

Converting research into business opportunities

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INNOVATION = IP + COMMERCIALIZATION

Nurturing innovation is a process

In the university context, the process is to transform intellectual resources (thoughts, ideas and insights) into intellectual assets

Intellectual assets become **intellectual property** (“IP”) through legal protection.

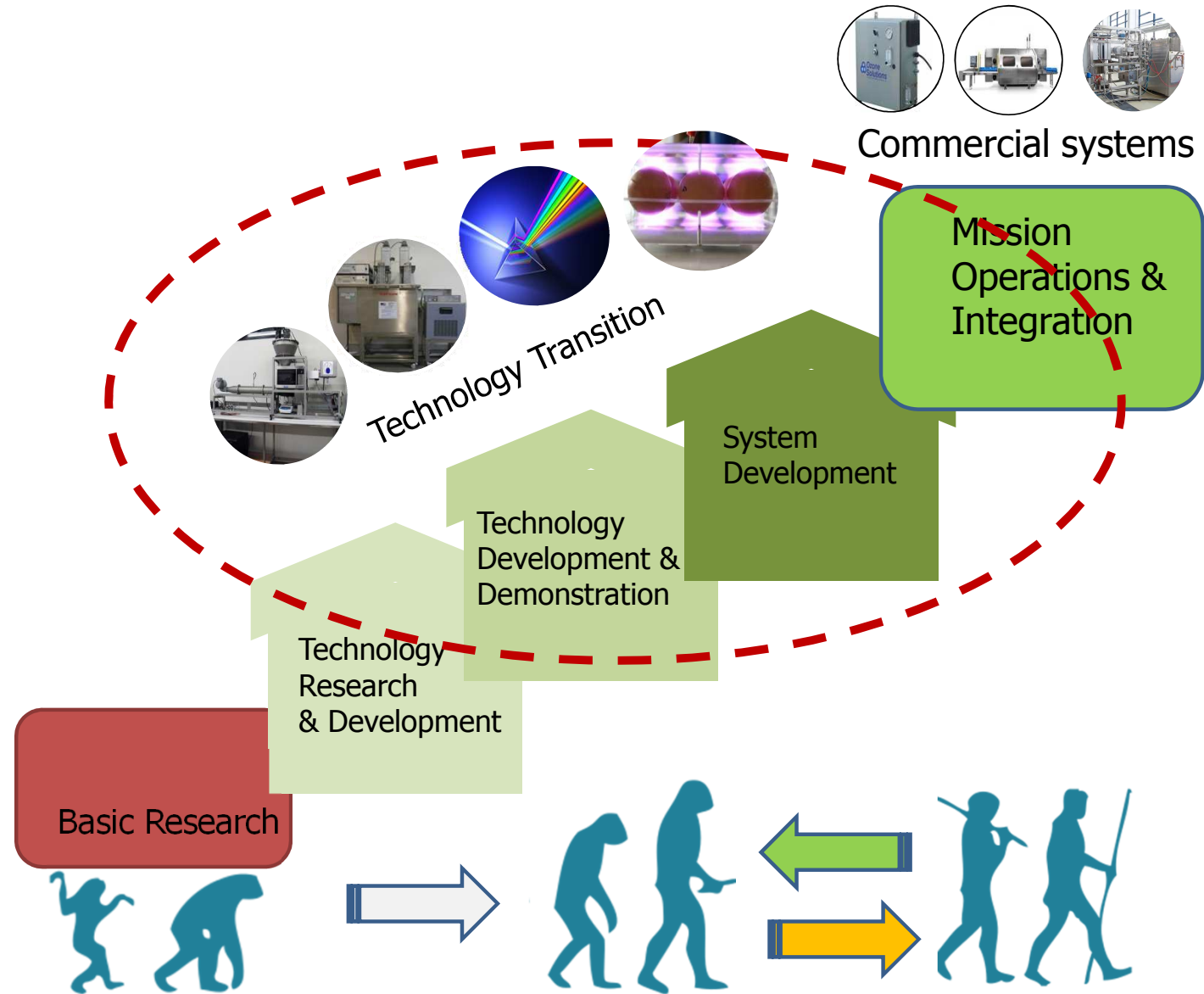
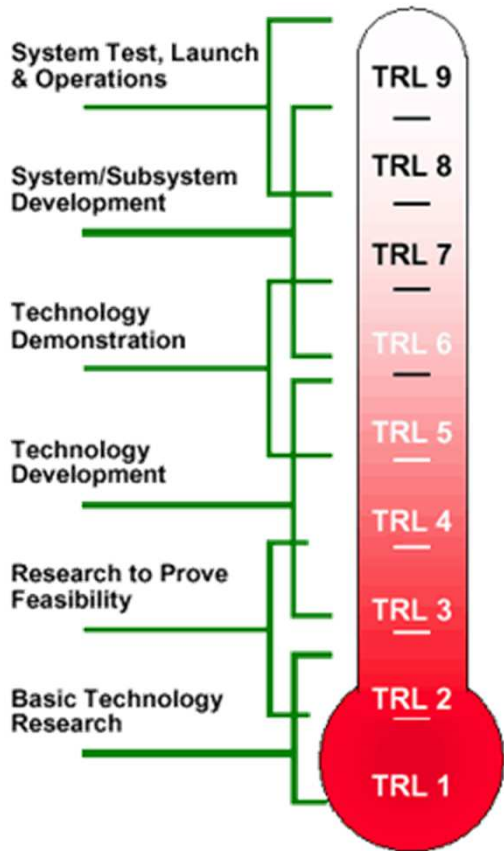
IP defines the value on which a company depends for successful commercialization.

