GT Sélection participative

Actors and users involvement in plant breeding programs

J. Lançon

Plan

Introduction

Which kind of participation?

Two examples of failure due to lack of participation

"Participation" in private plant breeding

Three examples of breeding organisation in France

Some tools to identify the relevant actors

Three ways of organising plant breeding

And plenty more questions ...

Plant breeding

It began with *domestication*
Followed by *dissemination* and *acclimatization* of the cultivated crops
But it only turned into an *occupation* during the 18th century

***Farmers* played a prominent role in the choice and knowledge of the relevant species to domesticate … but breeding could only become an ocupation when the biological phenomena linked with *reproduction* started to be conceptualised.**

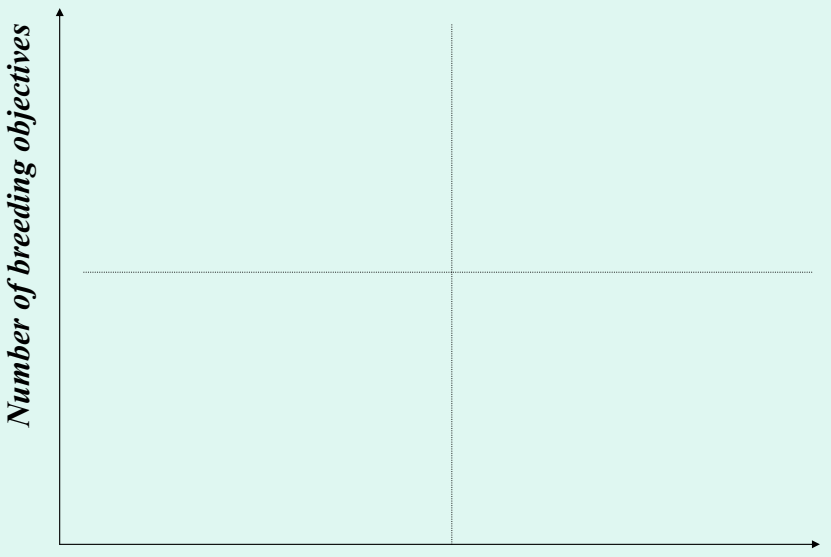
Participatory plant breeding

A lesson learned from the "Green revolution" experience.

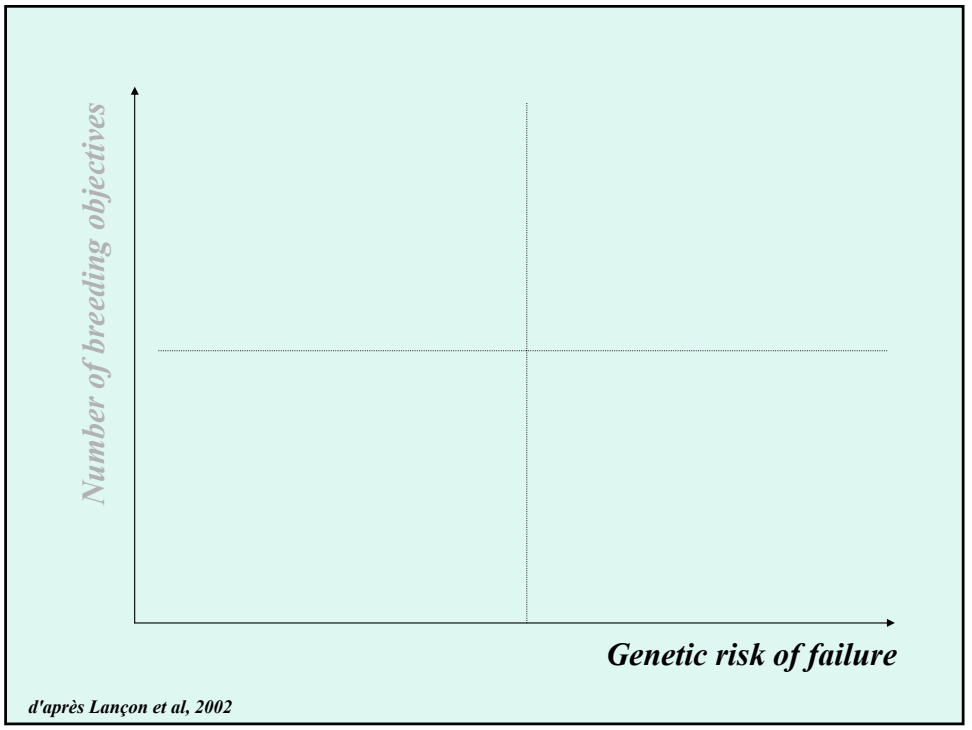
Analysis shows that:
• breeders did not target marginal (crop-wise) environnements
• in rare and very complex cases, (public) breeders were not always able to identify the relevant objectives and criteria.

What makes breeding difficult?

An attempt to explain the origin of some breeding failures.



d'après Lançon et al, 2002



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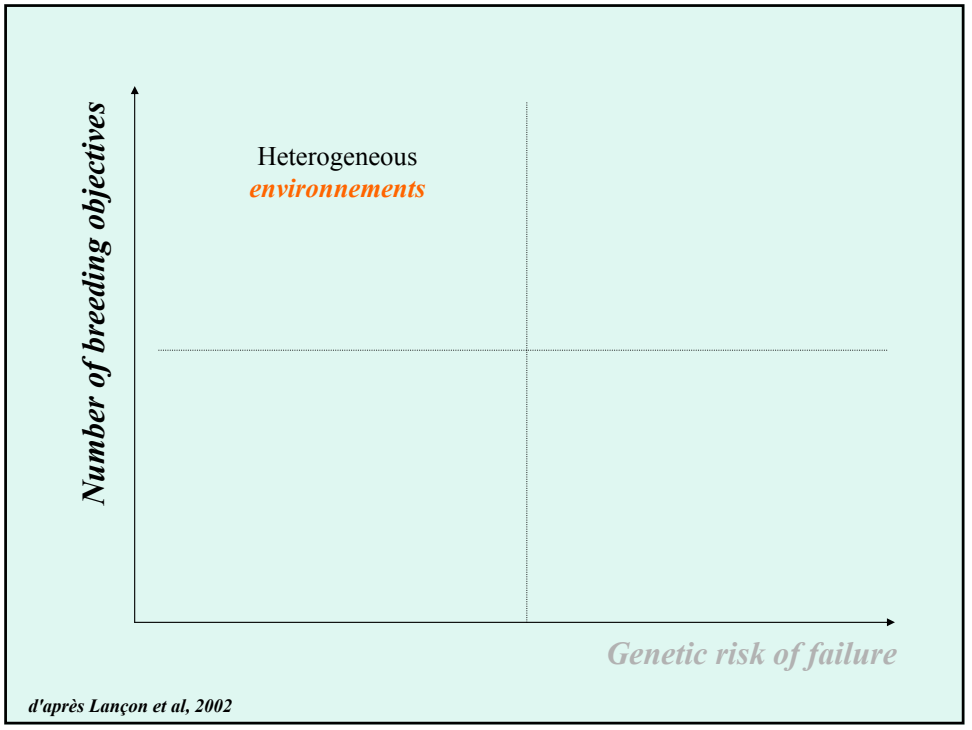

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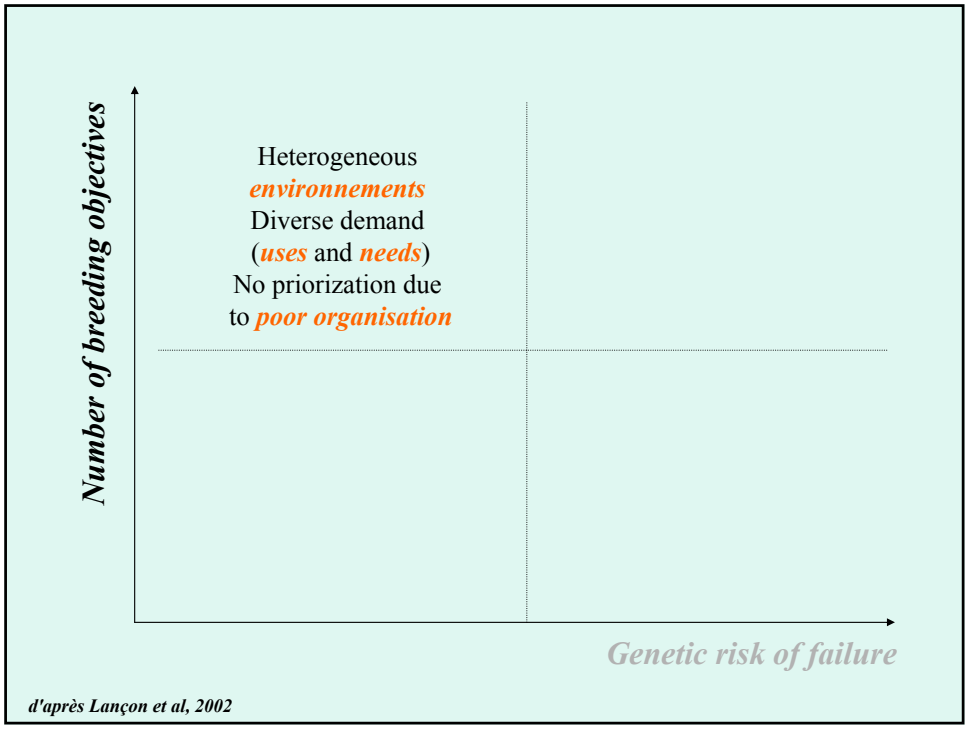

