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I&D nutrition in aquaculture

Tailoring your feeds

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Importância dos subprodutos de pescado para a indústria da alimentação animal

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IPMA Lx - December 3rd 2014
Project SECUREFISH
Workshop Valorização de Pescado e Subprodutos:
Tecnologias Alternativas e Garantia da Qualidade

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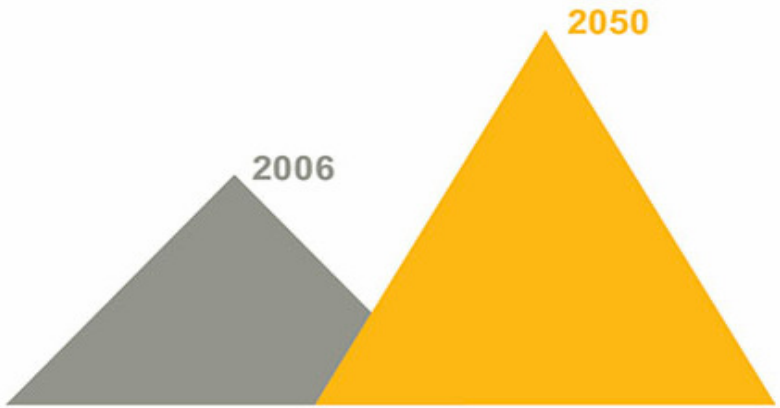
Our challenge…



69% Required increase in food calories to feed 9.6 billion people by 2050

Where will we find enough food for 9 billion?

- **BAU will lead to >70% of allowable emissions by 2050**
- **70 % of world's population will be urban (today, 49%)**
- **Increased scarcity of natural resources**

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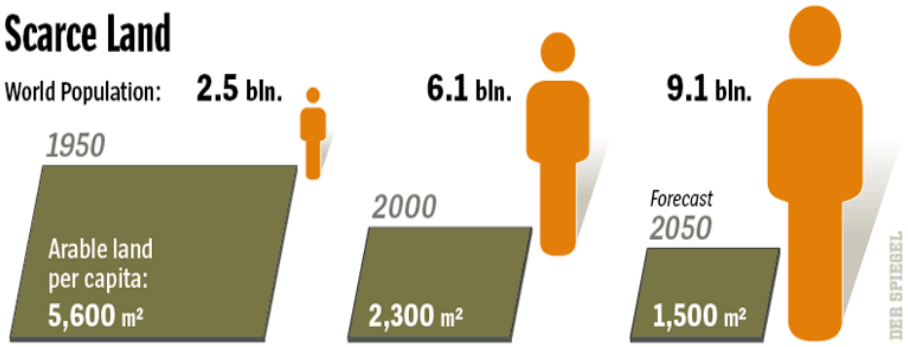
Natural resources will be scarce



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Limited land & freshwater….

We have to go marine…

Fish are among the most efficient farm animals in converting feed nutrients into edible meat

