BRIEFING NOTE (ID0423):

Emerging risks associated with feed and products of feed production technologies of increasing relevance (novel feeds)

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Lineup

Introduction:
- ✓ purpose of the Briefing Note
- ✓ sources of the information

EU-feed sector overview
- ✓ target population
- ✓ feed production

Conventional feed:
- ✓ protein/energy sources
- ✓ the protein/energy challenge
- ✓ environmental *"negative externalities"*

Novel feed & circular economy:
- ✓ new paradigms in agro-zootechnical practices

Mapping of hazards associated with novel feed
- ✓ insects
- ✓ former food products
- ✓ biofuel by-products
- ✓ aquatic products of animal origin
- ✓ aquatic products of plant origin

Conclusions and discussion

Purpose of the Briefing Note (BN)

- ✓ To overview the current and perspective uses of novel feeds:
  - ✓ *as alternative to conventional feeds in animal nutrition*
  - ✓ *as a response to the needs of modern agro-zootechnical practices*
  - ✓ *in line with the principles of a sustainable and circular economy*
- ✓ To overview the current state of knowledge on hazards related to novel feed
- ✓ To identify emerging risks related to the scale up production and increased consumption of novel feed
- ✓ To endorse the need to further explore gaps of knowledge on novel feed hazards and emerging risks

Sources of the information

The content of the BN is based on information from:

- ✓ Relevant **scientific literature**
- ✓ Presentations & abstracts from **International conferences**
  - ✓ 6th International Feed Conference - Feed 2018. Bergen (NO), October 25-26, 2018
  - ✓ ASPA 23rd Congress of the animal science and production association - new challenges in animal science. Sorrento (IT), June 11–14, 2019
  - ✓ IPIFF Workshop - Unleashing the Circularity Potential of the European Insect Sector through Research and Innovation. December 3, 2019 – Brussels (Belgium)
- ✓ **European Commission projects**
  - ✓ Horizon 2020

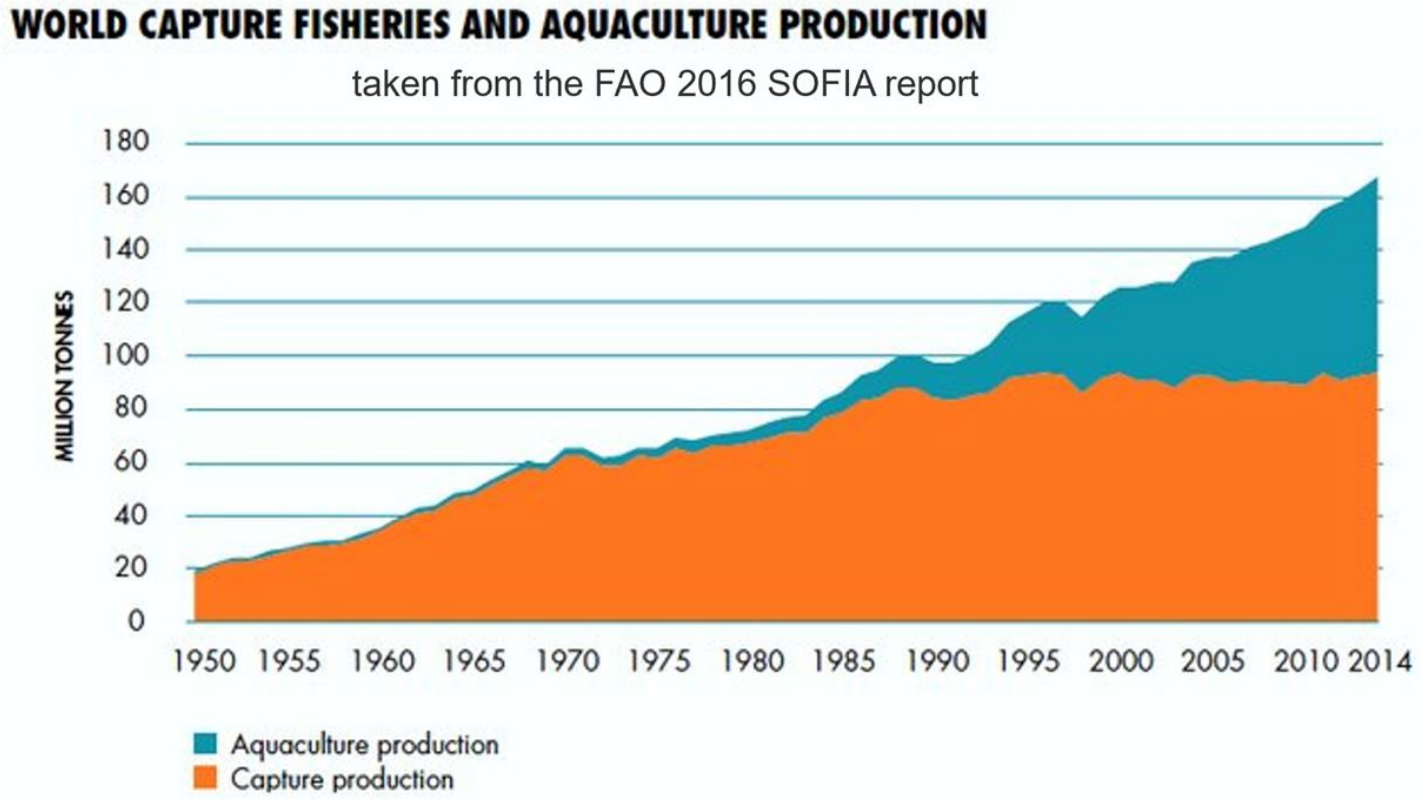
EU-feed sector overview: target population