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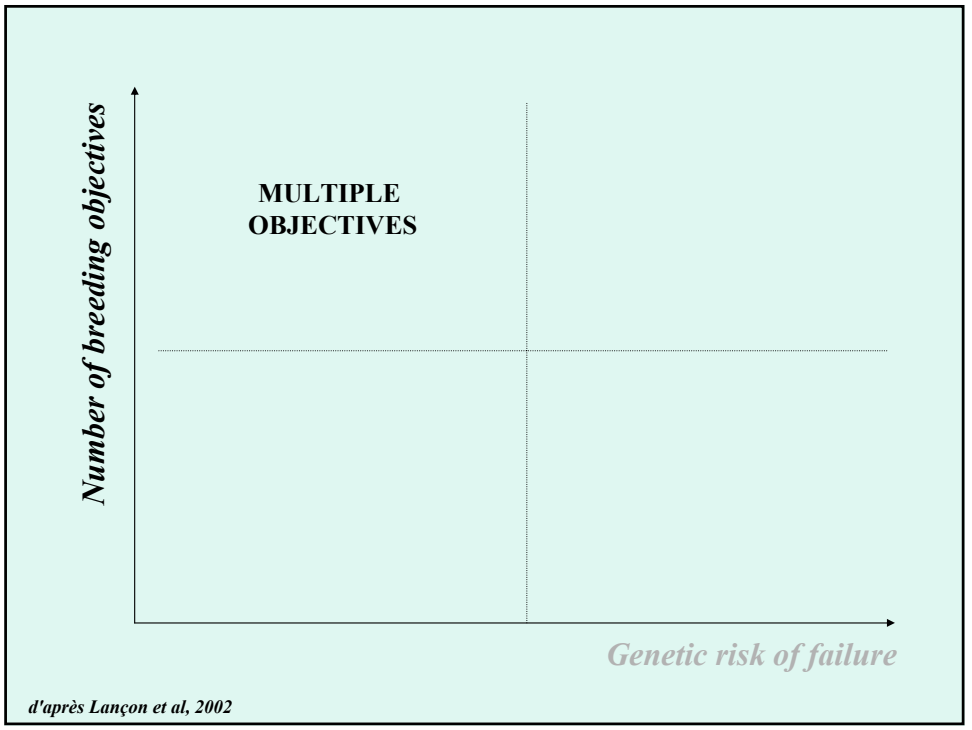

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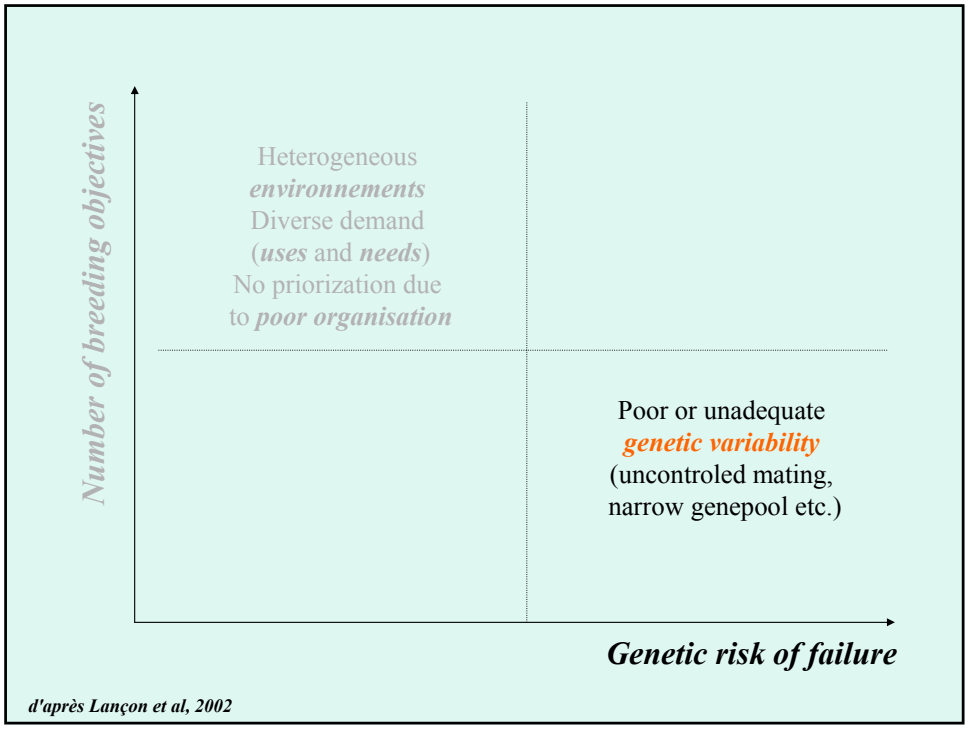

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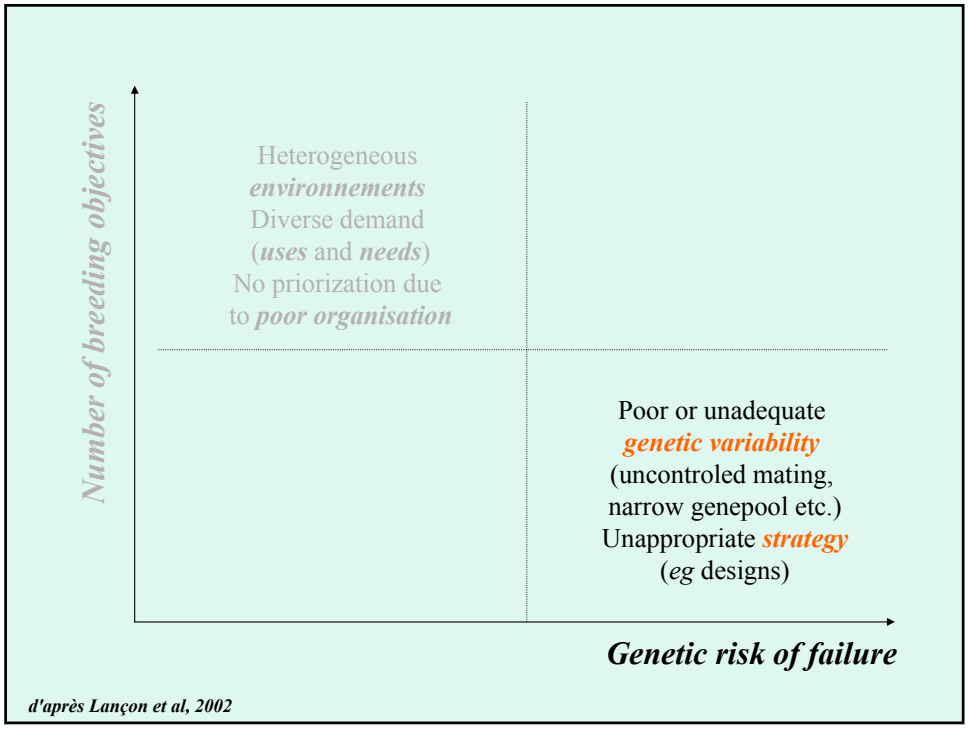