Innovation drivers in the agri- food industry

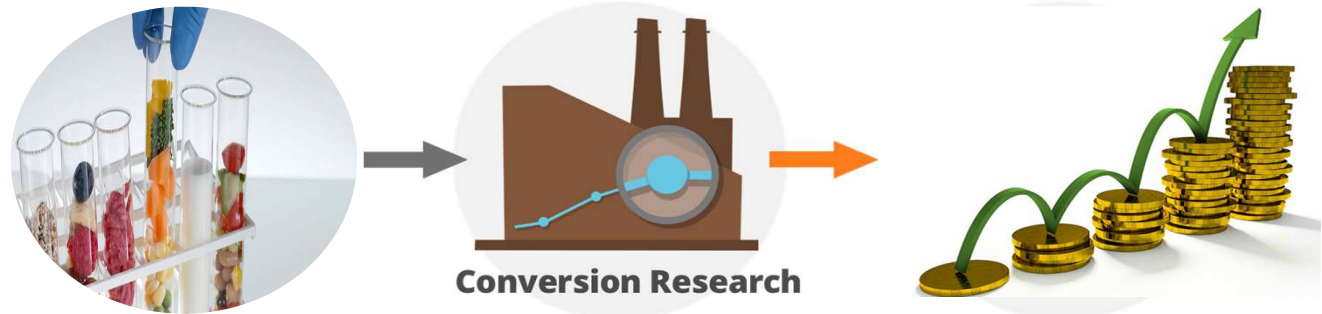
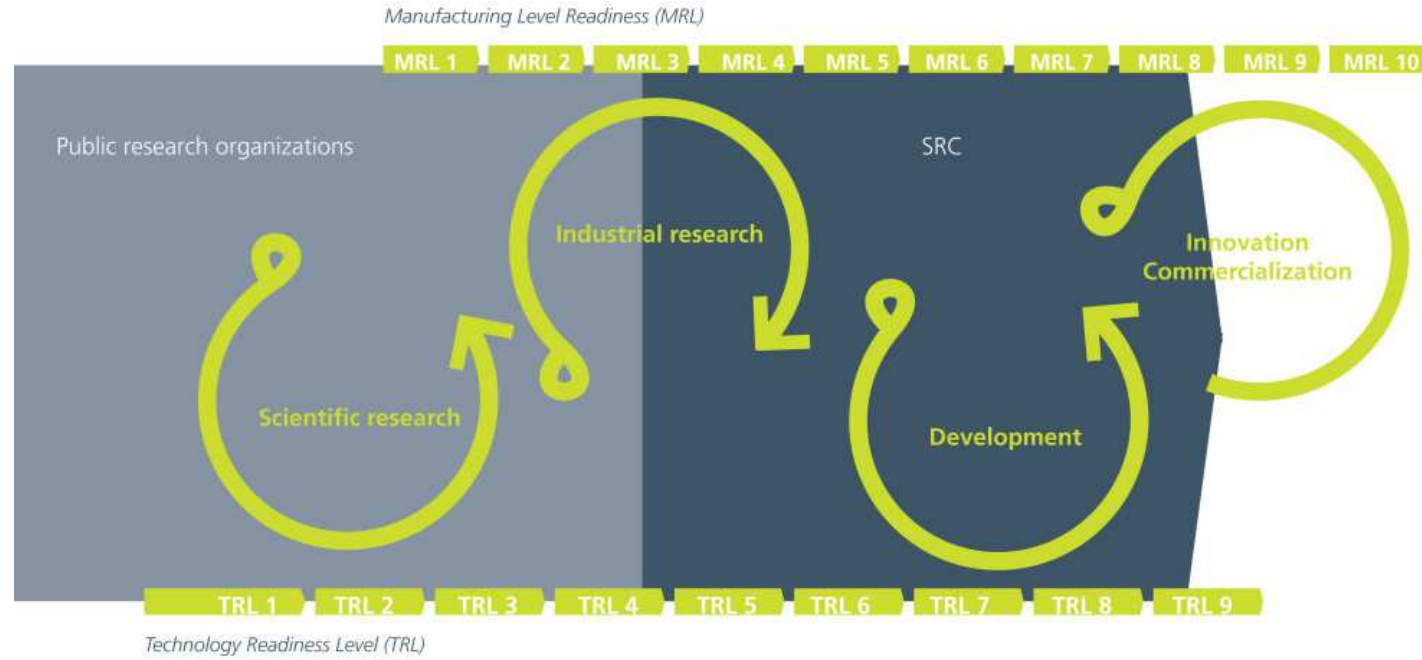


- Health / Nutrition
- Enhanced shelf-life
- Valorisation of by-products
- Implementing sustainability across the whole agri- food system
- Consumer led – food product innovation

