Participatory plant breeding in the Netherlands

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DIVERSIFOOD Workshop

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This project has received funding from the European Union's H2020 Programme under grant agreement no 633571

Introduction

- Focus on organic agriculture
- The problem: Lack of suitable varieties for organic agriculture
  - Adaptation required to specific growing, processing and marketing conditions
- How to stimulate breeding for organic agriculture in the Dutch context?
- How does that fit with the current regulations?

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What is participatory plant breeding?

- Collaboration of farmers in variety selection and breeding (Almekinders and Elings, 2001)
- Empowering farmers (Sperling et al. 2001)

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What can participatory plant breeding models offer?

(Morris & Bellon 2004)

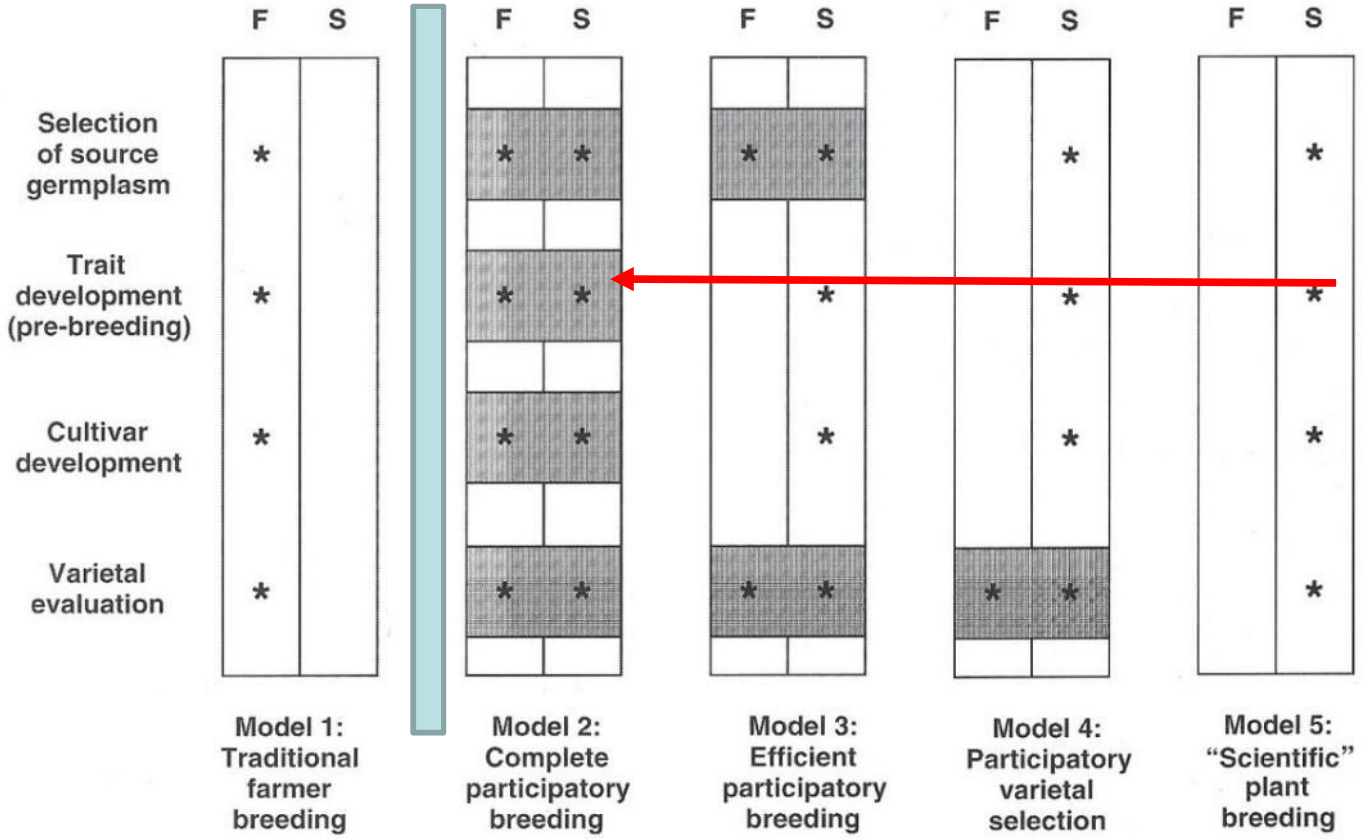

Figure 1. Integrating global and local approaches to plant breeding. Note: F = farmer; S = scientist.

