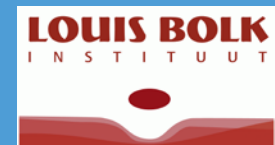


Potato post-copper workshop

Edith Lammerts van Bueren, Christel Engelen, Ronald Hutten
Louis Bolk Institute & Wageningen University, NL
Birmingham, 2 February 2017



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The problem(s)

1. In NL late blight occurs yearly (maritime climate)
2. In NL no copper based fungicides allowed in organics
3. Yet as copper leaf fertilizer is permitted.....
4. National rule to burn crop when 5% infestation
5. Since 2000, 20% of organic farmers stopped growing potato
6. Thus reasons enough for starting Bioimpuls 2009-2019
7. New: August 2016 (NL), decision no more copper in 2020.



Many traits required for organic farmers

■ Key:

- Resistance against foliage and tuber late blight

■ For durability of resistance genes:

- early tuber setting and tuber filling
- 30-40 tonnes/ha in 90-100 days
- stacking a diversity of resistance genes

■ For resource use efficiency, no herbicides

- early closing canopy with less N-input
- N-efficiency and ability to recover after stress

■ For robustness:

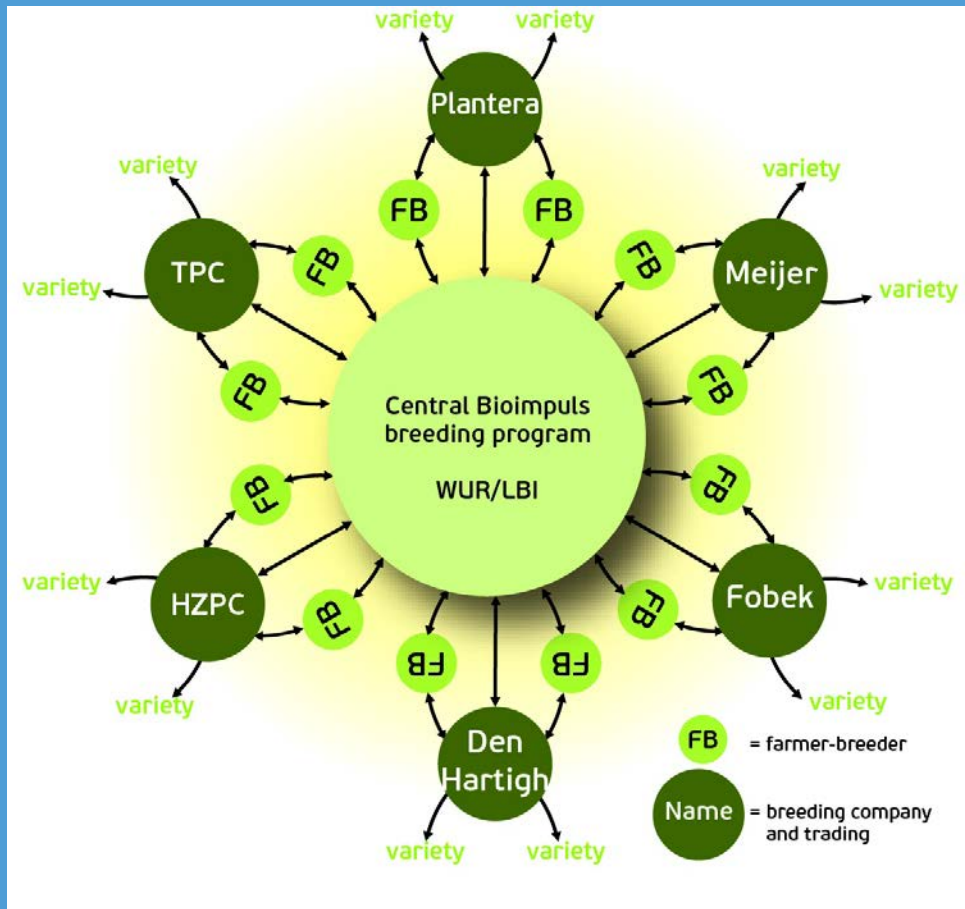
- less susceptible for virus, rhizoctonia and (silver)scab, alternaria

Requirements for the market

- Not only for organic market
but additional conventional market
- good quality, smooth skin, shape, flat eyes, flesh and skin colour, and taste



