The dead-end feature of hybrid cvs.

Phd student‘s Seminar February 2009

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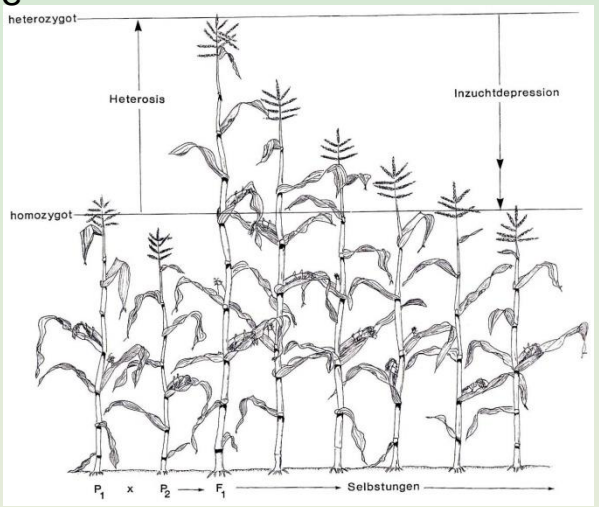
A modern “variety” (variety = contrary of uniformity) of wheat, soya, maize, colza or tomato etc. consists of plants that are genetically identical. These “varieties” are thus ***clones***, the contrary of what variety stands for.



Becker, 2009

Seed breeder’s goal is **to separate production from reproduction; reproduction** becomes his **monopoly**.
“Hybrid variety” = Terminator, mystified in terms of improvement.

‘Hybrid breeding’ proposed by Shull consists of replacing a **free variety** which the farmer can freely replant, by **captive clones**.

Shull and East:
substitute the real issue of the *interclonal variations* by **cloning**.
substitute a *scientific* question that can be answered, for an *esoteric* question.

The method of Shull and East is a method of expropriation.

Complot and Conspiracy!

All breeders in the U.S. Department of Agriculture (in 1936 a 100 head strong workforce) were directly or indirectly students of E.M. East. They were ‘formatted’ by East into the mysteries of heterosis. Only dazed geneticists, prisoners of their esoterism and cut off from biology and agronomy, can believe that to improve living beings, requires preventing them from multiplying in the farmers’ fields !


Terminator
Hybrid

Statements on the „Dead-End“-feature of hybrid cultivars

„Sorten sind Kulturbegleiter des Menschen; Hybriden als „Einweg“-Sorten können diese Aufgabe nicht erfüllen“. … „Errungenschaften der Züchtung sollten allgemein verfügbar sein. Hybriden widersprechen dem Züchterrecht, nachdem jede Sorte und Linie von anderen Züchtern zur Weiterzucht verwendet werden darf.“

“Crop cultivars are accompanying human culture; hybrids, being “end-of-line”-cultivars cannot fulfill his task”. … „Achievements of breeding should be openly available; hybrids contradict the breeder’s right, saying that each cultivar and line bred by other breeders may be used for further breeding.” Henatsch & Witten, 2002

„Allerdings, das muss man auch sagen, man kann schon auch mit den F1-Hybriden weiterzüchten, und daraus durch konsequente, mehrjährige Auslese wieder samenfeste Sorten machen. Man kann sich so den enormen Züchtungsfortschritt der konventionellen Züchtung zugute machen.“

„Yet, this has to be said, you can indeed use F1-hybrids for further breeding, and by a consistent, ongoing selection you can produce true-to-seed cultivars. One can thus well make use of the enormous progress in the conventional breeding.“ Laßnig, P., 2006

„Vermehren kann man diese Sorten nicht. Die Samen der F1-Pflanze degenerieren. Das Saatgut muss also immer wieder gekauft werden. Der nächste Schritt wäre der Verzicht auf Hybridsorten, von Demeter als langfristiges Ziel der Bio-Branche deklariert.“

„You cannot propagate these cultivars. The seeds of the F1-plants degenerate. You have to bye again and again new seed. The next step would be to avoid hybrid cultivars. This is a long-term objective of Demeter and of the entire organic branch.” Redlich-Gilliotte E., 2005

Statements on the „Dead-End“-feature of hybrid cultivars

“Hybrid progeny cannot be generatively propagated, which thus effectively keeps farmers from collecting seed themselves.” Lammers van Bueren et al., 1999

”Jeder Züchter hat das Recht, Sorten anderer Züchter in seine eigenen Züchtungen einzukreuzen. Diese Möglichkeit des Nachbaus wird bei der Hybridzüchtung verkompliziert. Die F2-Nachkommen spalten auf durch die Hybridzüchtung und haben nur selten alle gewünschten Merkmale der F1-Generation. Das Züchterrecht wird ausgehebelt. Hybridsorten können in der Regel nur ein Mal angebaut werden.”