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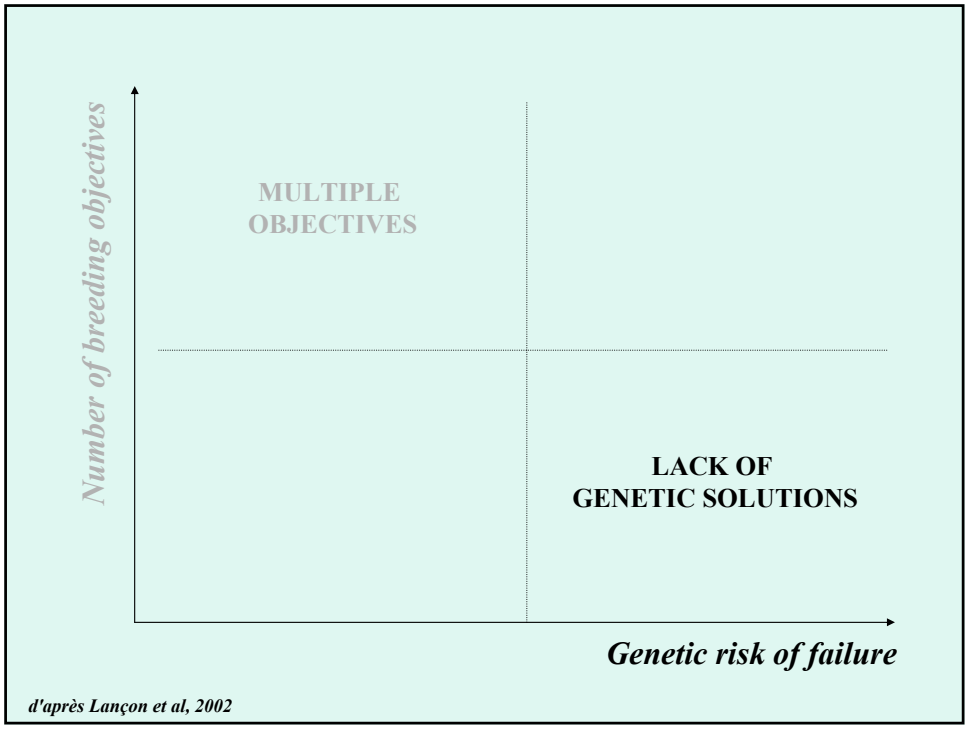

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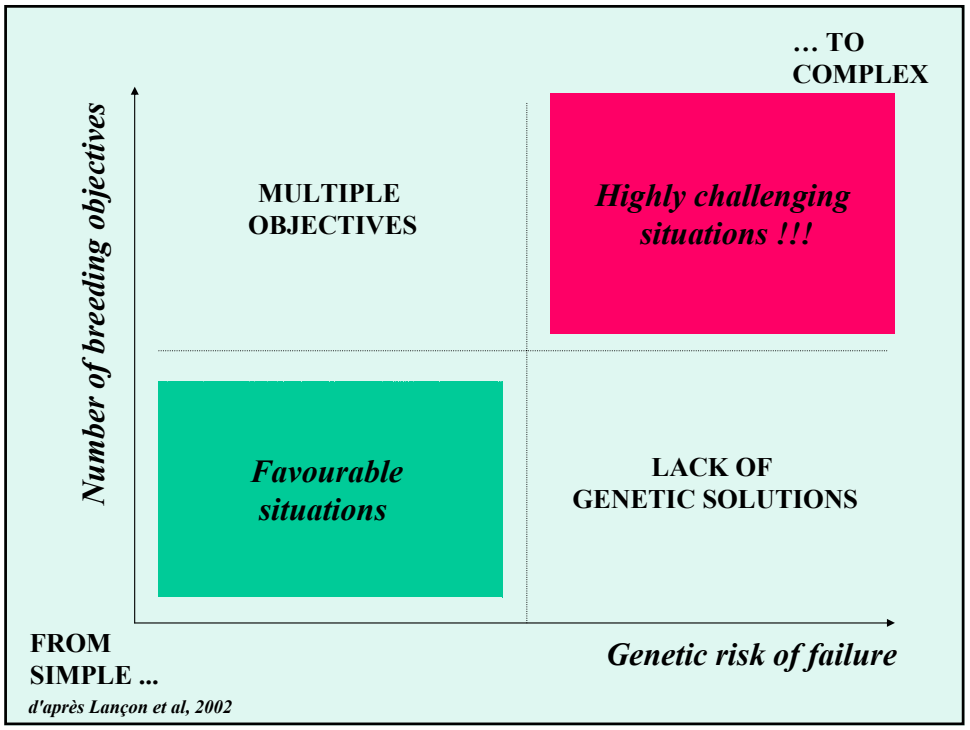
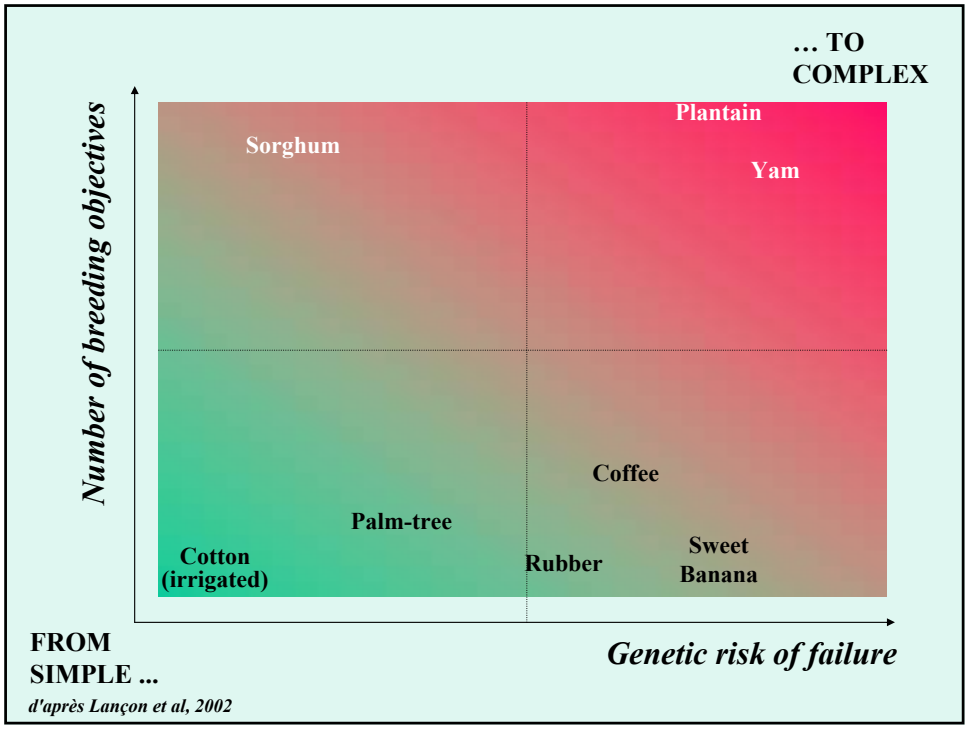
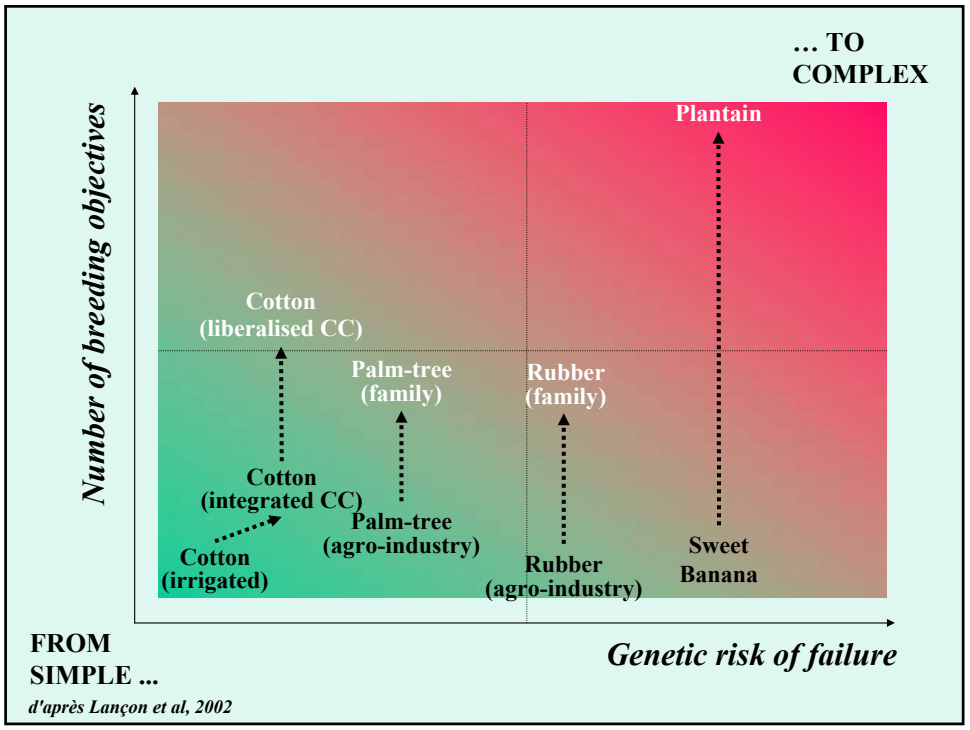
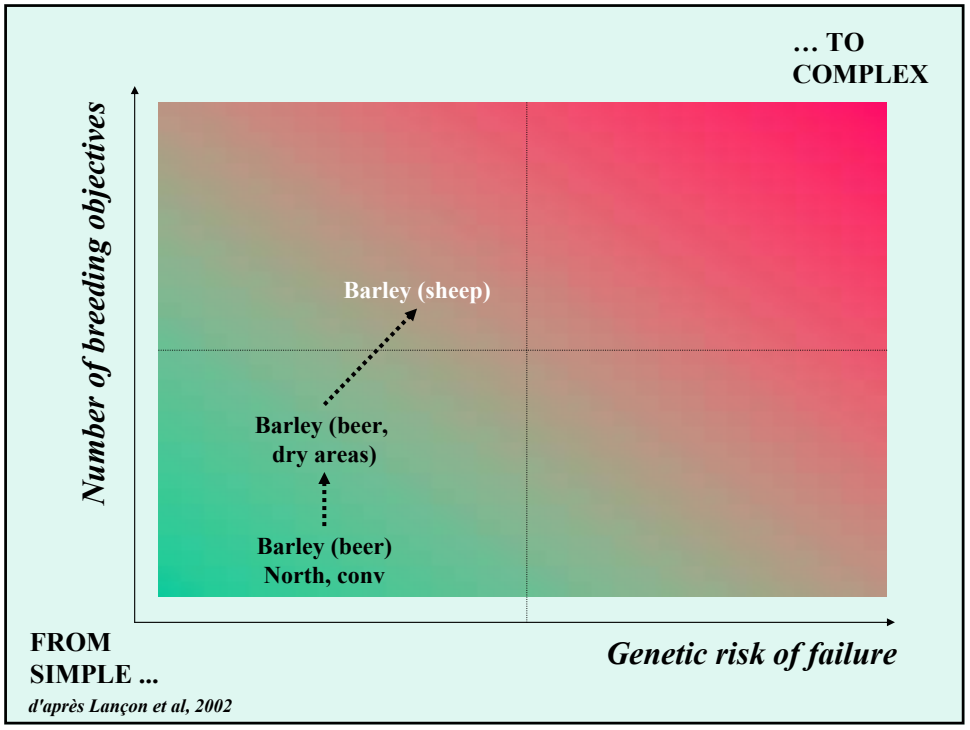

