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Organic makes a difference

the nutritional benefits of organically produced foods

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COMMUNITY RESEARCH

Sheepdrove Trust

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New evidence for significant and nutritionally relevant composition differences

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Higher antioxidant and lower cadmium concentrations and lower incidence of pesticide residues in organically grown crops: a systematic literature review and meta-analyses

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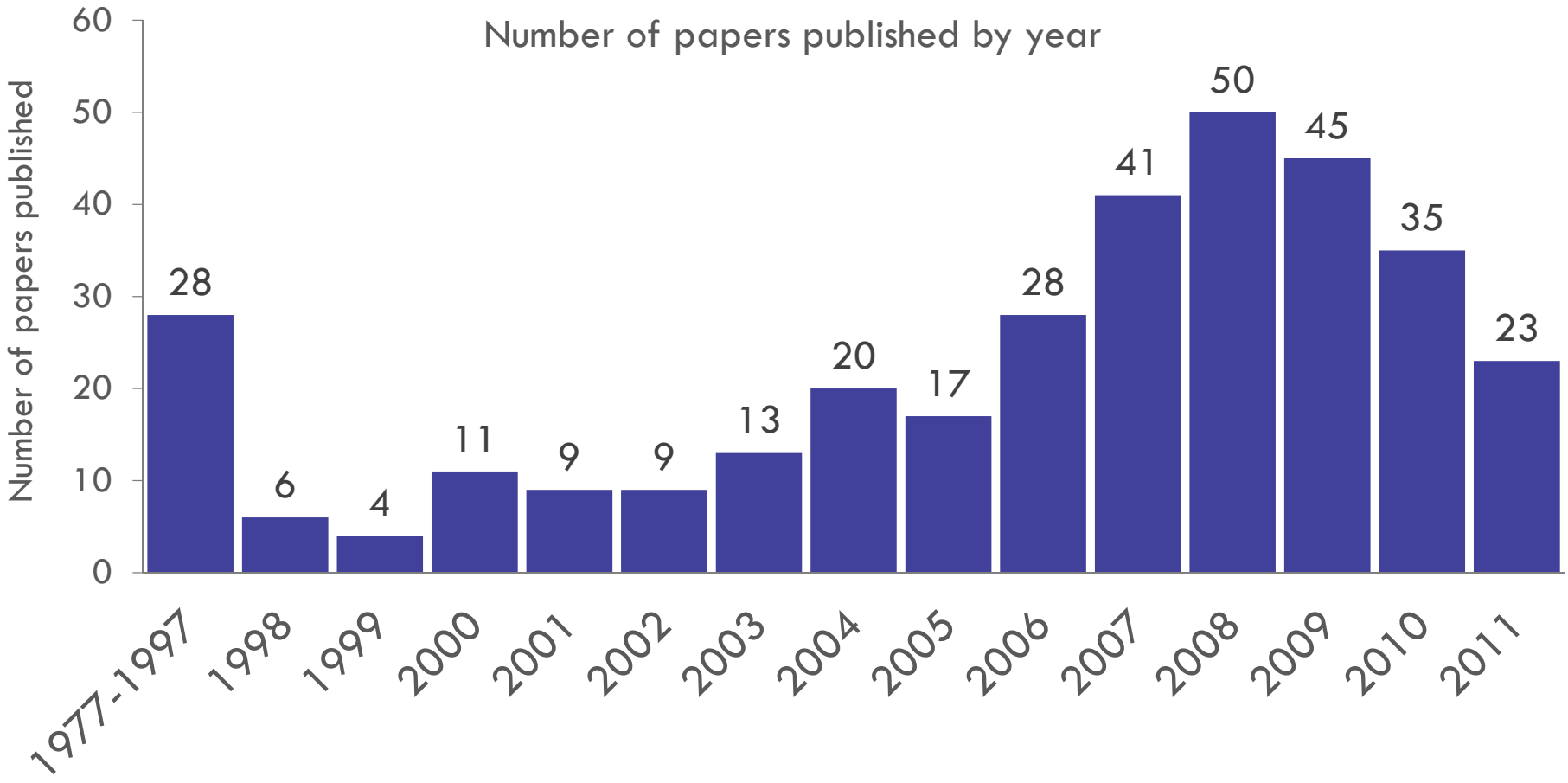
available online at *http://research.ncl.ac.uk/nefg/QOF*