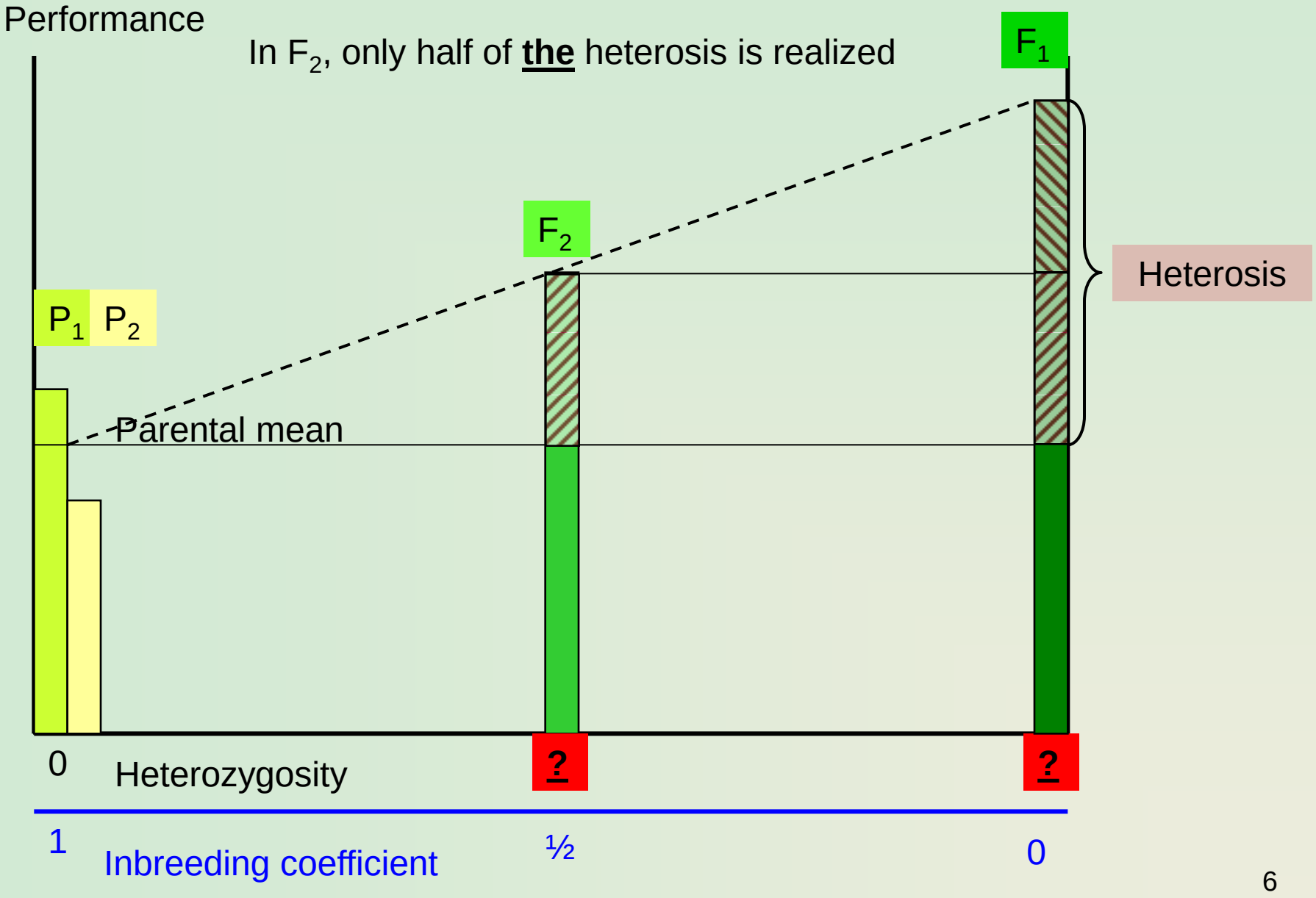
„Each breeder has the right to cross and breed with cultivars of other breeders. This option to reproduce is complicated in case of hybrid breeding. The F2-offspring segregate because of hybrid breeding and they rarely show all favourable features of the F1-genera-tion. The breeder’s right is undermined. Hybrid cultivars can normally only be grown one time.” Aigner, W. & Leopold, J., 2007