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How to deal with the gap left by participatory plant breeding?

- Better use the term ‘collaborative plant breeding’
- How to organise and finance collaborative plant breeding breeding
  - Which approaches exist?

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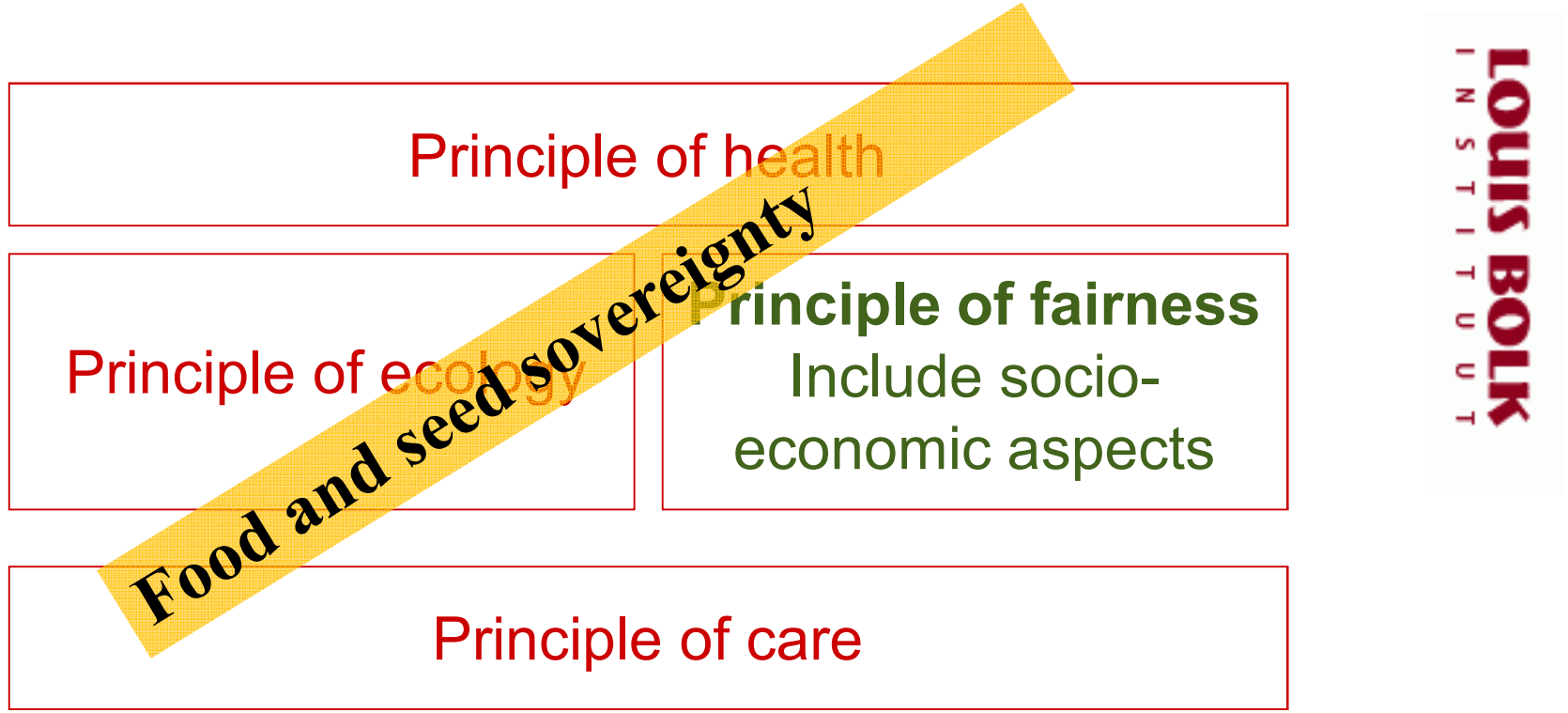
Translating IFOAM principles into collaborative plant breeding