of Nutrition

Systematic literature review: 343 peer-reviewed papers



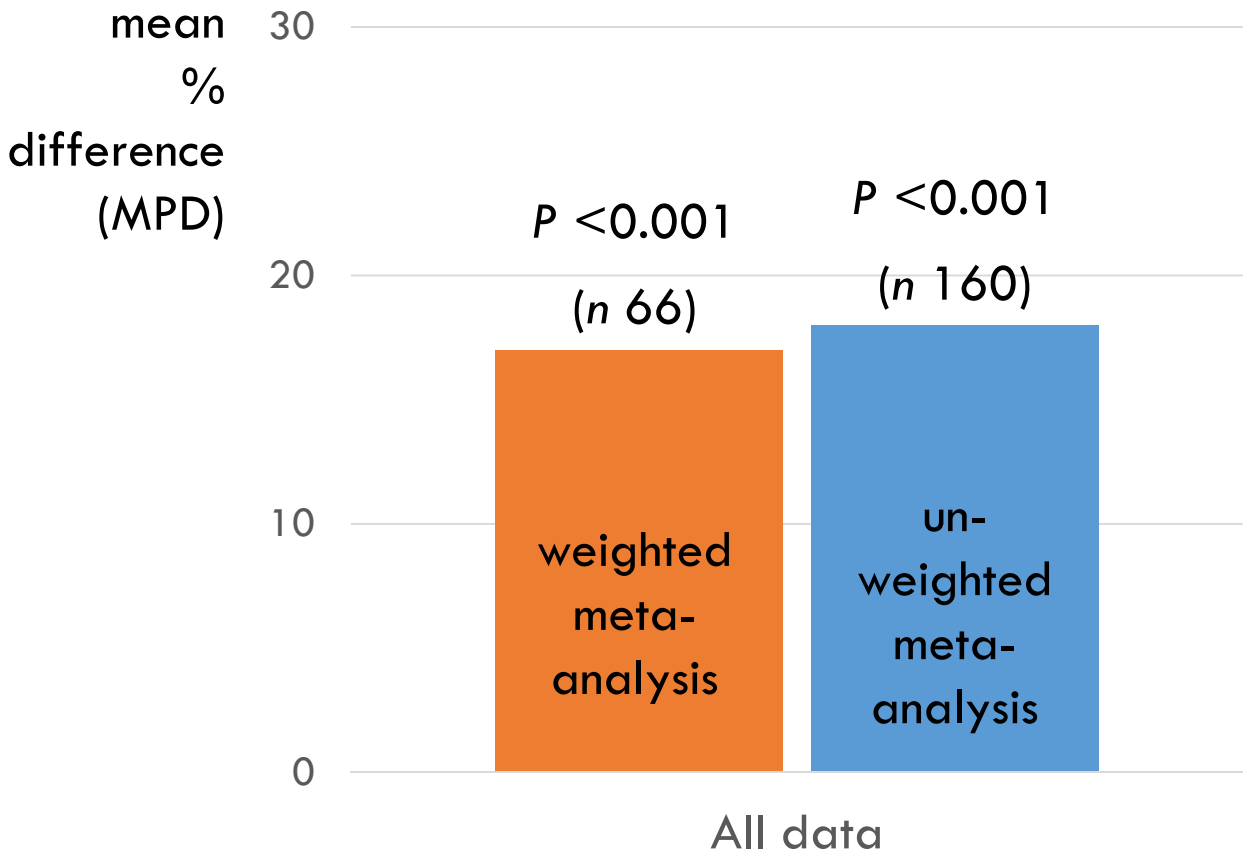
17% studies were published before 2002, and 45% were published between 2008-2011

Data from supplementary Figure 1 in Baranski *et al.*, 2014

Systematic literature review: studies per crop type

Data from supplementary Table 3 in Baranski *et al.*, 2014

Primary assessment – antioxidant activity is significantly higher in organic crops



What are antioxidants/(poly)phenolics?