… TO
COMPLEX
Number of breeding objectives
MULTIPLE
OBJECTIVES
Highly challenging
situations !!!
Favourable
situations
LACK OF
GENETIC SOLUTIONS
FROM
SIMPLE ...
Genetic risk of failure
d'après Lançon et al, 2002


… TO
COMPLEX
Number of breeding objectives
Sorghum
Plantain
Yam
Coffee
Palm-tree
Cotton
(irrigated)
Rubber
Sweet
Banana
FROM
SIMPLE ...
Genetic risk of failure
d'après Lançon et al, 2002


… TO
COMPLEX
Number of breeding objectives
Plantain
Cotton
(liberalised CC)
Palm-tree
(family)
Rubber
(family)
Cotton
(integrated CC)
Palm-tree
(agro-industry)
Cotton
(irrigated)
Rubber
(agro-industry)
Sweet
Banana
FROM
SIMPLE ...
Genetic risk of failure
d'après Lançon et al, 2002


… TO
COMPLEX
Number of breeding objectives
Barley (sheep)
Barley (beer,
dry areas)
Barley (beer)
North, conv
FROM
SIMPLE ...
Genetic risk of failure
d'après Lançon et al, 2002

Participatory plant breeding

• To build a better ***linkage*** between users' demand and breeders' offer *(spontaneous in private breeding)*.

• To help the farmers to get a better ***output*** from poorly controled cropping environments *(thanks to more diverse and locally adapted genetic material)*.

• To facilitate knowledge and know-how ***sharing*** between users and scientists.

• To contribute to *in situ* ***managing*** the genetic resources valuable for the local communities.

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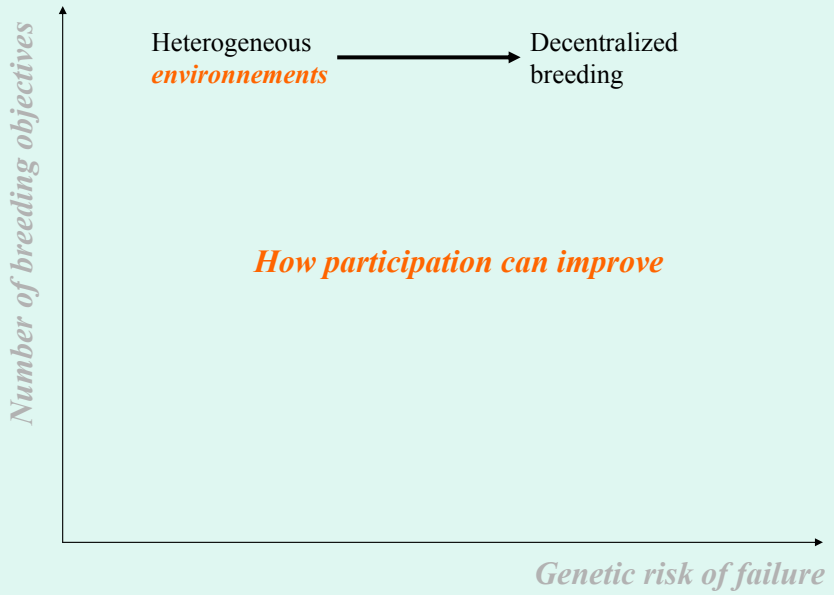
Why focusing on participation?

Plant breeding is a *long term* process:
• getting a good variety
• managing GR compatible with further genetic progress

Breeders cannot support on *their own* such a process: they need long term financial support and institutional commitment from the beneficiaries.

The *sustainability* of participation needs to be analysed in a given social context and considering the particular requirements of plant breeding.



