How does your garden grow?

Participatory polycultures research in the UK

Dr N.K. van der Velden

NATIONAL SCHOOL OF FORESTRY

UNIVERSITY of Cumbria

Ecological and Anthropological Approaches to Agrobiodiversity and Food systems

6-7 December 2012, Oxford

Submitted abstract

Plants growing in communities (polycultures) of certain mixtures have been shown to yield more biomass than do monocultures of their constituent species, as well as delivering enhanced ecosystem services, better pest regulation, and greater overall economic productivity (e.g. Malézieux *et al.*, 2009). Despite this, there has been surprisingly little commercial uptake of such multispecies systems. We suggest that the scale of use of these systems is fundamental to their successful implementation.

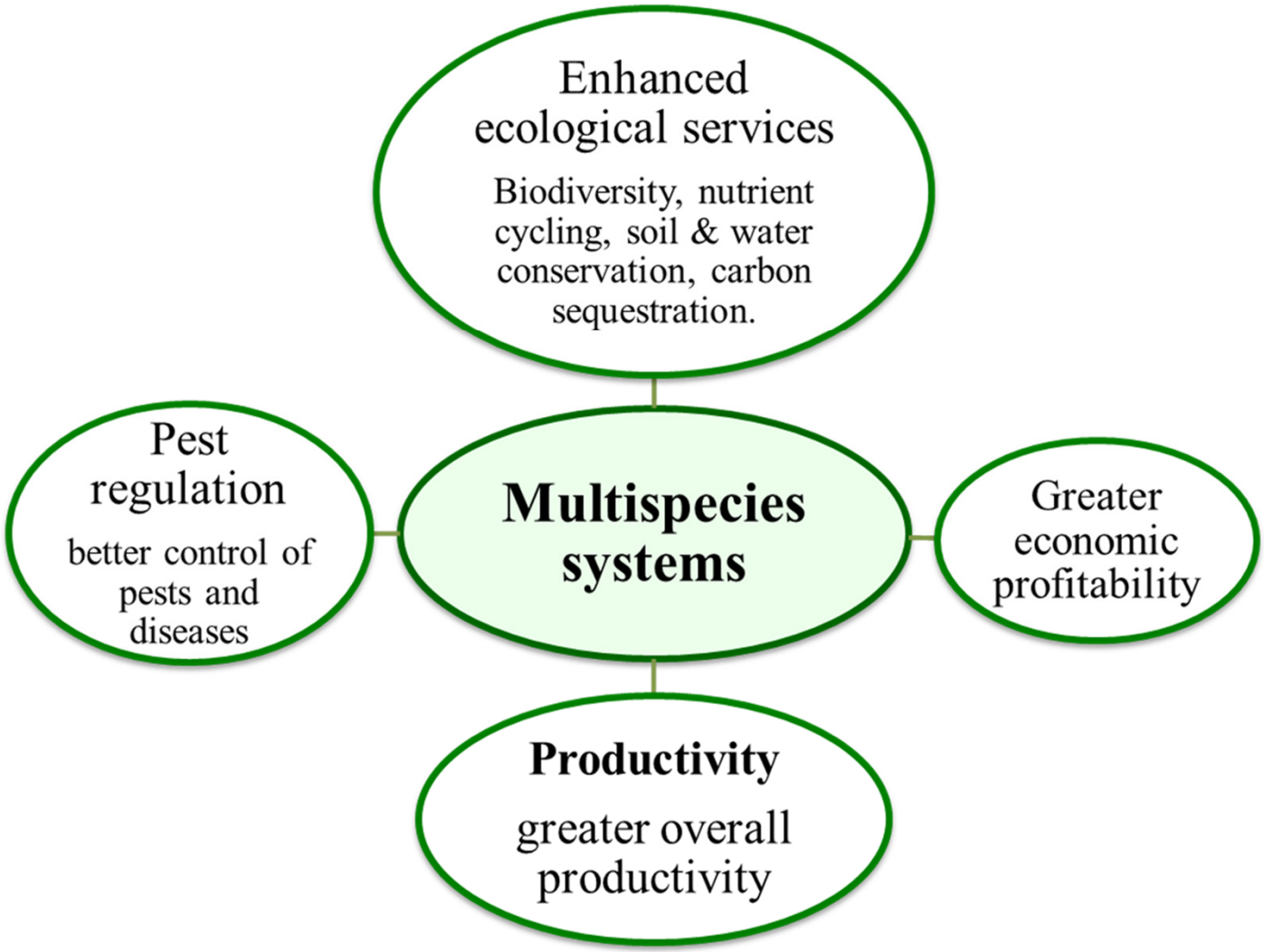
Concurrently with the growing debates over land use in large-scale agriculture and competition with other objectives such as conservation and fibre production, there has been a widespread increase in "grow your own" in the UK. There remains, however, a paucity of academic research on the productivity of these household-level systems. This study represents the first investigation of yield from household systems since 1948.

We used the principle of higher yield being associated with greater diversity to investigate productivity (per land area, per labour time input, & continuity of production) of food plants in low- (3 species) and high- (12 species) diversity polycultures in family food systems. Vegetable species from a range of plant families were chosen based on spatial occupancy niches & functional attributes, and grown in a participatory trial of 50 households from across the UK. Participants recorded data on yield, time spent on the plots, and also completed pre-and post-study questionnaires.

