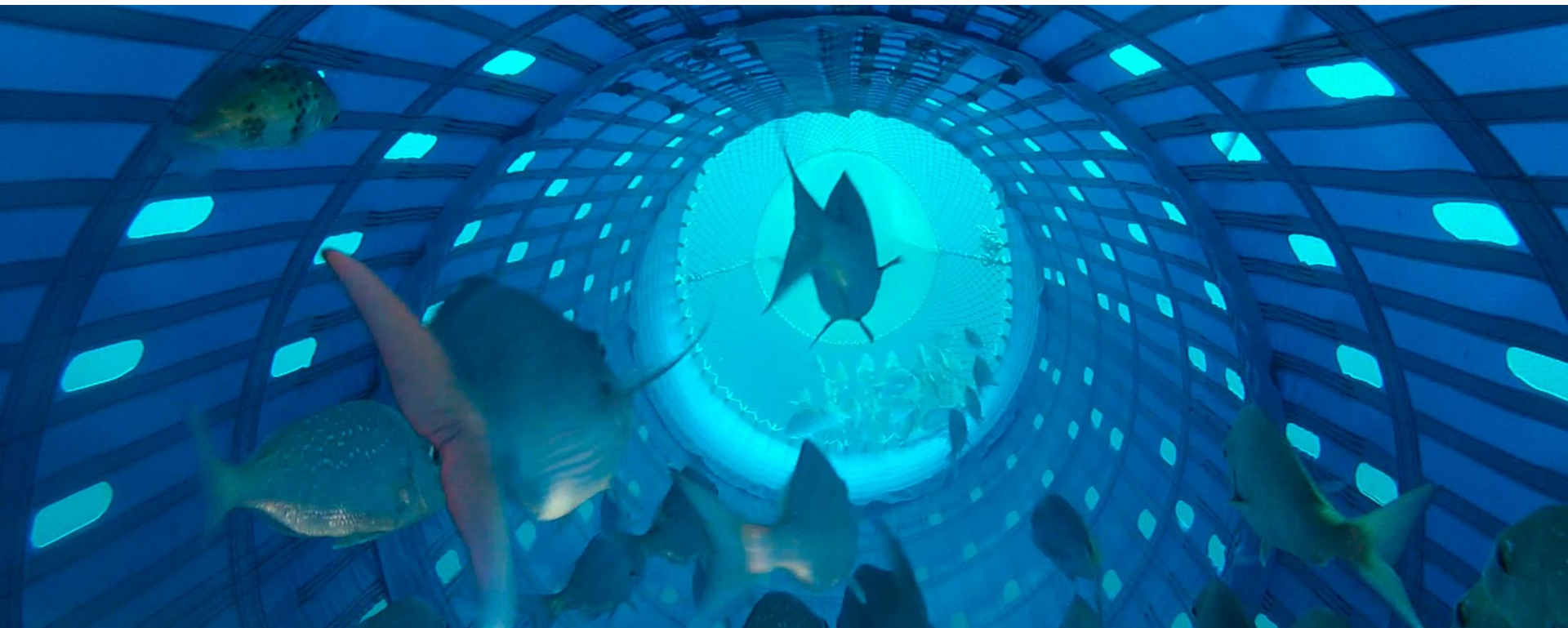


Ministry for Primary Industries
Manatū Ahu Matua



Plant & Food
RESEARCH

RANGAHAU AHUMĀRA KAI



we live for the sea



SUSTAINABLE SEAFOOD



Reducing loss and increasing value – a public-private approach

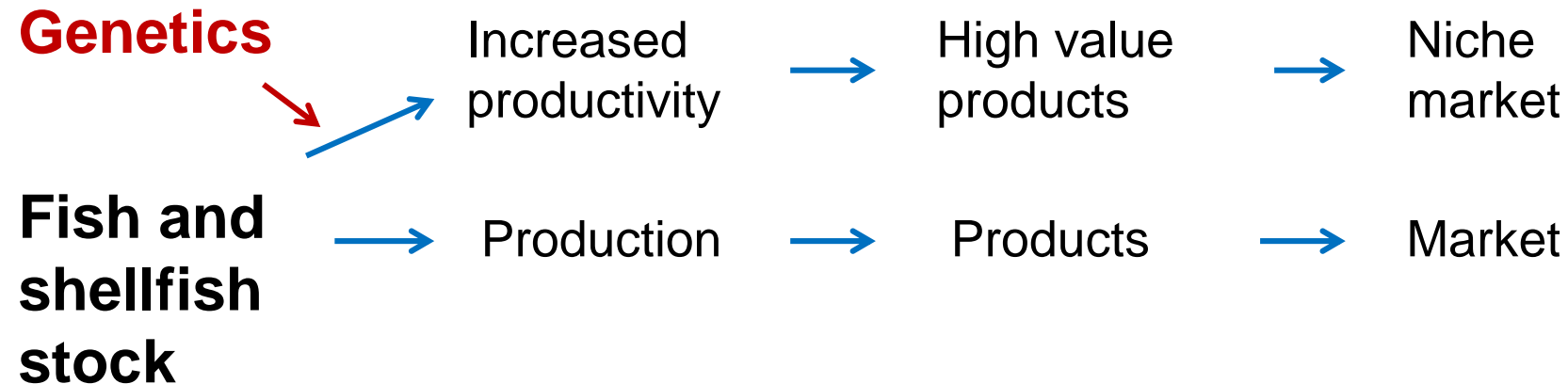
- 
- A large school of colorful fish, including various species of snappers and groupers, swimming in clear, shallow water. The fish are densely packed, creating a vibrant scene of orange, yellow, and pink hues against the greenish-blue water.
- >> Managing resource**
 - >> Reducing bycatch**
 - >> Reducing spoilage**
 - >> Increasing value of export product**

The systems-wide approach: Genetics can empower producers with the material and information needed to produce superior stock and improve fish and shellfish performance.



This can raise value at the start of the value chain, with consequent impacts through to the consumer.