- antioxidants neutralise free radicals, thus preventing them from causing damage to cells in the body
- increased consumption of foods rich in antioxidants has been linked to a reduction in many chronic diseases, including:
  - cardiovascular disease
  - certain cancers (e.g. prostate cancer)
  - neurodegenerative diseases (Alzheimer's disease)
- plant-based (poly)phenolics are the most abundant antioxidants in the diet

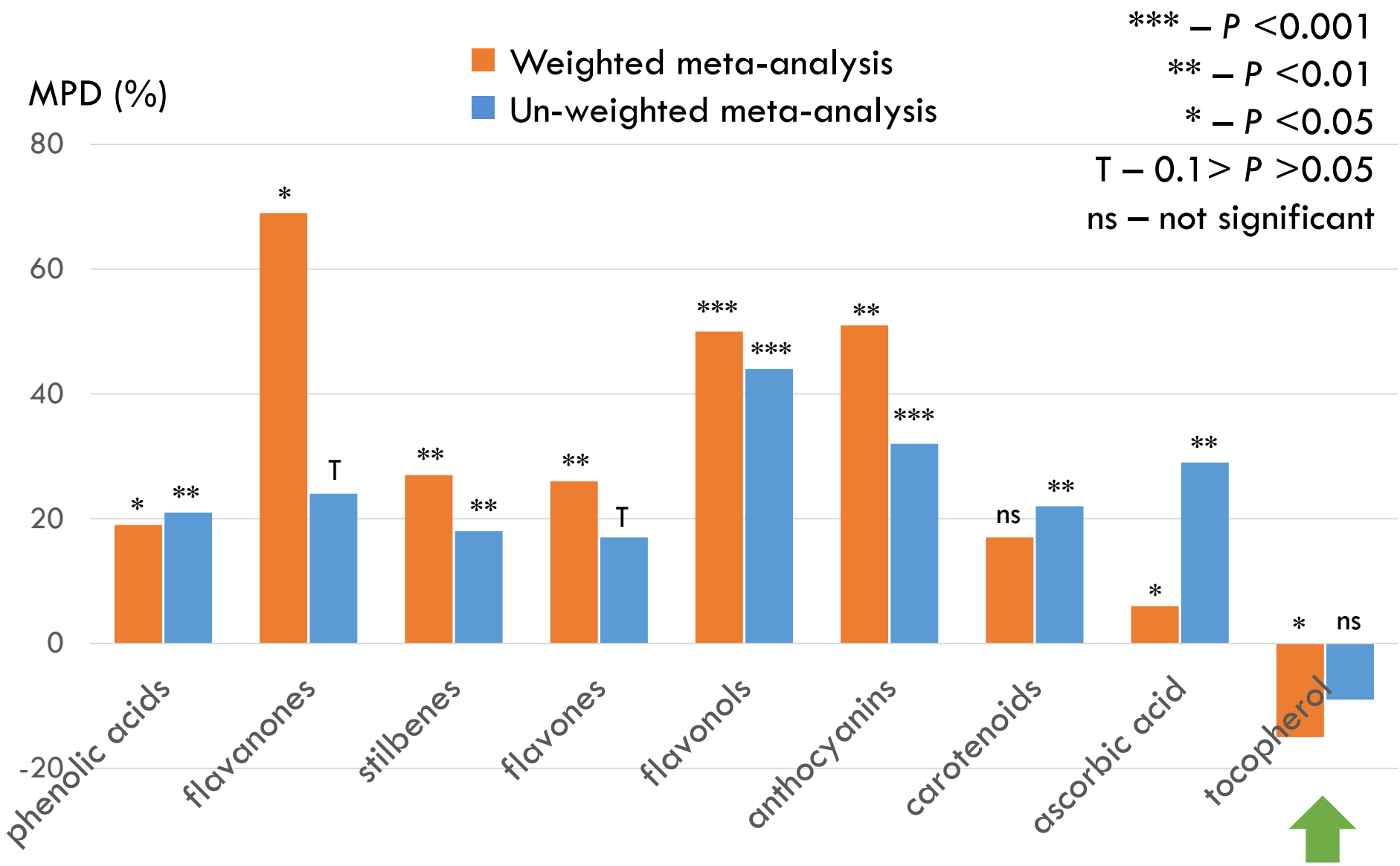
Literature:

Del Rio D, Rodriguez-Mateos A, Spencer JPE *et al.* (2013) Dietary (poly)phenolics in human health: structures, bioavailability, and evidence of protective effects against chronic diseases. *Antioxid Redox Signal* 18, 1818-1892.