Results show no overall difference in total yield, but significant differences in individual species' yields which suggests that compensatory mechanisms and competitive ability are important considerations. Yields differed across the country, and increased with increasing input time. People found the less diverse system easier to manage and more "worthwhile". Interestingly, these systems yield on average the equivalent of 35 tonnes per hectare, with some approaching over 100 tonnes per hectare. These diverse small scale systems have an excellent potential for improving food yields, as well as the potential to meet other targets in low-carbon transition, enhanced biodiversity and improved health and well-being. This may be a solution-driven win-win in the land-sharing/land-sparing debate that simultaneously engages the public with scientific research and inspires a conservation ethos.

Sustainable agriculture...

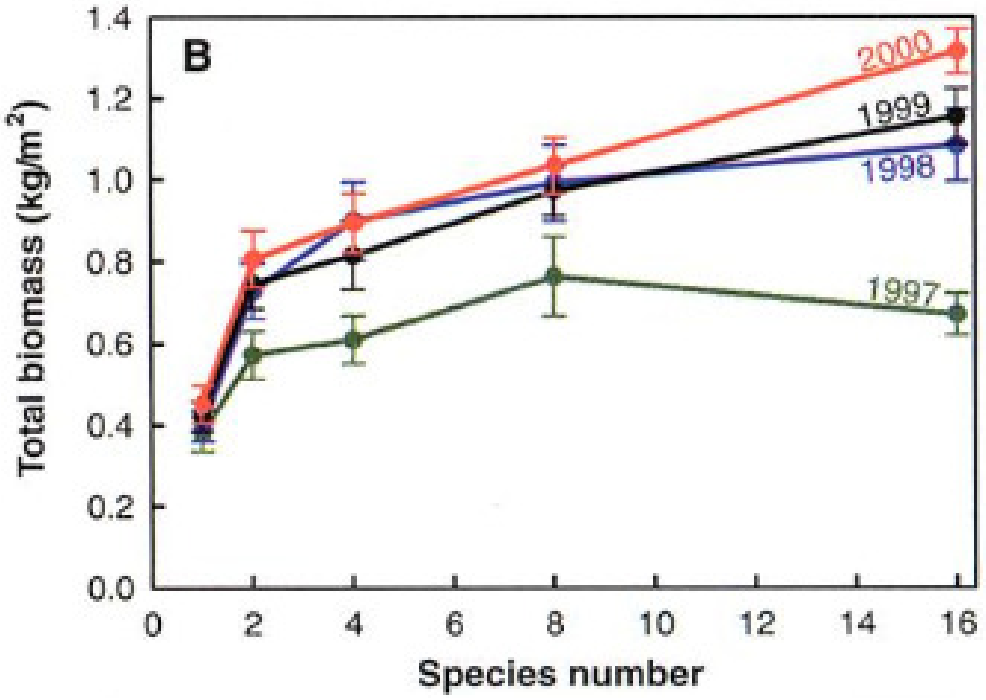
Benefits of multispecies systems



Adapted from Malézieux *et al.*, 2009. *Agron. Sustain. Dev.* **29** 43–629

Diversity and production

“16-species plots attain 2.7 times greater biomass than monocultures”



Tilman *et al*., 2001. *Science* **294** (5543) 843-845

Use of multispecies systems

- Subsistence production (tropics)
- Agroforestry (tropics, then temperate)
- Cottage gardens (European)

Little commercial production

Few published studies on barriers to use

Given the apparent advantages, why aren't they more used?

Use of multispecies systems

Given the apparent advantages, why aren't they more used?

Mechanisation? Labour costs

Complication? Knowledge and experience

Unfamiliarity? Trying new things - risk

Unpredictable yields? **Opportunity cost**?

Scale?

Scale in multispecies systems

Market gardens?

