Fruit and vegetable processing by-/co-products: Can they be used as functional feed ingredients in animal nutrition to produce novel value-added products?

Eleni Kasapidou[1], Evangelia Sossidou[2] and Paraskevi Mitlianga[1]

[1] Department of Agricultural Technology, Division of Agricultural Products Quality Control, Technological Educational Institution of Western Macedonia, Florina, Greece

[2] Hellenic Agricultural Organization-DEMETER, Veterinary Research Institute of Thessaloniki, NAGREF Campus, Thermi, Thessaloniki, Greece

3rd International ISEKI Food Conference
ISEKI_Food 2014
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Background

- **Food industry co- products and waste is estimated at approximately 36 million tonnes per year in the EU countries in 2010; following an increasing trend**

  Re-utilisation is a top priority

  Environmental, social and economic impact

- **Modern consumers are interested in**

  “clean”, “natural” and “eco/green” label food products

- **Fruit and vegetable industry co-products promising sources**

  Functional compounds

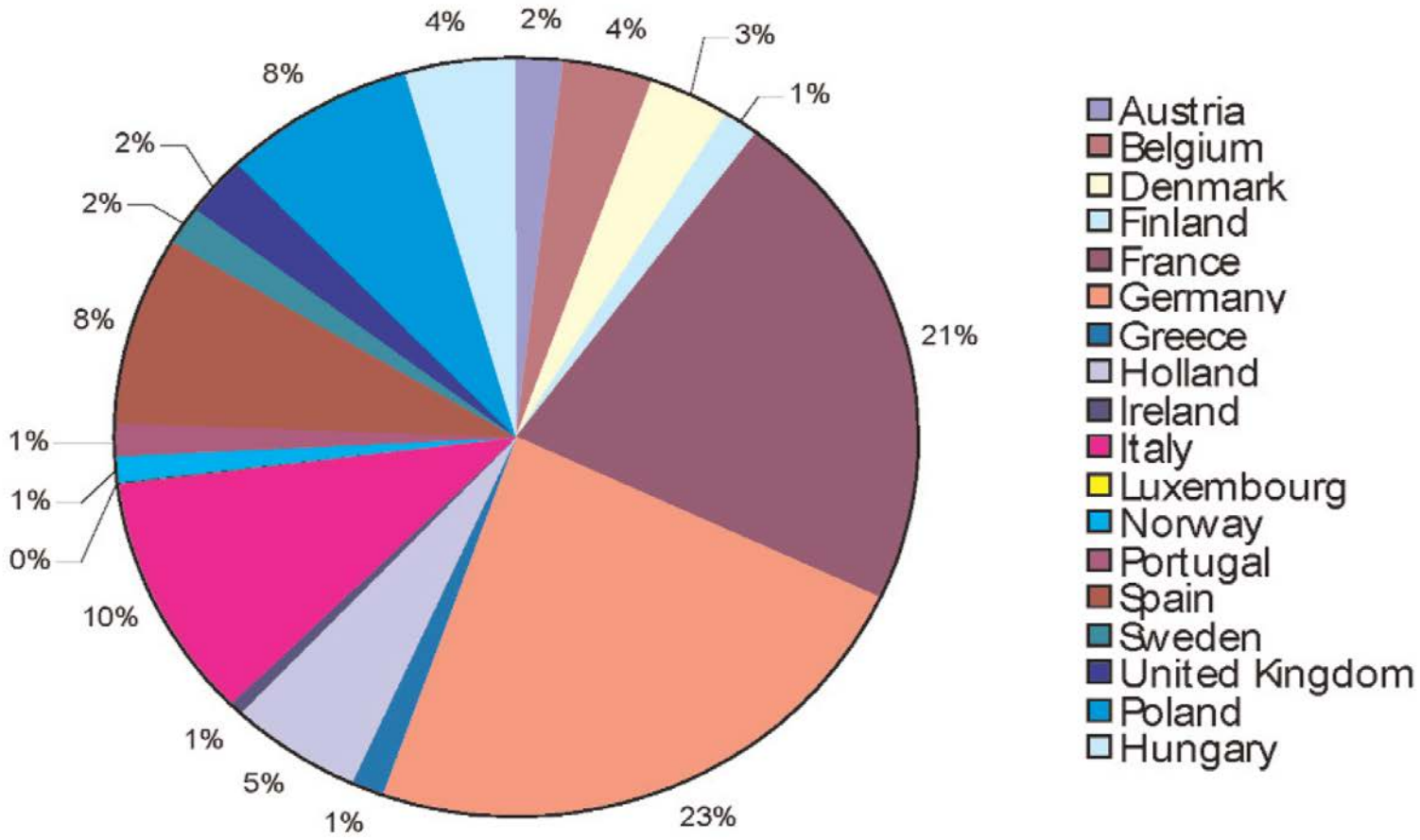
  Favourable technological or nutritional properties

