# The latest work on sustainable, organic and low input breeding





7<sup>th</sup> Organic Producers' Conference

#### 22-23 January 2013

Making producer-led innovation a reality



# **SOLIBAM:**



#### **Among the outcomes:**

• More seed options for organic growers



More methods for organic breeders

# DIVERSITY

#### **Cereal 'composite cross' populations**

#### **Ance**stral wheats

#### **Vegetable landrace populations**



Landrace-cross vegetable lines

# 1. Breeding strategies in Broccoli

- Agronomic Trial
- Multiplication Trial

# 2. Testing new bean lines



# 1. Breeding strategies in Broccoli

#### **Overwinter sprouting broccoli (outcrossing)**

### MATERIAL

- Italian landrace
- A selection of plants was allowed to cross-pollinate
- Groups of these were selected as 'mothers': an 8member group, a 4-member and a single mother
- Seed was saved from these groups and sent out to the trial sites



**Comparing the agronomic performance of landracederived populations and a commercial hybrid.** 

#### **METHODS**

- 8-mother, 4-mother and 1-mother populations plus an F1 commercial hybrid
- 4 replicates, 10 plants per rep, randomised block
- One UK site and three Italian; 3 generations
- Plant vigour, appearance, pests and disease susceptibility, stress tolerance, maturation time and yield all recorded



**ORGANIC** RESEARCH

ELM FARM

#### **Breeding strategies in Sprouting Broccoli:** 1. **Agronomic Trial**

#### **SOME FINDINGS: UK 2010 & 2011**



Per-plant yields 2010-11 (UK) 700 600 500 400 300 2010 200 2011 100 0

A-mother & mother 2-mother 21 mbrid



#### **SOME FINDINGS: ALL SITES 2010**

Total yields all sites (2010) 11,000 Average entry yields across sites (g) 10,000 9,000 8,000 7,000 6,000 5,000 4,000 A nother & nother who ther a hybrid





# **SOME FINDINGS**

- No consistent relationship between diversity and yield or other important parameters
- An advantage of the landrace plants: colour, texture and flavour.

• One more year to go.



Lots of internal diversity observed in landrace populations for shape, colour, yield, stress tolerance, harvesting period and other characters.





#### 1. Breeding strategies in Sprouting Broccoli: Multiplication Trial

*Testing a method of on-farm breeding to produce a locally-adapted sprouting broccoli line, and to validate the method for use by growers.* 

#### **METHODS**

- Using the 4-mother and 8-mother Italian populations (will a more diverse starting population be more beneficial?)
- Grow 18-24 plants each year, select the three best, allow them to cross-pollinate in isolation and save seed.
- Repeat using the saved seed for three generations.



elm farm

#### 1. Breeding strategies in Sprouting Broccoli: Multiplication Trial

In theory, growers can identify genotypes

- Well adapted for local conditions
- With the characteristics they want for their market.

#### Though there are lots of caveats and complications...



- Equipment
- Timing / season
- Seed-harvesting process

#### 1. Breeding strategies in Sprouting Broccoli: Multiplication Trial

... the potential rewards are great: agrobiodiversity, local colour, resilient cultivars and more.





#### I wanted to test the water with growers...

#### **Participatory work with Sprouting Broccoli**

- 3 growers in East Anglia started in summer 2012
- Landrace (selected at Wakelyns) and Commercial Hybrid
- Observing plants for commercial viability





# 1. Breeding strategies in Broccoli

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# 2. Testing new bean lines MATERIAL Common bean, cv. Coco



Landrace X Commercial pure-line

Offspring grown and observed; high-performers selected as parents for 17 new diversified lines.



Seed for new lines distributed to trial sites.

# **Overall message from project so far:**

- Exploiting diversity for organic and low input situations has potential: in many cases, internally-diverse varieties are performing as well as commercial cultivars.
- We now need to refine methods of using diversity in breeding, e.g. more consistent starter populations.





# Legal issues

- Only uniform varieties can be legally traded in the EU (DUS)
- The legislation must be adapted to allow 'internally diverse' varieties
- How should we legally define these to give the grower predictability while allowing genetic flexibility?