- Breeding approaches that allows involvement of all actors in society
- Access and maintenance of diversity for future generations



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Two main models of collaborative breeding

- Chain-based breeding: different chain actors
  - Shared economic interest
  - Design approach, aimed at particular product
  - ➢ Example: club varieties tomato / apple

- Community-based breeding
  - A group of farmers, also including other actors
  - Shared culture / common language
  - Idea driven, multiple options, process important
  - ➢ Example: Kultursaat in Germany

➢ Often, crop specific models needed

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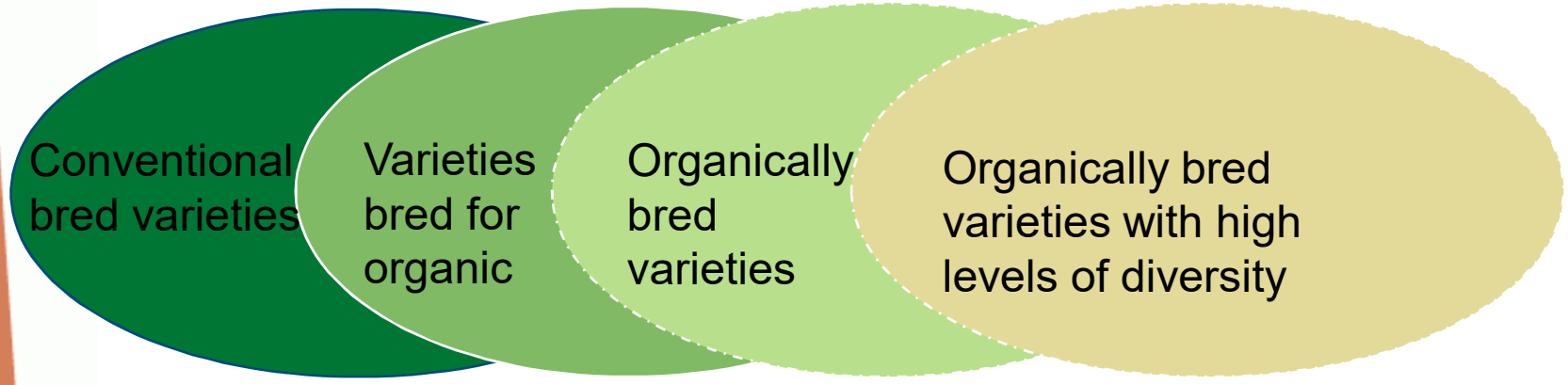
Different approaches, different types of varieties

- The degree of overlap between the types of varieties depends on:
  - Diversity in applied breeding techniques
  - Diversity in breeding goals / philosophy
  - Diversity in crop traits aimed for



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Current breeding models: work in progress
(with Edith Lammerts van Bueren)