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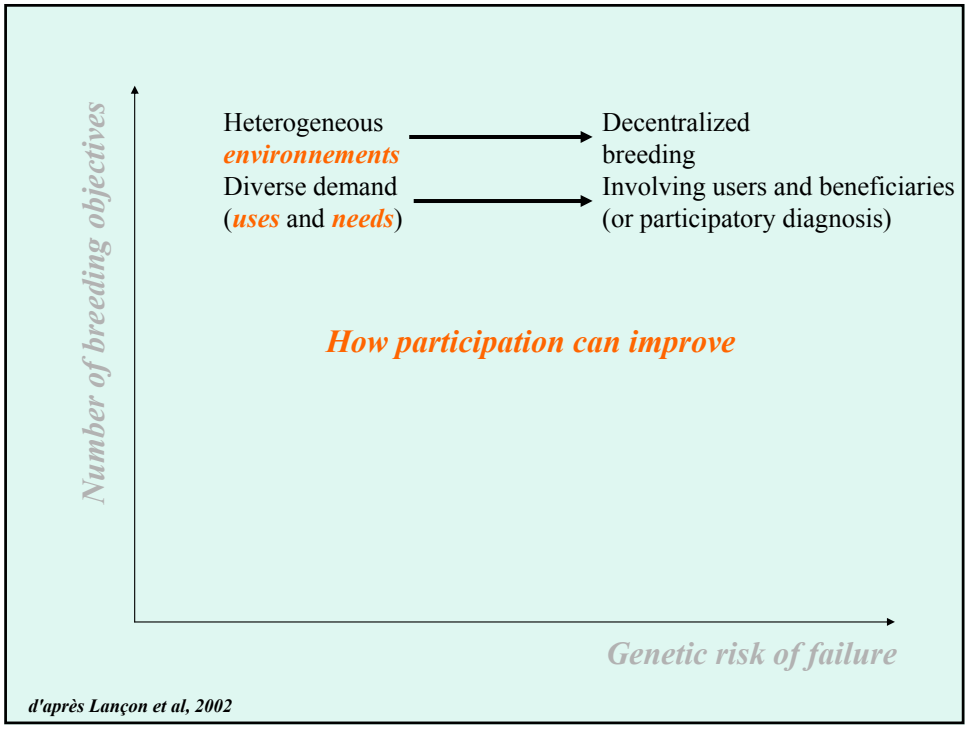
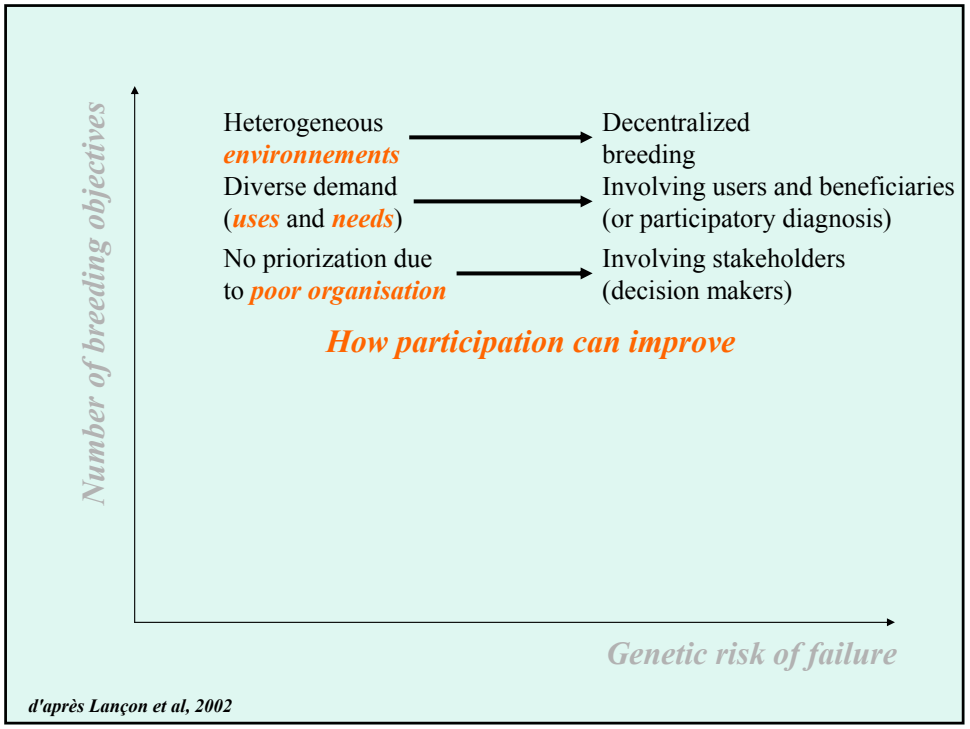
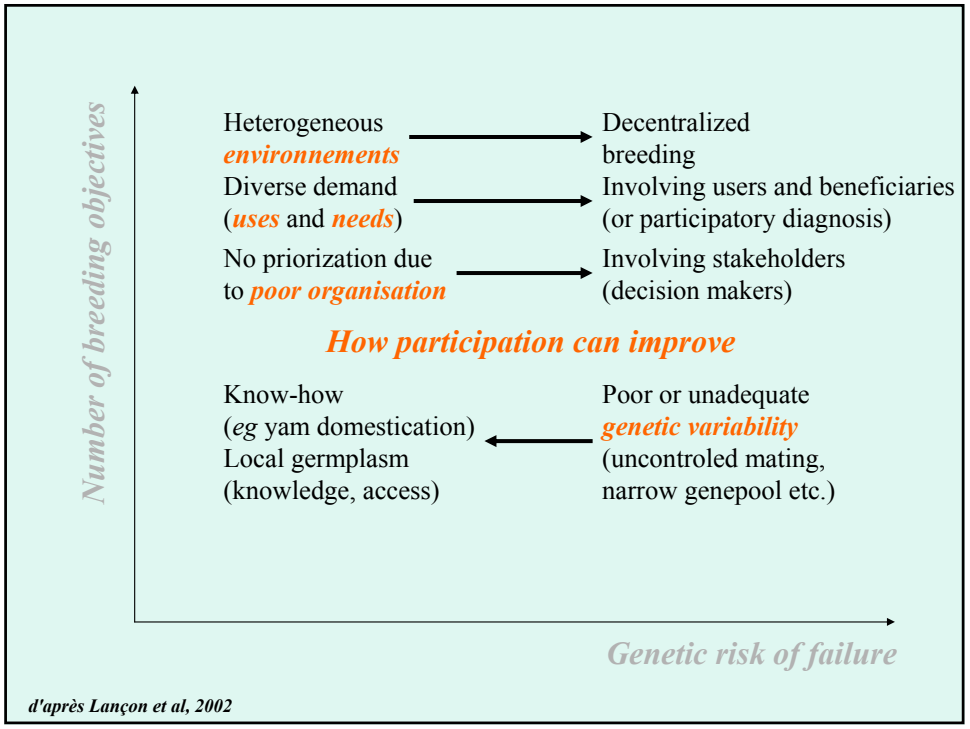
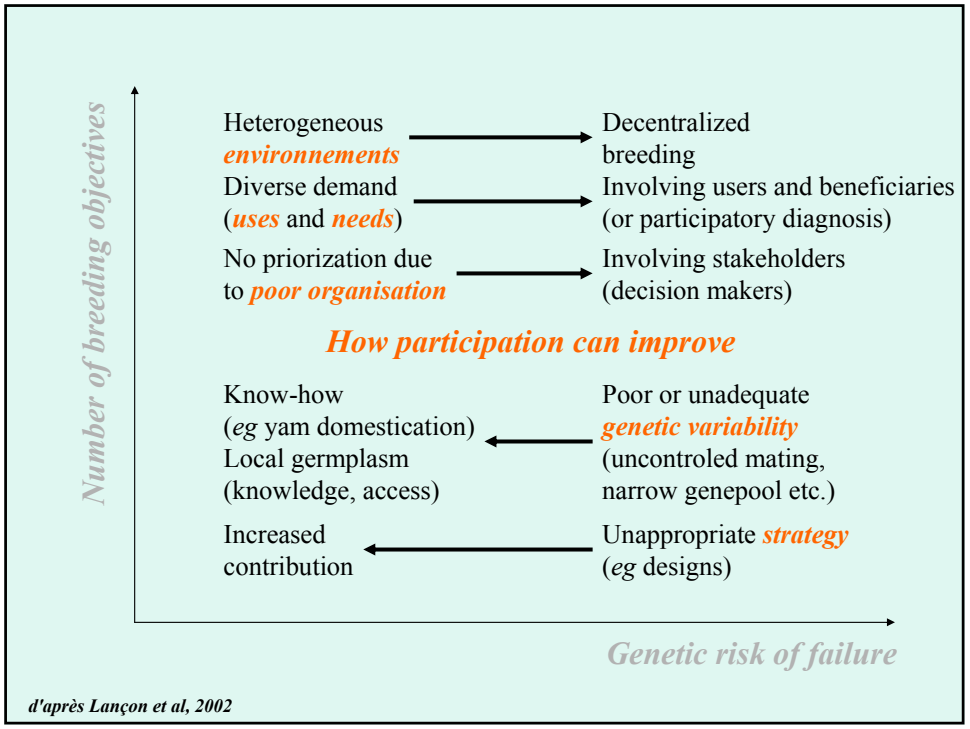

Number of breeding objectives
Heterogeneous environnements
Decentralized breeding
Diverse demand (uses and needs)
Involving users and beneficiaries (or participatory diagnosis)
How participation can improve
Genetic risk of failure
d'après Lançon et al, 2002

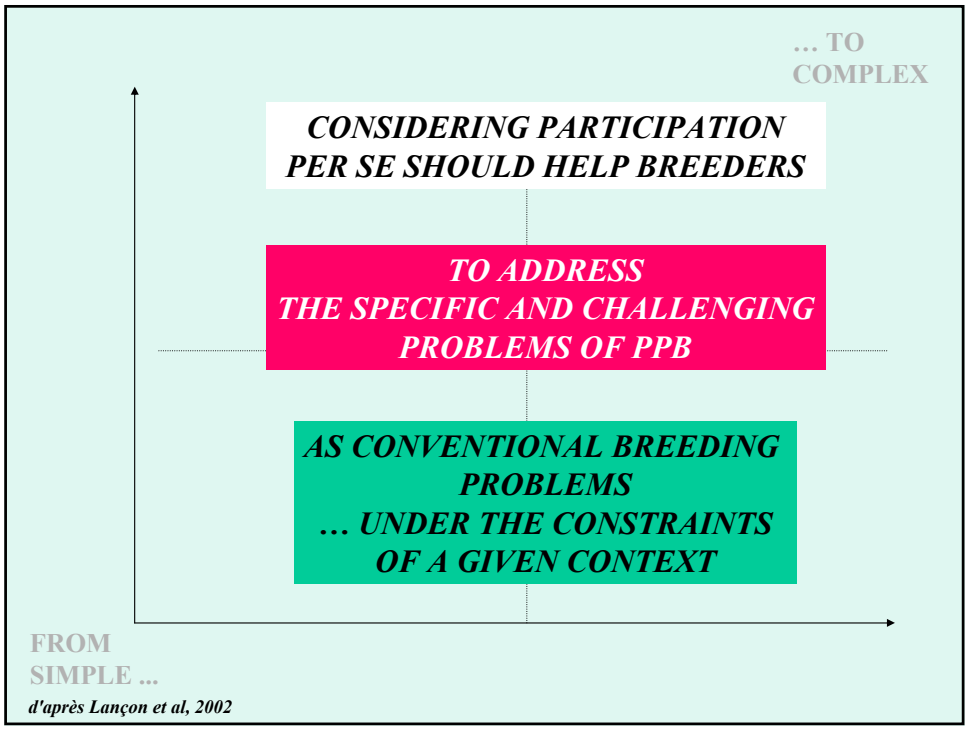

Number of breeding objectives
Heterogeneous environnements
Decentralized breeding
Diverse demand (uses and needs)
Involving users and beneficiaries (or participatory diagnosis)
No priorization due to poor organisation
Involving stakeholders (decision makers)
How participation can improve
Genetic risk of failure
d'après Lançon et al, 2002