Wahlqvist ML (2013) Antioxidant relevance to human health. *Asia Pac J Clin Nutr* 22, 171-176.

Fardet A (2010) New hypotheses for the health-protective mechanisms of whole-grain cereals: what is beyond fibre? *Nutr Res Rev* 23, 65-134.

Explanatory assessments – antioxidant compounds



WHY do organic crops contain higher levels of antioxidants?

Evidence from the long-term, factorial experiments at Nafferton Farm

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NEFG Nafferton Farm

- 360 ha Estate
- cereals, oilseed
- dairy, beef, lamb
- sample preparation

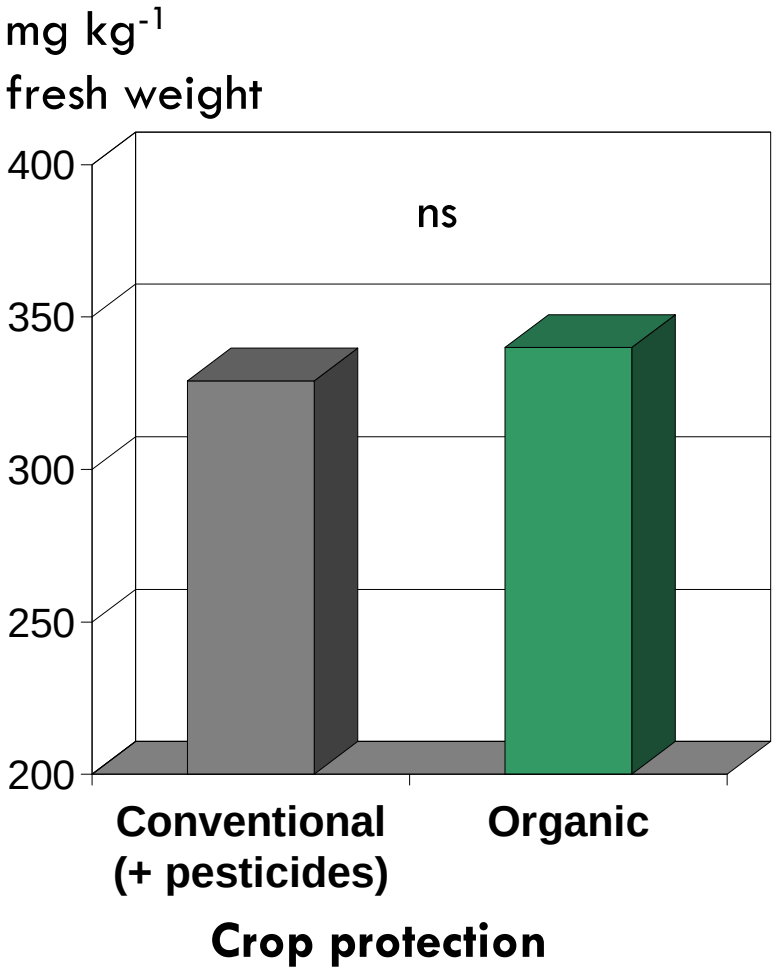
Nafferton Factorial Systems Comparison Trial experimental design - factors