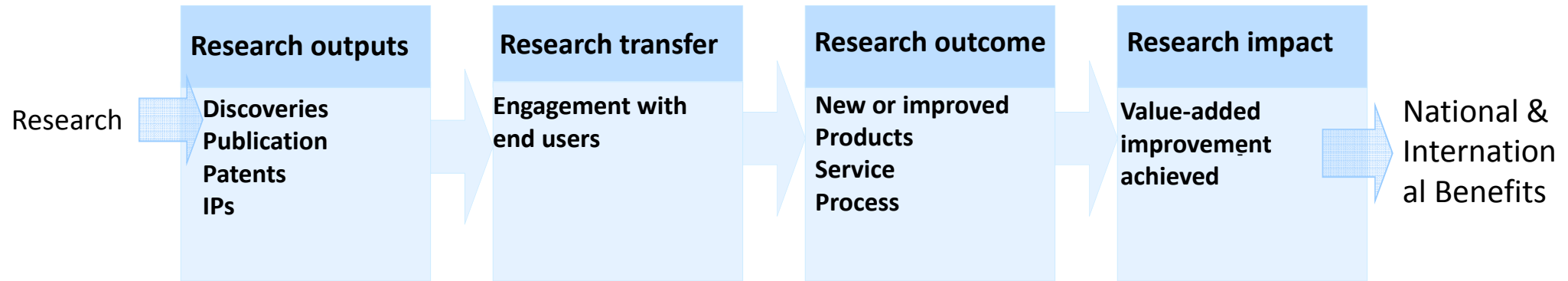
Innovation



Research Vs Business Opportunities

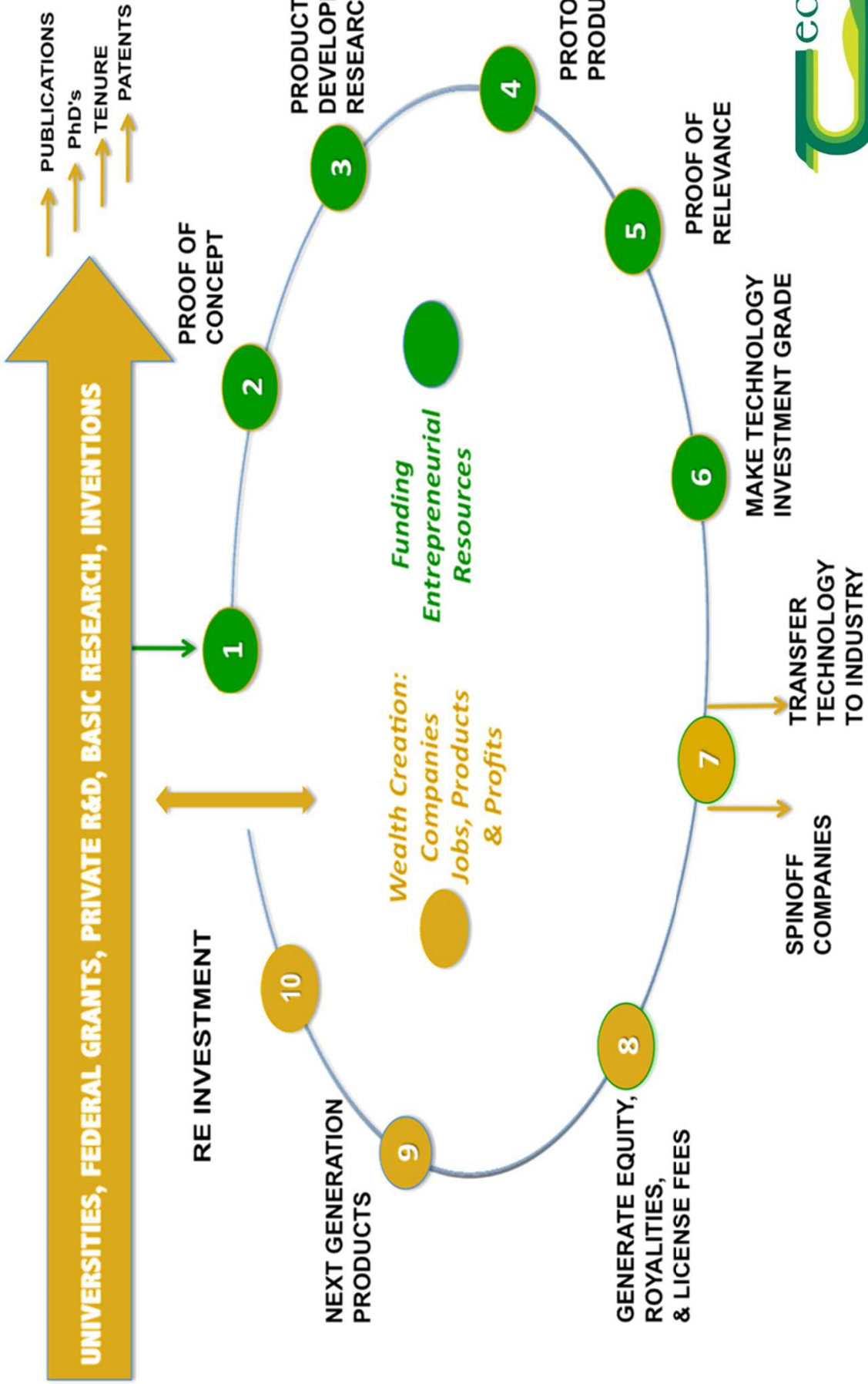


How does research make an impact?



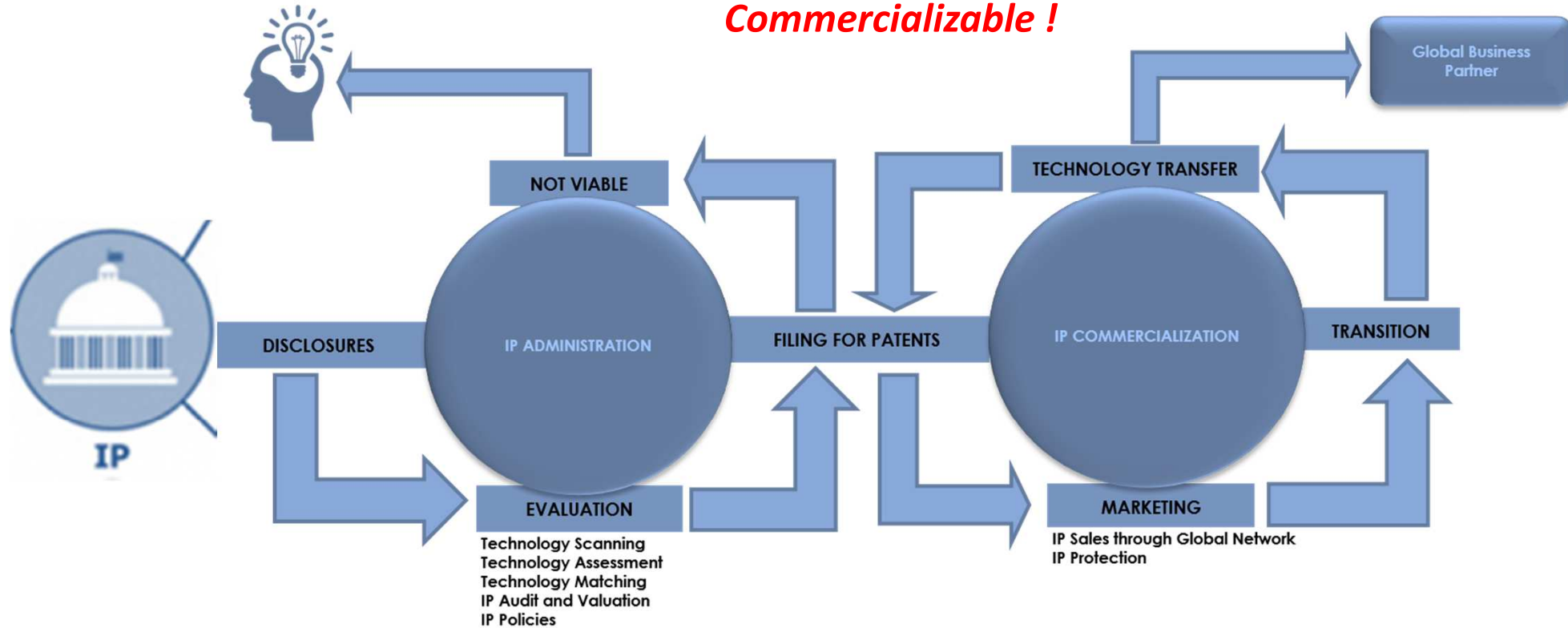
Linear model – *but more complex in the real world*
Varies across disciplines – *is more or less tangible*
Takes time – *but there may be intermediate outcomes on the way*
Evidence – *need to monitor and collect evidence for every stage*

Adapted from ATN, (2007) [Australian Technology Network Response to RQFDAG Impact Working Group](#)

