Food and Nutritional Sciences
Centre for Food Security

University of Reading

EVALUATING POTENTIAL CO-PRODUCTS FROM OILSEED RAPE

Carol Wagstaff

THE WASTE…

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Oilseed rape is now the major non-cereal crop grown in the UK: 700 000 ha in 2013 = 4t/ha average farm yield

40-45% oil

55-60% meal

POTENTIAL APPLICATIONS

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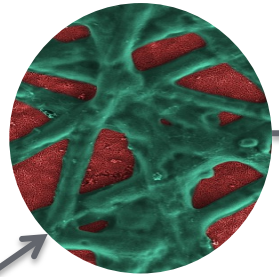
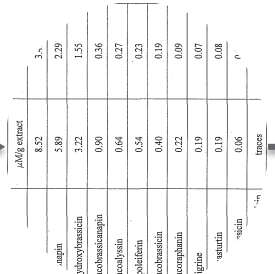
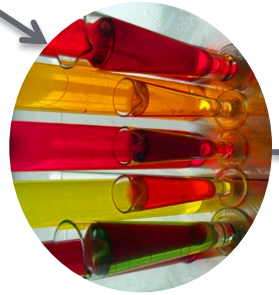


Fibres for packaging



Nutritional supplements or fortification



Food colouring

FoodWasteNet

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Aim:
To realise the potential of using food waste and by-products to produce renewable chemicals & biomaterials with added value and market potential

Up to £50k Proof of Concept funding available for projects to derive value from food waste. Info: www.foodwastenet.org

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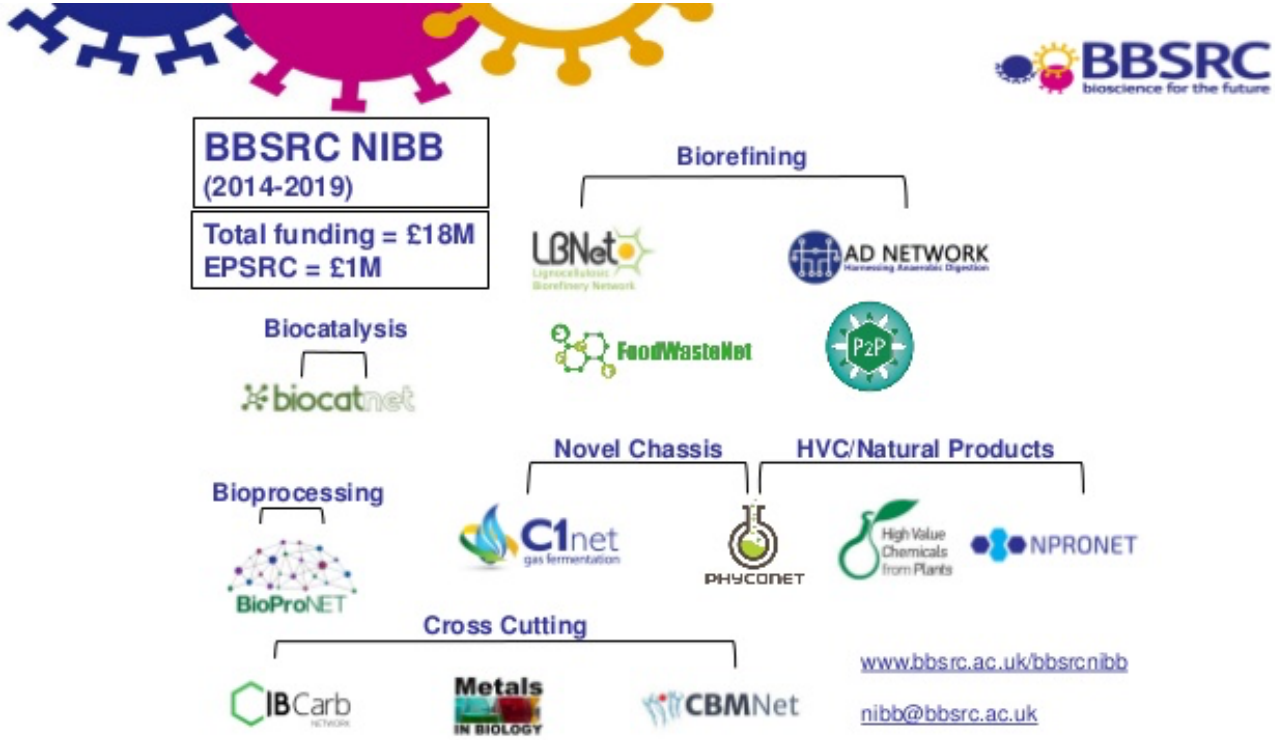
One of 13 BBSRC funded collaborative Networks in Industrial Biotechnology and Bioenergy (BBSRC NIBB). All networks will drive new ideas to harness the potential of biological resources for producing and processing materials, biopharmaceuticals, chemicals and energy.