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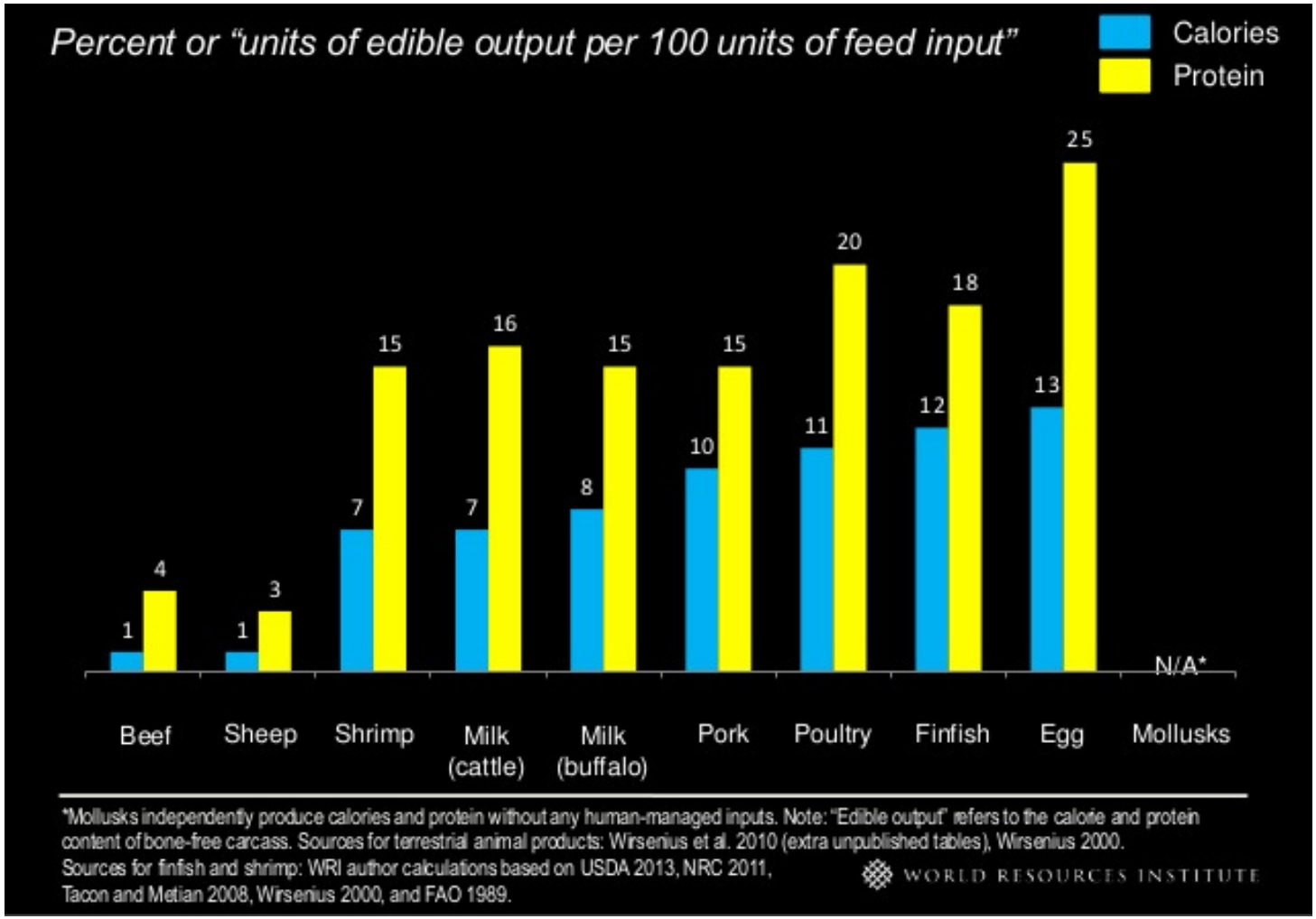
Seafood is a valid option