Bioimpuls infrastructure 2009-2019

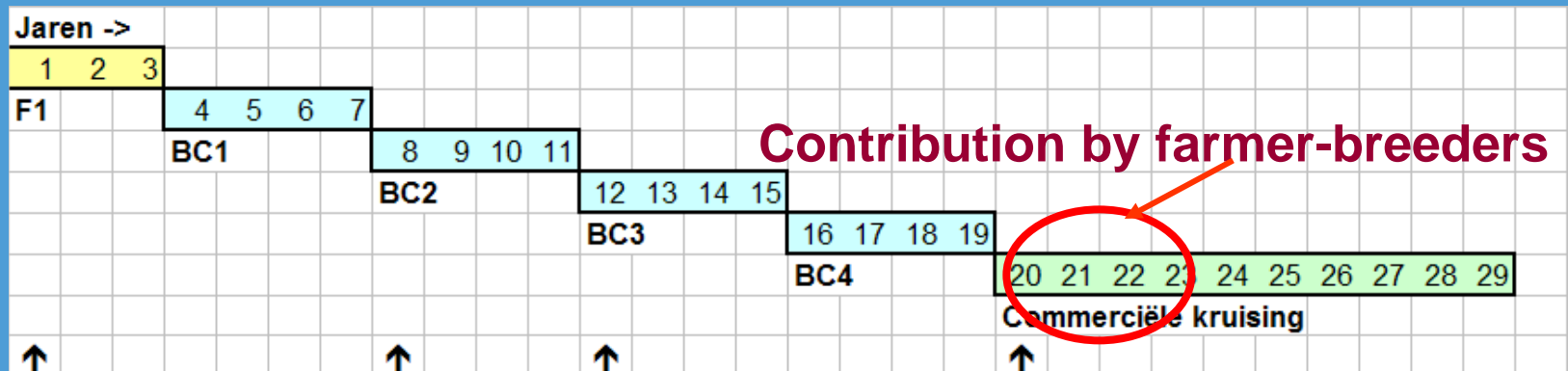


6 breeding companies

LBI and WUR

12 farmer-breeders

Potato breeding scheme



(Pre breeding)

From crossings with wild relatives (F1)
via back crossings (BC1-BC4)

3 years

3-4 x 4 years

approx. 20 years

(Commercial breeding)

to commercial varieties

10 years

In total

30 years

Dutch 'Hobby-breeders' model

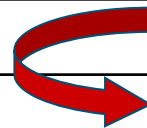
Basic principles:

- Farmer and breeder work in cooperation.
- Farmer's activity on a 'no cure-no pay' base.
- When a variety is registered and marketed, the farmer receives 50% of the royalties.



Farmer's selections return to company

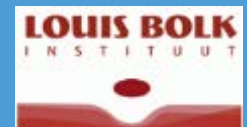
Year	Conventional (Meijer)	Niek Vos (farmer breeder)
0 (crossing)		
1 (F1, No of clones)	60.000	8.000
2	3200 (5%)	160 (2%)
3	750	20
4	150	4-6
5	30	3
6	10	2
7	26	1
8	1-3	0-1
9	0-2	variety?



WUR/LBI provide yearly 60.000 seeds
from 300 crossings/year



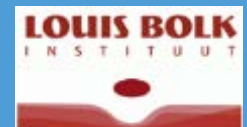
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From crossings to seedlings



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Farmer selection field (1) (Niek Vos)



First step:

- Negative mass selection:
discarding all infected plants,

Farmer selection field (2)

(Joute Miedema)



Second step:

- Selection among the healthy plants by evaluating tuber size distribution, skin quality etc

Field selection (2)



Discarded!



Farmer selection (3)



Third step:

- Store and replant the next season and select again

Potato breeding course to increase the number of organic farmer breeders



Selection based on cooking and baking quality



Yearly wintershow of our clones for the Bioimpuls partners



Aim to offer each year at least ten 3rd year clones to the partner companies

13 Sources of late blight resistance applied in Bioimpuls

Source	Gene	Cultivars	Period 2009- 2013	Period 2014	Expected period 2019	Marker available in 2014
ABPT	S.bulbocastanum (Rpi-blb2)	TOLUCA, BIONICA	Short term	Short term	Short term	Yes
CAROLUS ATHLETE	Known ?	CAROLUS ATHLETE	Short Short	Short Short	Short Short	Yes No
VR95-98	VR95-98 (R8)	VITABELLA	Short	Short	Short	Yes
SARPO MIRA	Sarpo mira (Rpi-Smira1)	SARPO MIRA	Short	Short	Short	Yes
2424A(5)	R8 differential (R8)		Middel	Middel	Short	Yes
2573(2)	R9 differential (R9)		Middel	Middel	Short	Yes
EDIFRI-3	S. edinense (Rpi-edn2)		Middel	Short	Short	Yes
BCP 326-3	S. brachycarpum (BCP)		Long	Middel	Short	No
IOP 273-1	S. iopetalum (IOP)		Long	Long	Middel	No
SCR 849-6	S. sucrense (SCR)		Long	Long	Middel	No
BUK 510-2	S. bukasovii (BUK)		Long	Long	Middel	No
MPT 364-1	S.multiinterruptum (MTP)		Long	Middel	Short	No

Bio-impuls 2017-2019

- Continue upgrading genitors through backcrossing
- Research on the relationship between foliage and tuber blight resistance
- Stacking resistance genes (2-4)
- Validating use of MAS
- PhD project on durable resistance management, modeling epidemics and socio-institutional dynamics (2014-2017)

Available late blight resistant varieties (2017)

Full level of resistance (9: major gene)

- Sarpo Mira (Danespo-McCain)
- Bionica/Niek's Witte (C. Meijer/Vos)
- Vitabella (Plantera)
- Carolus (Agrico), replacing Toluca
- Alouette (Agrico)
- Twinner (Agrico)

High level of field tolerance (8):

- Connect (Den Hartigh)



Transition towards copper free, late blight resistant cultivars - a chain wide approach, 2017-2019 -

Goal 2020: NL copper free, full assortment late blight resistant cultivars

Key actions:

- Regional variety trials
- Full commitment chain actors needed: Breeders, Farmers, Traders/packers/retail
- Training in resistance management to prevent establishment of new fysio's!
- Communication

Thank you!



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