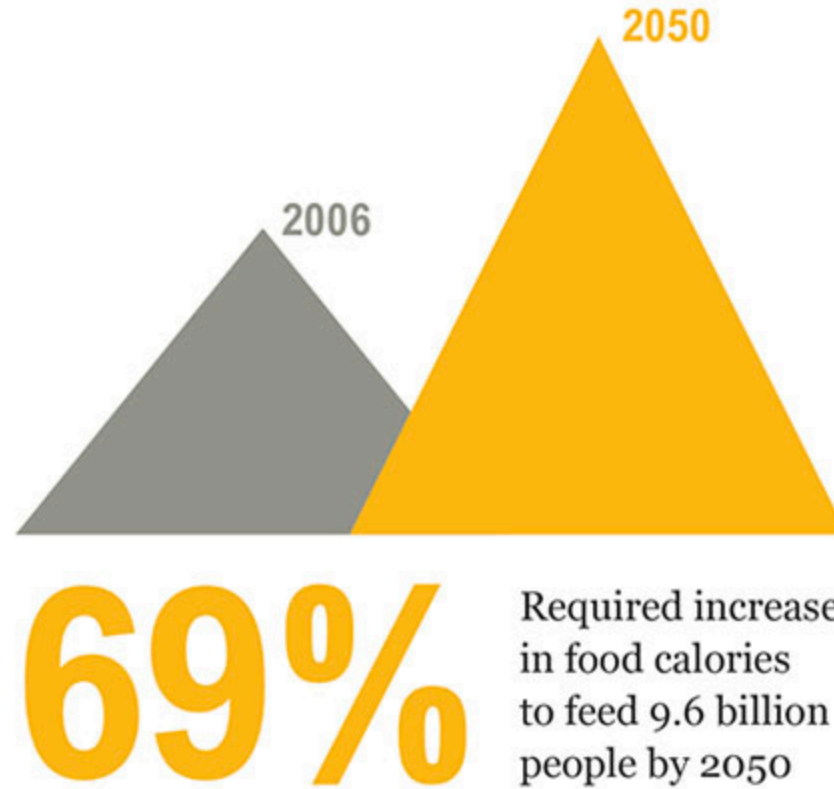




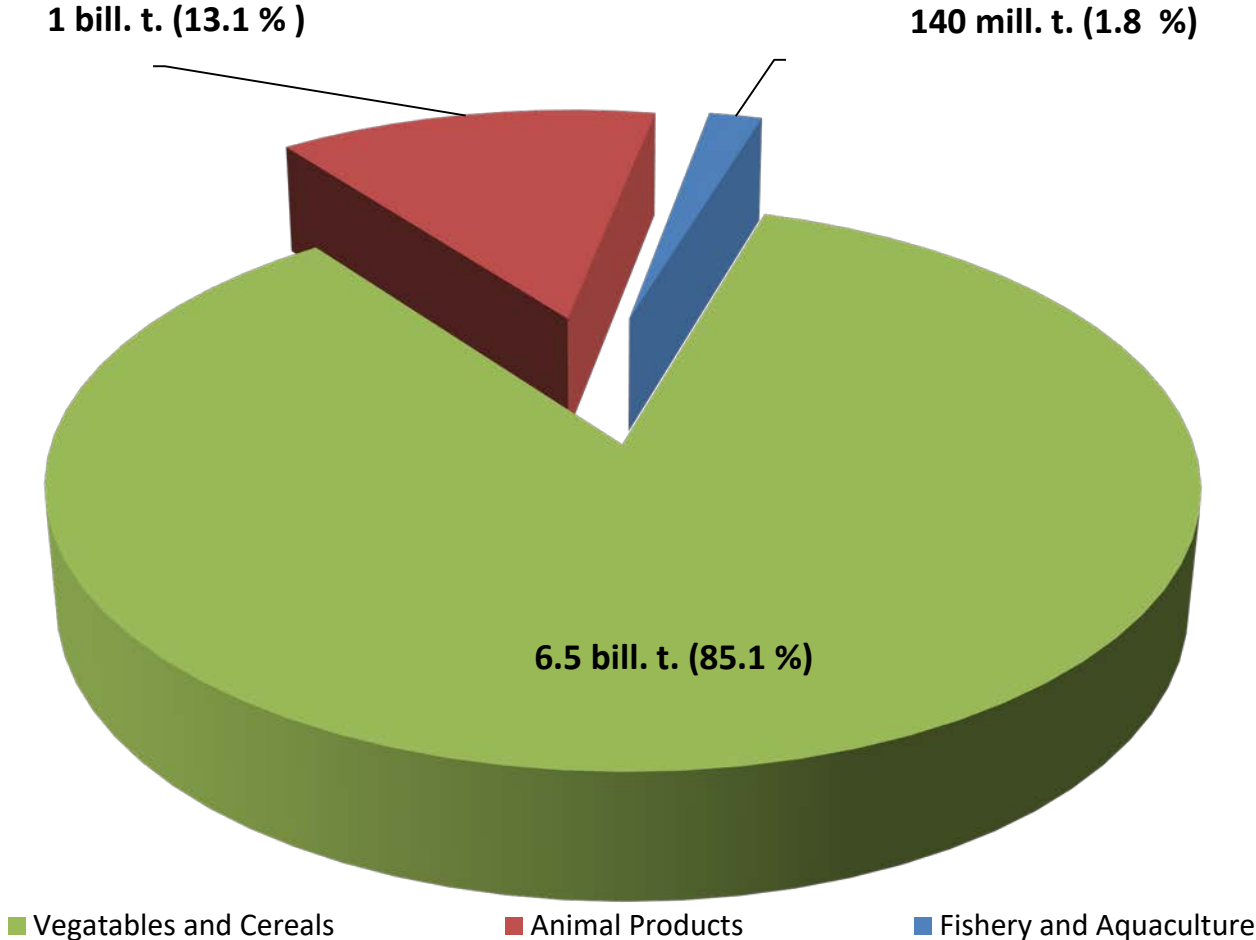
Veien mot produkter for humant konsum

Kjartan Sandnes, CSO Biomega Group AS
Regional FoU mobilisering for økt verdiskapning i biomarin næring
Ålesund, 20.september 2017