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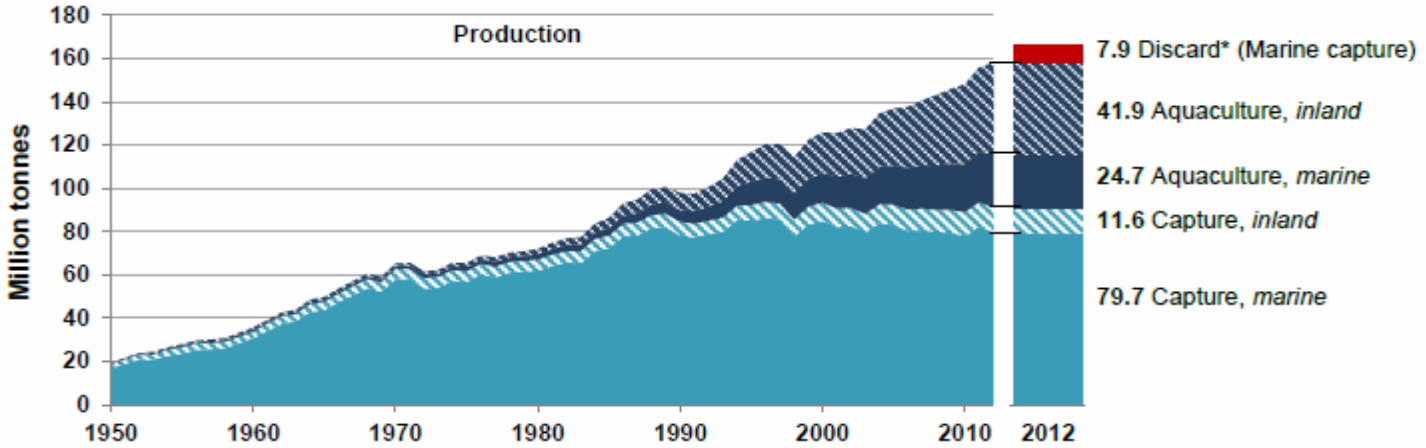
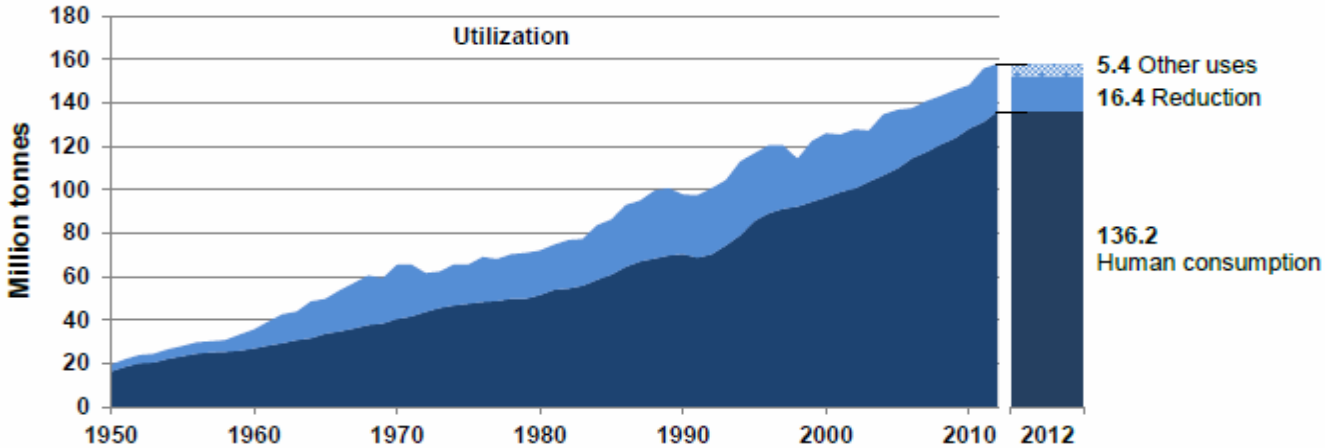
Where we stand…?





Source: FAO Statistics and Information Branch of the Fisheries and Aquaculture Department. *Discard is a calculation based on the 8% estimate on capture as in Kelleher, 2005. All mass numbers are expressed in live weight equivalent, including non-edible parts, as shell of molluscs, head part of fish, etc., and without accounting for post-harvest losses.

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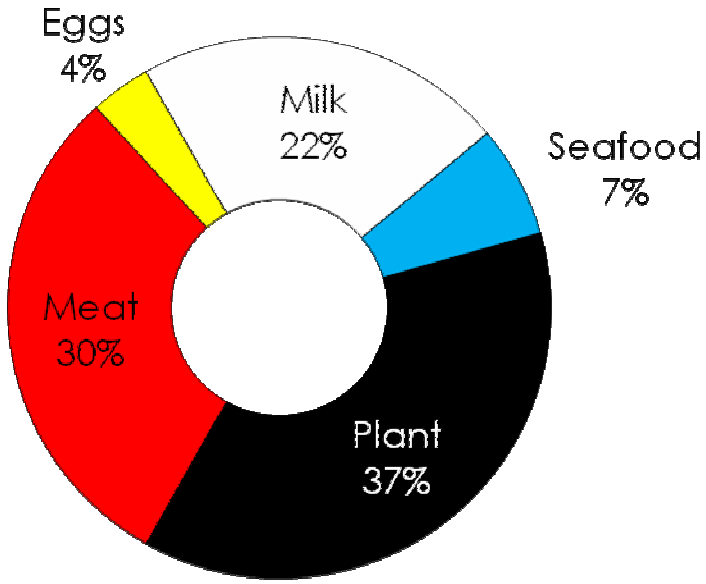
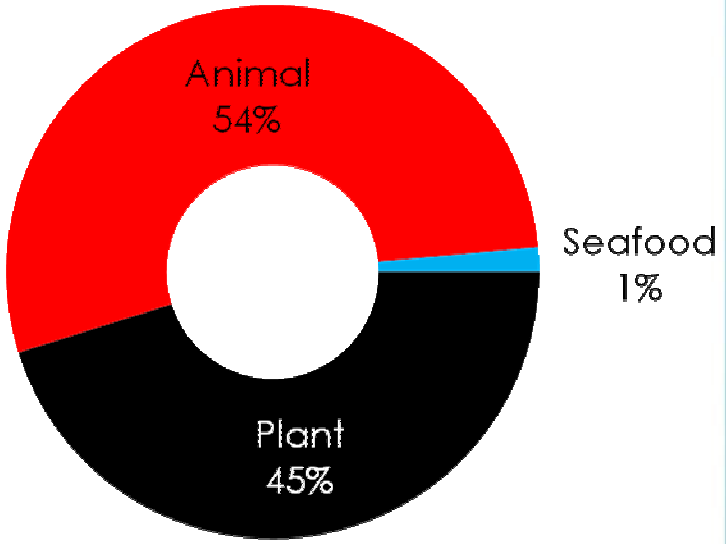
Seafood's contribution to protein & fat intake in Europe