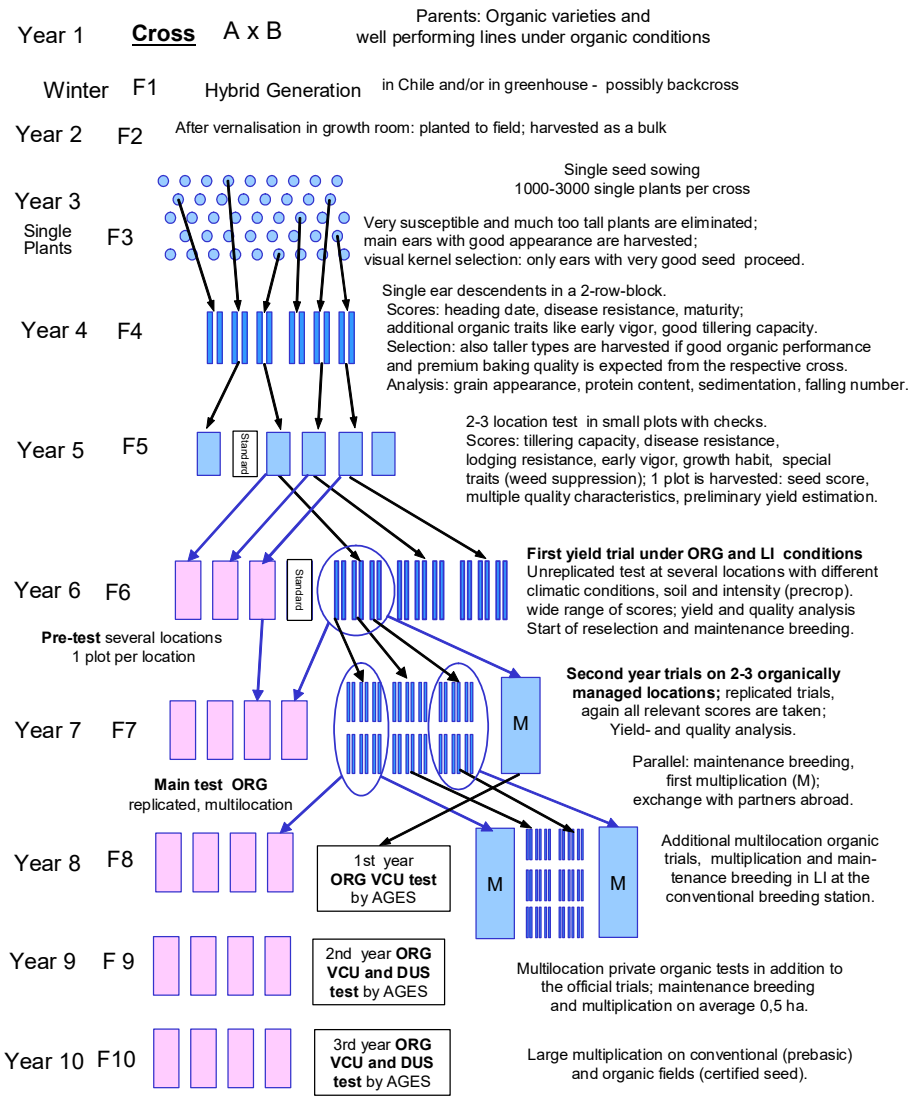
	Model 1. BFCA		Model 2. BFOA		Model 3. Complete Organic		Model 4. Organic based		**Model 5. Open source**	
	CONV	ORG	CONV	ORG	CONV	ORG	CONV	ORG	**CONV**	**ORG**
Prioritizing traits	x		x	x		x		x		**x**
Breeding for traits, incl. pre-breeding	x		x		(x)	x		x		**x**
Selection in early generations	x		x	(x)		x		x		**x**
Selection in late generations	x		x	(x)		x		x		**x**
Official variety testing for registration (DUS)	x		x		x		x	x?	**x?**	
Official variety testing for value and use (VCU)	x		x	x	(x)	x	(x)	x		**x?**
Testing of marketed varieties	x	x	(x)	x	(x)	x		x		**x**

Chain based

Community based

ing from the
gramme under

Example of Breeding for organic agriculture - BFOA



Saatzucht Donau
Austria

Breeder:
Franziskza
Loeschenberger

winter wheat

(Loeschenberger et al., Euphytica 2008)

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Adapted VCU for pure line varieties of spring wheat for organic

- How many locations and seasons?
- Include baking quality; how?
- Which disease resistances to include and what are the minimum requirements?
- How should a selection index look like?
- How do we organise the financial costs?