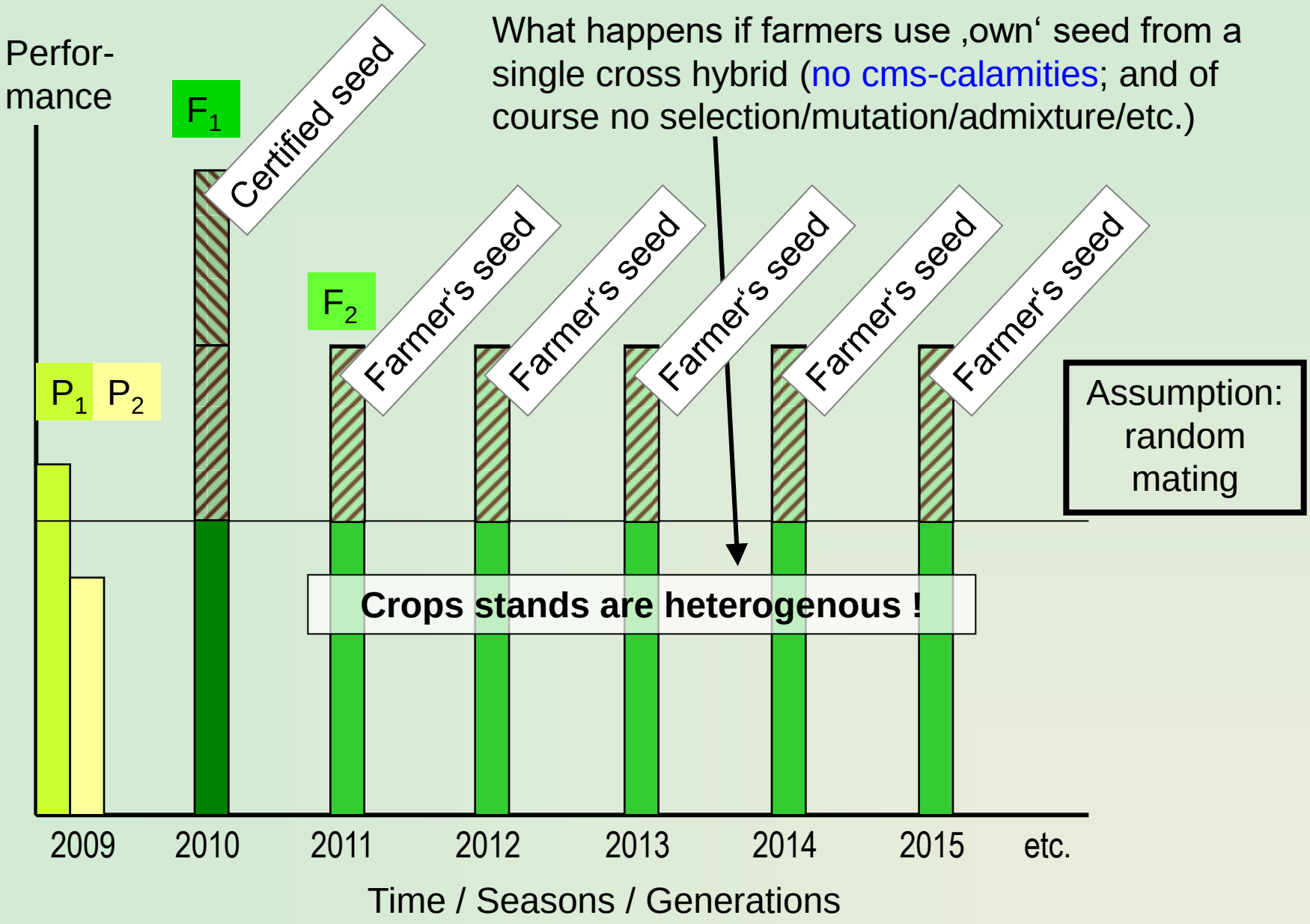
Aigner & Leopold, 2007. Forschungsring Info 1;www.forschungsring.de ; **Henatsch**, Witten, 2002: Aspekte biologisch-dynamischer Züchtung unter besonderer Berücksichtigung der Nahrungsmittelqualität. Workshop „Züchtung für den Ökolandbau“, Hannover, BSA; **Lammers van Bueren** et al., 1999. Sustainable