d'après Lançon et al, 2002



d'après Lançon et al, 2002



Which participation?

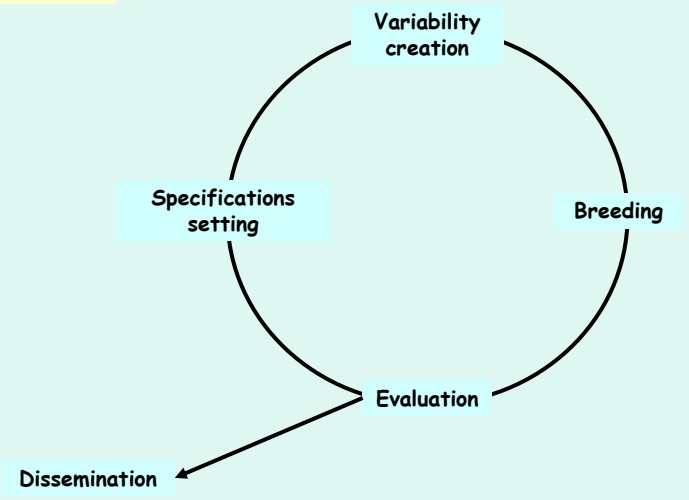
To help finding better participatory processes, we asked ourselves:

Who **has to participate?**

When? At which stages **of the breeding process?**

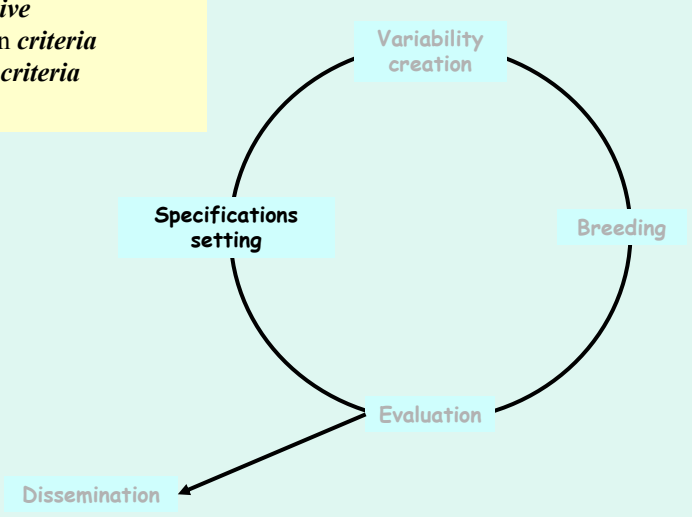
What **should be the role of each participant?**

5 steps for describing the genetic improvement of a cultivated crop



Components of specification setting :

- a breeding ***objective***
- a set of evaluation ***criteria***
- a set of selection ***criteria***
- ***resources***



Who should we consider?

Two categories of actors have the necessary ***resources*** to influence the breeding situation:

• the ***experts*** (their knowledge and knowhow are in adequation with the breeding objective)
• the ***stakeholders*** (they detain political influence or economic power)

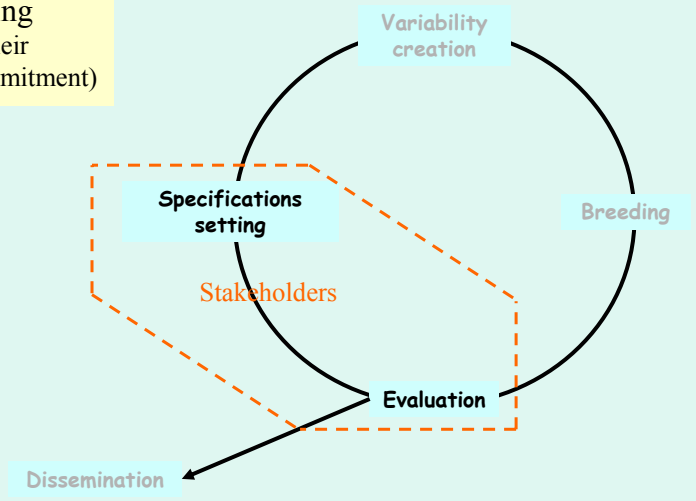
Their roles

Hypothesis:

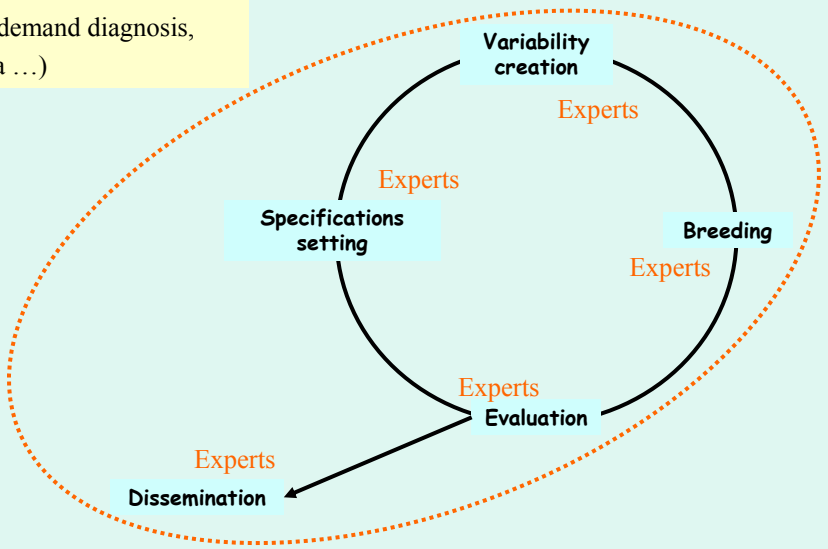
Actors' participation to the ***strategic*** phases of a breeding project may contribute to its ***sustainability*** .

It may also help reconciling ***individual*** interests (adapted varieties) with ***collective*** interests (priority setting and genetic resources maintaining).

Stakeholders must contribute to decisions taking (condition for their community commitment)



Experts should be given a consultative role (demand diagnosis, criteria …)



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A necessary preliminary operation

In order to understand better the situation, his potential partners and the best organisation, the breeder may do well in drawing the particular *system* in which his project stands.

