

# New Crop Product Functionality

Derek Stewart

Enhancing Crop Productivity and Utilization – JHI

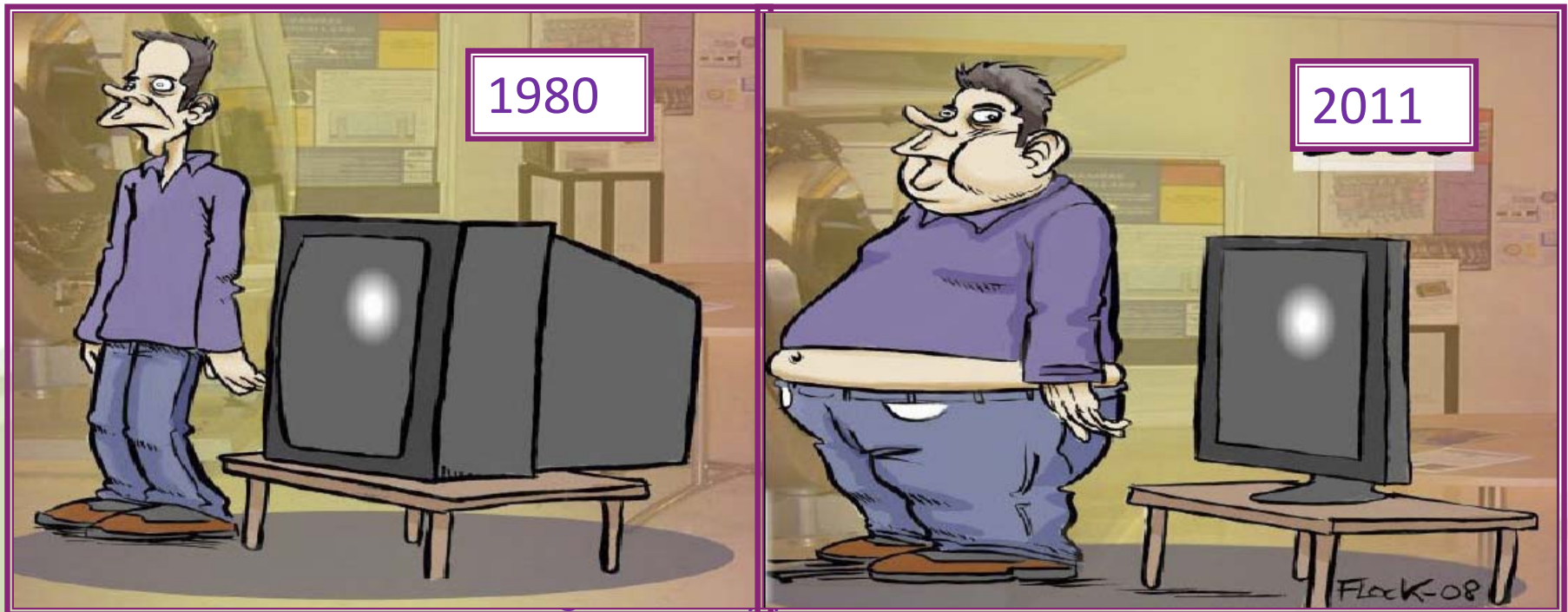
Chair of Food Chemistry – Heriot Watt University

## Drivers for crop product functionality



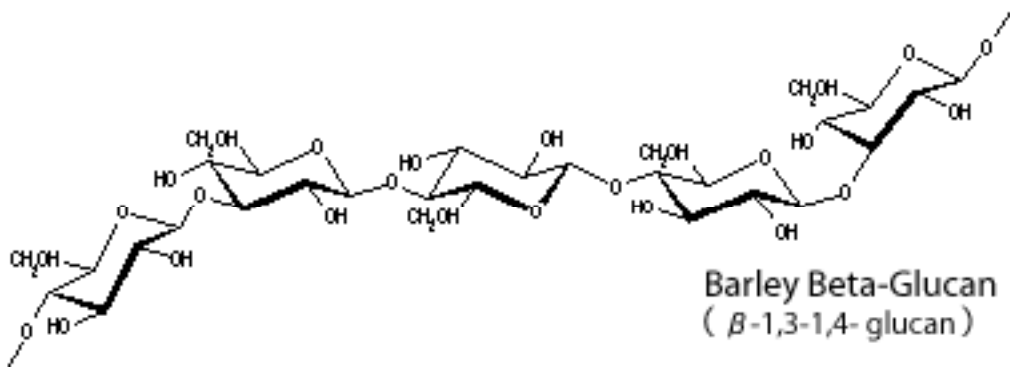
nes  
on  
te

- Mortality ↓ : Morbidity ↑
- Western population is living longer but is sicker.
- CVD, Diabetes, (some) cancers, neuro-degeneration and inflammation associated disorders