e.g. Bosley Patch,
Henley-on-Thames

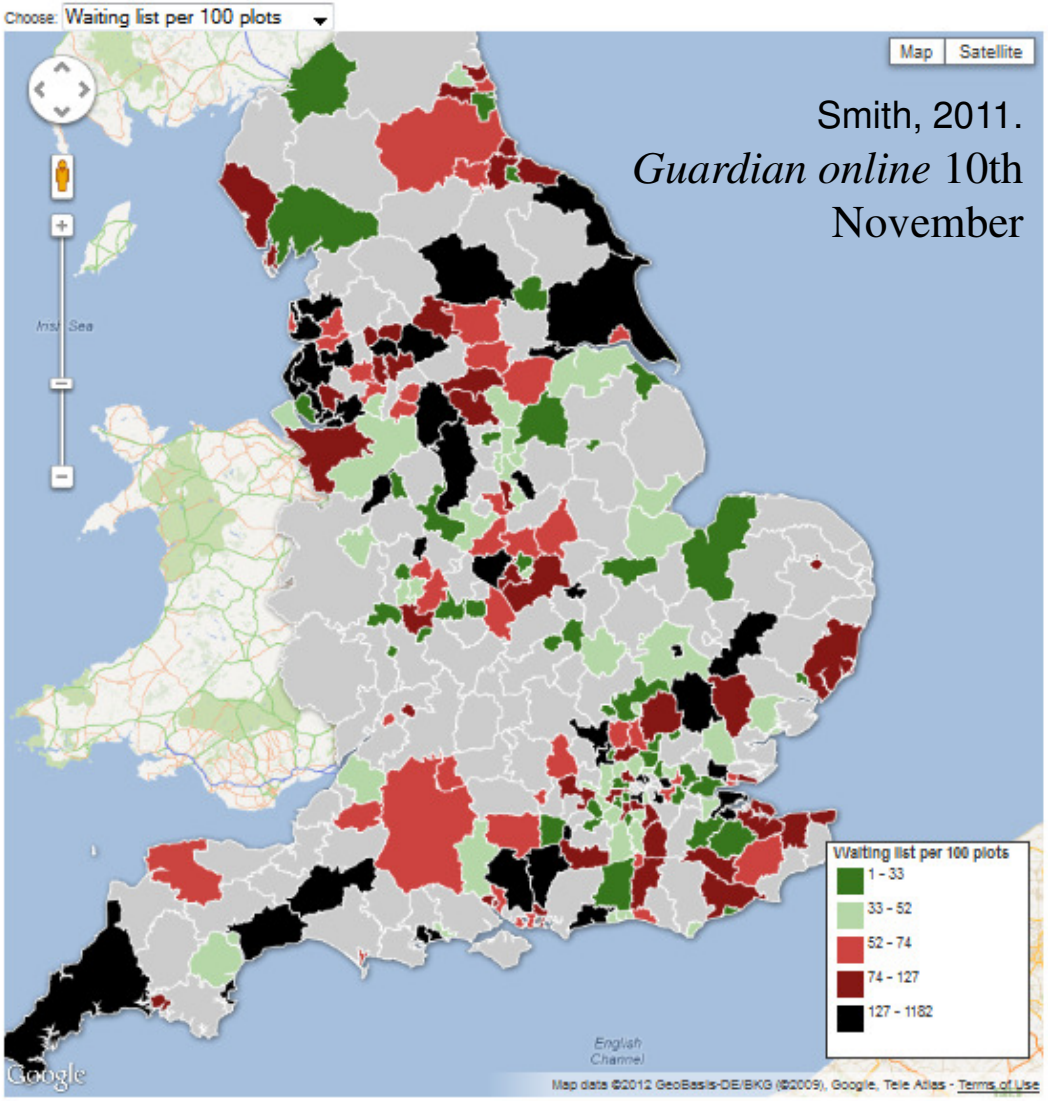
Allotments?

Household food production

Similar issues of land availability as in global agriculture

"Allotment demand leads to 40-year waiting lists"

Jones, 2009.
Guardian online 2nd June



Polyculture Productivity:

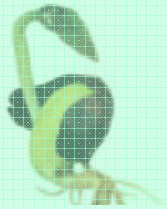
Diversity and Efficiency in "grow your own" food production

Naomi van der Velden[1], Andy Goldring[2], Tomas Remiarz[2],
Roz Brown[2], Ian Fitzpatrick[2]

[1] National School of Forestry, [1] University of Cumbria, [2] Permaculture Association

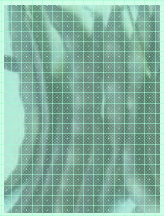
March - October 2011

Aim

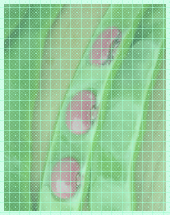


Methods

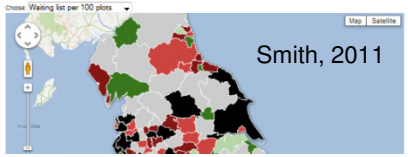
Results



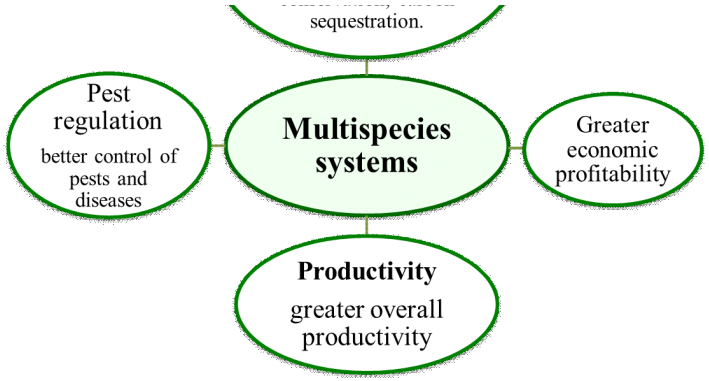
Context

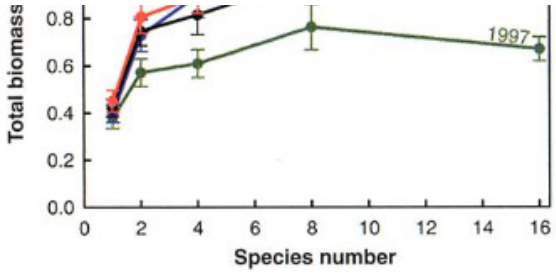


Diversity and production



Aim: To compare productivity of Low- and High-diversity mixes of veg in household gardens

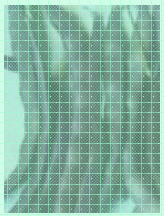




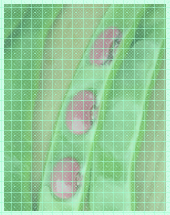
Rationale

Methods

Results



Context



Public participatory trial

"Mixed veg team" scientists, expert practitioners.