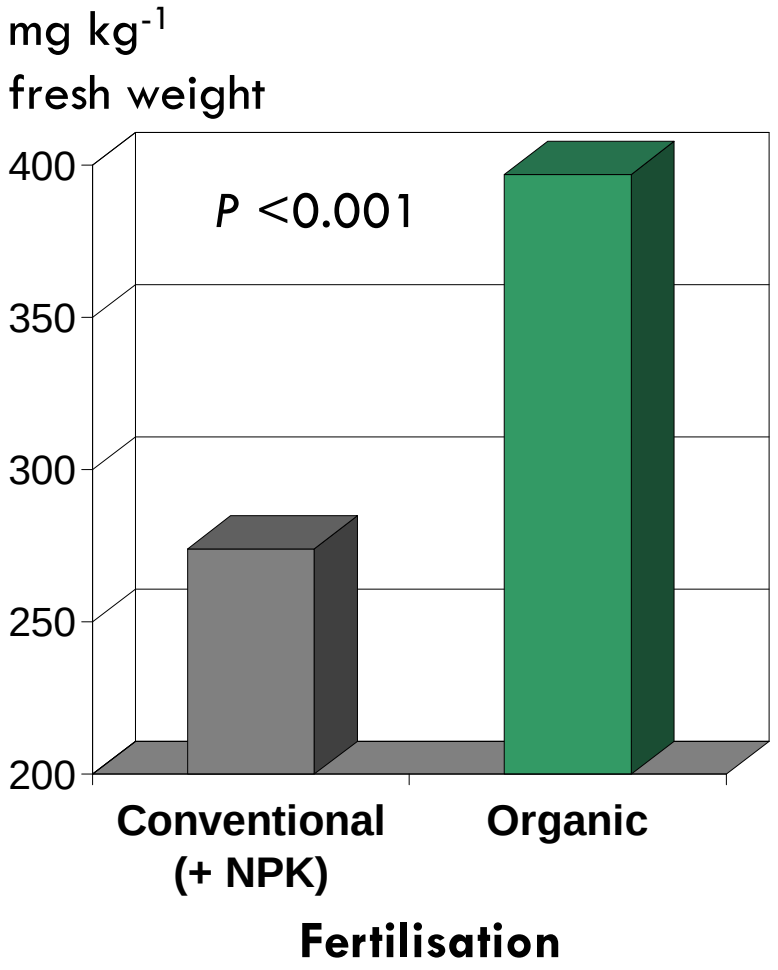
- Rotation design (4)
  - Non-diverse (2)
    - 2 years grass/clover, 6 years cereals
    - 1 year potato or vegetables
  - Diversified (2)
    - 3 years grass/clover, 2 years cereals
    - 2 years potato or vegetables, 1 year faba beans
- Crop protection (2)
  - Conventional (based on pesticides)
  - Organic (according to soil association standards)
- Fertilisation (2)
  - Conventional (based on mineral fertilisers)
  - Organic (composted manure inputs only)
- Replicate blocks (4)
- Replicate experiments (4)
- Total area 6 ha