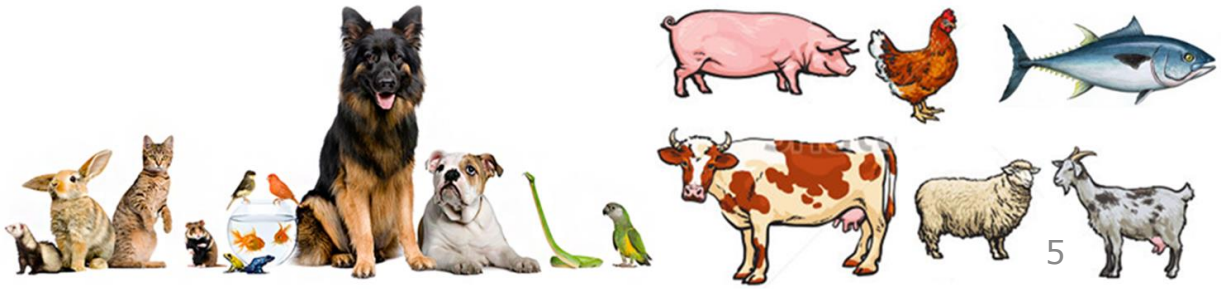
LIVESTOCK POPULATION (heads)
(FEFAC, 2018)

- Pig 148.2 million
- Sheep/goat 97.7 million
- Cattle 87.4 million
- Poultry data not available
- Aquaculture data not available

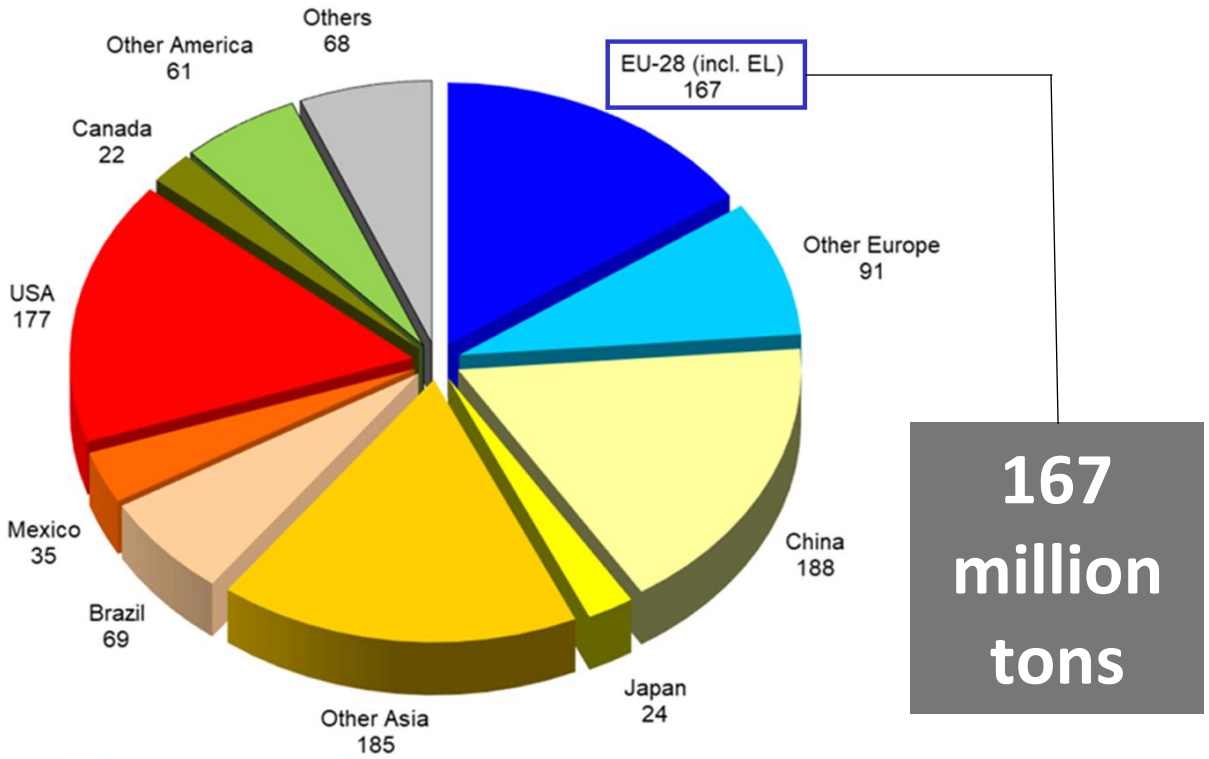
PETS POPULATION (heads)
(FEDIAF, 2018)