Additional advice from Garden Organics on participatory trials and Chris Evans on species mixes.

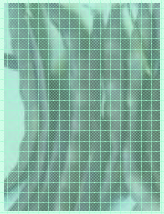
Pilot trial, feedback from practitioner growers during and after. Essential in refining and developing next stage.

Developing a programme to train practitioners in research skills.

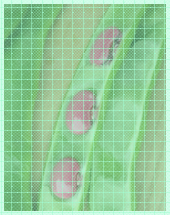
Rationale

Methods

Results



Context



Public participatory trial

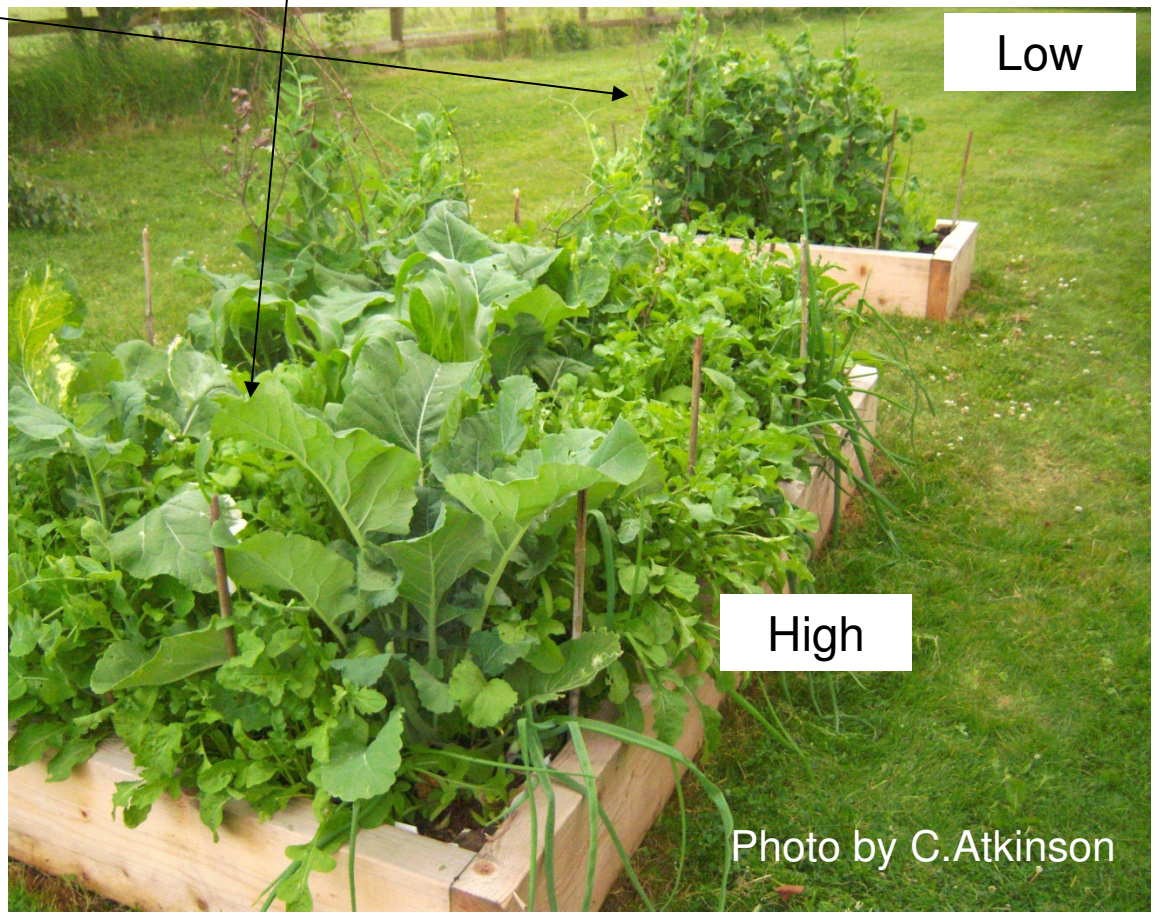
7 plant families
12 crops (plus 1 flower).

50 sets of seeds to participants

Weigh each crop every harvest.

Record time spent on each plot.

Questionnaires



Mixed vegetable research trials (2011)

Information for participants

Permaculture Association

Working in partnership with the National School of Forestry and Centre for Wildlife Conservation at the University of Cumbria