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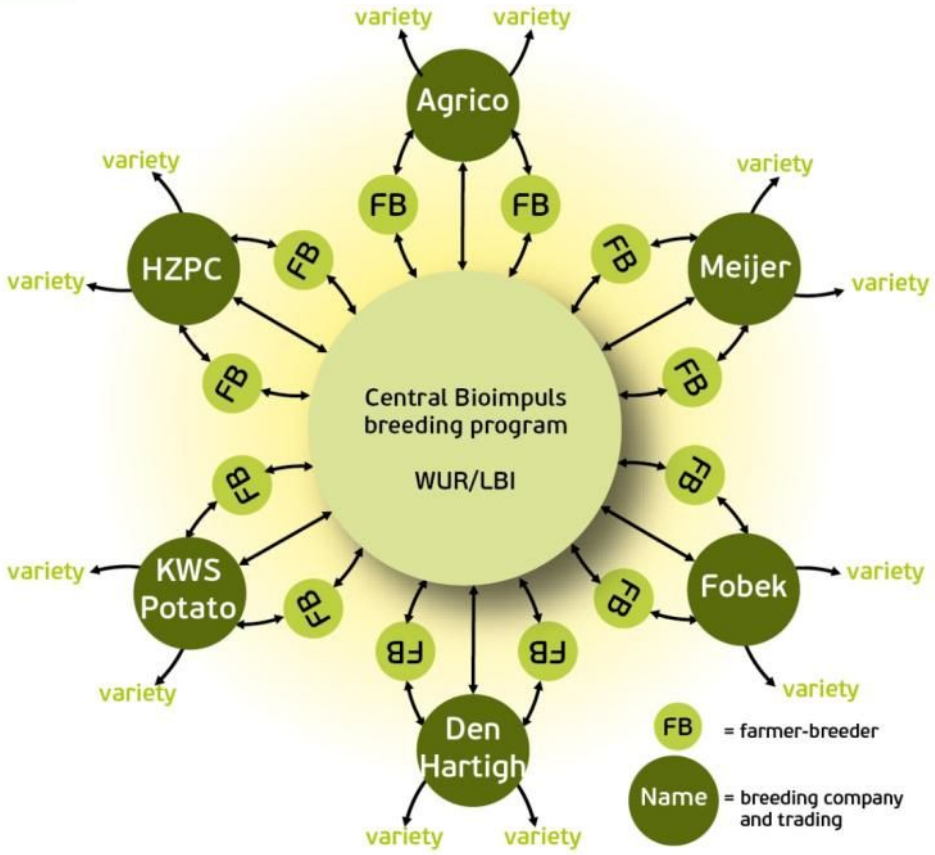
Bio-impuls – organic late blight resistance potato breeding



6 breeding companies

LBI and WUR

12 farmer-breeders

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Experiences on populations (CCPs) of spring wheat

Population

Pure line

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Lessons learned so far on regulations aspects for CCPs

- Rethinking required by authorities
  - Also a matter of different languages
- How to describe CCPs: can VCU-traits be used instead of morphological traits?
  - For example: In 2014 no clear differences found between two CCPs, but in 2013 clearly distinct
- How to garantue that CCPs don't get mixed up by farmers?
  - How to avoid confusion and misunderstanding?
  - Does it help if NAK has samples of the CCPs available for comparison?

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Some initiatives in NL on collaborative breeding

- Bio-impuls: organic potato breeding
  - Complete organic – Community based – No adjustments DUS/VCU
- Two initiatives in spring wheat
  - Screening pure line varieties/lines for organic
    - BFOA – Chain based – Some adjustment VCU required
  - Implementation of populations (CCPs / Composite Cross Populations / heterogeneous material)
    - Organic based – Community based – Temporary experiment on heterogeneous material
- Breeding vegetables: various initiatives emerging
  - Organic based –Chain / Community based – Some adjustments DUS required

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Key elements to help understand what kind of approach is feasible

- Ownership of the problem
  - Real necessity for all
- Complexity of the food chain / network
  - Shared thought styles: easier cooperation
  - Historical and organisational context differs per crop
- Crop specific traits
  - Breeding system, breeding approach, plant architecture
  - Role of farmers in selection and seed multiplication
- Level of policy support needed
  - varies per crop and food chain/community