The global challenge



The global food sources



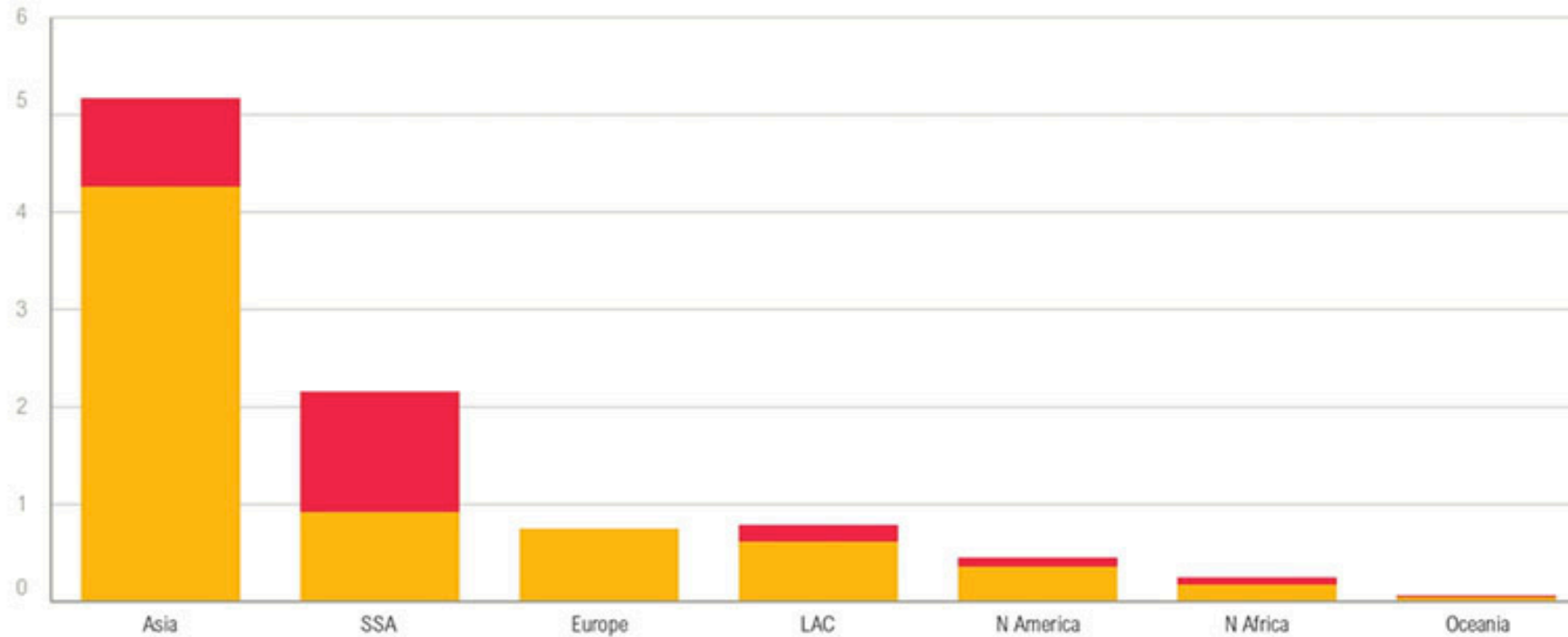
Source. FAO stat 2008



Projected Population Growth (in billions)

Population in 2012

Population growth from 2012 to 2050



Note: "SSA" = Sub-Saharan Africa, including Sudan. "LAC" = Latin America and Caribbean. "N America" = North America. "N Africa" = Rest of Africa.



WORLD RESOURCES INSTITUTE

Sources: <http://ow.ly/rpfMN>

Global Protein Ingredients Market: Overview

In terms of value, the market is expected to register a CAGR of 6.5% during the projected period (2021).

Growing popularity of plant protein ingredients is expected to push certain key products, such as soy and pea proteins to grow at high rates.

Egg and dairy products are expected to witness considerable demand in the future.

Increasing consumer demand for 'purer' products with low processing is enabling development of new products such as micellar casein and native whey.