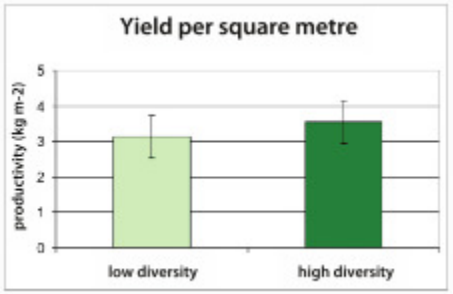
Rationale

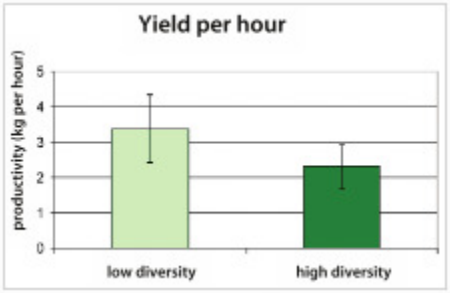
Methods

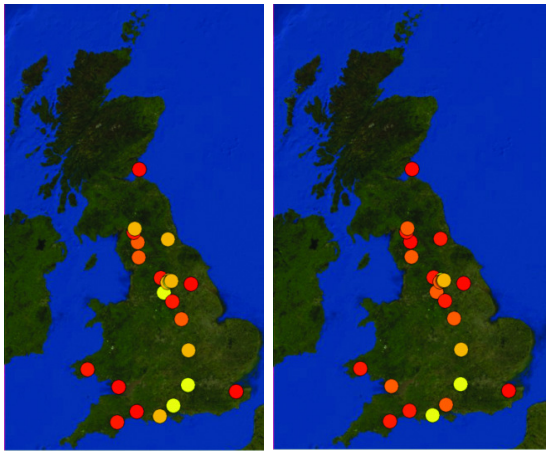
Results

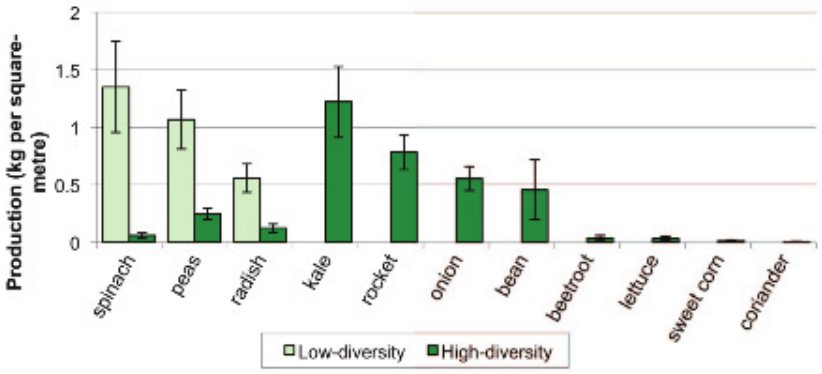
Context

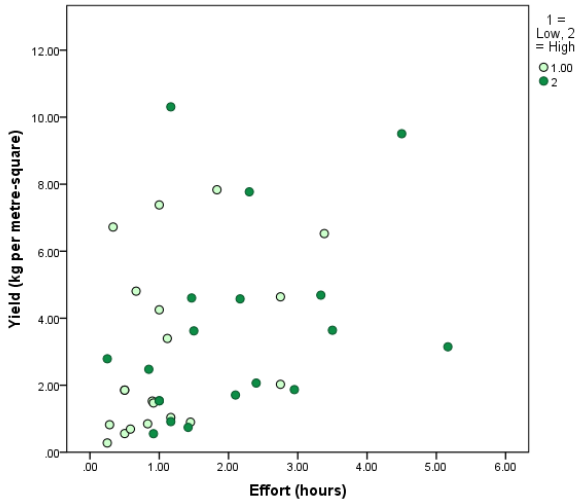
Veg production



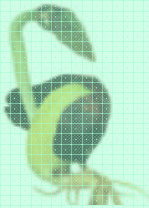