organic plant breeding. Final report: a vision, choices, consequences and steps; **Laßnig**, Demeter-Zeitung 2006, 7/25; **Redlich-Gilliotte**, 2005. Fördergemeinschaft für Umweltpflege durch Biol.Dyn. Landbau, Brief Herbst 2005

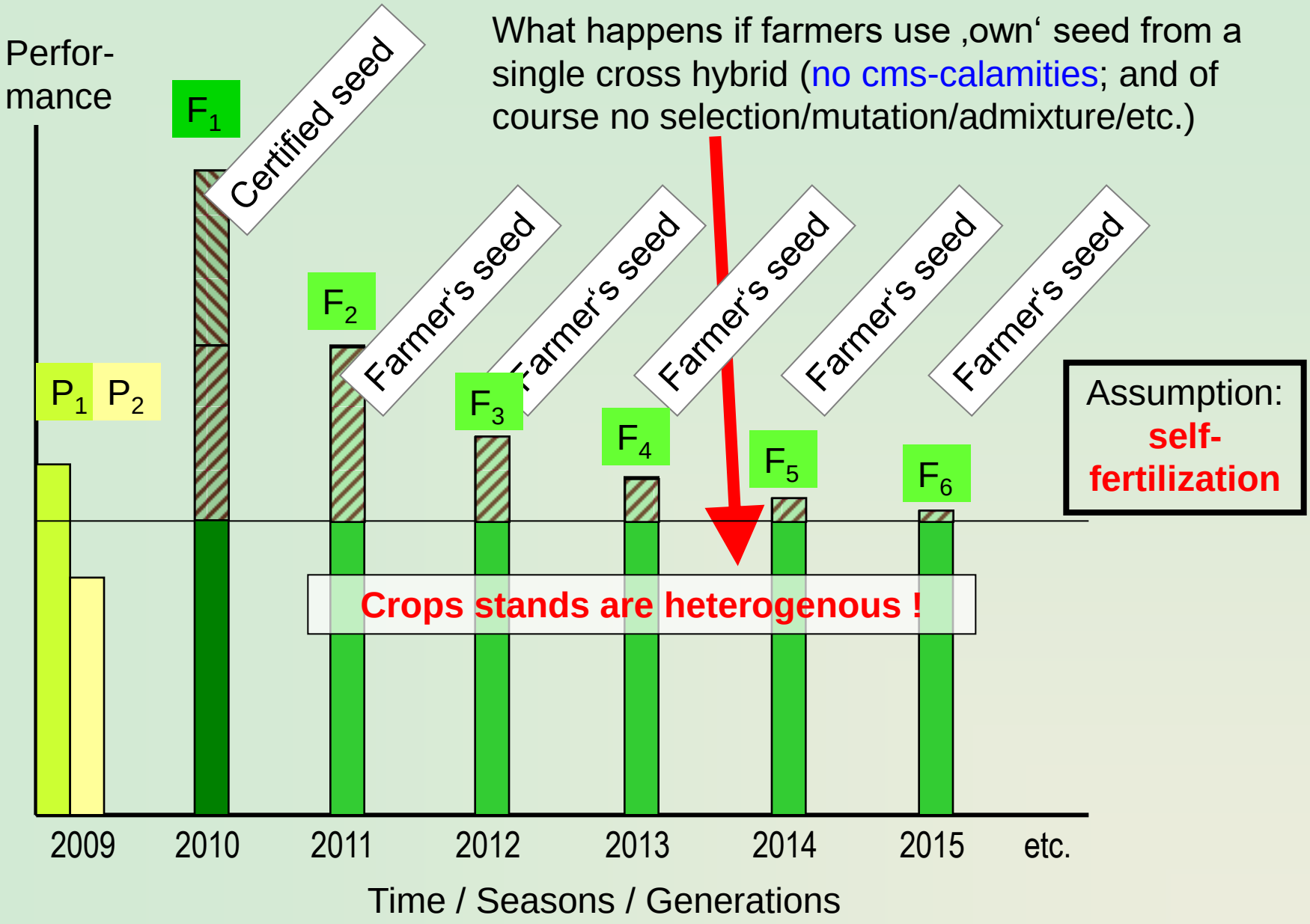
A farmer may wish to use seed harvested from his own field