Commodity → High Value Product

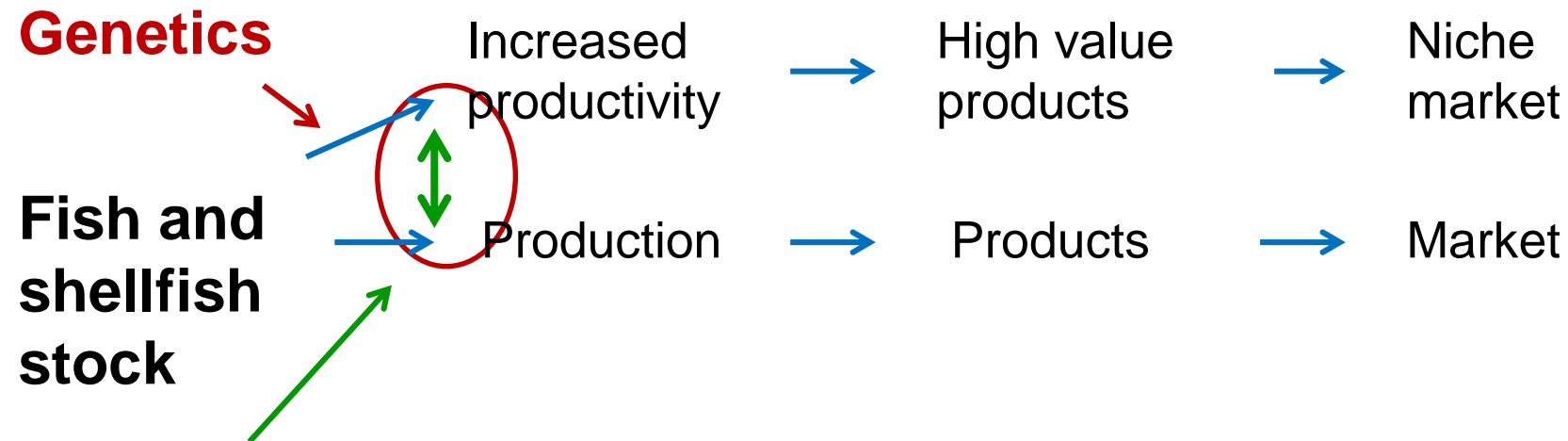


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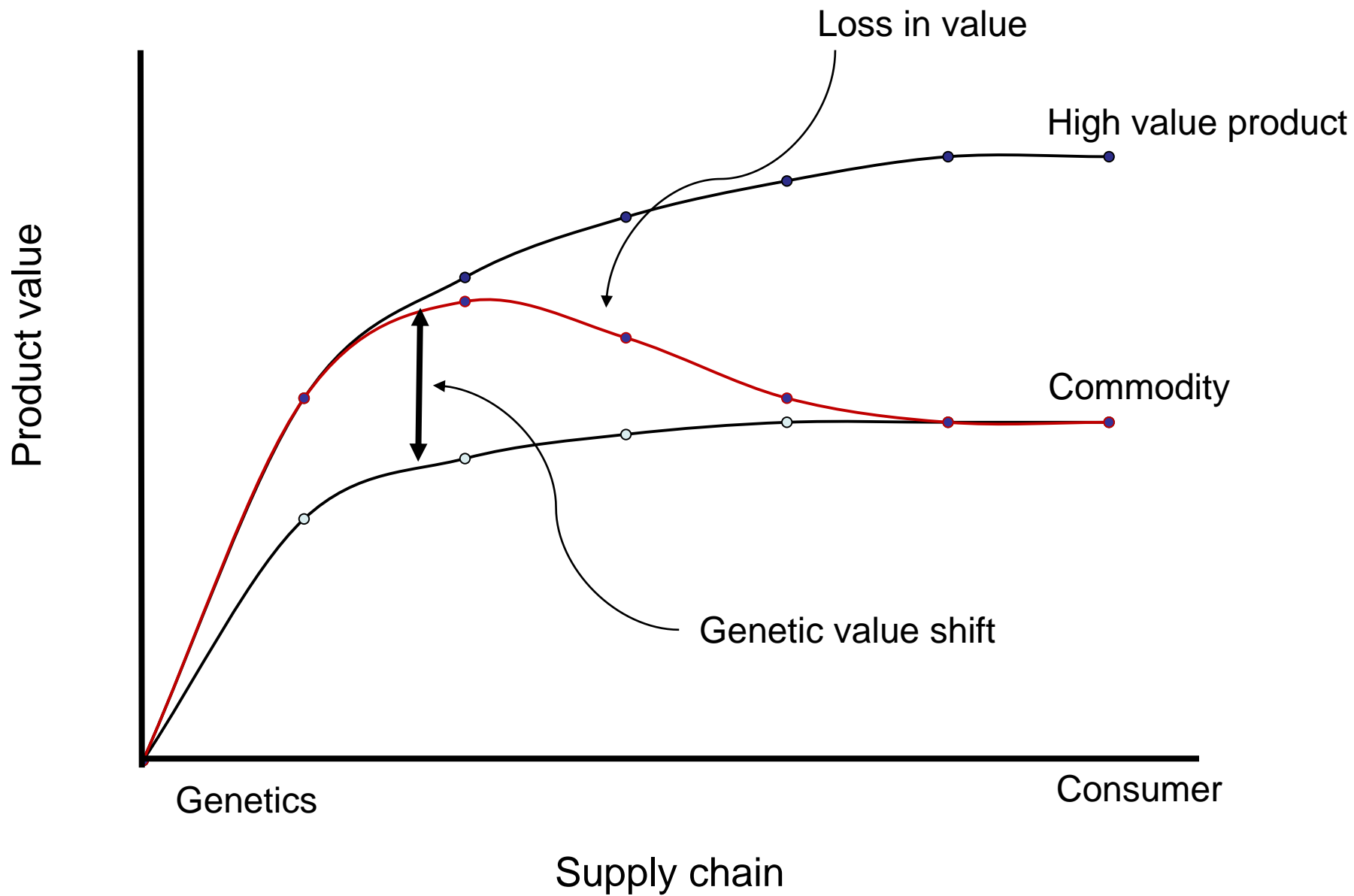
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Commodity → High Value Product