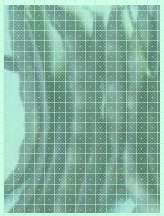


Rationale

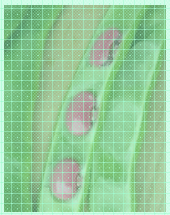


Methods

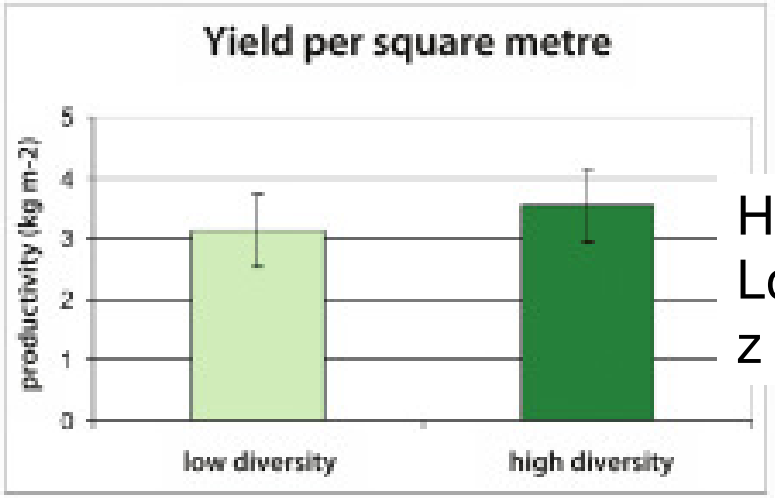
Results



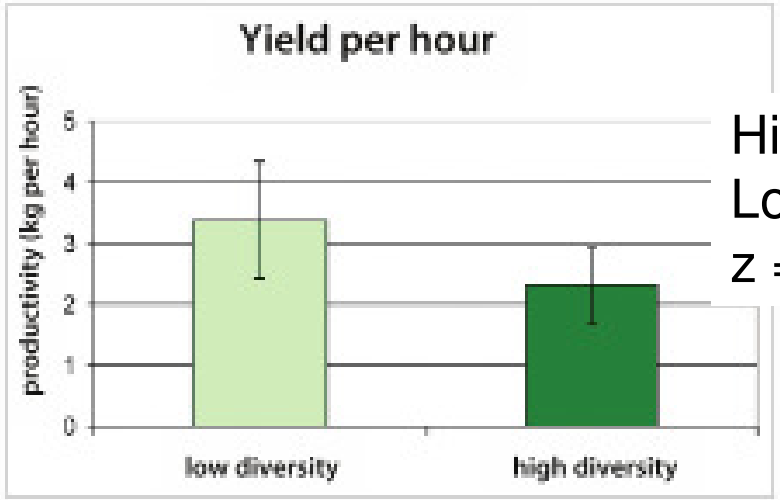
Context



Veg production

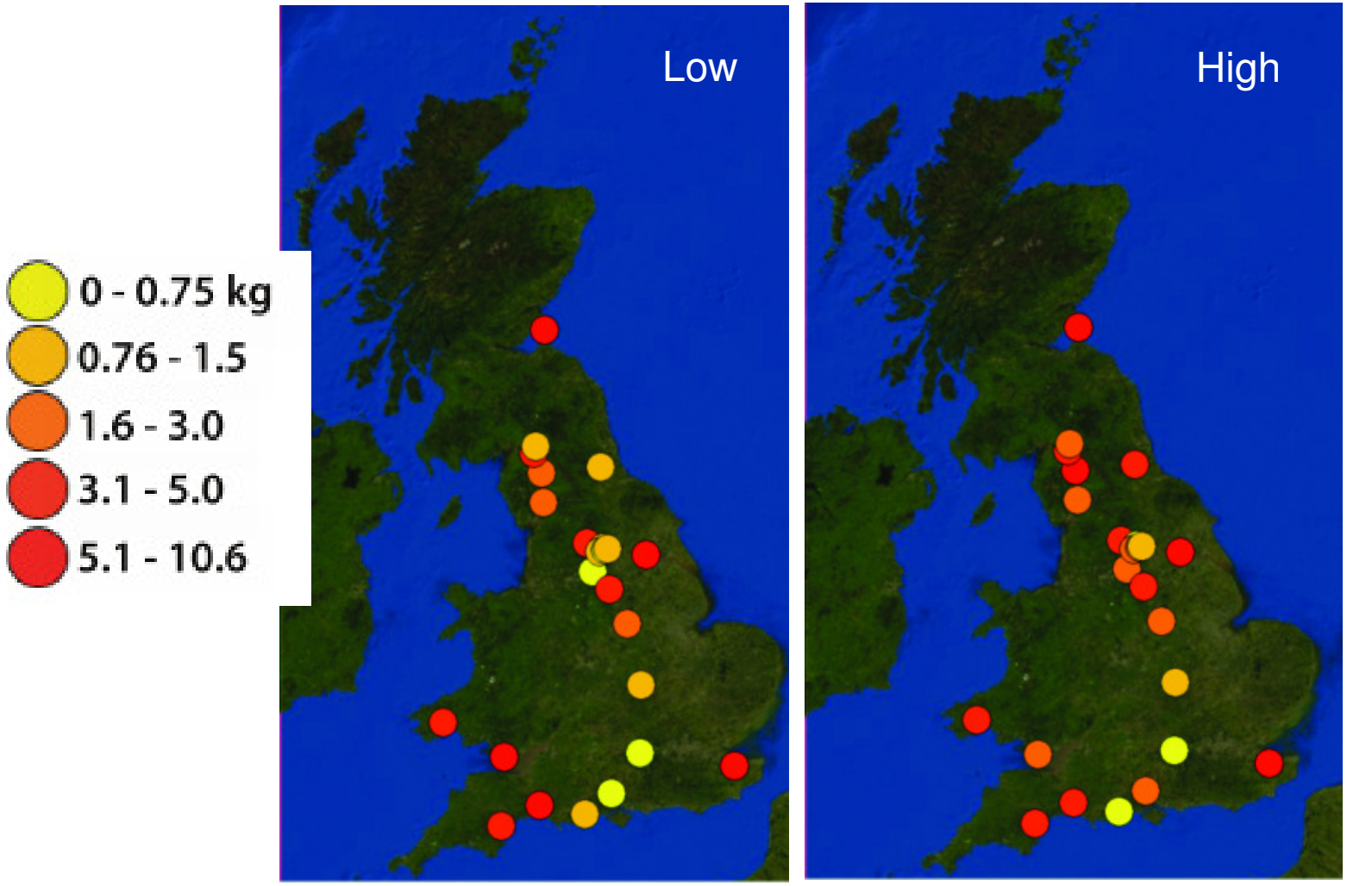


High 3.5 ± 0.6 kg m^{-2}
Low 3.1 ± 0.6 kg m^{-2}
z = 1.154, p = 0.130.