§ Unlike **clone, line and population *cvs*.** it is <u>not legal</u> if farmers use own seed for sowing in case of **synthetic and hybrid *cvs*.**!

~~In F_2, heterosis is only half as large as in F_1~~




What happens if farmers use ‚own' seed from a single cross hybrid (no cms-calamities; and of course no selection/mutation/admixture/etc.)
Perfor-mance
F1
Certified seed
F2
Farmer's seed
Farmer's seed
Farmer's seed
Farmer's seed
Farmer's seed
P1
P2
Assumption: random mating
Crops stands are heterogenous !
2009
2010
2011
2012
2013
2014
2015
etc.
Time / Seasons / Generations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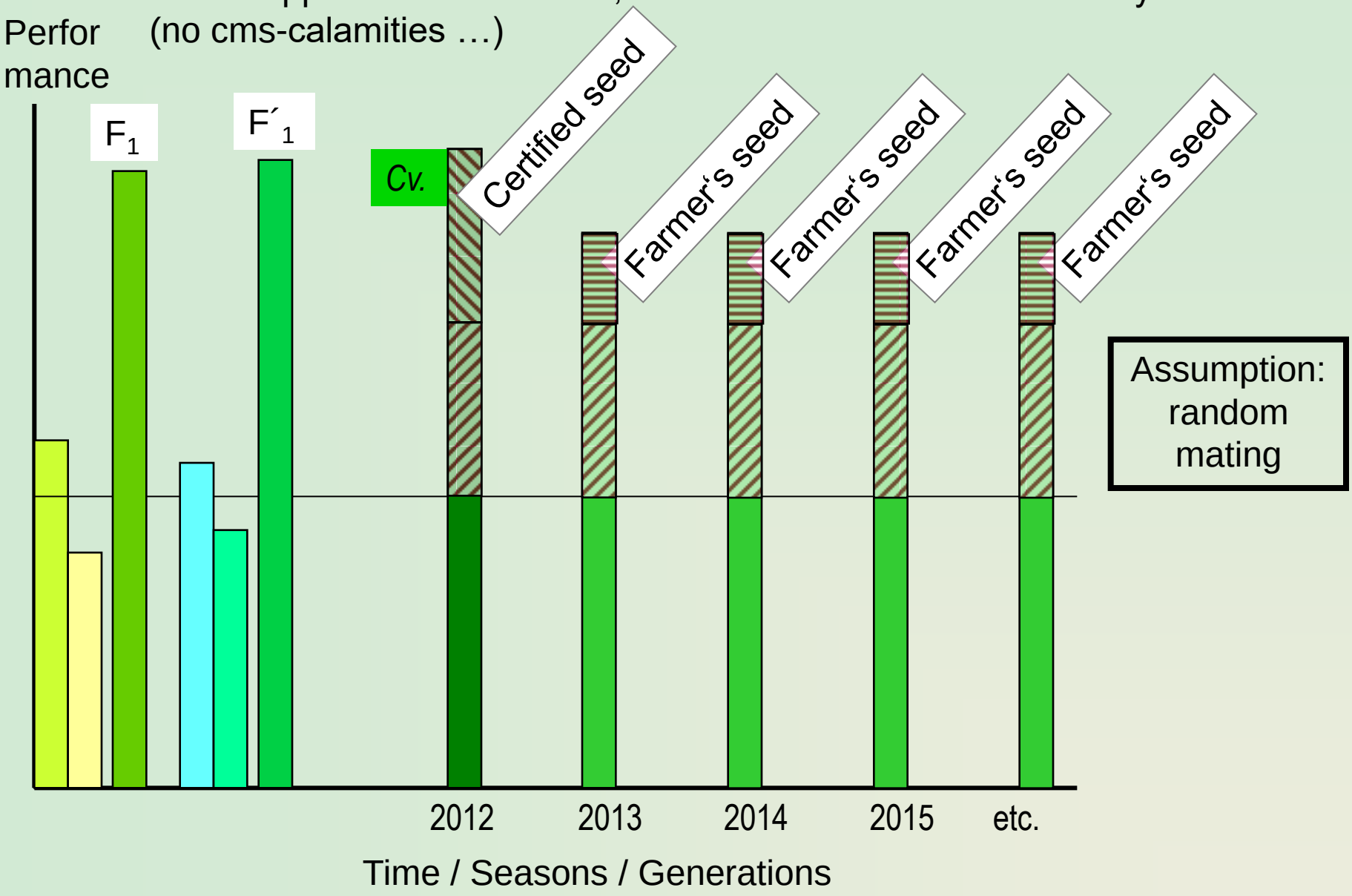
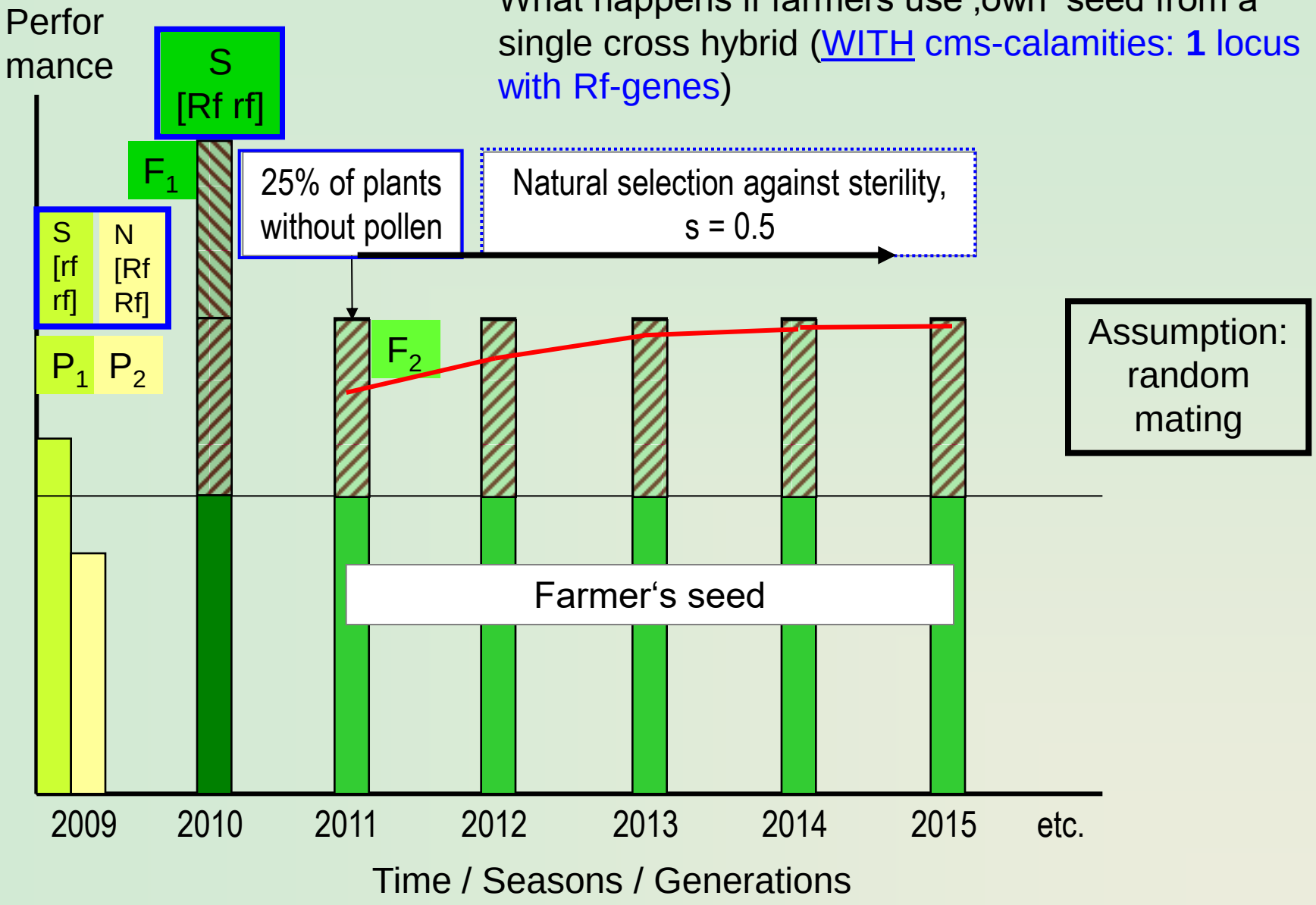
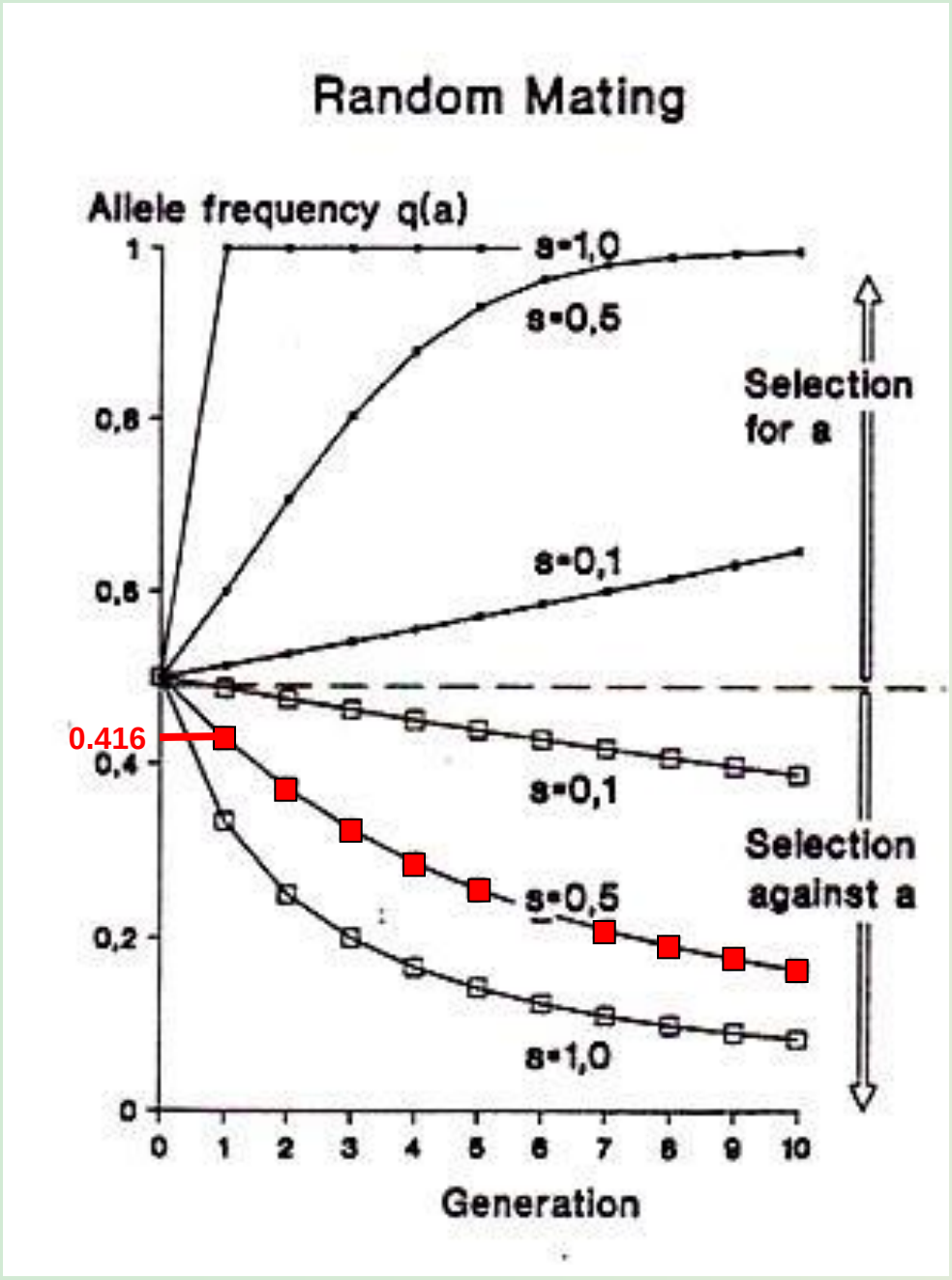
Perfor-mance
Certified seed
Farmer's seed
Farmer's seed
Farmer's seed
Farmer's seed
Farmer's seed
P1
P2
F1
F2
F3
F4
F5
F6
Assumption: self-fertilization
Crops stands are heterogenous !
2009
2010
2011
2012
2013
2014
2015
etc.
Time / Seasons / Generations