The other factors driving the market are increasing adoption of protein ingredients in food and beverage products, and growing consumer preference for fortified foods or foods enriched with protein ingredients.

Transparency Market Research (TMR)

Some key figures

FAO OUTLOOK UNTIL 2050: TIMES 1.6!

Million metric tons

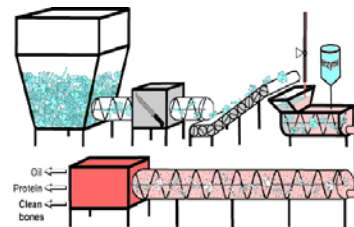
PROTEIN TYPE	2010	2050	% CHANGE
 BOVINE	66.7	107.5	62%
 POULTRY	98.9	201.9	104%
 PIGS	109.3	150.3	38%
 AQUA	59.9	113.7	90%
 MILK	722.9	1119.7	55%
TOTAL	1057.7	1693.1	60%

Source: FAO Global Food Outlook November 2012/FAO World agriculture towards 2030/2050 - 2012 Rev/OECD FAO Ag Outlook 2013

The Biomega biorefining story



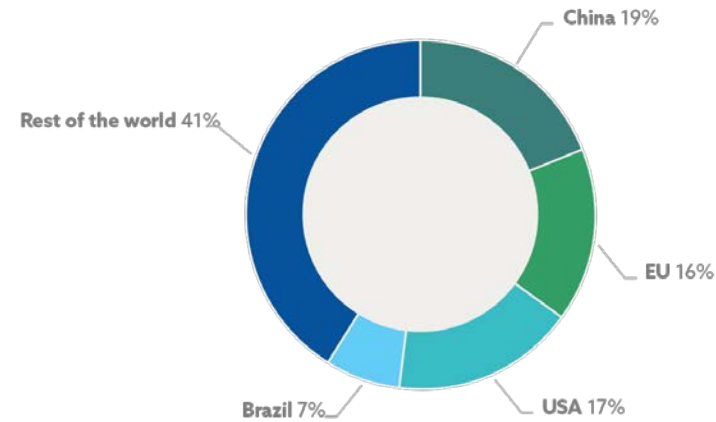
- 2000: Biomega AS established
- 2002: Production established with patented continuous enzymatic hydrolysis process.
- 2007: New site acquired for new factory.
- 2011: 30.000 tons raw materials processed.
- 2012: New plant with a capacity of 60.000 tons annually
- 2016: Acquired by Amerra Capital Management LCC, N.Y. Jørgen Horntvedt appointed CEO of Biomega Group AS.