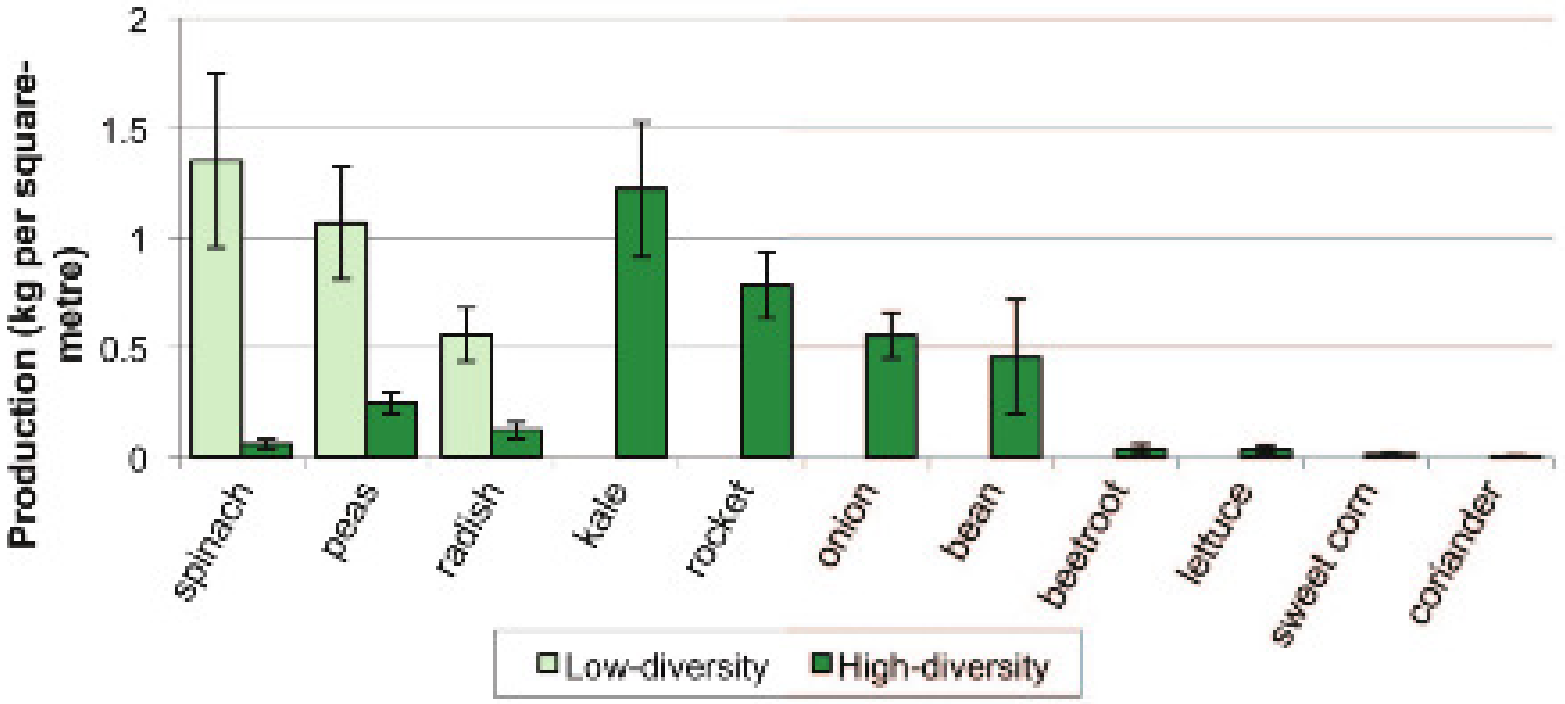


High 2.3 ± 0.6 kg m^{-2} hr^{-1}
Low 3.4 ±1.0 kg m^{-2} hr^{-1};
z = 1.680, p = 0.093