What happens if farmers use ‚own' seed from a double cross hybrid (no cms-calamities …)



What happens if farmers use ‚own' seed from a single cross hybrid (WITH cms-calamities: **1** locus with Rf-genes)

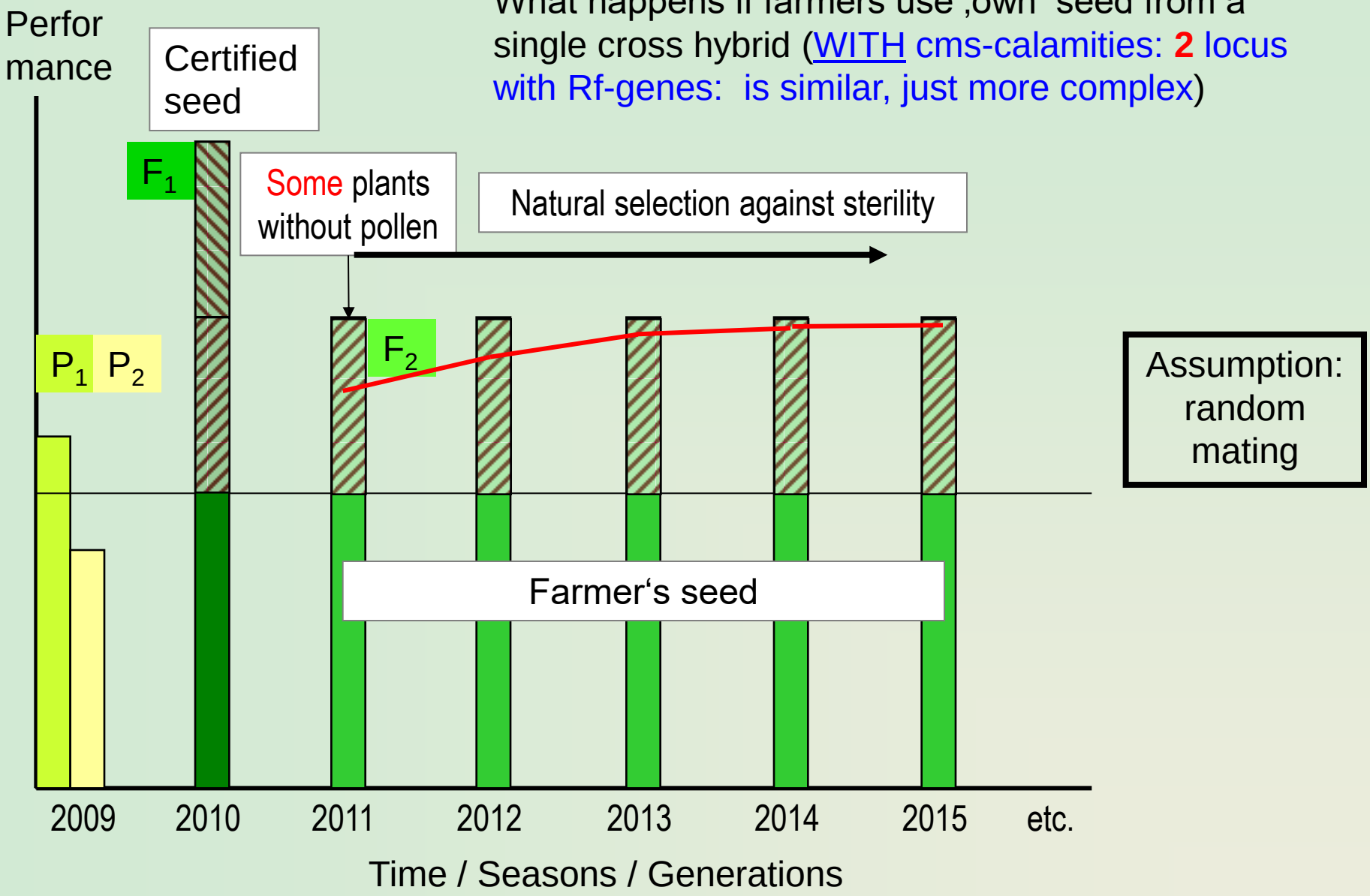




Decrease of recessive allele for non-restorer (= maintainer) characteristic, with s=0.5 (because of no disadvantage on female and lethal action of male side)

Becker, 1993

What happens if farmers use ‚own' seed from a single cross hybrid (WITH cms-calamities: **2** locus with Rf-genes: is similar, just more complex)



A breeder may wish to use a foreing, released hybrid cultivar for his own further breeding

§ For all types of cultivars, **clone, line and population, synthetic and hybrid *cvs*.**, it is legal to use a released cultivar for own breeding purposes (assumption: no GMO calamities).

Allium cepa, 2n=2x=16, protrandric, self-compatible to varying extent

We are talking about a situation where hybrid cultivars need not be male fertile, like onion hybrids.

How do you 'normally' make use of good genes in a hybrid cultivar that was released by your competitor?

S [Rf rf]
[Ω q]

The foreign, heterozygously restored F1-hybrid in sterile cytoplasm with heterozygosity for a monogenetic dominant resistance Ω

N [rf rf]
[q q]

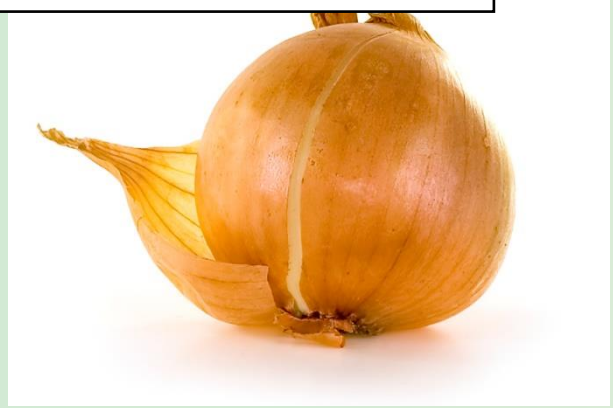
Your non-hybrid genotype without resistance

♀ N [rf rf] x ♂ S [Rf rf]
[q q] [Ω q]

♀ N [rf rf]
[Ω Ω]

Crossing and breeding allows to exploit the hybrid cv., you can breed new male fertile lines that combine features of your and of the foreign material.