RAPESEED OIL PRODUCTION

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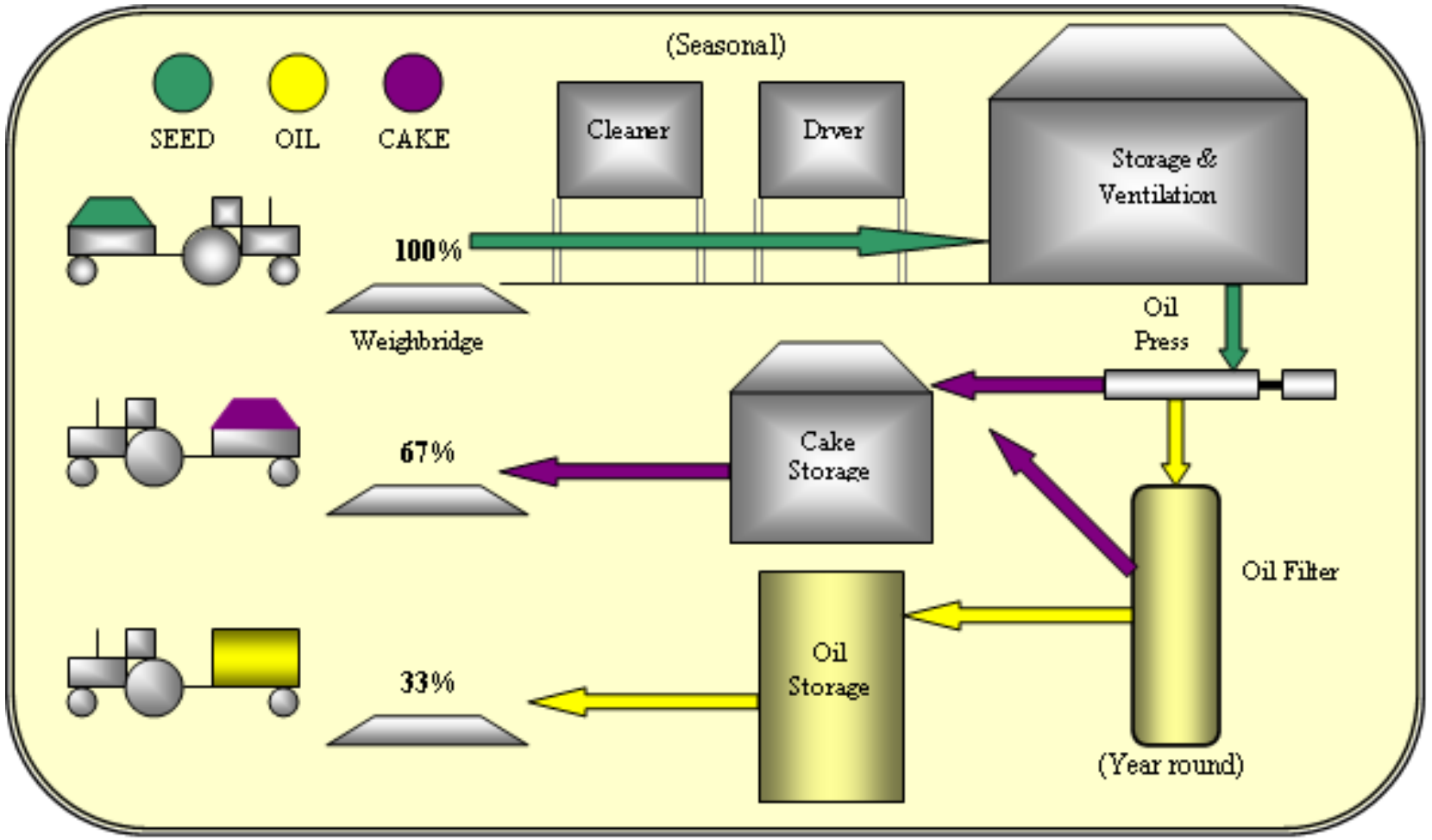