Percentage of food wastes and by-products in fruit and vegetable production

Production process	% of wastes and by-products
White wine production	20-30
Red wine production	20-30
Fruit and vegetables juice production	30-50
Fruit and vegetables processing and preservation	5-30
Vegetable oil production	40-70
Corn starch production	41-43
Potato starch production	80
Wheat starch production	50
Sugar production from sugar beet	85

(AWARENET: Agro-Food Wastes Minimisation and Reduction Network, 2004)

Food wastes and by-products distribution (Tn/yr)



(AWARENET: Agro-Food Wastes Minimisation and Reduction Network, 2004)

Natural and clean label trend

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Green and eco label trend

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Current practices

Feed additives market potential

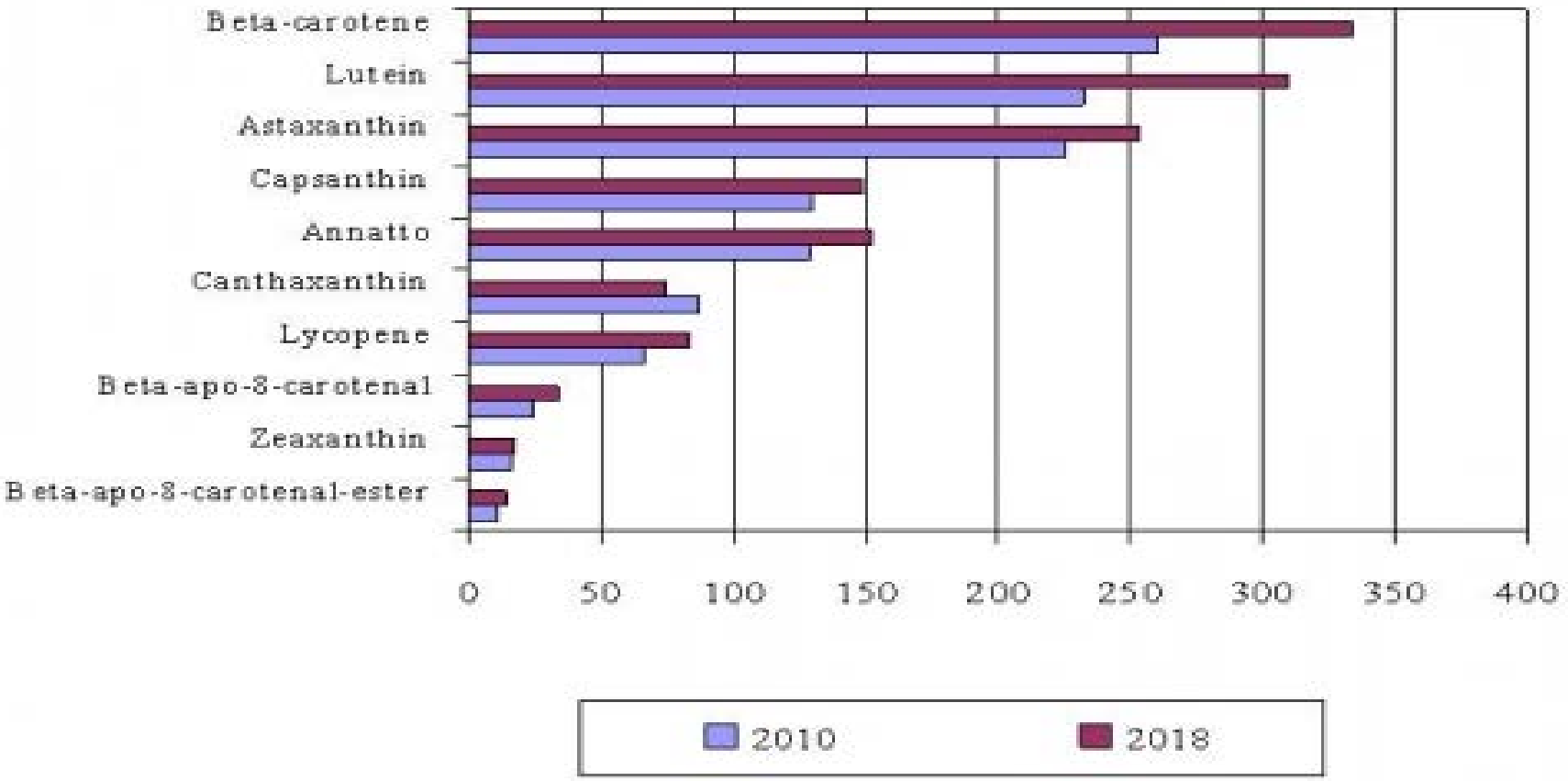
The global market value of feed additives