- Cat 75.3 million
- Dog 65.5 million
- Bird 35.5 million
- Small mammals 19.4 million
- Aquarium 10.6 million
- Reptile 6.3 million

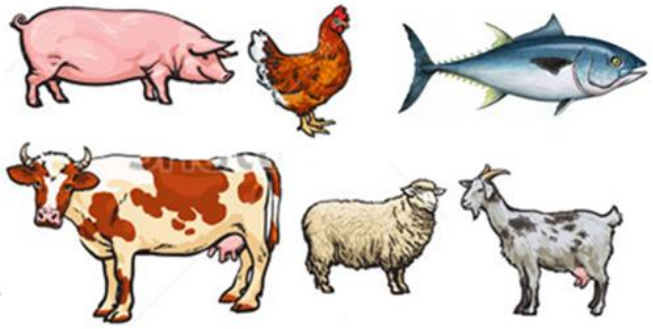




EU-feed sector overview: feed production



167 million tons



FEFAC, 2018

Annual livestock compound feed production

8.8 million tons

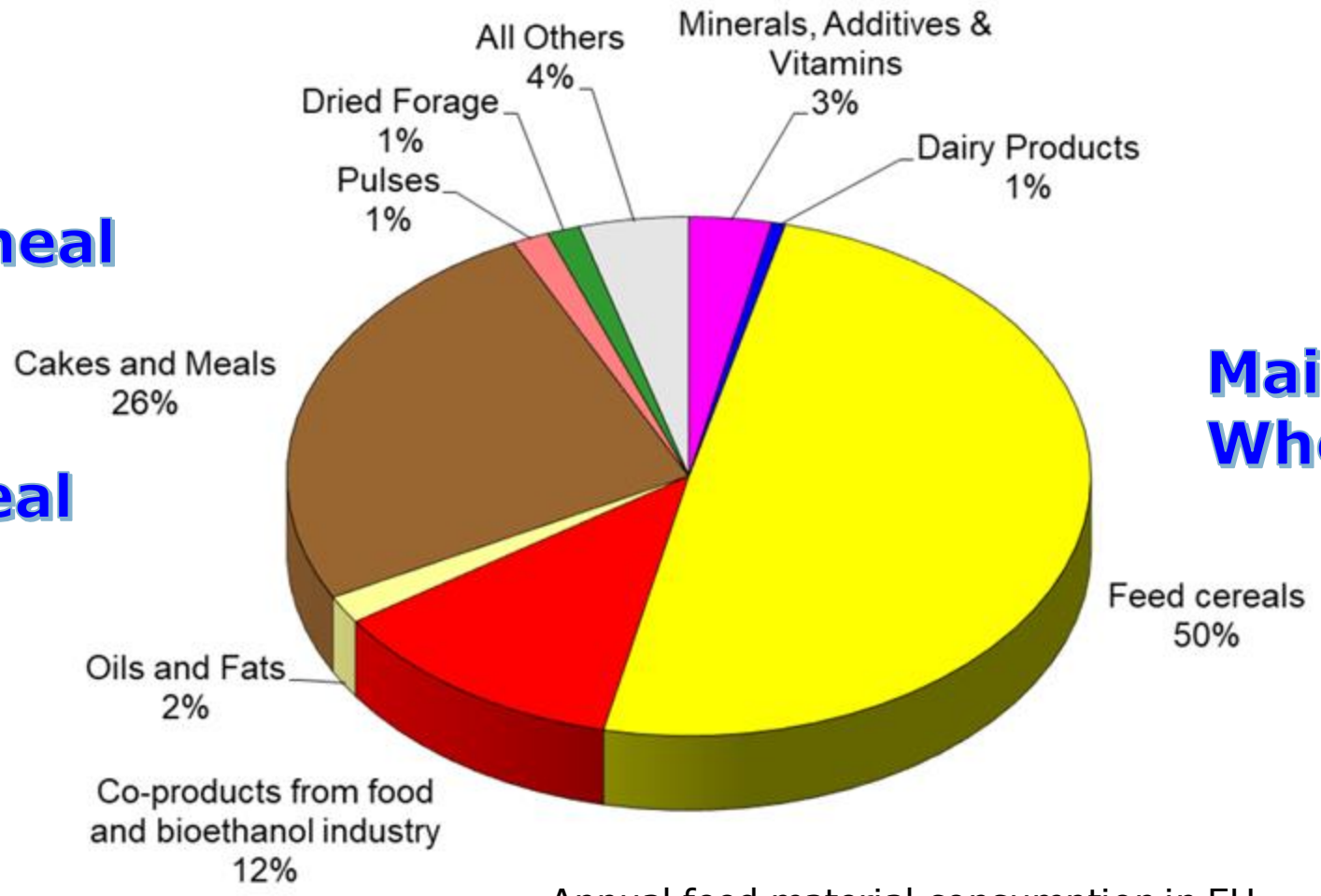
Annual sales of pet food products:

FEDIAF, 2018

Conventional feed: protein/energy sources

Soybean meal

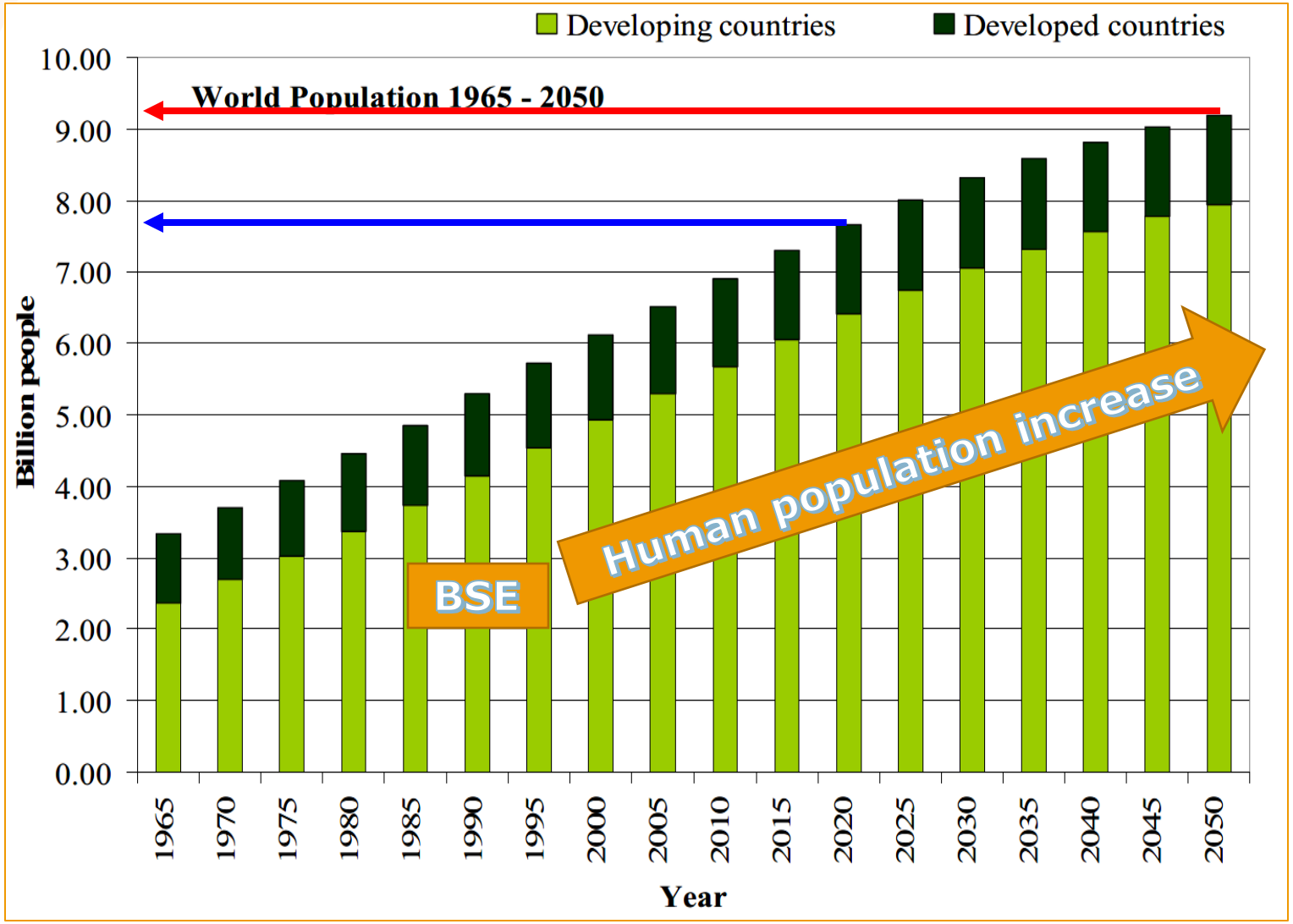
Fish meal

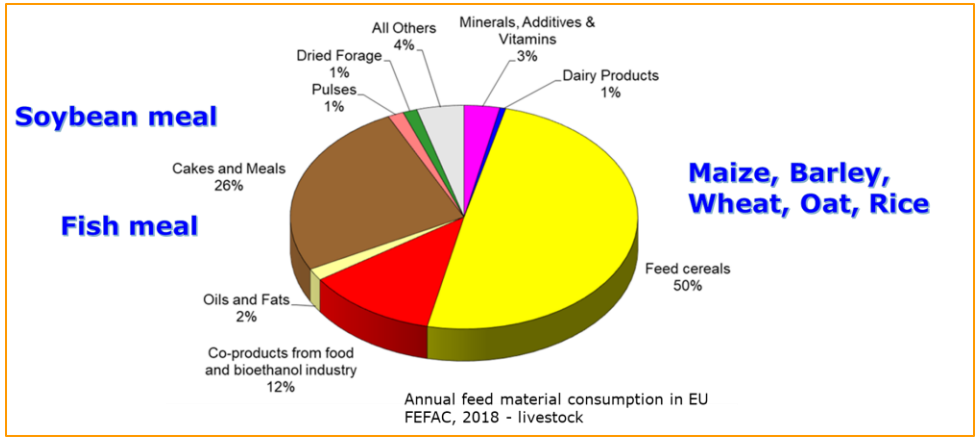


Maize, Barley, Wheat, Oat, Rice

Annual feed material consumption in EU
FEFAC, 2018 - livestock

Conventional feed: the "protein/energy challenge"





Will conventional feed be able to meet the nutritional needs of the next few years?

Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat (2007)

Conventional feed: environmental "negative externalities"

Linear economy: take - make - consume - throw away

Primary resources extinction

Less availability of farmland

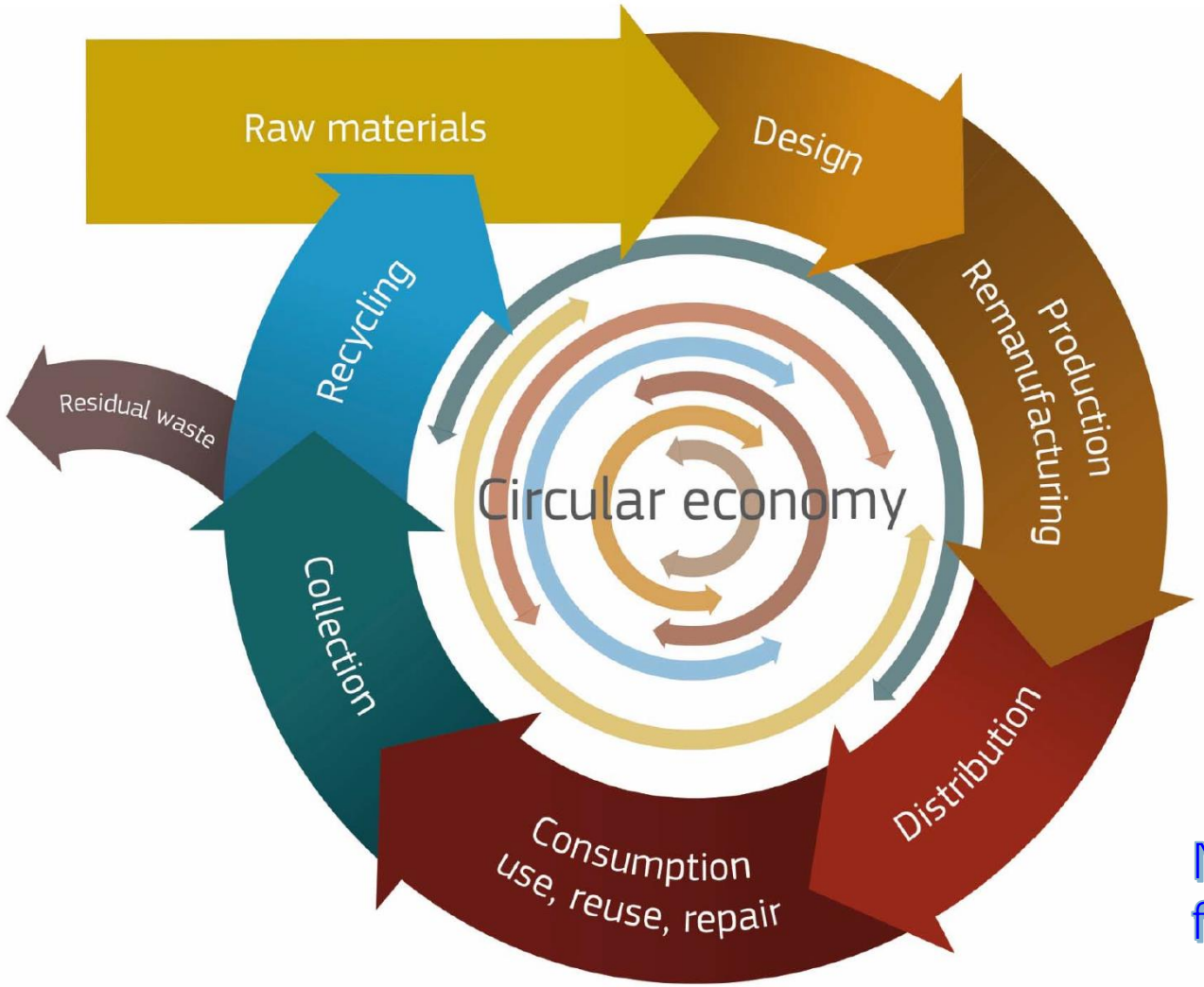
Oceans depauperation

Environmental pollution

Loss of biodiversity

Climate change

Novel feed & circular economy: new paradigms in agro-zootechnical practices



Novel feed as alternative source to conventional feed

- e.g.: insects, algae, biomasses

Novel feed as recycled source from production technologies

- e.g.: biofuel by-products

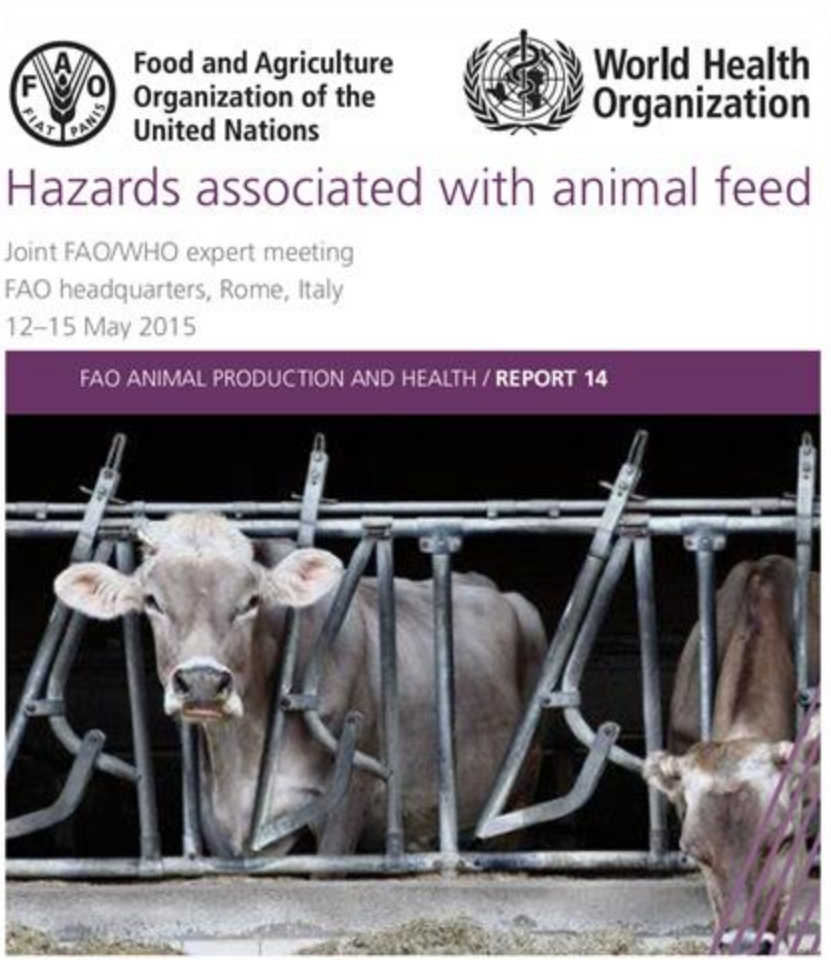
Novel feed as recycled source from the food market distribution

- e.g.: former food products

Mapping of hazards associated with novel feed

What do we know about potential hazards from novel sources of feed?

Hazards associated with animal feed (FAO, 2019)



- ✓ Novel feed products
  - ✓ Potential hazards
  - ✓ Potential impact on human/animal health
  - ✓ Feed-animal transfer
  - ✓ Knowledge gap (scarce evidence to draw conclusions)

Insects
Former food products
Biofuel by-products
Aquatic products of animal origin
Aquatic products of plant origin