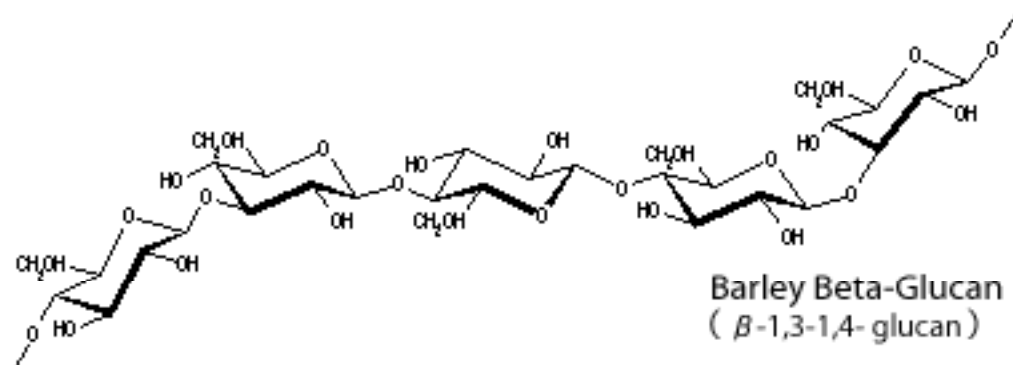
# Functional products from cereals

- Wheat, Barley, Oats and Rye - Major grains for food and feed in Europe
- Worldwide at least 1500 Mtonnes cereal grain produced annually (inc rice).
- Only Barley and Oats contains  $\beta$ -1,3-1,4-glucan, one of the few plant components with an approved health claim.
- $\beta$ -glucan has been shown to lower/reduce blood cholesterol. *“Blood cholesterol lowering may reduce the risk of (coronary) heart disease. The (EFSA) Panel considers that, in order to bear the claim, foods should provide at least 3 g of oat  $\beta$ -glucan per day”.* EFSA 2010.



# Functional products from cereals

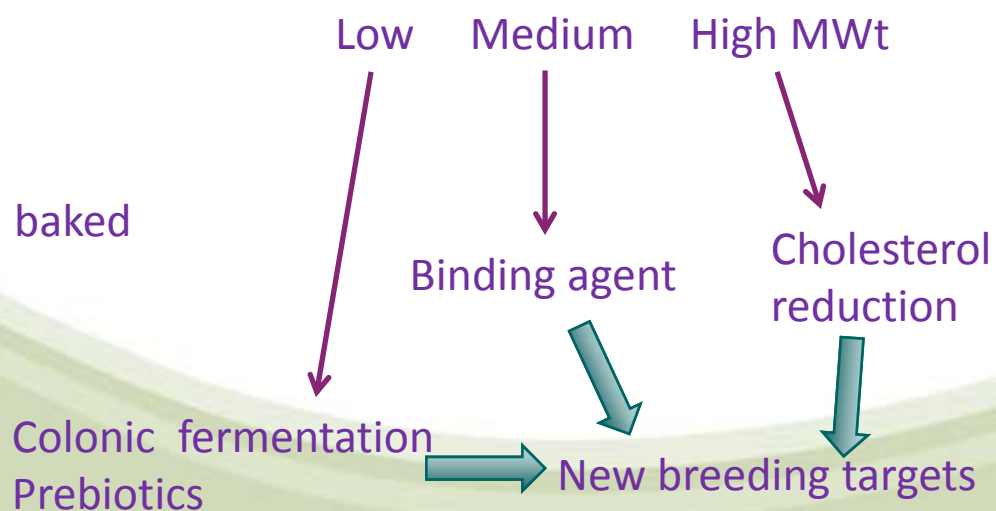
Functional fat replacer in multiple products -  
mayonnaise, spreads, dips & dressings, sauces, meat  
products, baked goods, ready meals,



Problem (?)

- Biosynthesis still to be fully elucidated but being addressed.
- The “product” is a MWt distribution of polysaccharides -  $31-3100 \times 10^3$ .
- What is the real target?
- Are there actually several targets?

Functional binding agent - meat products, baked  
goods, ready meals,



# Functional products from cereals



- Worldwide: at least 1500 Mtonnes cereal grain produced annually.
- This also generates 2250 Mtonnes of straw. Bran is also generated.
- Previously low value residues they are now increasingly becoming targets for valorisation: feedstock for fuel, chemicals, ingredients etc.
- These approaches (not fuel) have been reinvigorated with the shift towards sustainable production.
- The biorefinery approach (wet, dry solvent etc) is being explored by several groups globally.