Nafferton Factorial Systems Comparison Trial experimental design - assessments

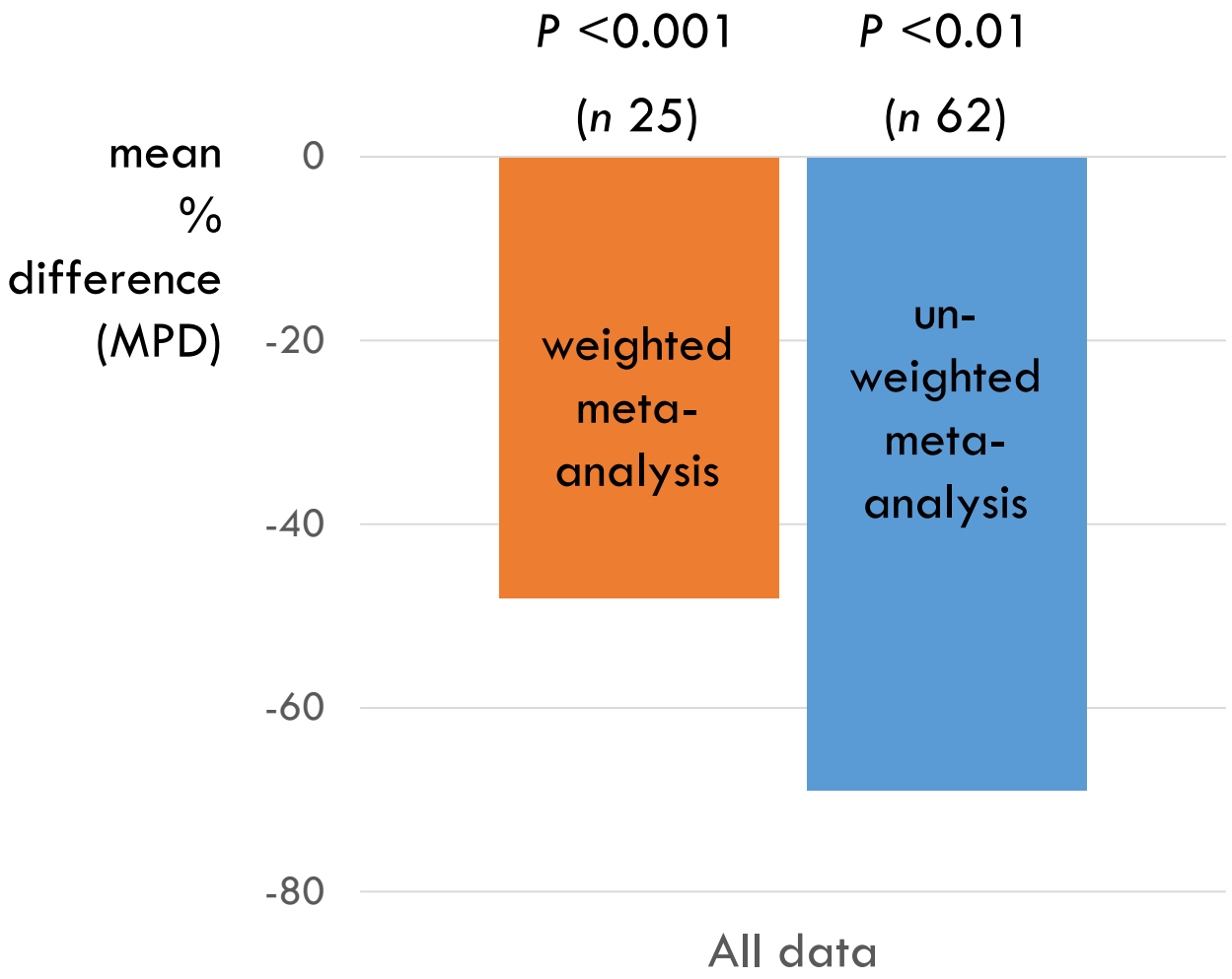
- Crop yield and quality parameters
- Disease, pest and weed incidence/pressure
- Gene, protein and metabolite expression
- Soil physical, chemical and biological parameters (including soil carbon sequestration)
- Environmental impact (e.g. N_2O, NO_3 and P losses) and life cycle analyses (LCA) for GHG emissions
- Resource use efficiency (e.g. fertiliser and crop protection inputs)
- Economic sustainability related parameters
- Biodiversity (e.g. non-crop plants and invertebrates)