Seafood supplies approx 7% of the total protein intake



Seafood supplies approx 1% of the total fat intake



Source data: OCDE and FAO Outlook 2012

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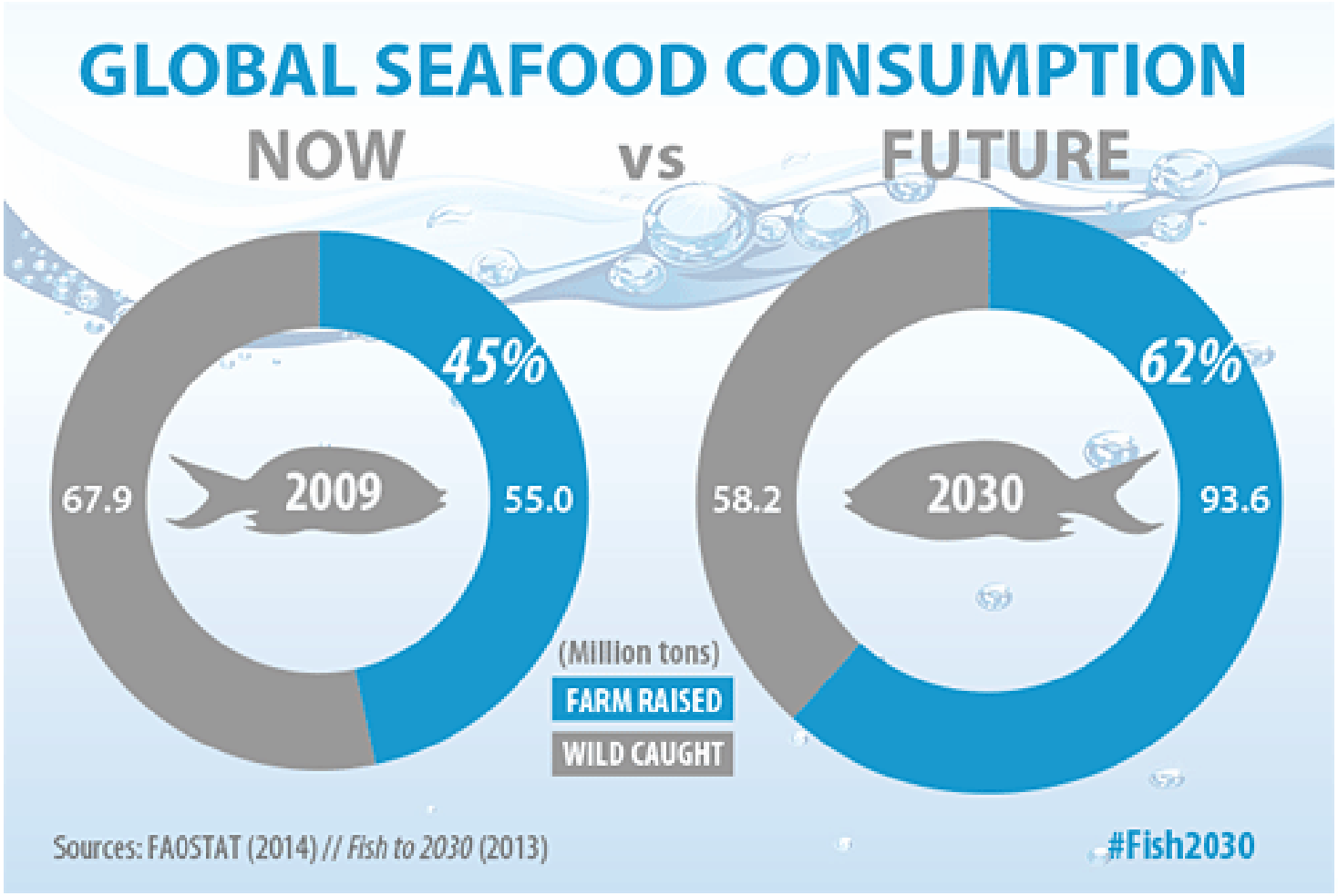
How to fuel this growth…?