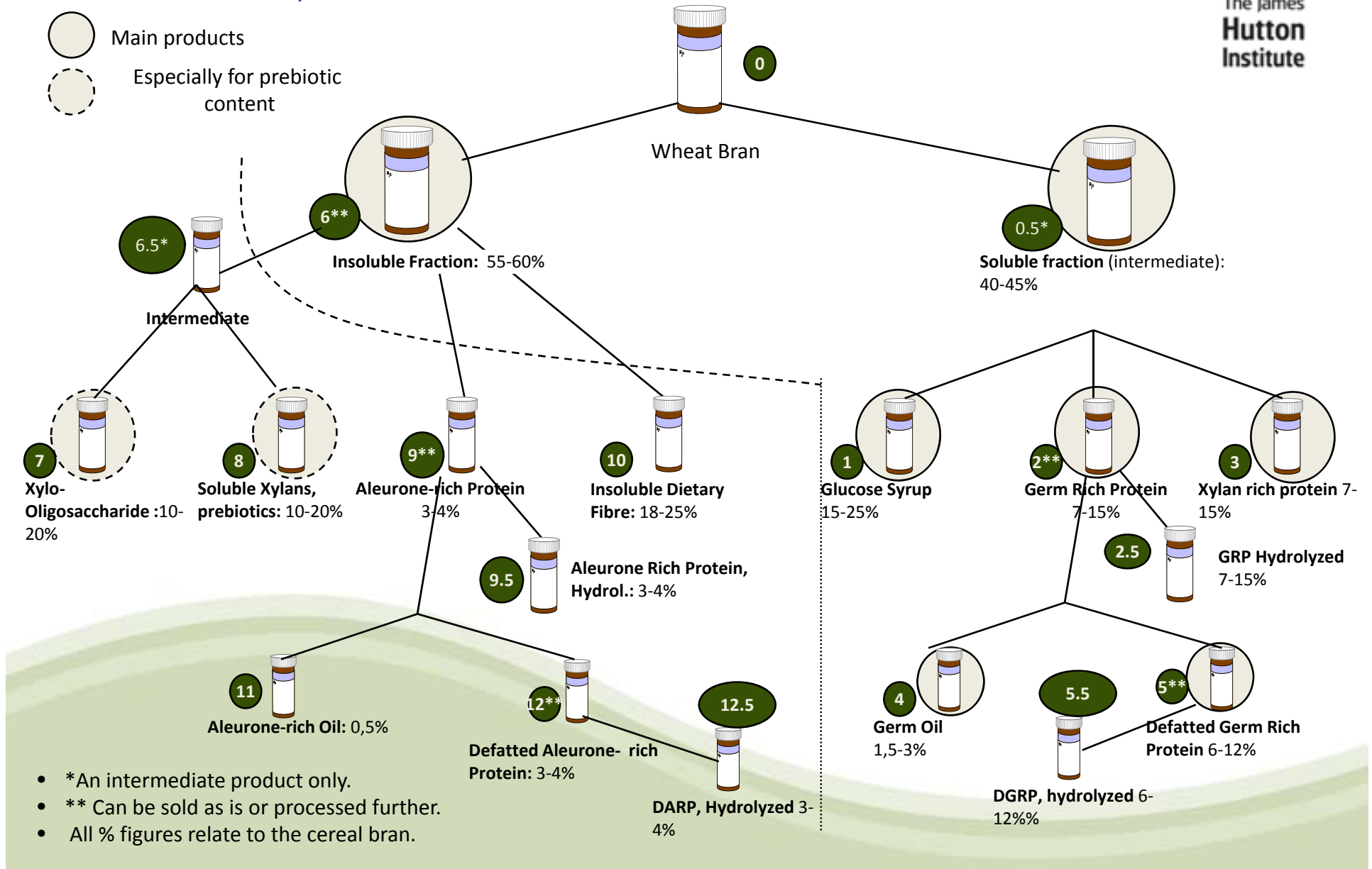
# Wheat bran wet fractionation stream

Mark Lawther DTI, DK



Main products

Especially for prebiotic content



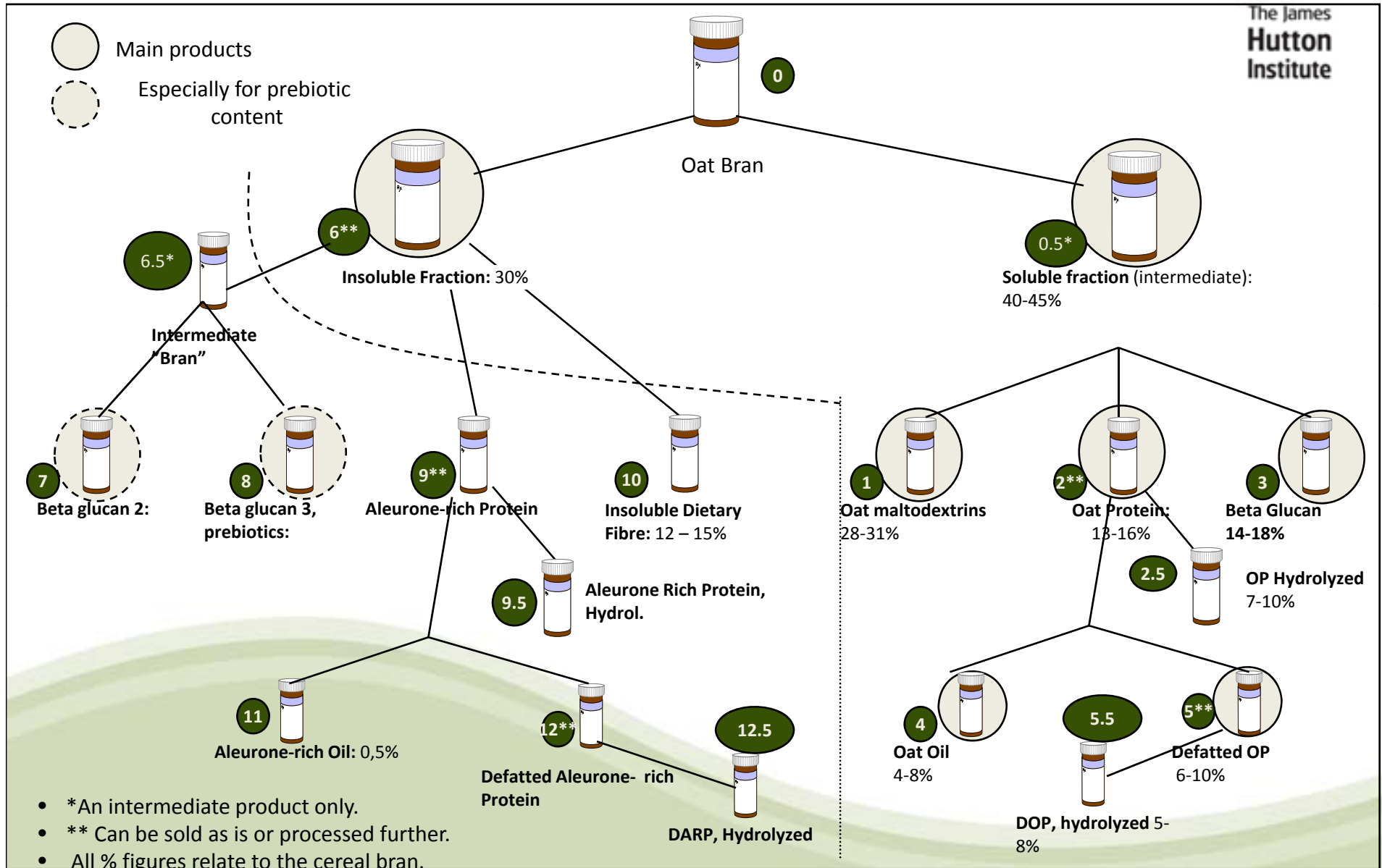
- \*An intermediate product only.
- \*\* Can be sold as is or processed further.