Effect of fertilisation and crop protection on the glucosinolate content in cabbage (average of 2 seasons)





Primary assessment – cadmium concentration are significantly lower in organic crops



WHY do organic crops contain lower levels of cadmium?

Evidence from the long-term, factorial experiments at Nafferton Farm

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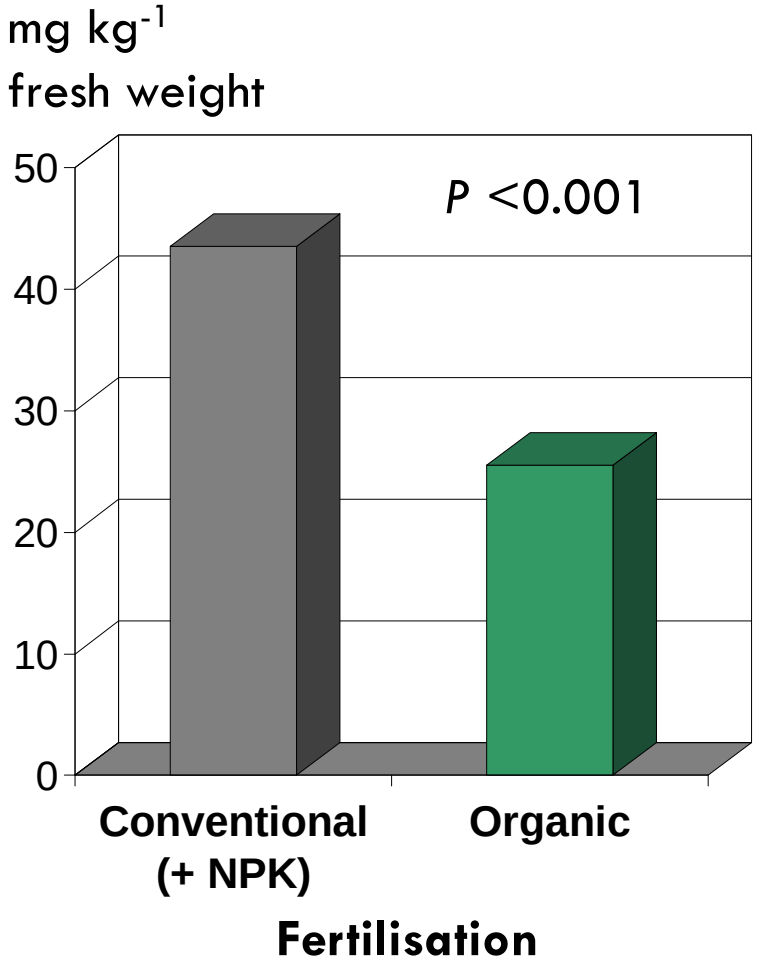
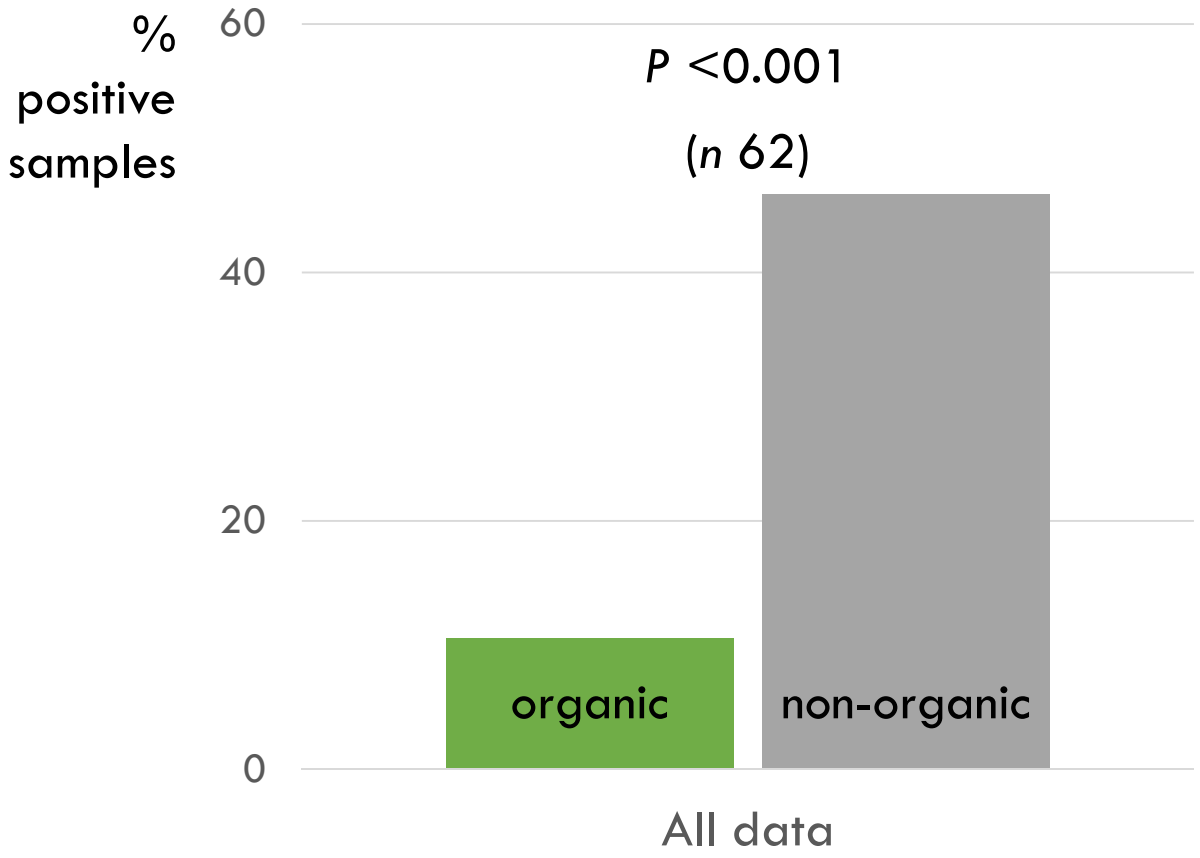
Effect of fertilisation and crop protection on the cadmium content in potato

(average of 4 seasons)