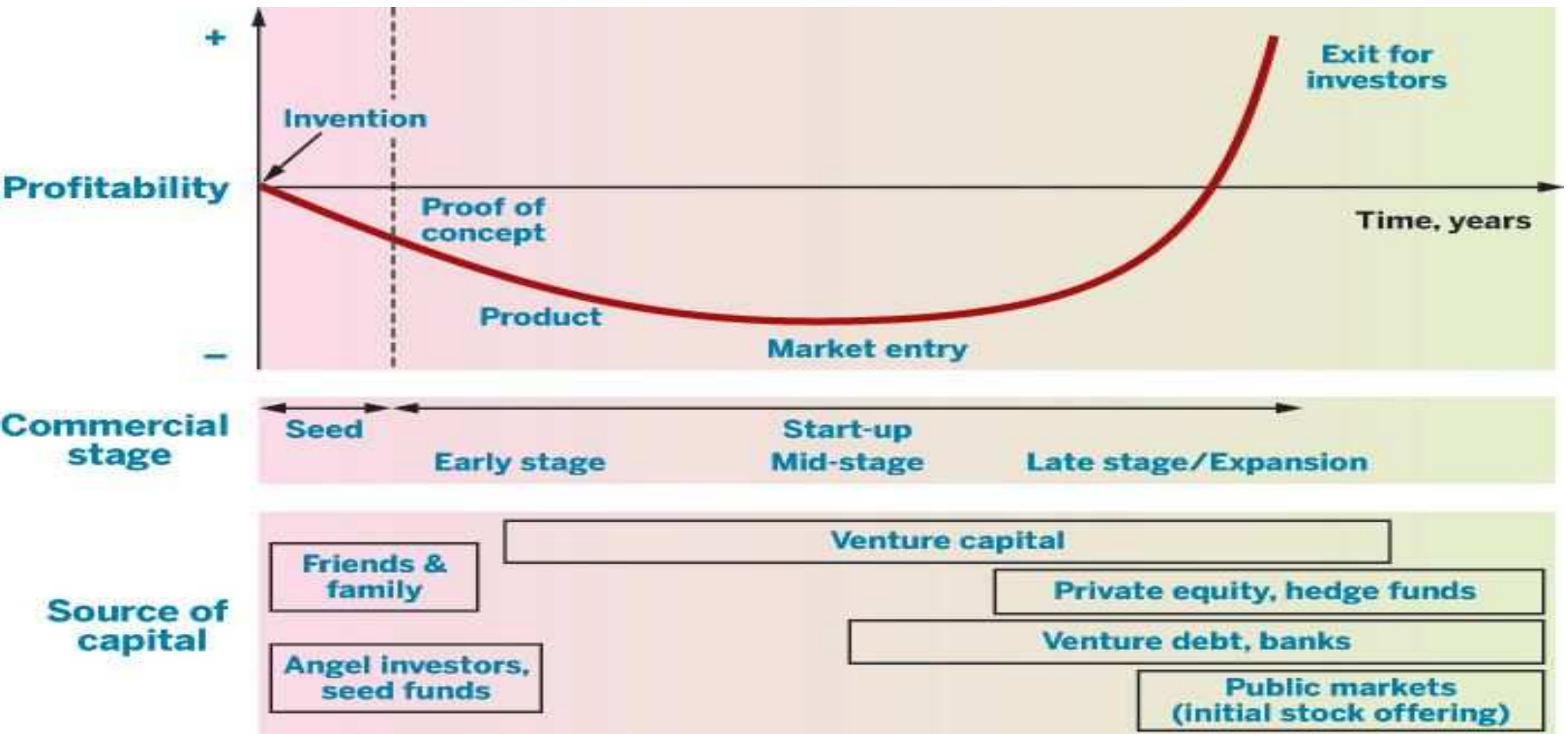


IP Exploitation

*All that is Patentable
is NOT necessarily
Commercializable !*



Commercialization stages beyond the Academic Research



Commercialization: Thinking in Commercial Terms

To License, one must:

- Satisfy a customer need
- Solve a “pain”
- Have a product, a process, a service
- Know industry/company entry points



For a “successful” Spin-off, must have:

- A market
- A viable business model and plan
- A management team
- Critical resource mass (\$, people, know how)
- Defensible technology



“If you want real growth, you have to have new technologies”

Challenges with emerging technologies?

- ✓ Regulation
- ✓ Surface cleaning and disinfection
- ✓ Food safety and shelf life extension
- ✓ Nutrient and sensory aspects
- ✓ Consumer and processor acceptability
- ✓ Technology advances
- ✓ Environmental impact