- **$16.1 billion in 2010**
- **$27.6 billion in 2017**

Estimated compound annual growth rate of 8.1% from 2010 to 2017 due to the expansion of meat and livestock production/consumption in the developing countries

(BCC Research Market Forecasting, 2012)

World market carotenoids (millions dollars)



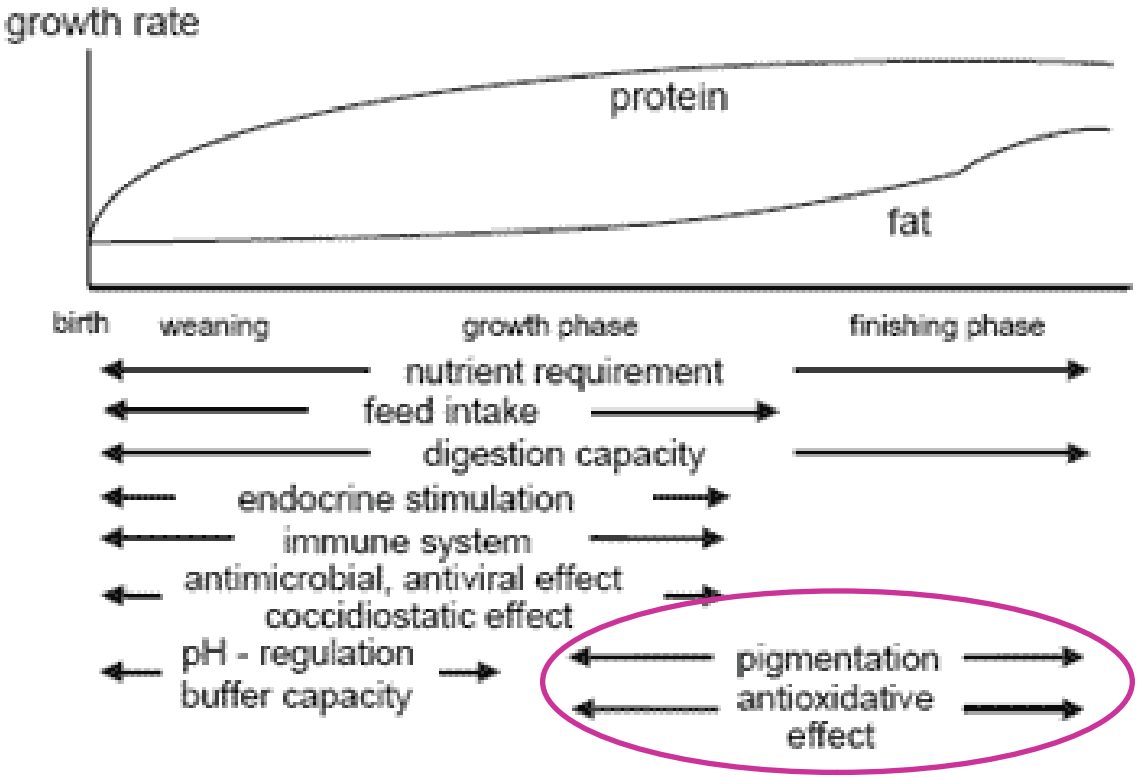
(BCC Research Market Forecasting, 2012)

Objective

To present the recent developments in the field of utilisation of food industry co-products in livestock nutrition