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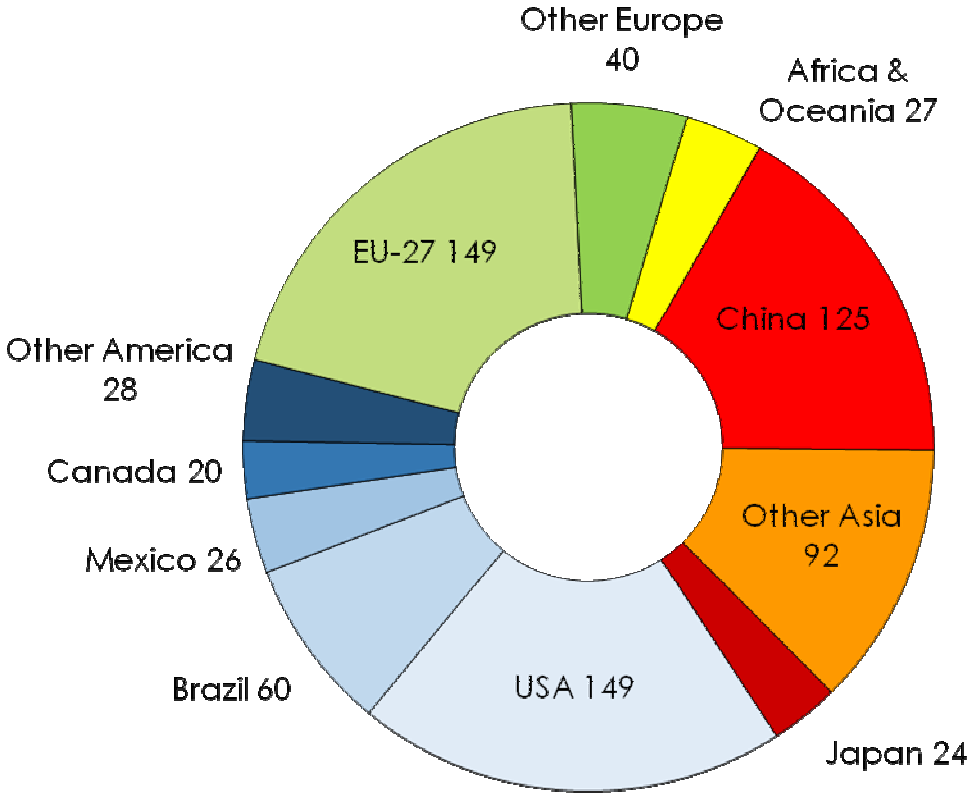
Animal feeds & Aquafeeds



Animal Feeds:
Globally: 740 million tons

Aquafeeds:
5% of total feeds
High reliance on marine-derived ingredients

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Ingredients used in fish feeds