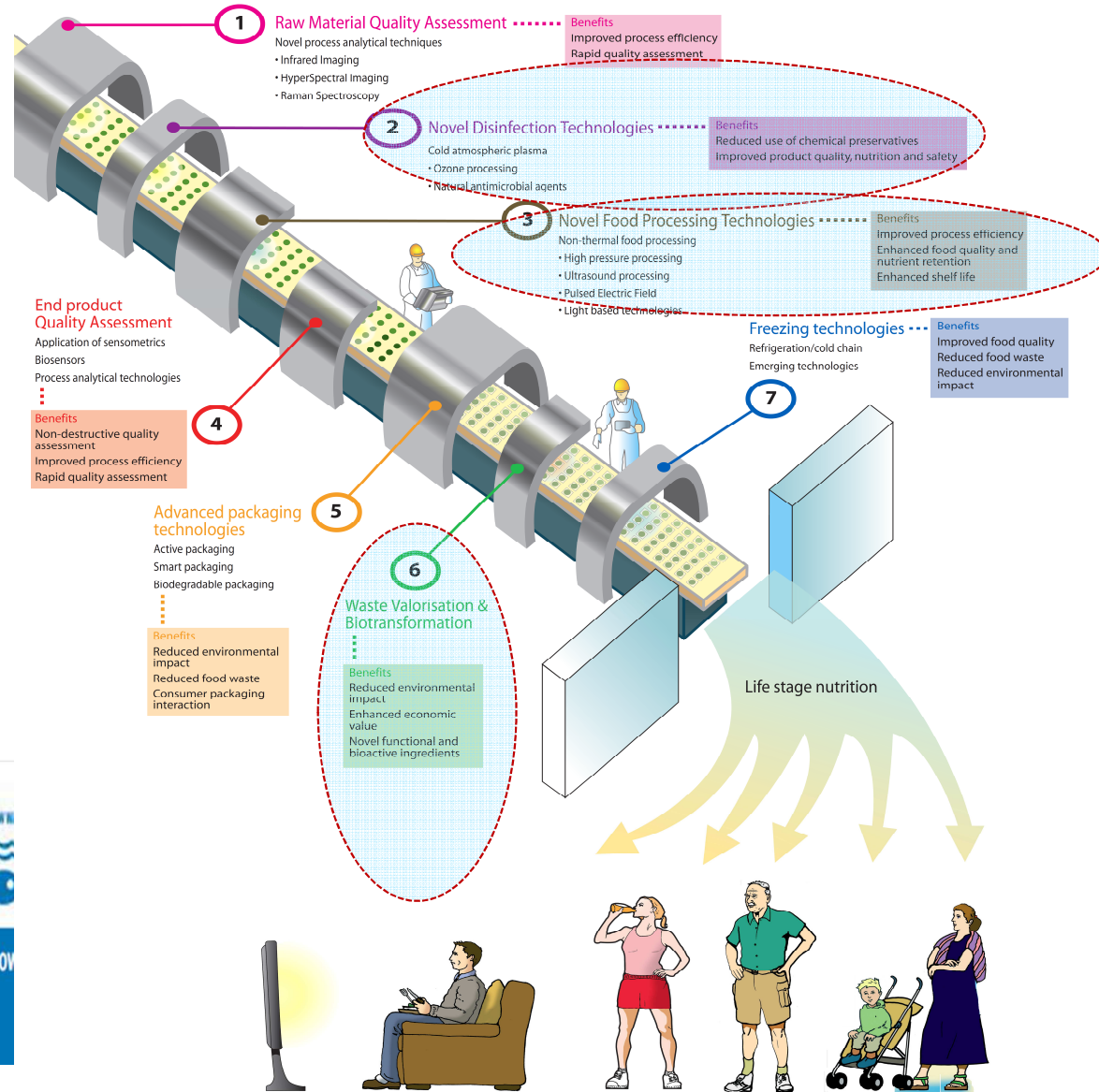


Agri- Food sector alignment with the UN Sustainable Goals



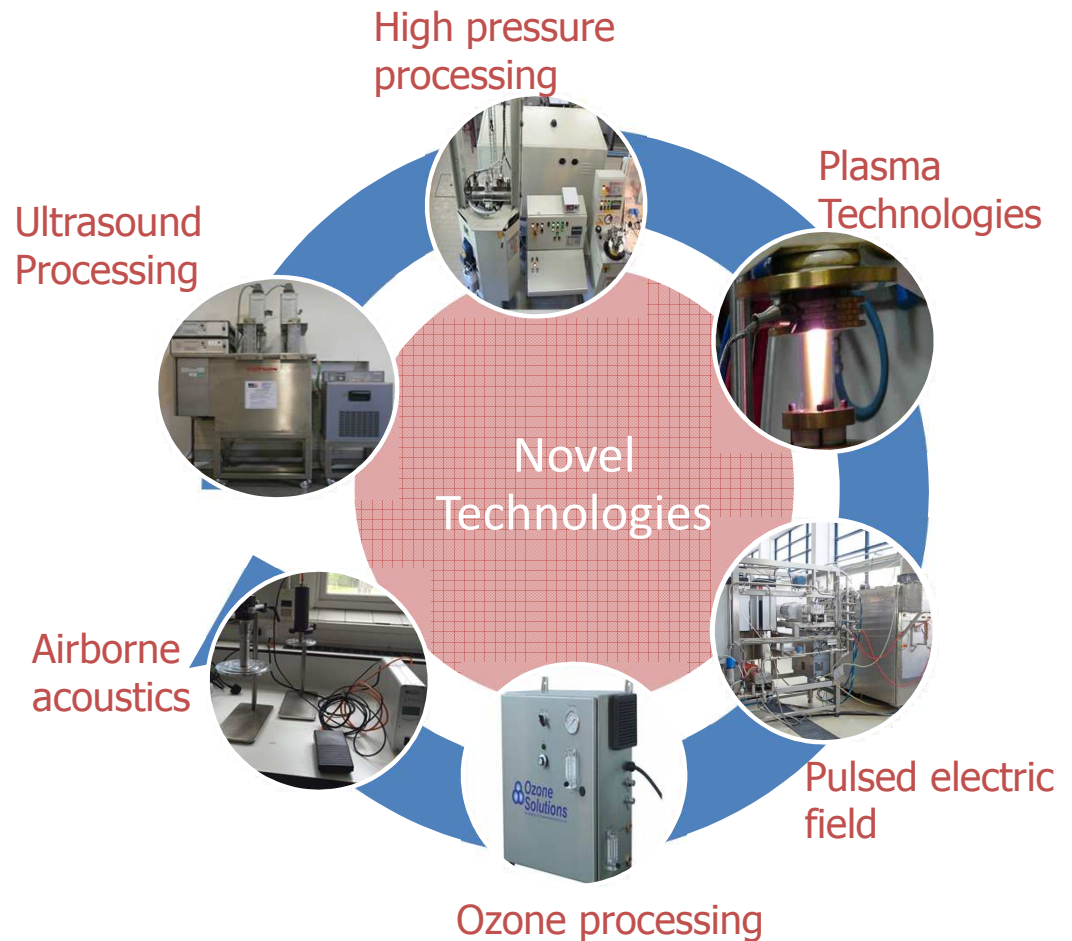
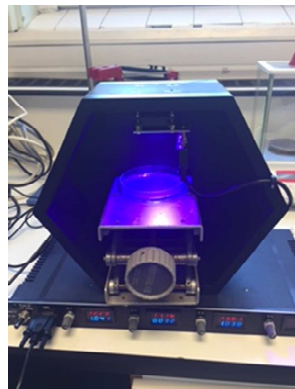
Food processing chain

- ✓ Improved food quality
- ✓ Valorisation of food processing by-products
- ✓ Reduced energy and water consumption (clean and green solutions to key challenges faced by the food industry)
- ✓ Employ new technological interventions for developing new food products underpinning key health, nutrition and wellness challenges



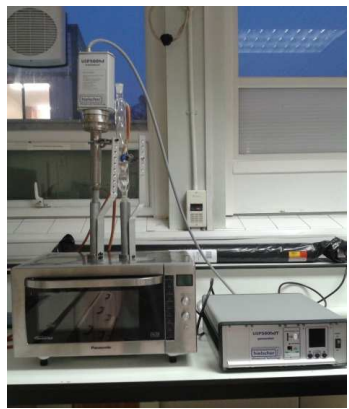
Novel Food Processing Technologies @ Teagasc

- Ensure food safety
- Improved shelf life
- Nutrient retention
- Environmental friendly
- Process efficiency

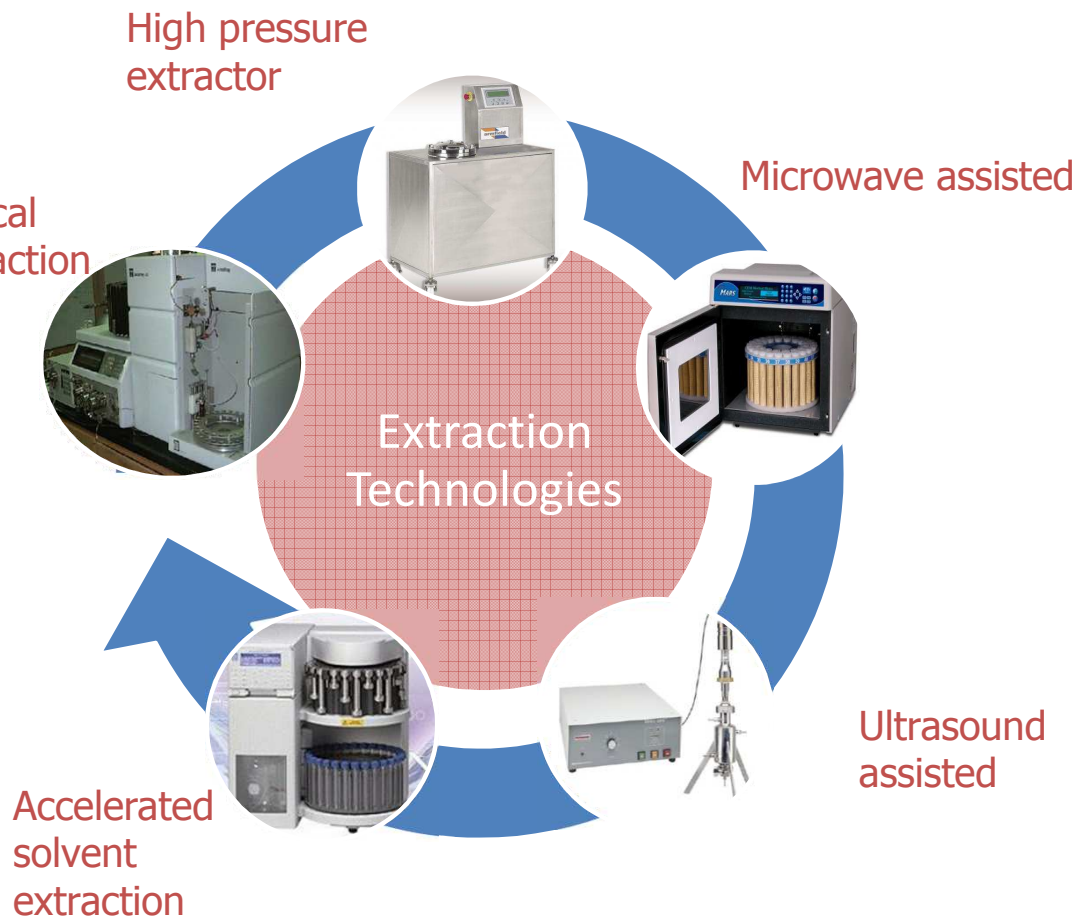


Novel extraction technologies @ Teagasc

- Enhanced extraction yield
- Process efficiency
- Clean and green
- Reduced solvent usage
- Bioactivity retention