The Genetic Value Shift : Injecting high value into the whole supply chain



Public-private partnership on mussel breeding (NZ Primary

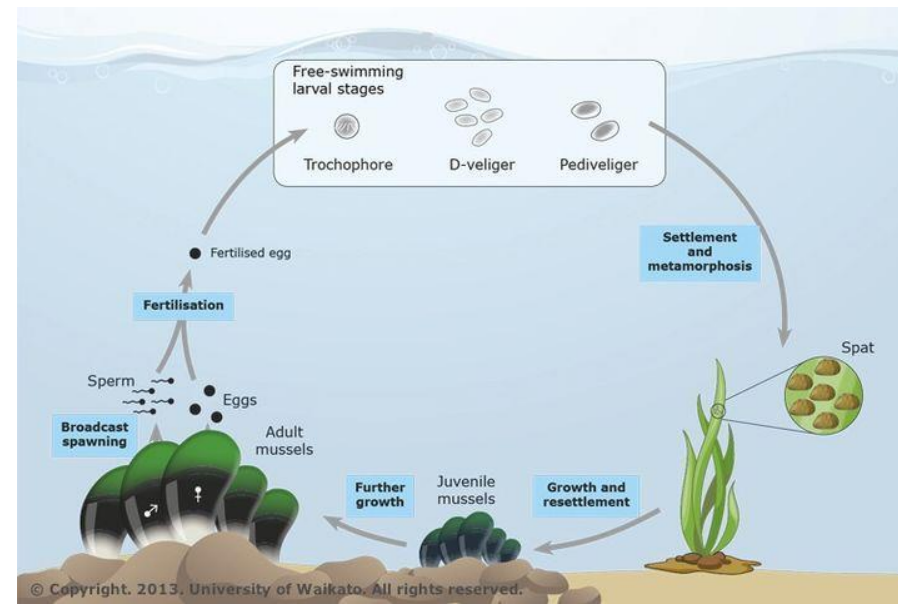
Growth Partnership programme)