Two examples of conventional plant breeding failures

Both programs were funded with public money

Durum wheat
(France)

Coffee
(Central America)

Durum wheat

Historical:

• in the 50s: durum wheat production started in France with Maghreb varieties

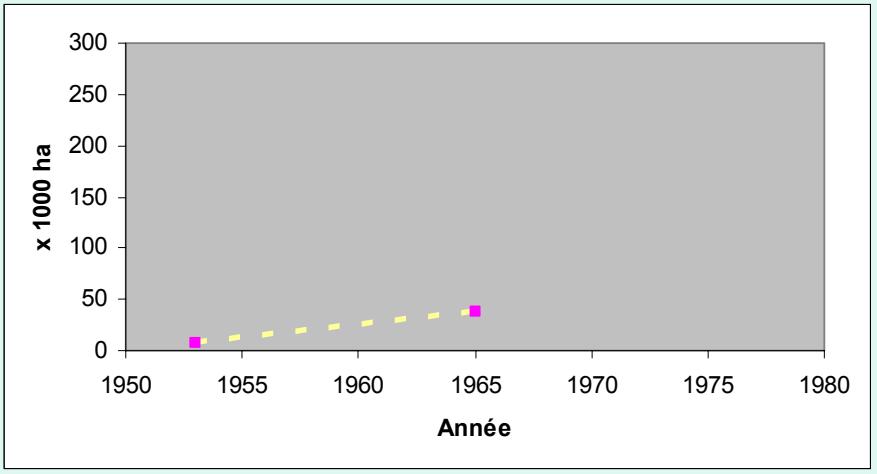
• in 1965: american varieties (more productive) and begining of breeding

→ DURTAL variety was obtained by INRA

d'après Desclaux, 2003

First phase: introduced varieties

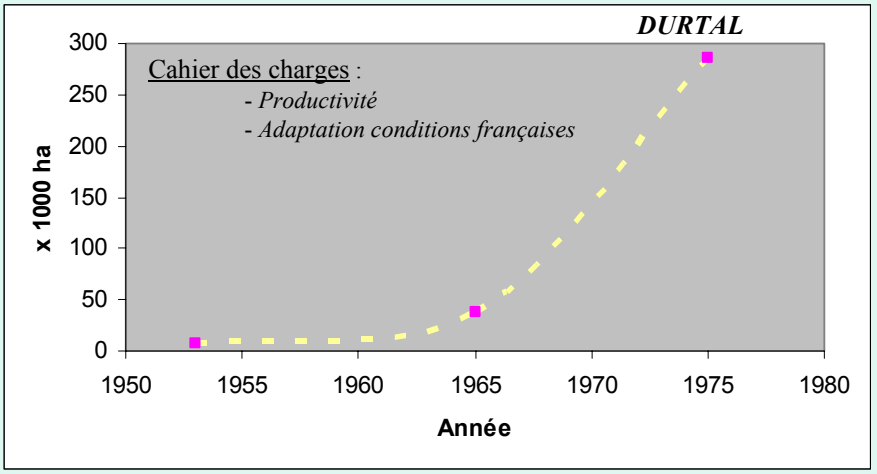
(durum wheat, France)



d'après Desclaux, 2003

Second phase: Durtal

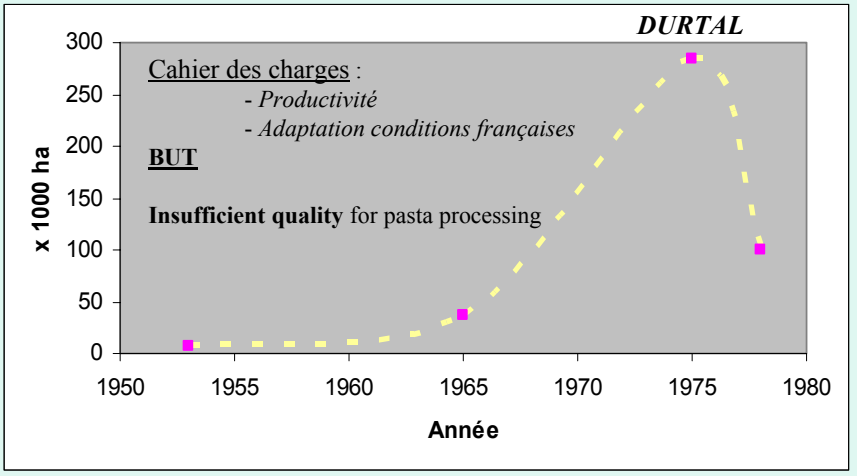
(durum wheat, France)



d'après Desclaux, 2003

Third phase: decline

(durum wheat, France)



d'après Desclaux, 2003

Coffee in costa-Rica

Diagnostiquer les jeux d'acteurs

les premiers programmes sont **rejetés** par les acteurs oubliés ;

le nouveau programme s'efforce de les associer.

d'après Lançon et al, 2002

Local level: PRODUCERS
"we want varieties that are more productive and better adapted to intensive cropping sustems"

Technical approach of breeding:
➔ fields tests

First specification set: ➔ 1980 variety T 5175

National level: BUYERS
"be careful with grain size and cup quality"

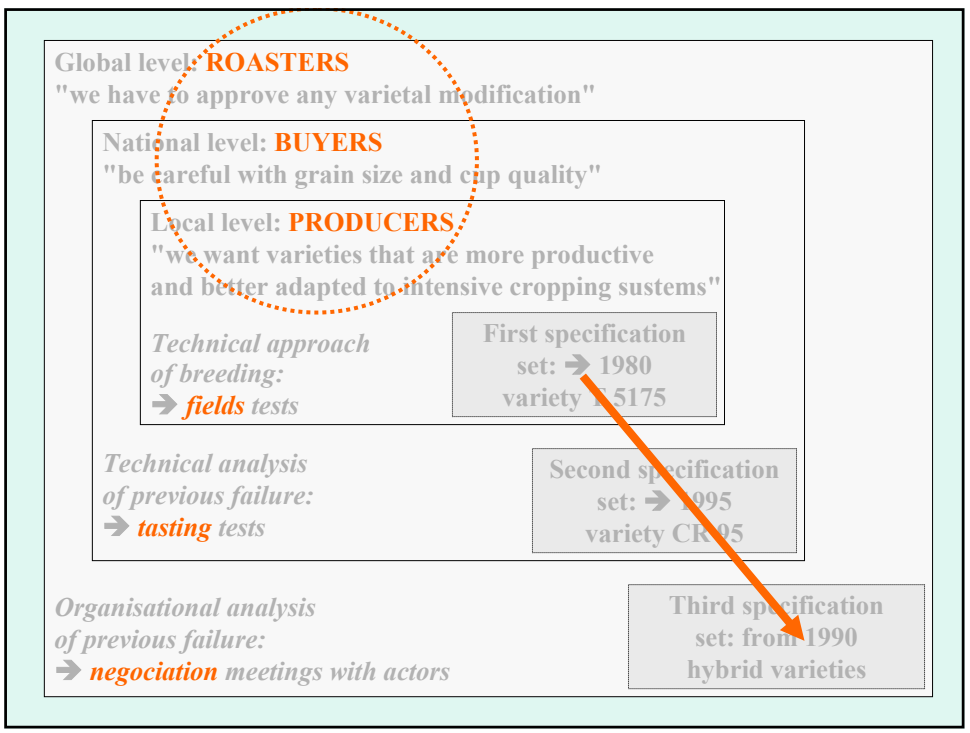
Technical analysis of previous failure:
➔ tasting tests

Second specification set: ➔ 1995 variety CR 95

Global level: international ROASTERS
"we have to approve any varietal modification"

Organisational analysis
of previous failure:
➔ negociation meetings with actors

Third specification
set: from 1990
hybrid varieties



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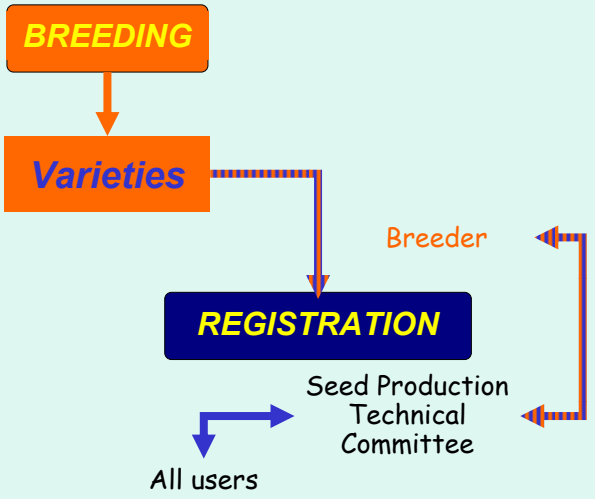
The breeder's role

in a private breeging project (France)

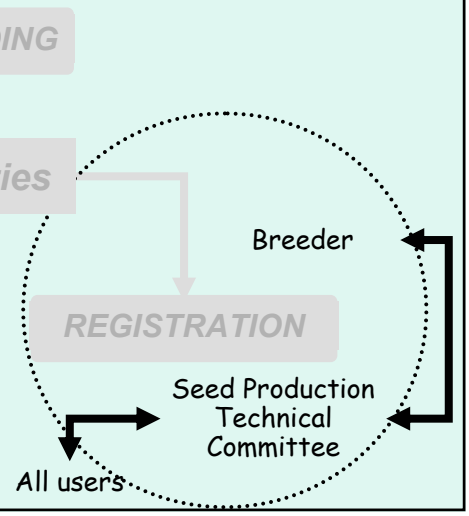


Variety release process

A ***decision-making*** committee with:

- private ***breeders***
- ***professiona***l representatives
- ***technical*** institutes
- ***ministry*** of Agriculture