Mapping of hazards associated with animal feed: insects (i)

Product

- ✓ Whole insects
- ✓ Processed insects (as powder or paste)
- ✓ Insects extract (as protein isolate, fat, oil)

Potential hazards

- ✓ **General:** substrates, insect species, harvest stage, farming and harvesting conditions and post-harvest processing
- ✓ **Biological:** pathogenic bacteria, viruses, prions
- ✓ **Chemical:** heavy metals, dioxins, vet. drug residues, pesticide residues, mycotoxins, plant toxins, insect toxins
- ✓ **Allergens:** allergic proteins

- ✓ **Baseline consumption data:** Low to high scale up production

Knowledge gaps

- ✓ Use of manure and sewage sludge as substrates considering the kind of treatment applied
- ✓ Occurrence of human and animal bacterial pathogens in insects processed for feed
- ✓ Transfer of contaminants from different substrates to insects
- ✓ Potential allergenicity for animals
- ✓ Transfer of allergenic peptides from insects feed to edible animal products
- ✓ Magnitude and frequency of feeding insects and derived products to farm animals

Mapping of hazards associated with animal feed: insects (ii)

Reg. 999/2001 – TSE regulation

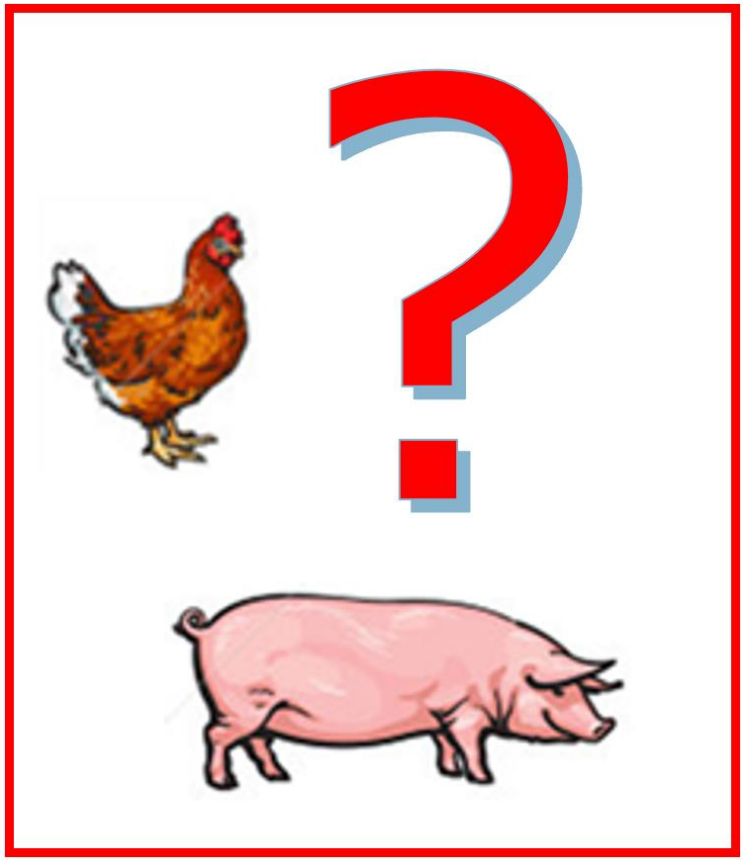
Reg. 1069/2009 & Reg. 142/2011 – animal by-products