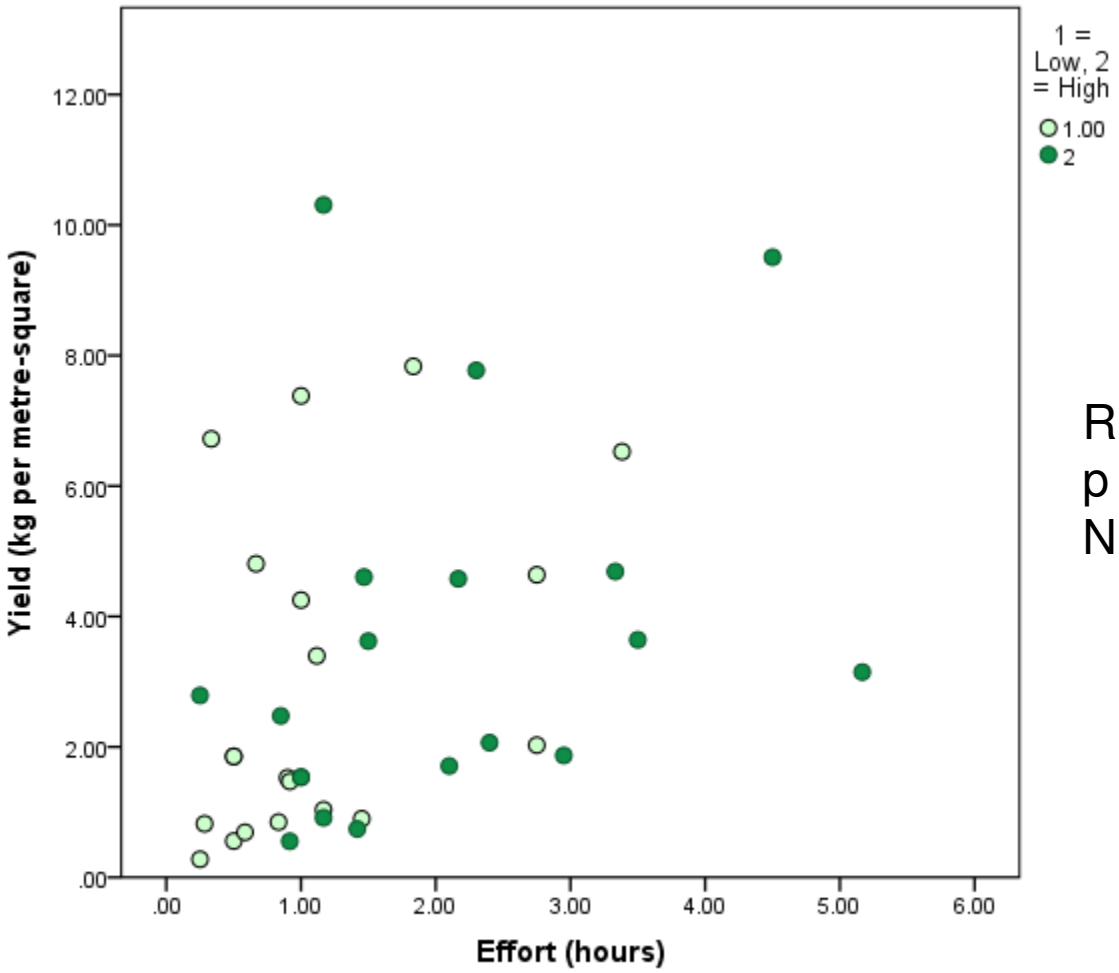
Veg production



Veg production

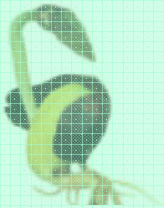


Veg production



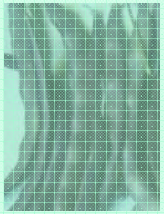
R = 0.462
p = 0.03
N = 39

Rationale

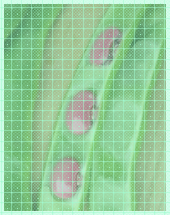


Methods

Results



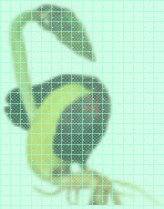
Context



Veg production

- Average production was equivalent to 35 tonnes per hectare.
- No significant difference in total yields
- Significant differences in individual species (More peas, spinach & radish from Low-diversity plot)
- Production linked to effort (50%), plus probable differences in soil, weather, location etc.
- Lower diversity plot was generally considered easier to manage, and more rewarding

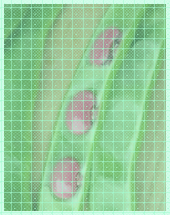
Rationale



Methods

Results

Context



Context and next steps

Household yields are high; 35 tonnes ha^{-1}.

- Allotment yields of 16 tonnes ha^{-1}, Supplying 10% of UK food production. (Stamp, 1948)
- UK field veg yields 19 tonnes ha^{-1} in 2011 (BHS, 2012)

Polycultures may yield more than monocultures at this scale.

Production linked to effort (~50%). Time costs are leisure time. Additional health benefits to gardening (Leake *et al.*, 2009)

Own-produced food could meet some [UK] food demand in a low input, low-impact way. **How much?**

BHS – British Horticultural Society info [online records]

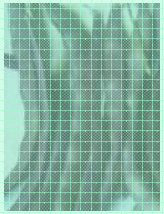
Leake *et al.*, 2009 . *Environmental Health* 2009, **8**(Suppl 1):S6

Stamp, 1948 *The Land of Britain: it's use and misuse*. Longmans, Green & Co. London


Rationale


Methods


Results


Context

References

Jones, R. 2009 "Allotment demand leads to 40-year waiting lists" *Guardian online* 2nd June [accessed 14/8/12] http://www.guardian.co.uk/money/2009/jun/02/allotments-shortage-waiting-lists

Malézieux *et al*., 2009 Mixing plant species in cropping systems: concepts, tools and models. A review *Agron. Sustain. Dev*. **29** 43–62

Smith, A.P. 2011 "The English allotment lottery mapped" *Guardian online* 10th November [accessed 14/8/12]. http://www.guardian.co.uk/news/datablog/interactive/2011/nov/10/allotments-rents-waiting-list-england

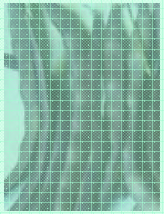
Stamp, 1948 *The Land of Britain: it's use and misuse*. Longmans, Green and Co. London

Tilman *et al*., 2001 Diversity and Productivity in a Long-Term Grassland Experiment. *Science* **294** (5543) 843-845.

Rationale

Methods

Results



Context

Thanks!

Thanks - For listening!

To all the participants, to co-ordinators Celia Ashman and Edgars at the Permaculture Association. To Chris Evans for advice on appropriate plant mixes. Thanks to these seed companies for supplying the seeds

BEANS and Herbs

Chase Organics
IAN ALLAN GROUP

TUCKERS SEEDS

garden organic

Contact : n.k.vandervelden@cumbria.ac.uk

More at: http://www.permaculture.org.uk/mixedveg