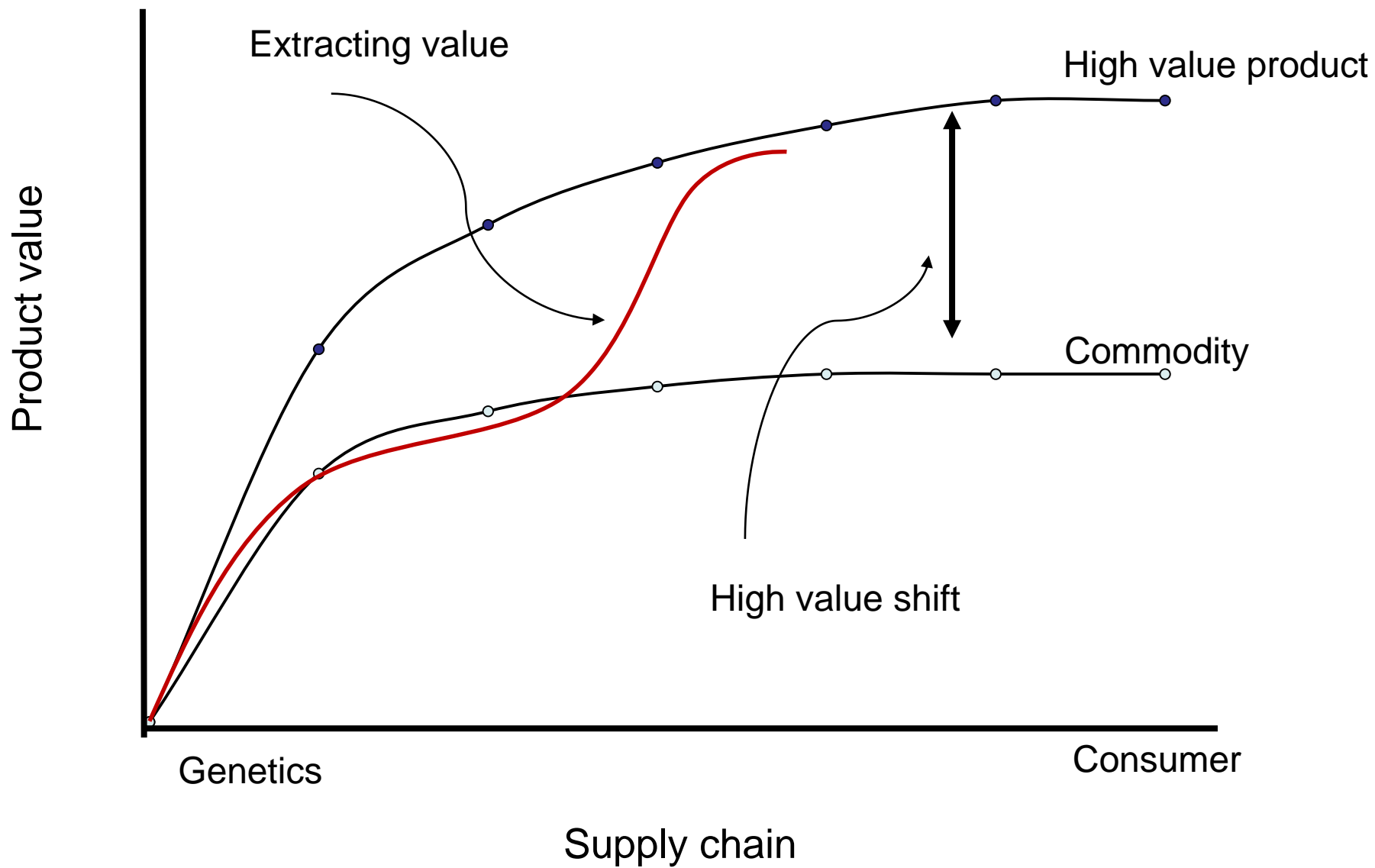
Wild-caught spat makes it difficult to deliver a consistent supply of mussels with the characteristics demanded by premium markets.