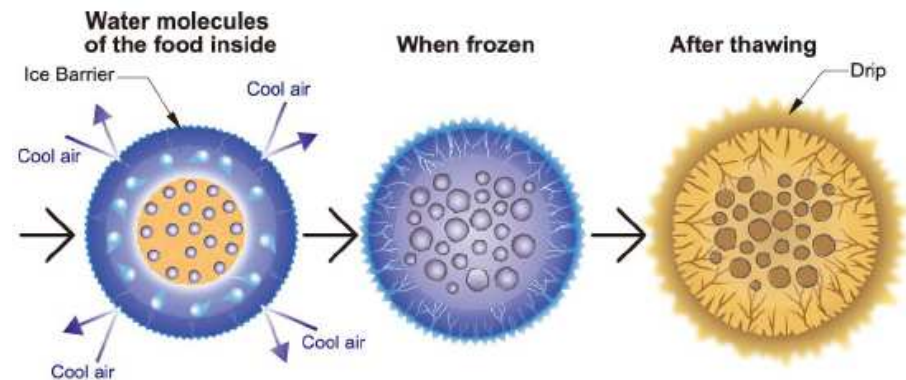
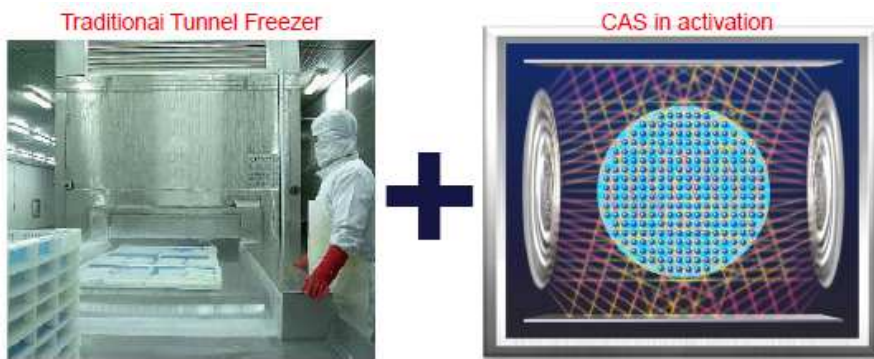


Combined MW+US



Freezing technologies

- Water molecules gather to form a big core
- At thawing, tasty and trace elements are lost as drip



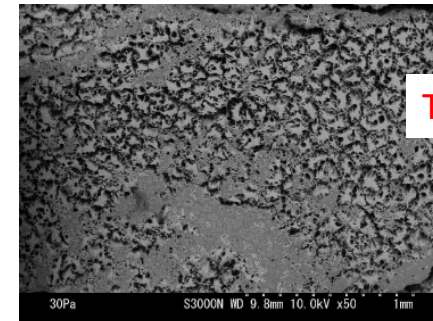
Example of squids

- Squids deteriorate fast
- CAS system allows retention of colour, taste and flavour

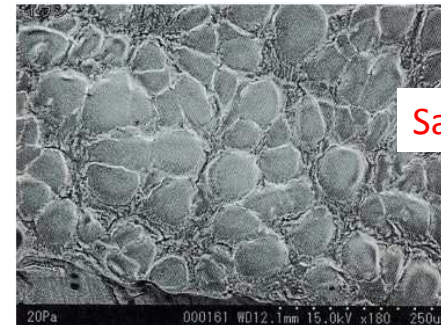
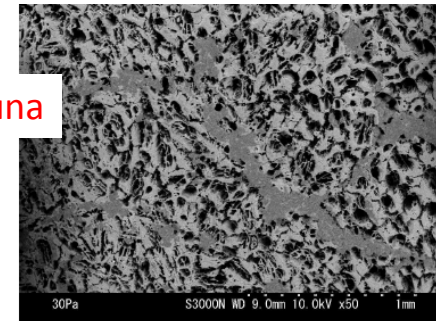


CAS

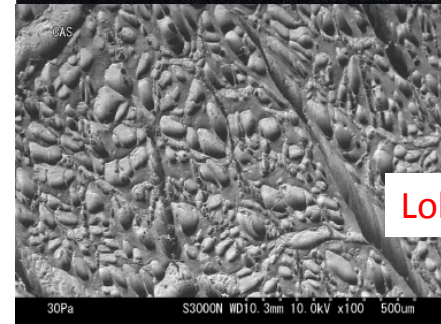
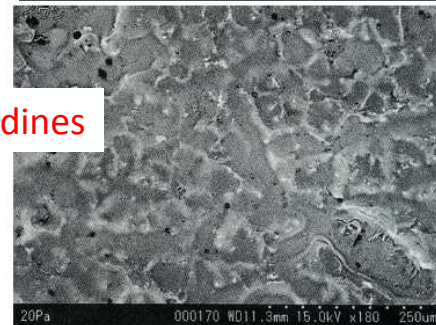
Quick frozen



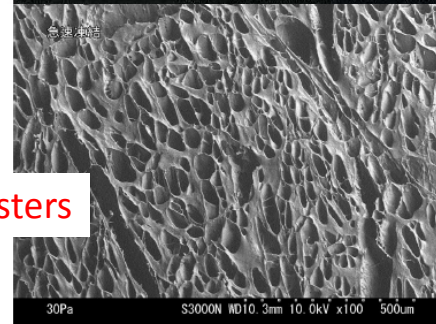
Tuna



Sardines



Lobsters



CAS products thawed after 3 years



CAS products in Brittney France



Protein recovery from fish by-products

Fish by-products, a global issue

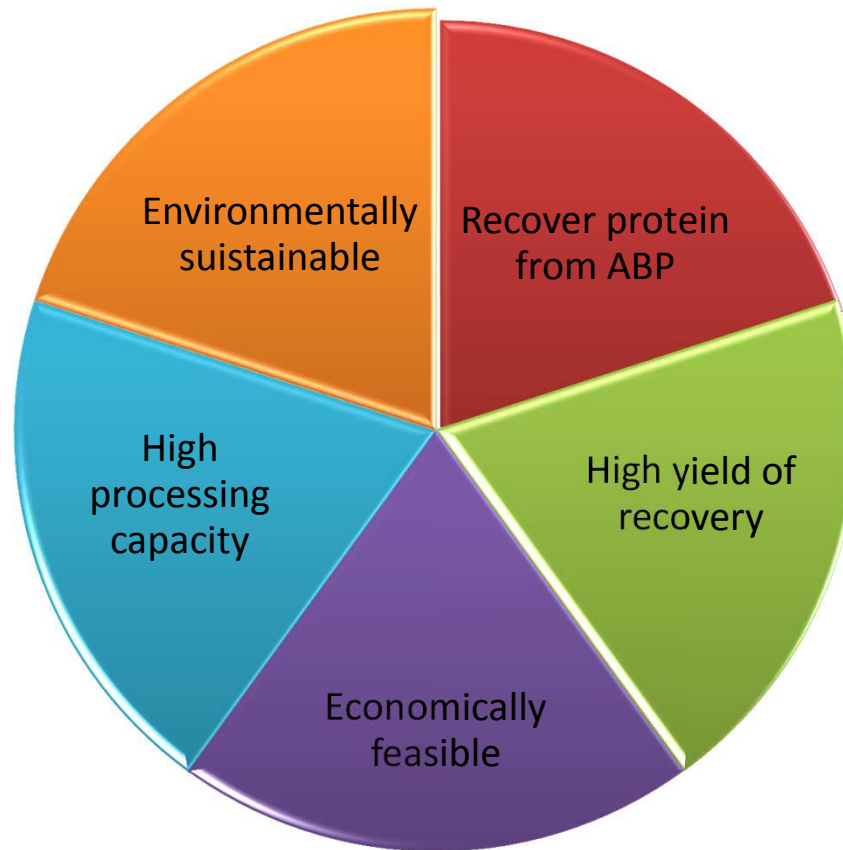
World fisheries and aquaculture production, in millions of tonnes.