Reg. 56/2013 – changing provisions on PAP (no insects)

Reg. 2017/893 – changing provisions on PAP (insects)

Feed materials	Farmed animals			Pets and fur animals
	Ruminants	Non-ruminants	Fish	
Ruminant PAP, including ruminant blood meal	NA	NA	NA	A
Non-ruminant PAP, including non-ruminant blood meal and insect PAP, excluding fishmeal	NA	NA	A	A
Blood products from ruminants	NA	NA	NA	A
Gelatine and collagen from ruminants	NA	NA	NA	A
Hydrolysed proteins other than those derived from non-ruminants or from ruminants hides and skin	NA	NA	NA	A
Fismeal (**milk replacers containing fishmeal are authorised for unweaned ruminants*)	NA*	A	A	A
Blood products from non-ruminants	NA	A	A	A
Di-tricalcium phosphate of animal origin	NA	A	A	A
Hydrolysed proteins from non-ruminants or from ruminants hides and skin	A	A	A	A
Gelatine and collagen from non-ruminants	A	A	A	A
Egg, egg products, milk, milk products, colostrum	A	A	A	A
Animal proteins other than the above mentioned	NA	A	A	A

PAP: processed animal protein; NA: not authorised; A: authorised



Base-line consumption data
Low to high scale up production

Mapping of hazards associated with animal feed: former food products (i)

Product

- ✓ Food products passing the expiry date
- ✓ Food products with mislabeling, packaging damage, etc.
- ✓ Kitchen and catering waste
- ✓ Food processing by-products of food

Potential hazards

- ✓ **Biological:** +++ viruses
- ✓ **Chemical:** from packaging material; acrylamide and semicarbazide in bakery waste
- ✓ **Physical:** remnants of packaging materials