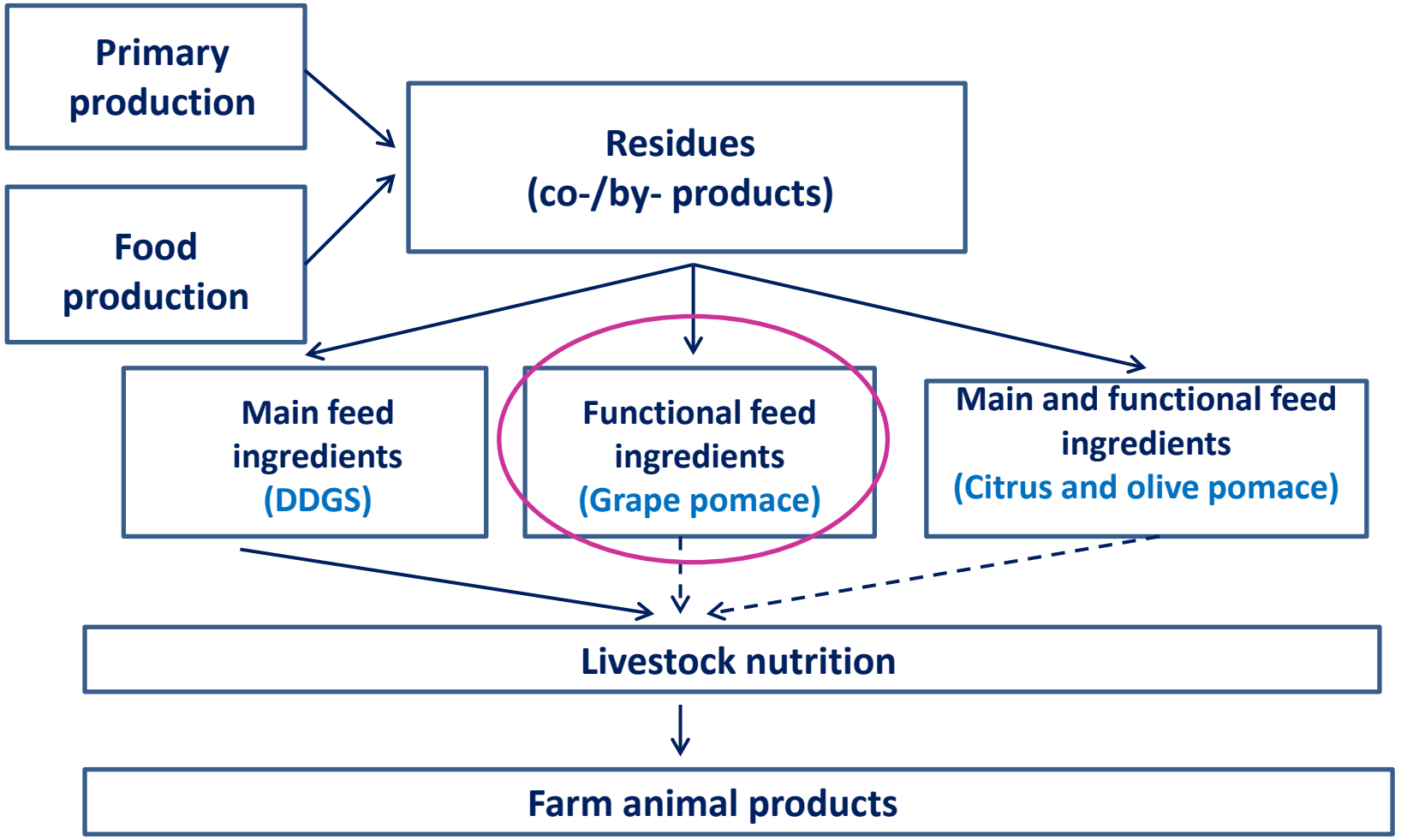
- **for improved product quality**
- **to consider the current limitations and**
- **to set the targets for future research work**

Modes of action of feed additives in growing animals



(Wenk, 2011; www. engormix.com)

Food - feed - food system



Examples

Co-/by product	Animal	Activity
Choceberry pomace	Broilers	Antioxidant
Grape pomace	Broilers	Antioxidant
Dried tomato pomace	Broilers	Hypocholesterolemic
Hesperidin (citrus pulp)	Broilers	Antioxidant
Mushrooms	Broilers	Growth promotion Antioxidant
Tomato pomace	Quails	Antioxidant
Tomato pomace	Layers	Egg yolk pigmentation

Examples

Co-/by product	Animal	Activity
Grape pomace	Ewes & Goats	Fatty acid composition (CLA content)
Olive pomace	Lambs	Antioxidant
Olive pomace	Rabbits	Antioxidant
Olive pomace	Pigs	Antioxidant Fatty acid composition
Grape extract	Pigs	Sensory (tenderness)
Cranberry pulp	Pigs	Antimicrobial

Considerations/ Limitations

- **Available information regarding their application in animal nutrition derives only from experimental small scale trials.**
- **Seasonal and locally produced products affecting extensive application**
- **Variable chemical composition**
- **Complicated feed legislation**
- **Image of these products to the consumers in relation to recent food scandals**

Factors affecting the commercial application of by-/co-products ingredients in animal nutrition

- **Animal**

  Presence of antinutritional factors influencing species, age, growth stage and quantity of the material used

- **Logistics**

  Efficient product quantity to support a supply chain and to be incorporated in various types of feed formulations (matrices)

- **Commercial**

  The value of the product should be attractive to the producer, all active members in the supply chain and the livestock producer who will be the end user of the product

Conclusions

- **Fruit and vegetable co-products can be effectively used in farm animal nutrition for the production of animal food products with improved quality characteristics**

- **Production of "natural" and "green" animal products is a promising area for the food industry. Embracement of the trend is still very slow.**

- **Modern biorefinery processes can satisfy the majority of constraints and lead to effective and sustainable utilisation of fruit and vegetable industry by-/ co- products in animal nutrition.**

Needs for research

- **Examination of other functions (antimicrobial, antiviral) of food industry co-products.**

- **Standarise composition of products irrespectively of botanical origin, storage conditions, processing to promote/ ensure extensive application in farm animal nutrition.**

The road ahead