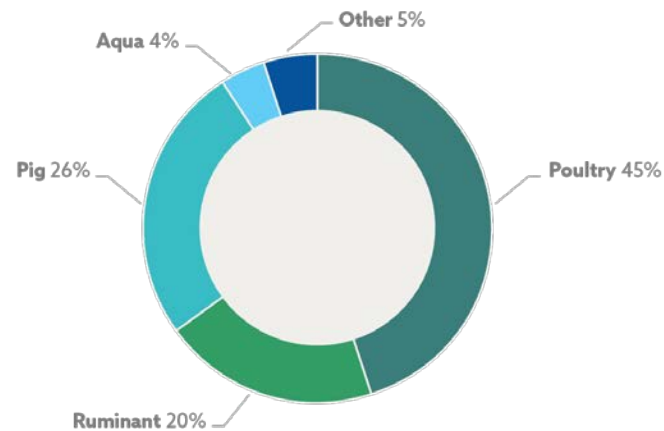
2016: Global feed production surpasses 1 billion metric tons for first time

FOUR COUNTRIES PRODUCE OVER 60% OF COMPOUND FEED GLOBALLY

THE TOP FOUR AS A PERCENTAGE OF THE GLOBAL FEED PRODUCTION TOTAL



THE GLOBAL FEED MARKET AS A PERCENTAGE BY SPECIES



Ingredients with a human market potential

Salmigo[®] Protein hydrolysate

- Soluble and highly digestible marine protein
- Allows protein to be absorbed more directly, without the need for digestion
- Outperforming whey protein on bioavailability and uptake
 - Nutrition companies has for a long time been looking for alternative protein sources to whey
 - Several studies supports marine protein's position within human nutrition
- Final solid product contains ~90% proteins and are 100% water soluble
 - Traditional fish powders are not 100% soluble
- Improved taste and flavour
 - The combination of high nutritional value and neutral taste properties make the product ideal as a nutritional supplement in variety of end products
- The spray dried product is stable and has limited risk of bacterial outbreaks

Sports nutrition



Healthcare supplements



Protein supplements



Salmon Meal

- Biomega's Salmon Meal is produced from top quality raw materials in order to have human grade standard
- The Salmon Meal contains between 66-70% of proteins
- Unlike the SPH, Biomega's Salmon Meal has a defined fish taste, which makes the product a suitable nutritional supplement in products designed to taste like fish
 - Biomega can utilize its competence and process to adapt to customers requirements regarding taste and flavour
 - Ideal as an ingredient to fish soups and bouillons
- May replace less suitable products, as seaweed meal

Soups and fish bouillon



Prioriterte kunnskapsområder for bærekraftig utvikling

Forskningsrådets vil styrke og målrette innsatsen innenfor områder særlig relevante for FN-målene der Norge har fortrinn og muligheter, og der forskning og innovasjon er særlig viktig for å møte bærekraftsutfordringer i Norge og globalt.