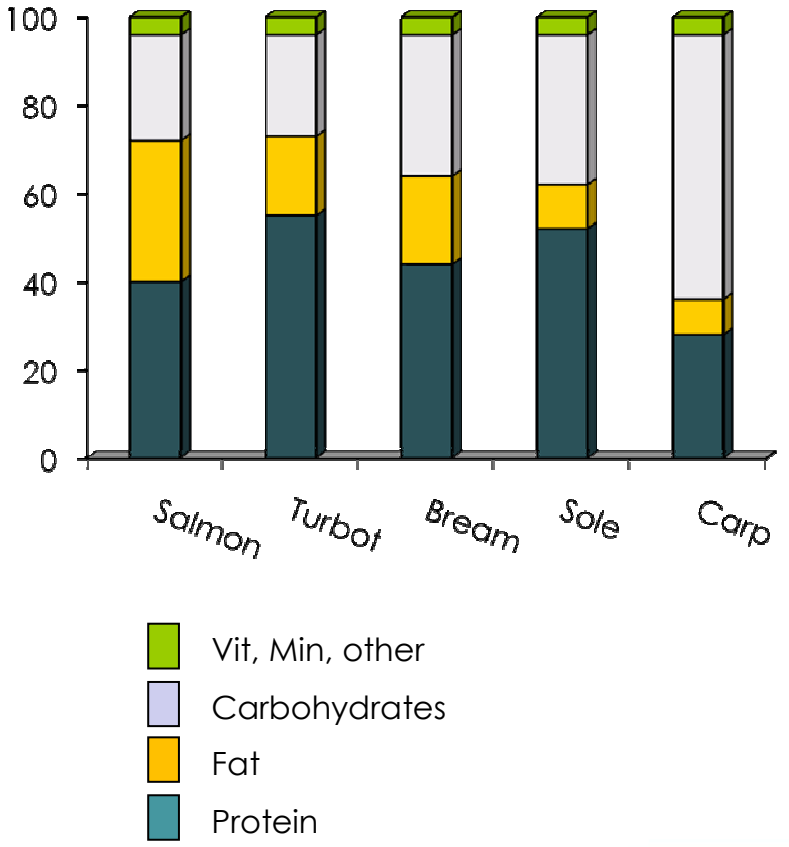
Protein sources
- Fishmeal
- Marine hydrolisates (fish, squid, krill)
- Vegetable meals and concentrates
- Animal processed by-products

Lipid sources
- Marine oils: fish, krill, copepods
- Vegetable oils: rapeseed, soy, palm, linseed
- Animal fats

Carbohydrates
- Cereals, starches (wheat, corn, peas)

Vitamins & Minerals

Additives: additional functionalities



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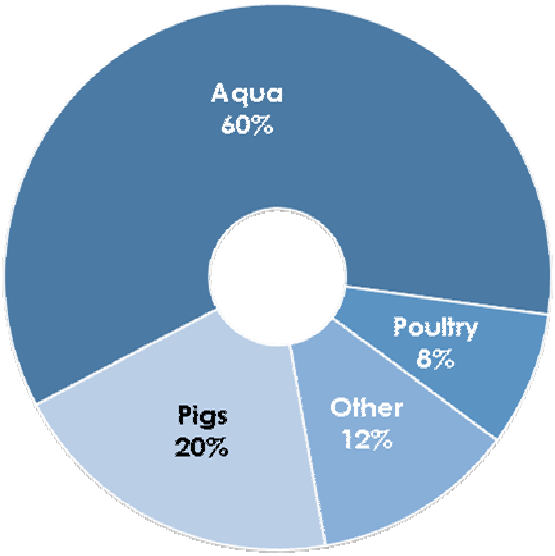
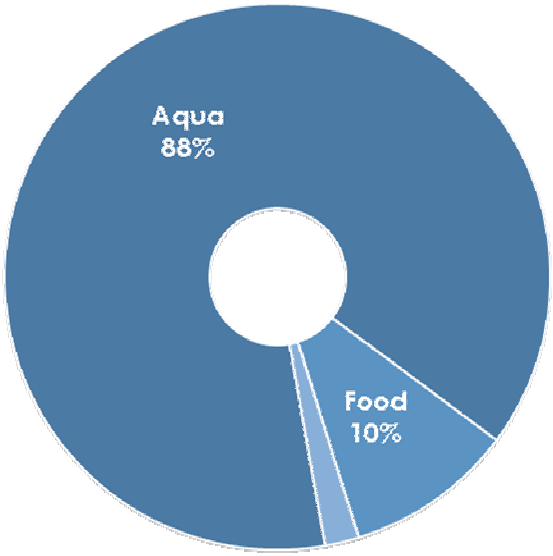
The marine trap…