- All % figures relate to the cereal bran.

# Oat bran wet fractionation stream

Mark Lawther DTI, DK



The James  
Hutton  
Institute



# Minor crop wastes also have major value



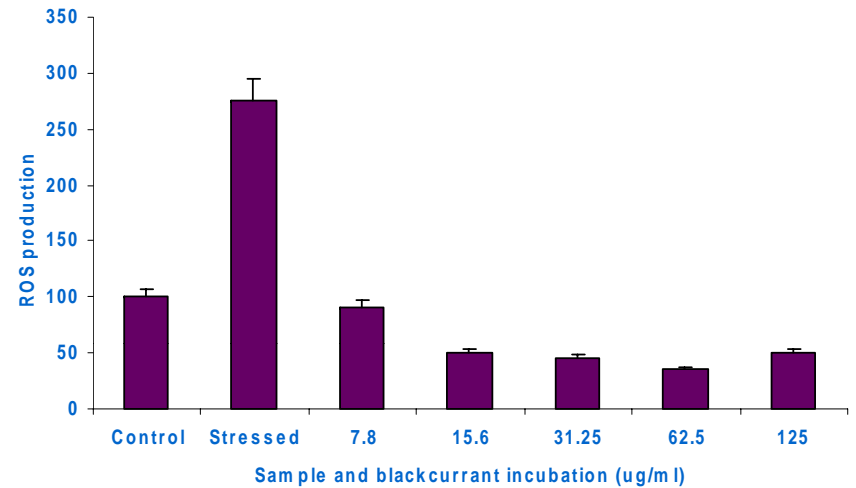
Future-proofing berries  
**CLIMAFRUIT**