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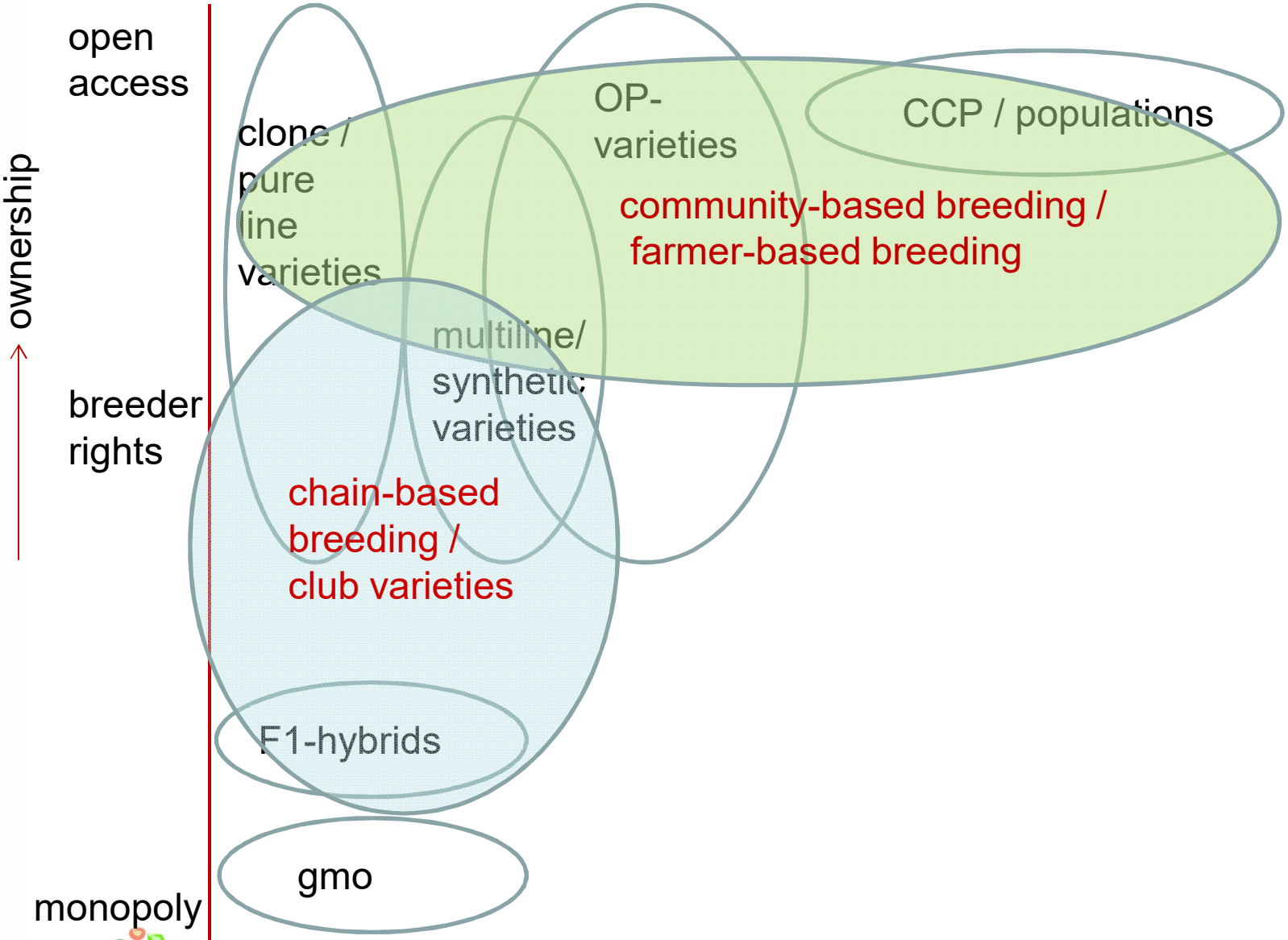
Various pathways in breeding to co-exist



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Thank you

Any questions?

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