Year	2006	2007	2008	2009	2010	2011
Inland waters	41.16	43.50	46.32	48.62	52.23	55.07
Marine areas	111.49	113.27	113.80	115.57	115.88	123.24
Grand total	152.65	156.77	160.12	164.19	168.11	178.30

178,000,000 tonnes of fish X 0.4 waste X 0.15 protein content = 10,680,000 tonnes of protein wasted
10,680,000 tonnes / 7.2 billions population = 1.5 kg of pure protein each person/year
Enough to cover one month of recommended protein intake (1g/kg body weight per day)

- a) After filleting it around 50% of the living weight is considered a by-product or a waste
- b) By-products used for low-added value activities: pet food, composting or animal feed
- c) Landing obligation: European Commission does not allow "the wasteful practice of discarding. Will increase the amount of non - marketable landed fish.
- d) Amino acid profile as good as fillets

Why we need to address this issue?

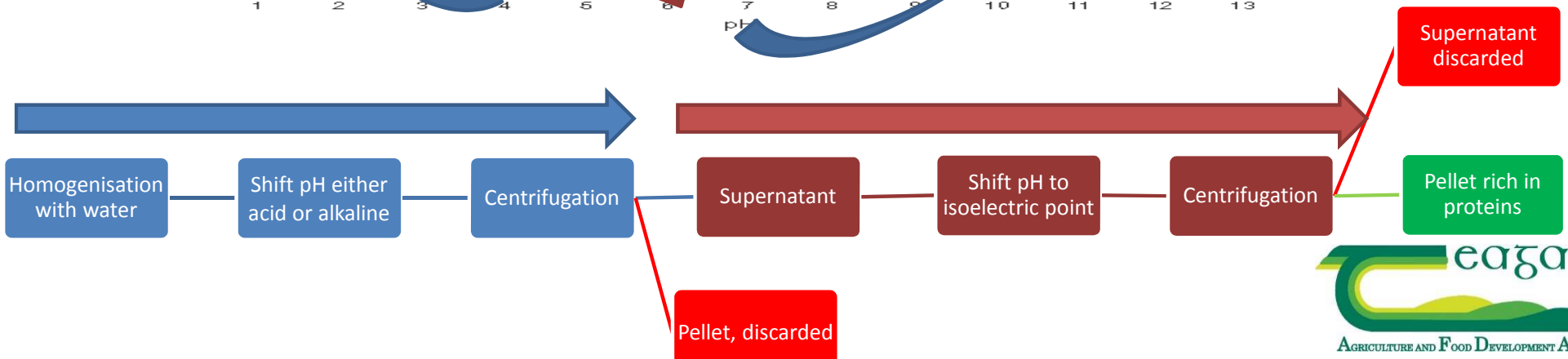
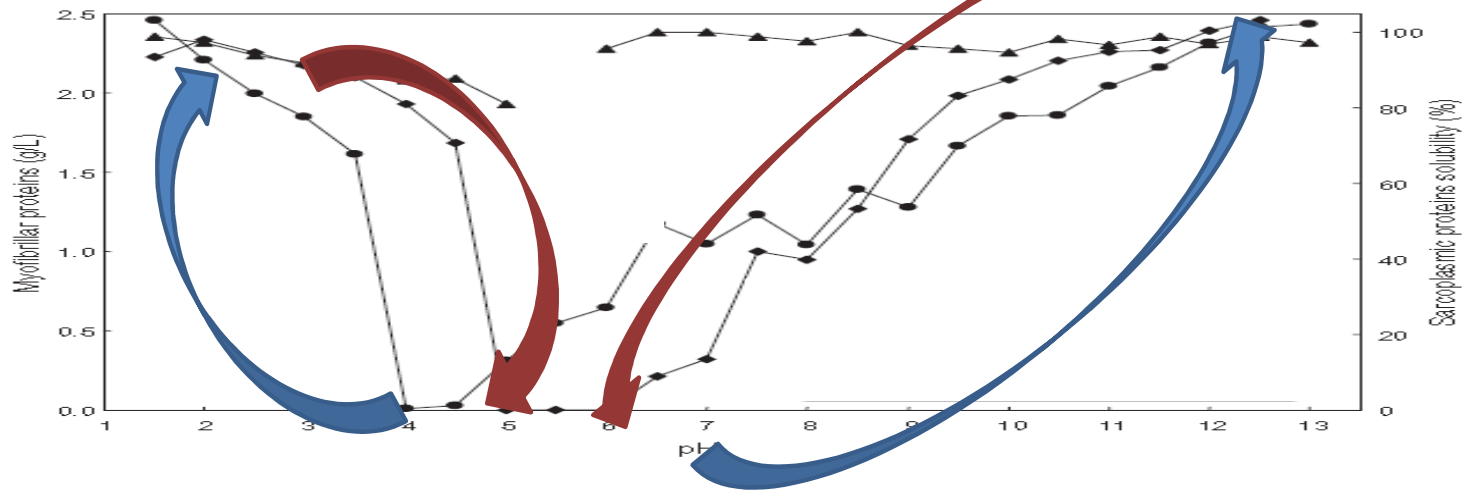