- ✓ **Baseline consumption data:** Low to high scale up production

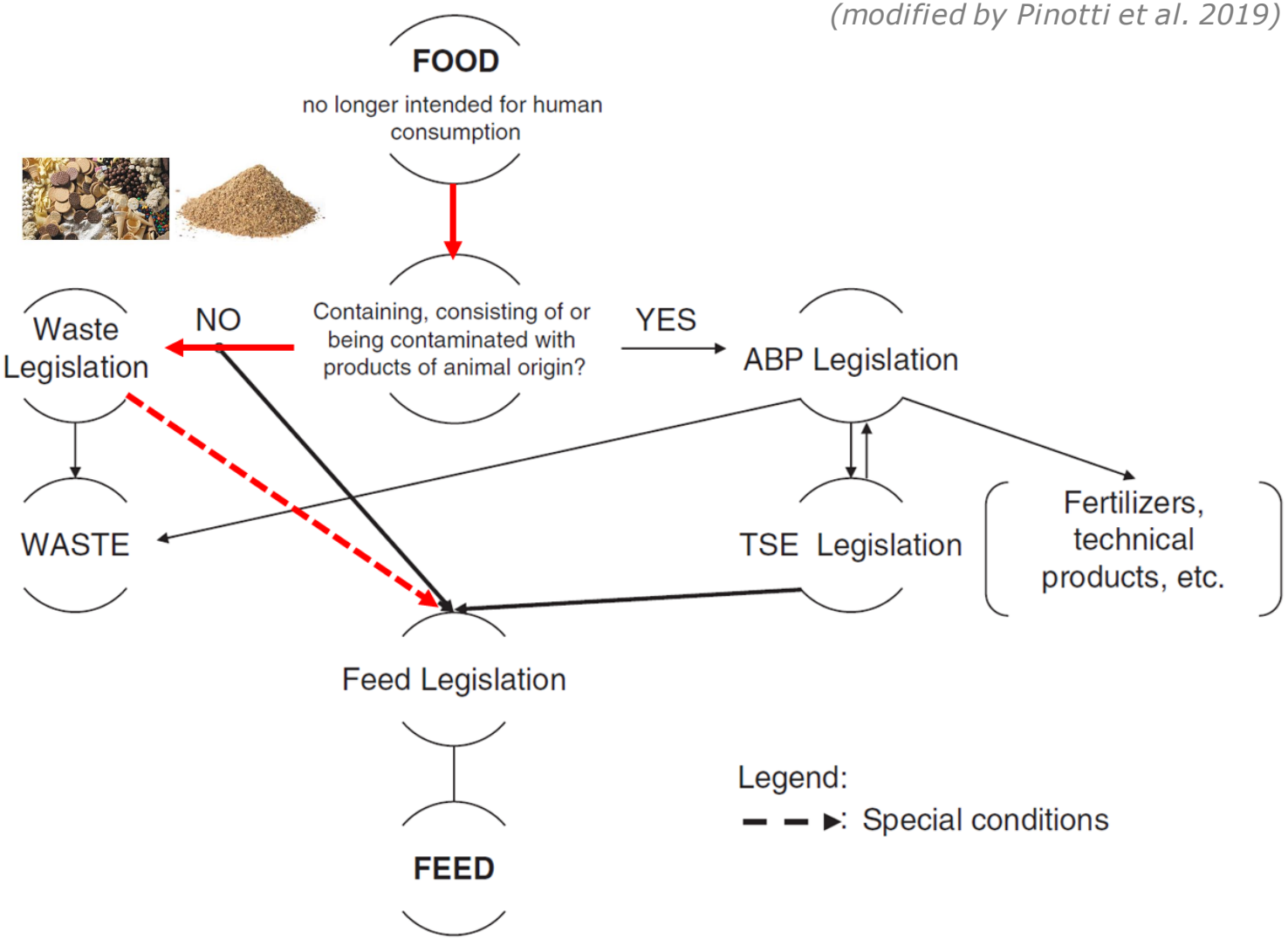
Knowledge gaps

- ✓ Impact of feed as transmission vector
- ✓ Monitoring presence of chemical and physical contaminants in the feed/food chain
- ✓ Magnitude and frequency of feeding FFP to animals

Mapping of hazards associated with animal feed: former food products (ii)

Commission notice 2018/c 133/02

(modified by Pinotti et al. 2019)



Base-line consumption data ?
Low to high scale up production

Flowchart from food to feed (EC, 2018)
ABP: animal by-products
TSE: transmissible spongiform encephalopathy

Mapping of hazards associated with animal feed: biofuel by-products

Product

- ✓ Bio-ethanol production:
  - ✓ dried distiller's grains with solubles (DDGS)
  - ✓ wet distiller's grain (WDG)
- ✓ Bio-diesel production:
  - ✓ crude glycerol
  - ✓ plant press cakes/meals

Potential hazards

- ✓ **Biological:** WDG: growth of moulds and fungi; predisposition to formation of mycotoxins; limited shelf life
- ✓ **Chemical:** DDGS/WDG: mycotoxins, antibiotic residues, sulphate/sulphite
  Crude glycerol: methanol, sodium
  Plant press cakes: plant toxins and anti-nutritional factors (new crops)

Knowledge gaps

- ✓ Transfer of chemical contaminants and prohibited substances in feed and food of animal origin (levels and safety aspects):
- ✓ Transfer of residual plant toxins to food of animal products and effect on human health

Mapping of hazards associated with animal feed: aquatic products of animal origin

Product

- ✓ Hydrolysates and silage from fish by-products and waste
- ✓ Krill oil and meal

Potential hazards

- ✓ **Chemical:** Bio-accumulation via aquatic food webs: preservatives (impurities, metabolites); high fluorine levels in Krill
- ✓ **Biological:** Zoonotic pathogens from input materials surviving processing conditions
- ✓ **Physical:** Nano and microplastics in tissues of marine organisms used as feed ingredients

Knowledge gaps

- ✓ Uptake and toxicity of nano and microplastics from aquatic products of animal origin (feed ingredients)
- ✓ Biological and chemical hazards of novel ingredients not traditionally processed into feed
- ✓ Occurrence and behaviour of acid-resistant biological and chemical hazards in fish hydrolysates and silage particularly if no heating is applied during production

Mapping of hazards associated with animal feed: aquatic products of plant origin

Product

- ✓ Macro-algae (seaweed):
  - ✓ feed ingredients or additives
- ✓ Microalgae (e.g. spirulina):
  - ✓ omega-3-PUFA-rich oil
  - ✓ protein-rich biomass

Potential hazards

- ✓ **Chemical:** Bioaccumulation via aquatic food webs; high iodine levels in seaweed
- ✓ **Biological:** Bacterial pathogens taken up from aqueous environment
- ✓ **Physical:** Nano and microplastics taken up from aqueous environment

Knowledge gaps

- ✓ Uptake and toxicity of nano and microplastics from aquatic products of plant origin
- ✓ Several specific aspects related to chemical and biological contamination of aquatic products of plant origin:
  - ✓ Occurrence, processing stability, toxicity, effect on animal health

Novel feed safety, emerging risks and circular economy: a common denominator for EFSA

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- ✓ EREN MEETING
- ✓ StaDG-ER MEETING

Procurement on food and feed safety vulnerabilities in circular economy - end by late 2021 / early 2022

EFSA Conference 2022 – to be confirmed

Thanks for your attention …… and