STAINSWICK FARM

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- Small-scale producer of rapeseed oil
- Sell through farmers' markets, county shows and food fairs
- Waste rapeseed meal currently goes for animal feed
- Milling approx. quarterly, then meal stored in dry barns

POTENTIAL PRODUCTS

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- Total protein content was measured according to Kjeldahl analysis (Nitrogen content x 6.25). Soluble protein analysis was also performed using a Bradford method as a comparison.
- Carbohydrate, lignin and ash content were determined according to NREL analytical protocols.
- Residual oil was determined by petroleum ether extraction in a Soxhlet apparatus and analysed in a Gas Chromatography-Mass Spectroscopy (G.C.-M.S.) system.
- Fatty acid (lipid) analysis was performed using GC on the extracted residual oil of the two batches and compared to the rapeseed oil of the farm.
- Tannins were assessed using a HCl/Butanol assay.
- Glucosinolates were extracted and analysed by LC-MS using the method of Bell, Oruna-Concha and Wagstaff (2015).
- Polyphenolic compounds were assayed by HPLC with comparison to known standards.
- Myrosinase activity was assessed via a spectrophotometric assay using known standards as a control.
- Carotenoids were assayed using a spectrophotometric assay after extraction in N,N-Dimethylformamide according to the method of Wellburn, 1994.

CARBOHYDRATE

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- The majority of carbohydrates are in the cellulose fraction from the cell wall, with a relatively small quantity derived from hemicelluloses. Hemicellulosic oligosaccharides are medium and long chain sugar molecules containing xylose, mannose, and arabinose.
- These sugars can be classified as non-digestible carbohydrates, thus playing an important role in gastrointestinal health as prebiotics.
- Hemicelluloses and celluloses are prebiotics and can be fermented by gut microflora to produce short chain fatty acid sources of energy.