Current alternatives

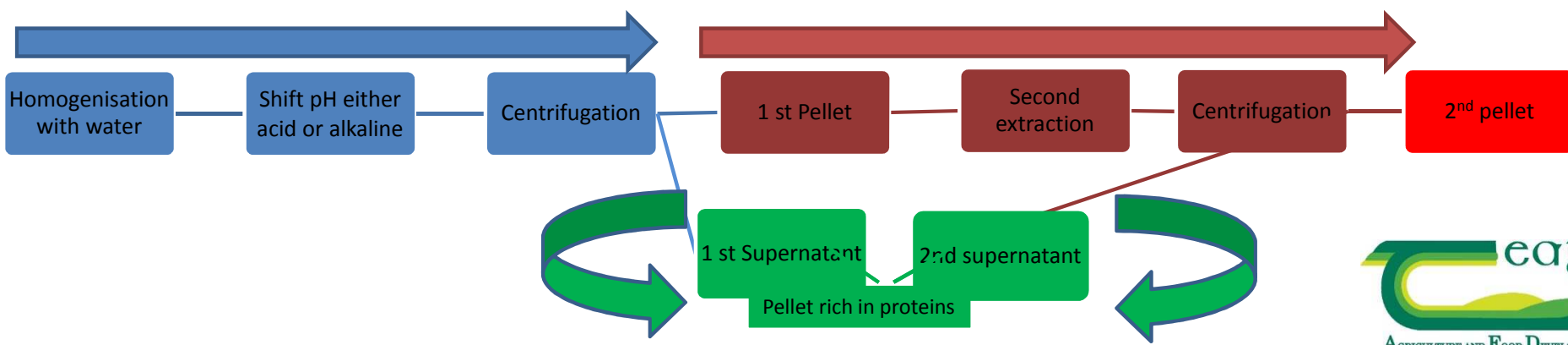
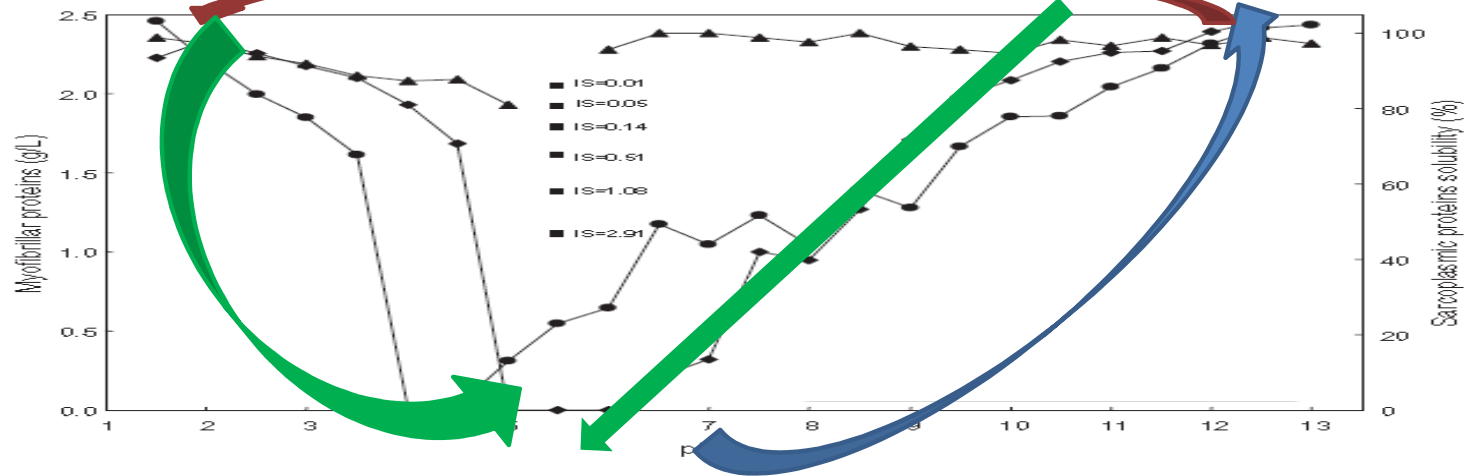
Technique	Advantages	Disadvantages
Enzymatic	High recovery yield	Loss of textural properties High reagent cost Long process times
Water extraction	Good textural proteins	Very low yield High water consumption
Traditional ISP	Short times Low reagents cost	Variable yield
ISP US assisted	Improved yield Short processing time	Difficult to scale-up High equipment investment

How ISP does work?

Isoelectric solubilization precipitation: dissolve proteins by shifting the pH away from their isoelectric point



How sequential ISP does work?



Sequential ISP extraction in mackerel by-products



Trials using 200ml and 2 L volumes were performed

	Acid-Alkaline extraction		
	1 st extraction	2 nd extraction	Total recovery
	HCl 0.1 M	NaOH 0.1 M	
Sequential ISP	49.48±0.84 ^a	49.23±1.51 ^a	98.6% ^a
Seq ISP US 20%	60.31±0.66 ^b	35.27±8.18 ^a	95.5% ^a
Seq ISP US 60%	74.66±5.25 ^c	19.00±3.49 ^b	93.6% ^b

	Alkaline-Acid extraction		
	1 st extraction	2 nd extraction	Total recovery
	NaOH 0.1 M	HCl 0.1 M	
	64.05±0.09 ^d	19.27±1.19 ^b	83.3% ^c
	87.59±3.3 ^e	4.86±0.80 ^d	92.5% ^b
	94.71±0.82 ^f	2.62±2.30 ^d	97.3 % ^a

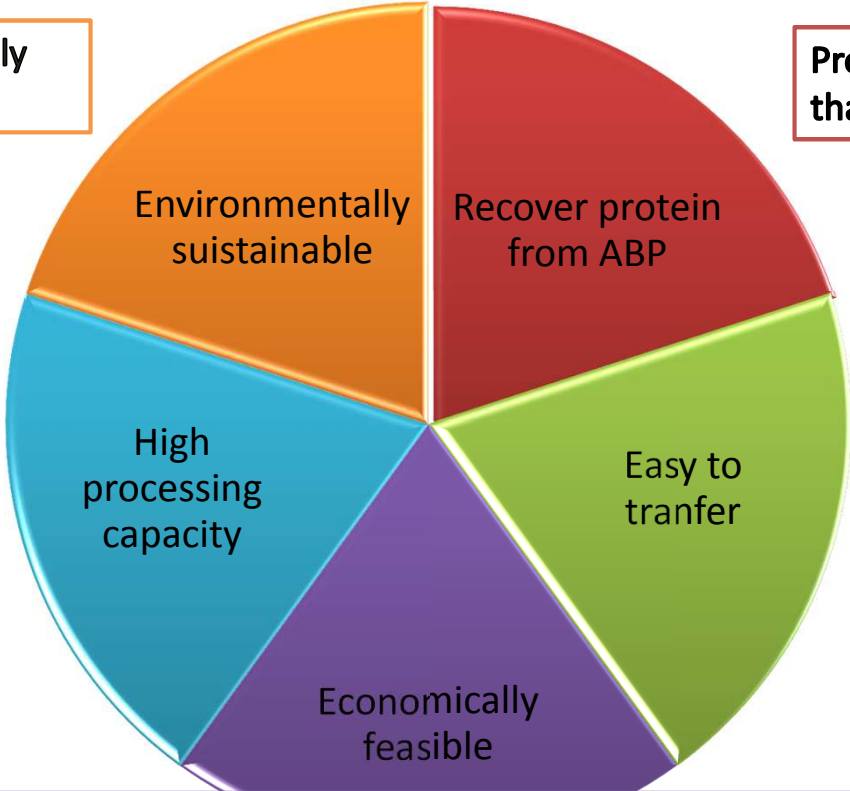
Traditional ISP vs. Sequential ISP

Traditional	Sequential
Common industrial equipments are employed	
Cheap reagents	
Remarkably reduction of fisheries wastes	
Easy to scale-up	
Recovery of proteins able to be used for high added-value purposes	
Only acid or alkaline soluble proteins are extracted	Both alkaline and acid soluble proteins are extracted
Reagents are just used for extraction or neutralization	Reagents are employed for both extraction and neutralisation
Two wastes are generated	Only salty water is generated

How sequential ISP addresses the fish by-product issue ?

Waste from fisheries highly reduced.

Protein recovery yield higher than 90%



Easy to scale-up

Equipment required is already implanted in fish processing facilities

Cheap reagents are employed. Opens the door to new high added-value product development

Sustainability assessment of emerging technologies