Therefore, selective breeding of mussels in captivity is essential. Wild spat sources allow little control over the quality of the crop, whereas selectively-bred spat can be produced from the very best parents.

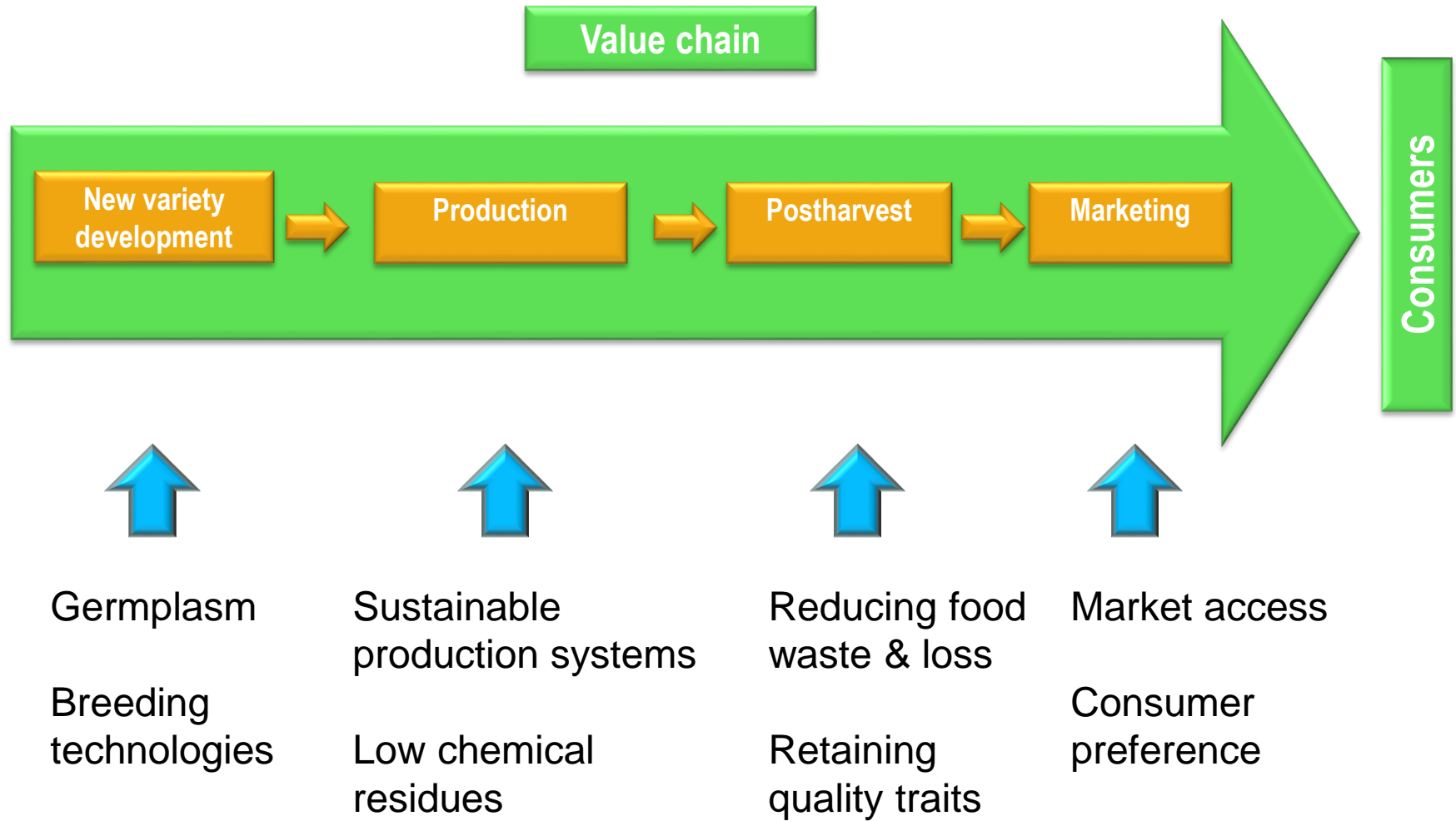
Research into selective breeding is the focus of this programme along with the development of hatchery technology to breed and hatch improved spat.