SUMMARY OF POTENTIAL

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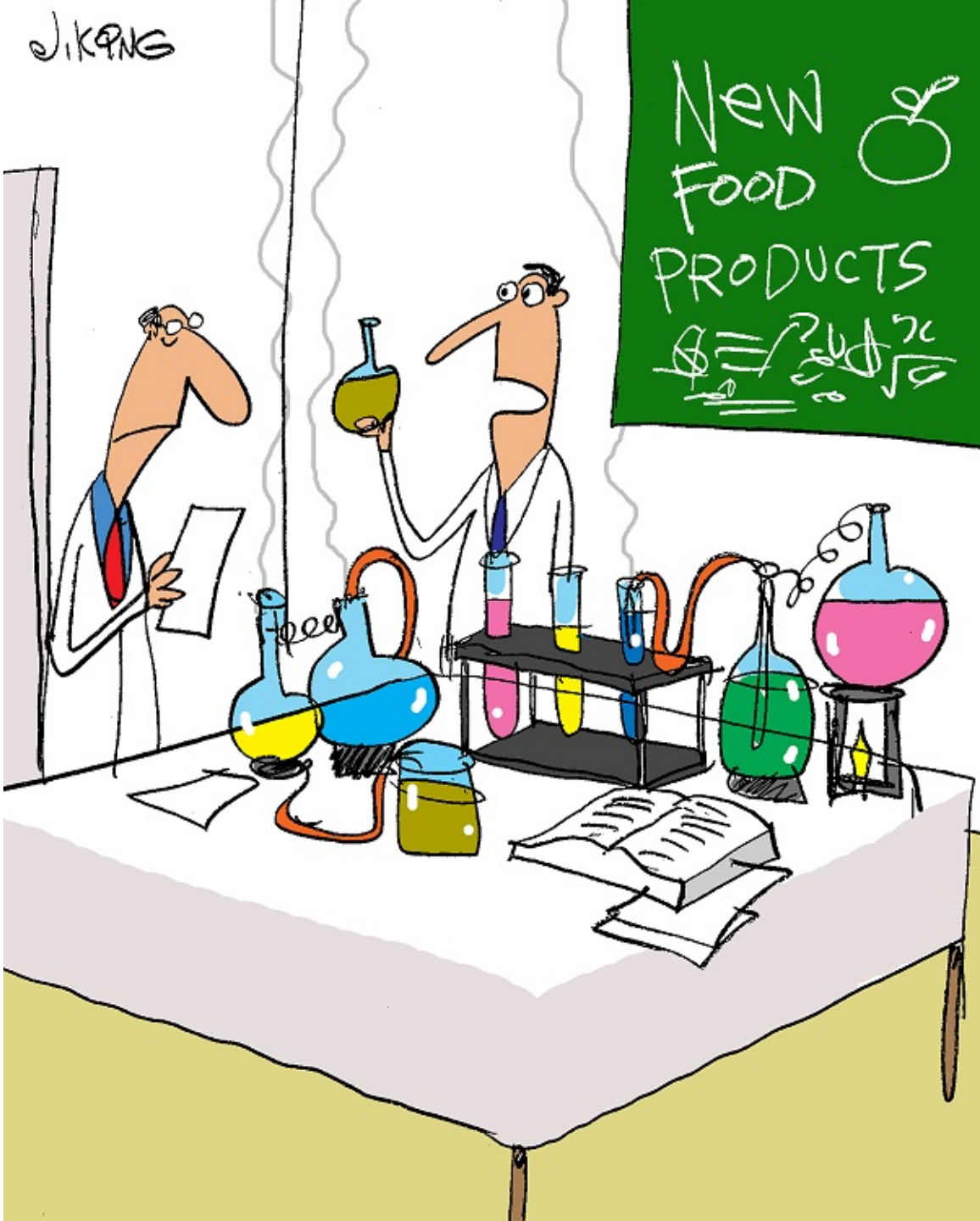
- Residual oil – could be extracted by hot pressing/solvents
- Glucosinolates - biocidal activity against a wide variety of organisms, such as insects, plants, fungi, and bacteria. Purification for further trials into human health benefits (lowering the risk of developing some cancers).
- Myrosinase – purified from the protein fraction to enable feed detoxification and enhanced yield of industrial flavour production
- Anthocyanins – food colourants and pharmaceuticals for the benefit of human health

NEXT STEPS

- Stack value- added oil and protein traits together
- Investigate protein fraction further to identify other enzymes of value
- Identify prebiotic potential that may arise from lignocellulosic fraction
- Economic analysis of producing different co-products



THANKS TO…

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- Dr Afroditi Chatzifragkou (macromolecular composition)
- Dr Irene Mueller-Harvey (tannins)
- Luke Bell (glucosinolates)
- Chelsea Snell (protein)
- Bola Oloyede (myrosinase)
- Rashed Alarfaj (polyphenols)
- Kala Radha (carotenoids)

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