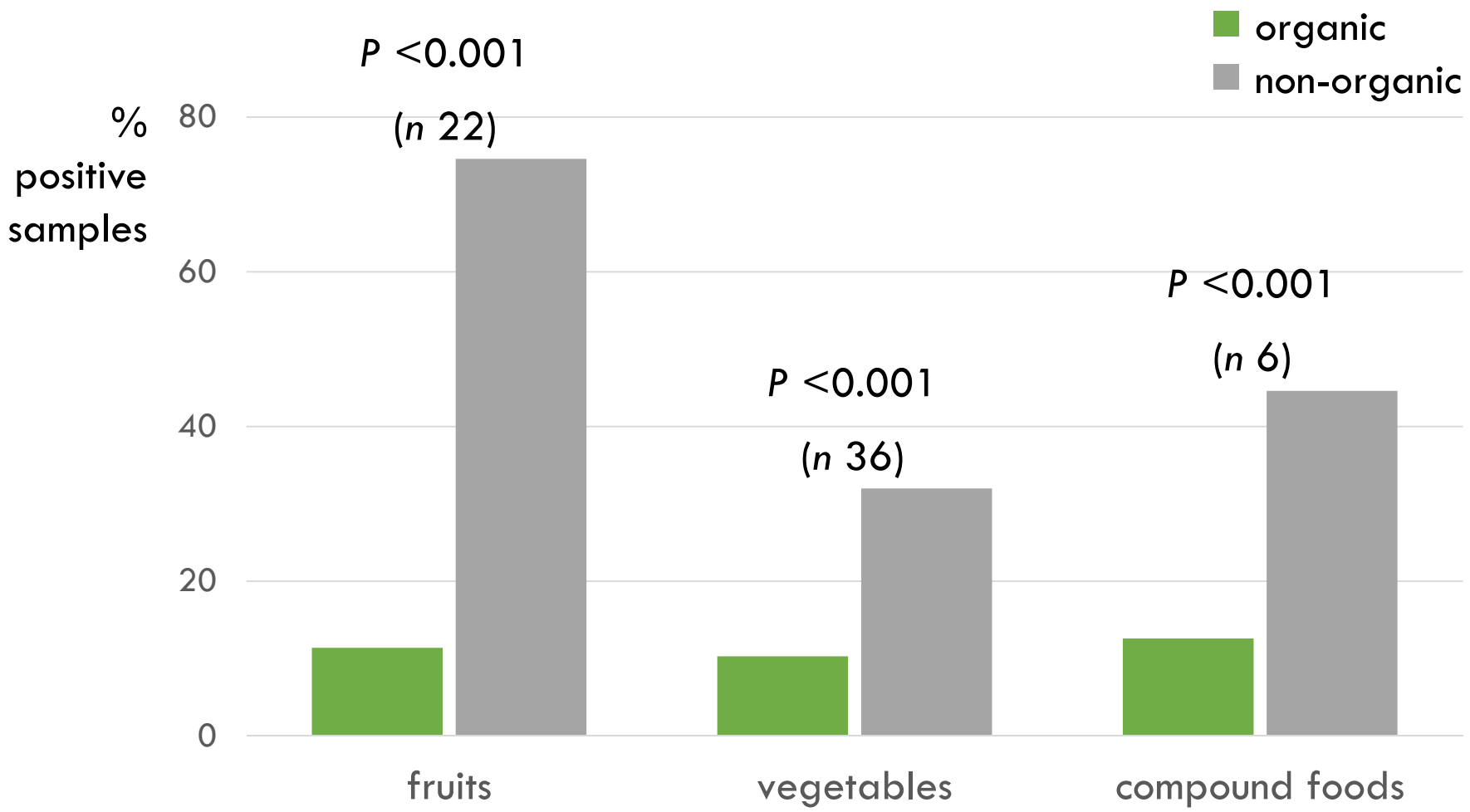
- mineral P-fertilisers contain cadmium (Cd)
- a range of scientific studies showed a close link between P-fertiliser use and cadmium concentrations in crops
- (Cooper *et al.*, 2011)



Primary assessment – pesticide residues are less frequently detected in organic crops



Explanatory assessment – pesticide residues in different crop types



Pesticide concentrations in organic and conventional crops

- There were too few studies/data-sets to compare pesticide concentrations in organic and conventional crops
- In the few individual studies where pesticide concentrations were compared, concentrations in conventional crops were 10 to 100 times higher

Why is the frequency of pesticide residues lower in organic crops?

- The use of synthetic chemical pesticides is prohibited in organic farming
- Organic farmers stick to the rules!!!

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Thank you