Fishmeal 2013



Fish oil 2013



Too high dependency on marine ingredients
For now we went towards vegetarian fish

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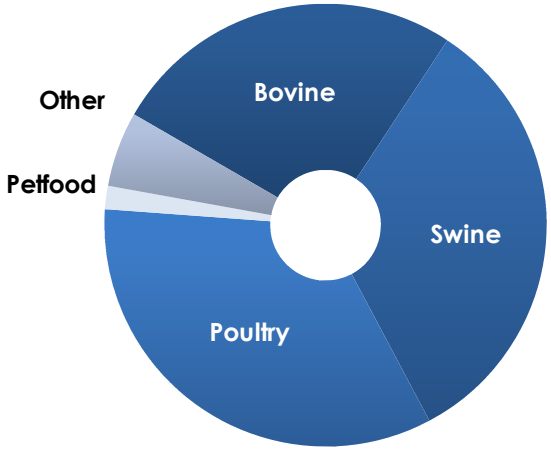
Urgent need for protein sources

EU27 2012 : Animal compound feeds = 150 Million Ton

Crop	Use in EU animal feeds (x1000 Ton/year)	EU self-sufficiency
Soja	17823	2%
Sunflower	1246	63%
Corn gluten	611	81%
Fishmeal	559	55%
Other	217	29%
Rapeseed	3932	93%
Forage	789	106%
Legumes	413	104%



EU market has a protein deficit of -73%

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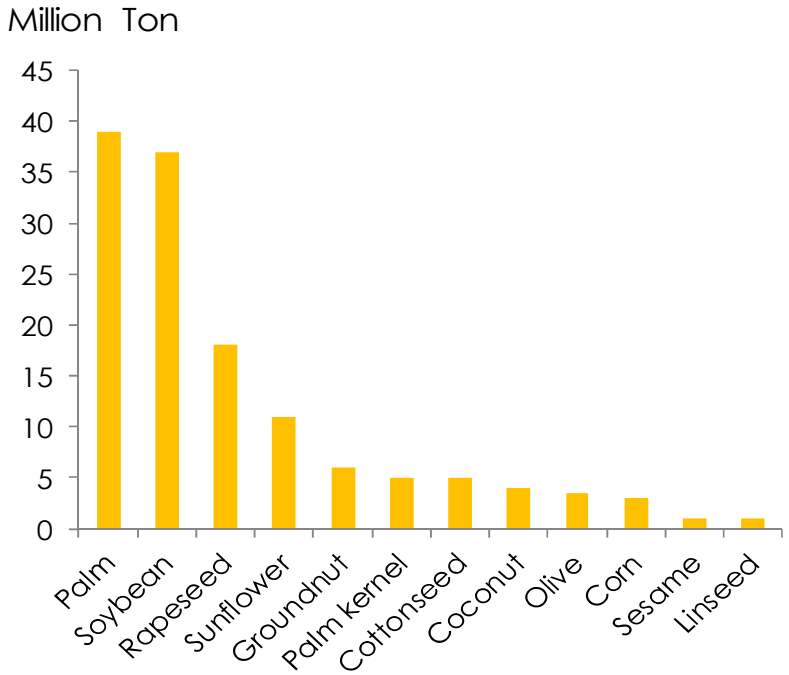
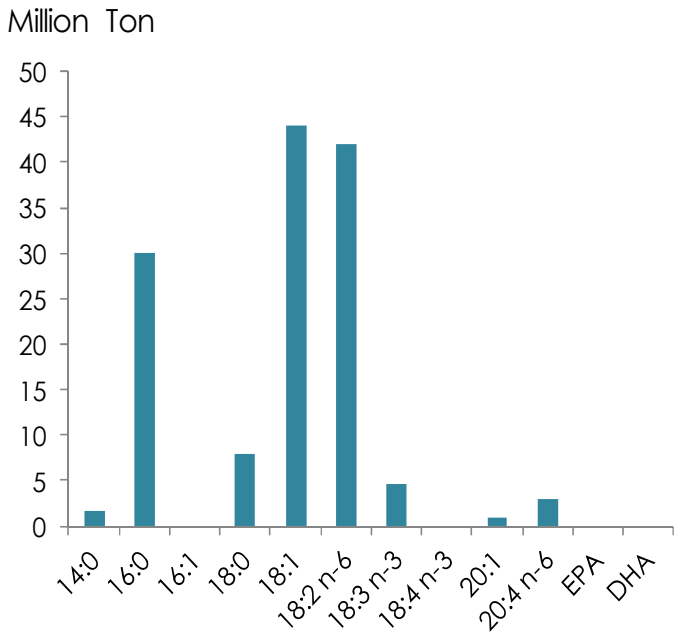
Desperate for LC n-3 PUFA sources