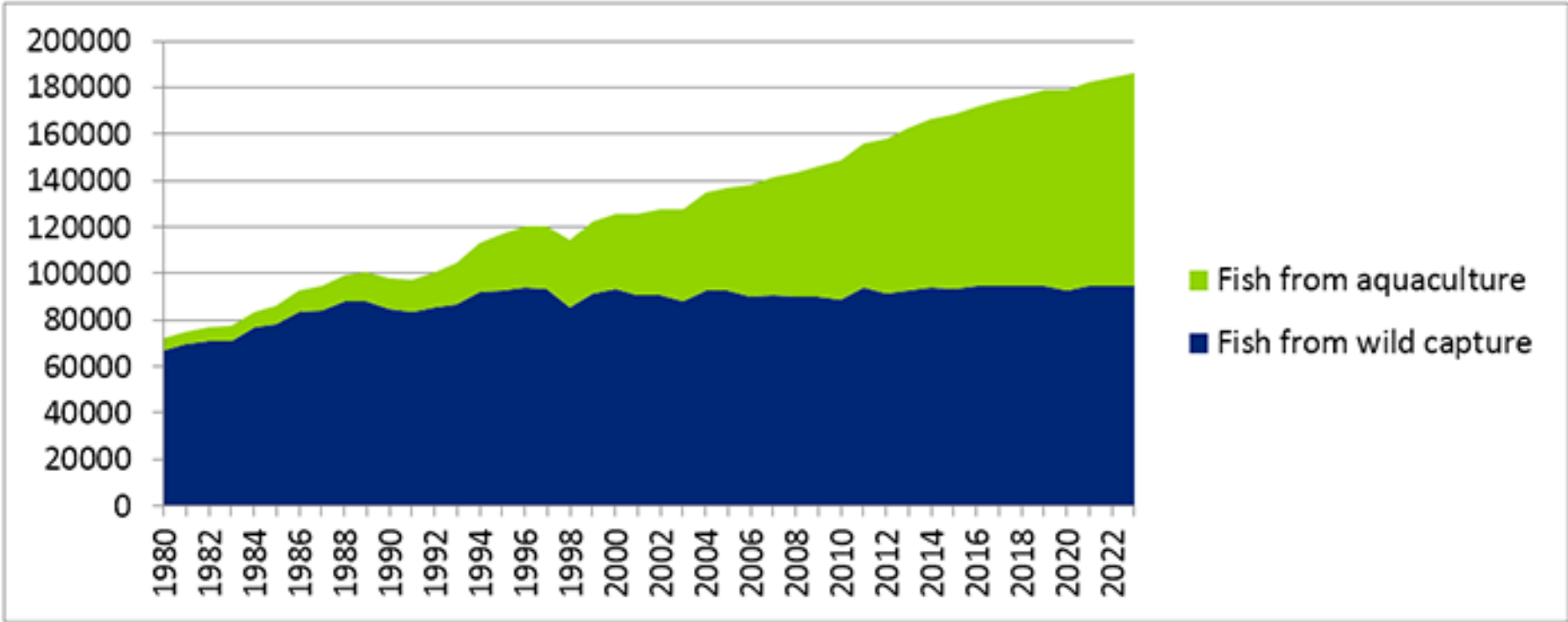


Prioriterte kunnskapsområder

Områder som bidrar til næringsutvikling som støtter opp om bærekraft og grønn konkurransekraft

- > Rene, trygge og produktive hav
- > Bærekraftig bioøkonomi
- > Ren energi – grønn konkurransekraft
- > Sirkulær økonomi

No more fish from wild capture?