The dead-end feature of hybrid cvs.



Allium cepa, 2n=2x=16, protrandric, self-compatible to varying extent

Can you make use of good genes in a hybrid cultivar that was released by your competitor, if the hybrid is **male sterile**?

♀ S [rf rf] [Q q] x ♂ N [rf rf] [q q]

♀ S [rf rf] [Q q] ; ♀ S [rf rf] [q q]

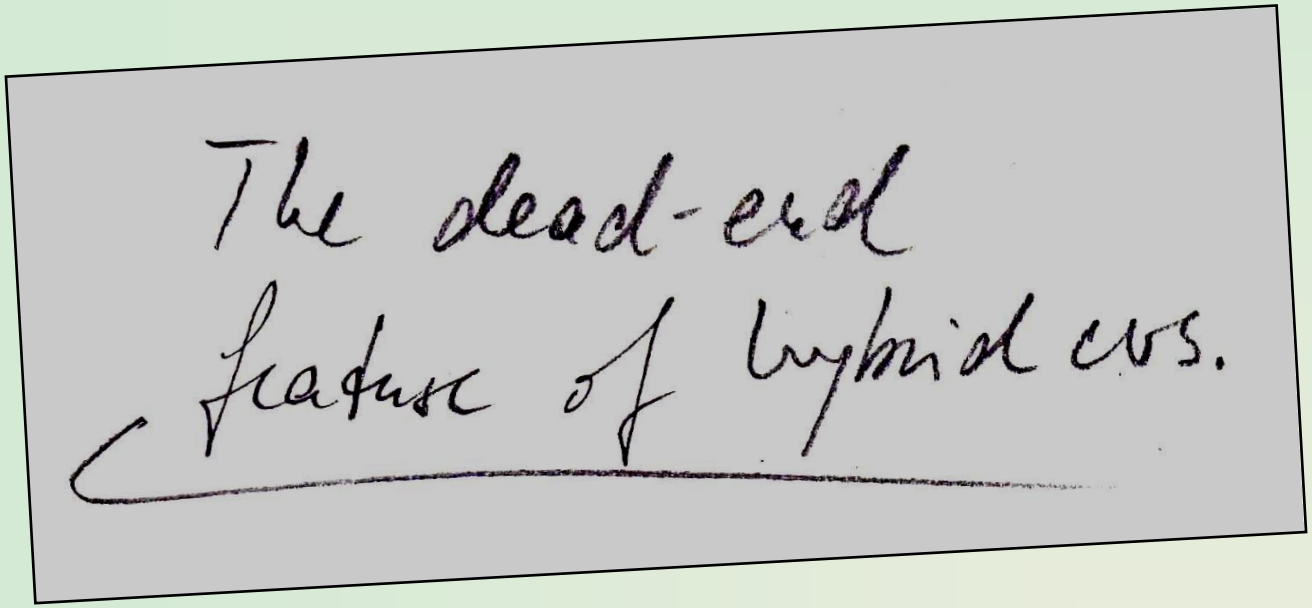
You need to use your genotype as pollinator, thus you 'dilute' the foreign genotype.

You cannot breed a homozygous [Q Q]-line, even! not in sterile cytoplasm. This is because you have not restorer genes, and whatever seed is growing on the male sterile genotype produces male sterile offspring. **You can even** not maintain this foreign hybrid as mother for new 'own' hybrids (for this you anyway needed the ok from your competitor).

Lack of restorer alleles makes this a dead-end situation.

You could start a backcrossing series with your material as recurrent parent and select for the Q allele as foreground selection. In this way you would receive a genotype which is isogenic to your material and for the Q allele would be heterozygous: ♀ S [rf rf] [Q q].

Yet, such genotype would still be male sterile. If you employ it as mother for a hybrid, then the hybrid seed would segregate 1:1 for [Q q] and [q q].


The dead-end
feature of hybrid cvs.

„Der Anbau von Hybridsorten ist heute insbesondere bei Gemüse auch im Ökolandbau weit verbreitet, ist aber nicht unumstritten. Besonders kritisch gesehen werden männlich sterile, also nicht-restorierte Hybriden.“

„Today, and particularly for vegetable cultivation, hybrid varieties are widespread as well in organic agriculture, but this is not without controversy. The attitude towards male sterile, hence non-restored hybrids is especially prone to criticisms.”

Becker, Heiko, 2002: Zusammenfassung der Arbeitsergebnisse und Abschlussdiskussion. Workshop „Züchtung für den Ökolandbau“, Hannover, BSA.

“F1-hybrid production would be permitted according to IFOAM (International Federation of Organic Agriculture Movements) standards provided that the F1-offspring are fertile and that the parent lines can be propagated under organic conditions.”

Wolfe, MS., 2002. Organic plant breeding. In: Powell et al. (eds), UK Organic Research 2002: Proceedings of the COR Conference, 26-28th March 2002, Aberystwyth, pp. 303-305.

End of lecture