This research, innovation in hatchery technology and enhanced capability will provide significant economic and environmental returns, providing a more uniform product and reducing food loss.



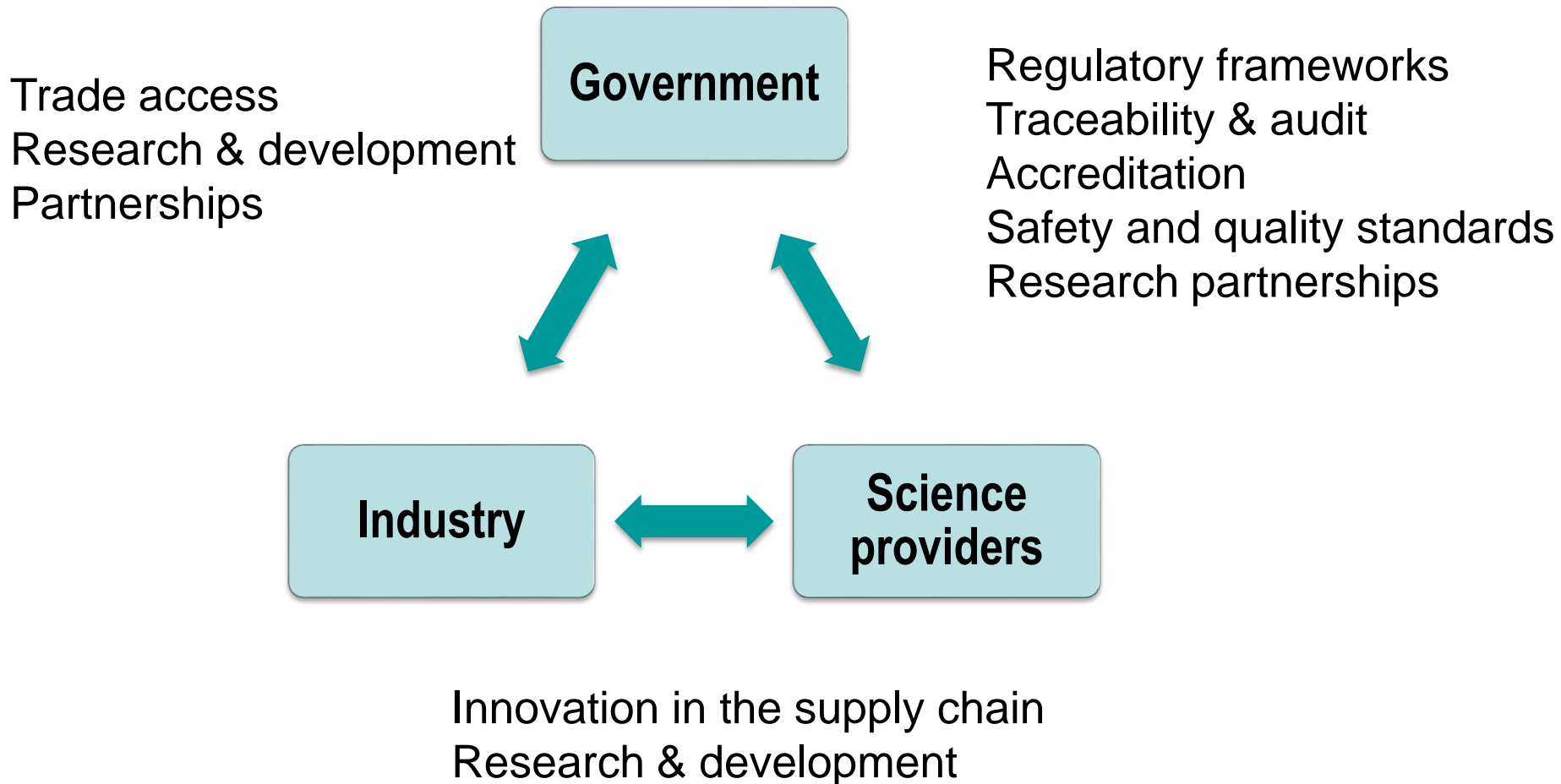


Value chain: input of science-based agricultural services



Summary:

Reduction in food loss and waste can be substantial, and enduring if a whole-of systems, partnership approach is undertaken. This will provide benefits: **nutritional sustenance**, **supply chain efficiency**, and **economic gain**.





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