Emerging options

Mesopelagic



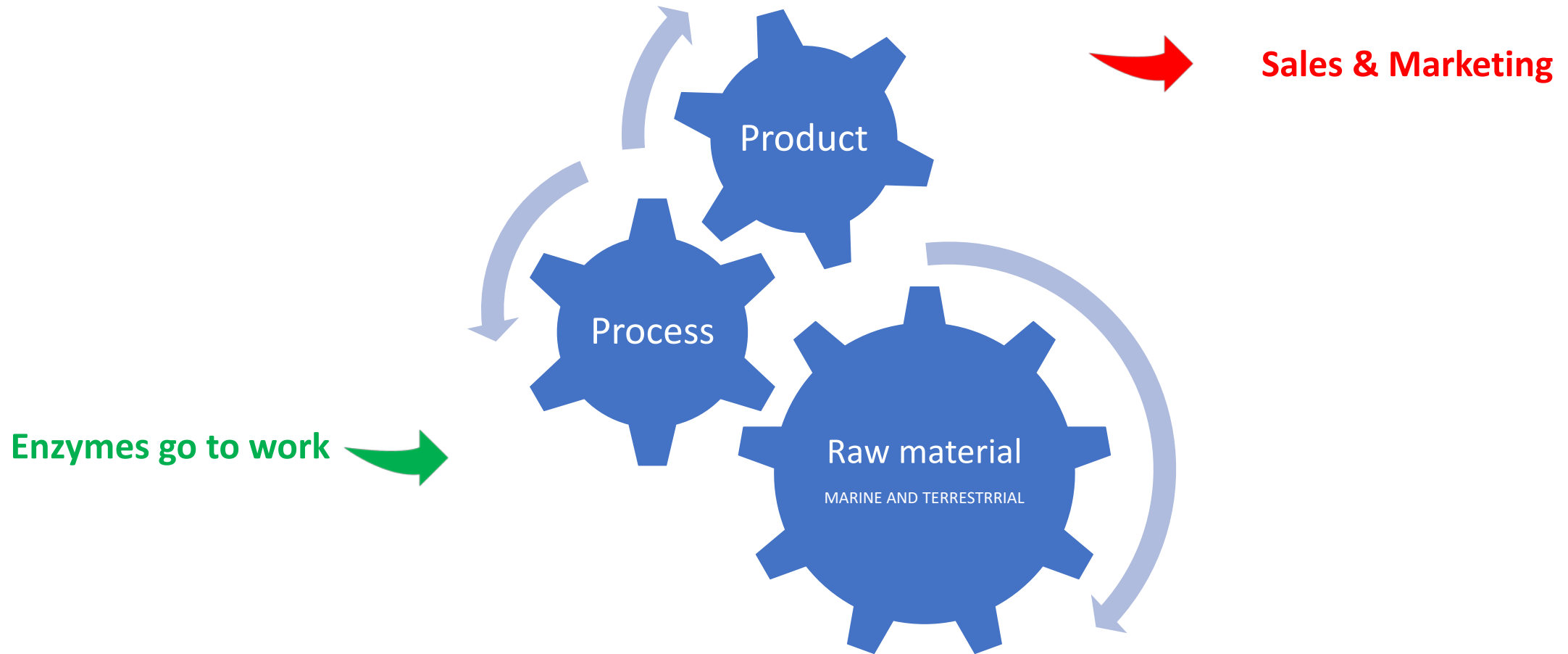
Seaweed

Mussels

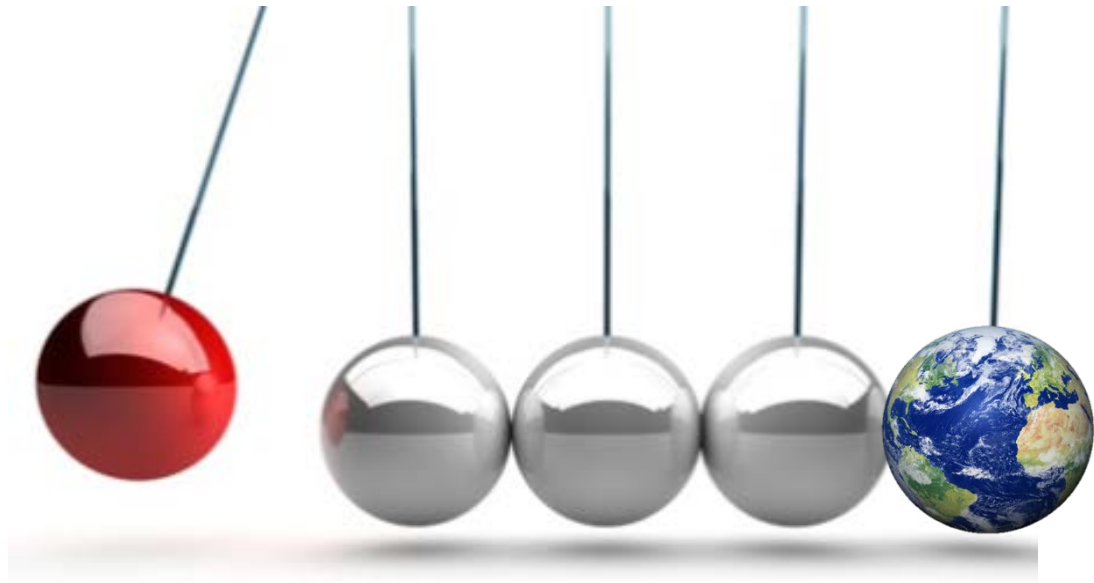


Insects

The R&D challenge



Biotechnology...



...sets great things in motion