Blackcurrant

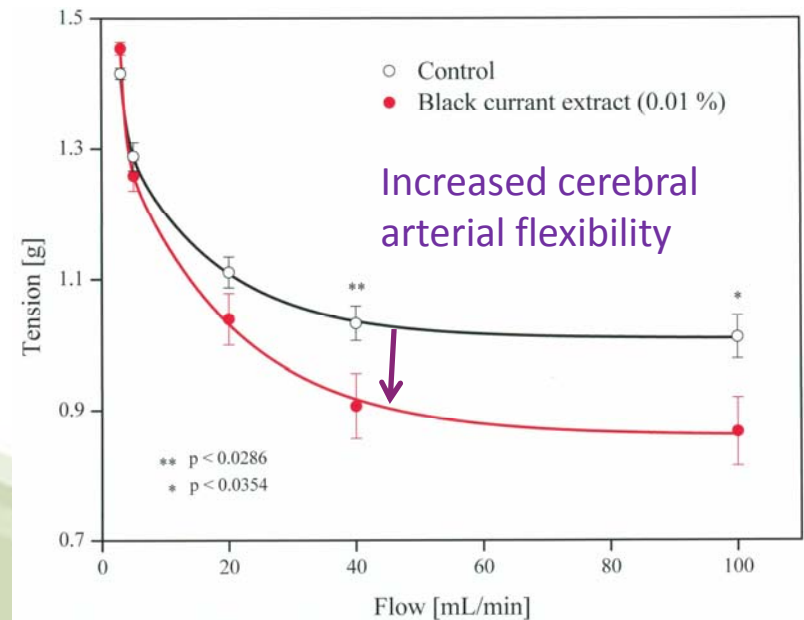
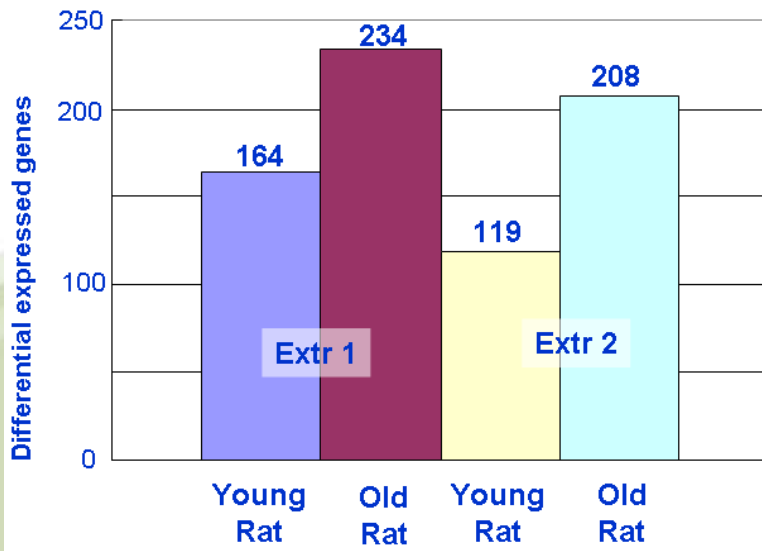


Juice + Pulp → Anthocyanin rich Feedstock (Food or Pharma)

Neuroprotection via blackcurrant polyphenol pre-incubation



Age-related Rat Liver Gene Expression Following Blackcurrant Consumption







# Conclusions

- Crops can be more significantly utilised.
- The decreasing cost of genomes sequencing and advent and utility of high throughput metabolite analysis (metabolomics) should identify many more potential targets.
- The push for sustainability will facilitate the valorisation of lower value crops, waste and spoiled material.
- These alternative functional products will feed into the expanding functional food markets.
- The exploitation of these undervalued resources will need an interdisciplinary approach, in particular the inclusion of socio-economic skill bases.
- Cereal waste exploitation is likely to be an immediate winner particularly in the boom economies e.g. India.