Global avalability of oil sources



Global availability of fatty acids



Fish oil ≈ 1 Mton

EPA & DHA are **ESSENTIAL** to marine fish

We need alternative sources n-3 HUFA (microalgae, yeasts, GMO-plants)

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The upgrade of existing resources

Besides traditional fishmeal and fish oil...
Marine by-products currently used in our feeds at SPAROS

Fish meal from industrial by-products
•Multi or mono-species (salmon, tilapia, tuna, sardine)

Fish solubles concentrates

Protein hydrolisates:
•Fish
•Krill
•Shrimp

Salmon oil, tuna oil
n-3 HUFA-rich oils
Concentrated phospholipids

Other:
•Fish bones
•Shrimp shells meal
•Fish gelatin
•Macroalgae

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Protein sources: fishmeals

Fishmeals	Benefits	Contraints
Multi-species	>35% of traded fishmeal Lower costs	Lower quality than a traditional fish meal (lower protein, higher ash, less free AA)
Mono-species	Higher standardization of composition	Low volumes No intra-species use

Product	€/ton	Use
Fishmeal 70 LT	2,200	General
Fishmeal FAQ	1,900	General
Fishmeal Super Prime	1,500	General
Fishmeal 60 (multi species by-products)	900	General
MicroNorse (with stick-water and micronized)	20,000	Larvae
Fishmeal Tuna (mono-species by-products)	1,800	General

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Protein sources: hydrolisates

Hydrolisates	Benefits	Contraints
Fish Krill Shrimp	High nutritional value High palatability	High cost Higroscopic properties

Product	€/ton	Use
Krill meal (60% protein)	3,200	Young stages, <5%
Squid meal (80% protein)	2,700	Young stages, <5%
Fish hydrolisate (CPSP 90) (85% protein)	2,700	Young stages, <5%
Fish hydrolisate (CPSP G) (72% protein)	2,500	Young stages, <5%
Shrimp hydrolisate (65% protein)	3,500	Young stages, <5%
Krill hydrolisate (73% protein)	3,800	Young stages, <5%

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Lipid sources: oils

Oils	Benefits	Contraints
Fish oil Krill oil n-3 PUFA concentrated oils Copepod phospholipids	High nutritional value High LC n-3 PUFAS	High cost

Product	€/ton	Use
Fish oil (Southern hemisphere)	1,900	General
Salmon oil (by-product from farmed salmon)	2,200	General
Tuna oil (refined, 18% DHA)	23,000	Larvae / Broodstock
Krill oil (high phospholipids)	150,000	Larvae / Broodstock
EPA/DHA-rich fish oil (50% DHA+EPA)	110,000	Larvae / Broodstock
DHA-rich tuna oil (70% DHA)	300,000	Larvae / Broodstock
PhosphoNorse (copepod phospholipids)	260,000	Larvae / Broodstock

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Other products

Oils	Benefits	Contraints
Fish bones (waste)	New source of P	High cost
Fish gelatin	Good protein / Binder	High cost
Shrimp shell meal (waste)	Astaxanthin	Low nutritional value (chitin)
Macroalgae	Minerals / Binder / Bromophenols	Low protein

Product	€/ton	Use
Fish bone meal	11,000	General
Fish gelatin	12,000	Larvae
Shrimp shell meal	2,100	Ornamental fish
Macroalgae mix	2,200	General
Laminaria (iodine-rich macroalgae)	12,000	As an additive

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Conclusions

The feed market:

- Needs new sources of protein
- Is desperate for n-3 LC PUFAs
- Be careful with misleading messages

Very little of dietary a-linolenic acid (18:3 w3) is converted into EPA or DHA

Seafood remains the unique source

The feed market:

- Requires large volumes - LOW cost
- If associated to a functionality – MEDIUM cost

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Thank you for your attention
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