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Multi-species systems in Agroecology

Dr N.K. van der Velden

BES 1st Agroecology meeting
1st 2nd November 2012, London
Sustainable agriculture...
Benefits of multispecies systems

Enhanced ecological services
Biodiversity, nutrient cycling, soil & water conservation, carbon sequestration.

Pest regulation
better control of pests and diseases

Multispecies systems

Productivity
greater overall productivity

Greater economic profitability

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”

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?

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

Context:
- Pest regulation
- Better control of pests and diseases
- Multispecies systems
- Greater economic profitability
- Productivity
- Greater overall productivity

Results

Methods

Smith, 2011

Diversity and production
Public participatory trial

Rationale

Methods

Results

Context

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

Photo by C. Atkinson
Veg production

### Rationale

- **Methods**
- **Results**
- **Context**

### Yield per square metre

![Graph showing yield per square metre](image)

- **Low diversity**
- **High diversity**

### Yield per hour

![Graph showing yield per hour](image)

- **Low diversity**
- **High diversity**

### Production (kg per square metre)

- **Spinach**
- **Peas**
- **Red lentils**
- **Kale**
- **Cabbage**
- **Onion**
- **Beans**
- **Broad bean**
- **Lettuce**
- **Sweetcorn**
- **Chillies**

- **Low-diversity**
- **High-diversity**

### Effort (hours)

- **Yield (kg per square metre)**

- **Low, Medium, High**
- **Effort (hours)**

![Graph showing effort vs. yield](image)
**Veg production**

**Rationale**

**Methods**

**Results**

**Context**

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

Rationale

Methods

Results

Context

Veg production levels in different regions of the UK, indicated by color-coded maps:
- Yellow: 0 - 0.75 kg
- Orange: 0.76 - 1.5 kg
- Red: 1.6 - 3.0 kg
- Deep Red: 3.1 - 5.0 kg
- Dark Red: 5.1 - 10.6 kg

The maps show regions with low and high veg production.
Veg production

![Graph showing production of various vegetables in low and high diversity conditions.](image)
Veg production

Rationale

Methods

Results

Context

Veg production

R = 0.462
p = 0.03
N = 39
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.
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.
Malézieux et al., 2009 Mixing plant species in cropping systems: concepts, tools and models. A review Agron. Sustain. Dev. 29 43–62
Stamp, 1948 The Land of Britain: it’s use and misuse. Longmans, Green and Co. London
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

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