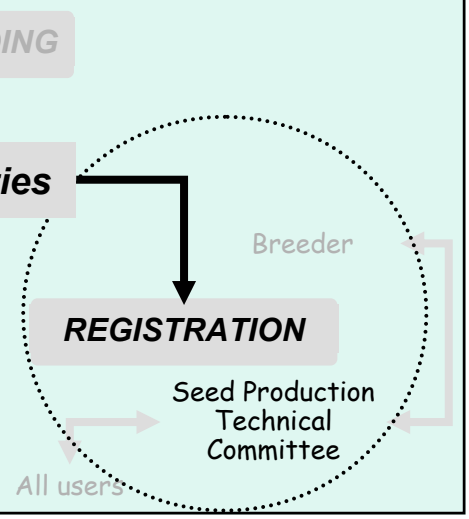
- ***research*** (plant specialists) playing a facilitation role



Variety release process

The ***decision-making*** committee:

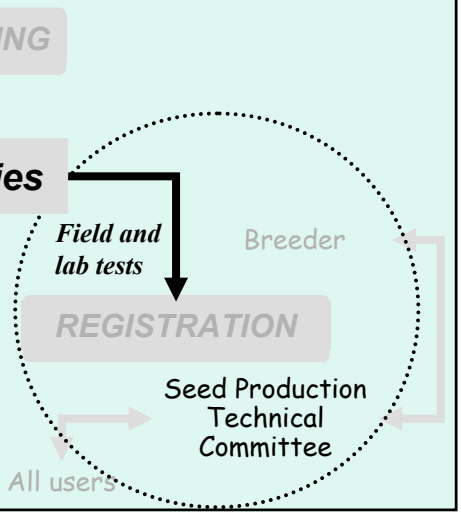
- chooses the ***list*** of evaluation criteria
- ***weights*** theses criteria
- and finally decides which variety to ***register***



Variety release process

Three groups of ***experts*** to document the registration process:

1. decides which ***trials*** to validate for variety registration
2. evaluates each variety for ***DHS*** criteria (distinction, homogeneity, specificity)
3. evaluates each variety for ***VAT*** criteria (agronomic and technological value)



The marketing man's role

in a private breeging project (France)

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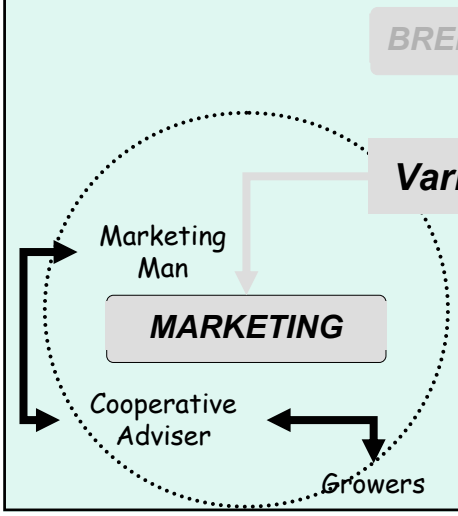
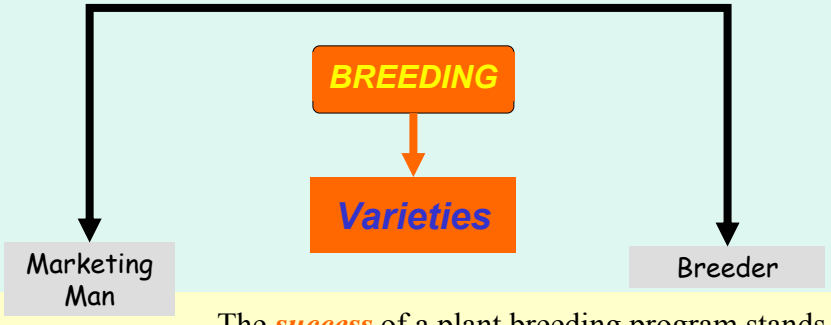


The ***marketing man***:

- convinces the cooperative advisers to ***test*** their varieties
- gets ***information*** back from the cooperative advisers and growers (needs and opinion)
- finally ***sales*** seeds

The information flow

in a private breeging project (France)

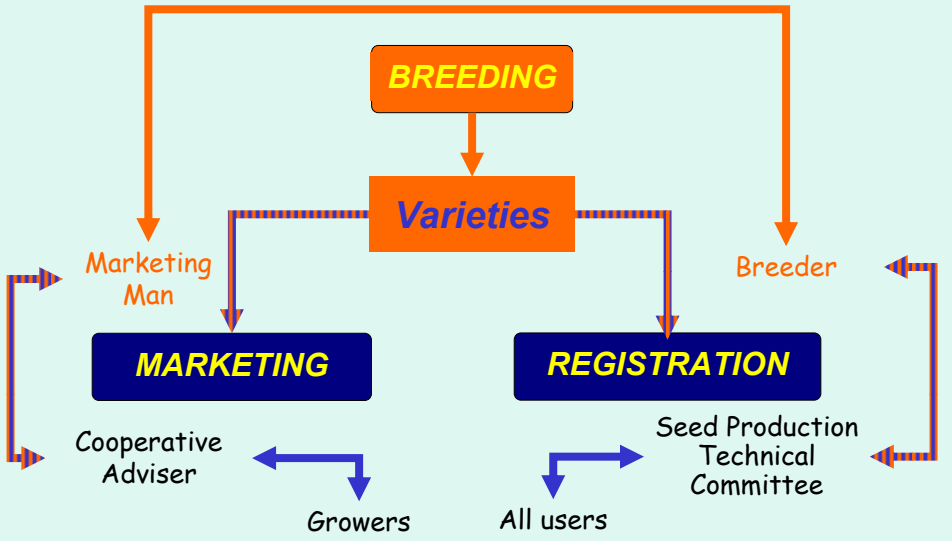


The ***success*** of a plant breeding program stands a lot on this relationship quality:

- for fixing relevant breeding ***objectives*** and ***criteria*** (according to producers and other users demand, to registration requirements and to other companies works)
- for managing and adjusting the program according to all sort of varieties ***evaluation*** results (formal and informal)

Plant breeding stands on two legs

(a private project in France)



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Examples of breeding organisation in France

Maize (semolina)
(integration avoids marketing)

Soja bean
(small markets do not pay)

Dairy cattle
(a case of Participatory breeding)

Maize breeding

(corn meal or semolina)

The example of an ***integrated commodity chain***

Maize in Europe
17% of the cultivated area, out of which:
- 70% for animal feed
- 17% for starch
- 7% for milling (semolina, flour, corn flakes for example)

Small market with rather specific objectives
Requirements
- starch percentage (genetic character)
- grain size (process dependant)

Maize breeding

(corn meal or semolina)

The actors involved in maize breeding

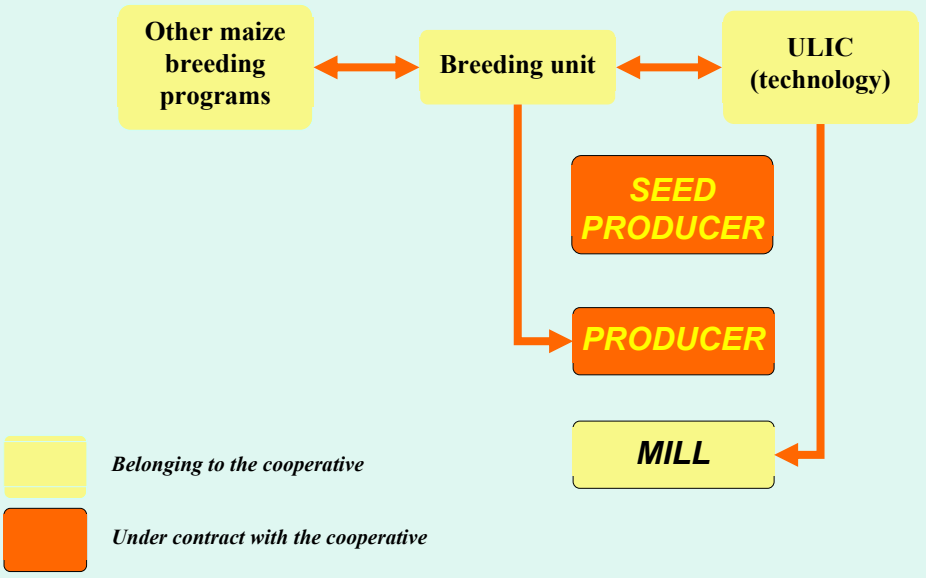
The cooperative is formed by farmer members.

It coordinates all breeding activities:

- Research is ensured by the cooperative (breeding and technology)
- Producers and seed producers are members and under contract with the cooperative
- Semolina is processed by the cooperative

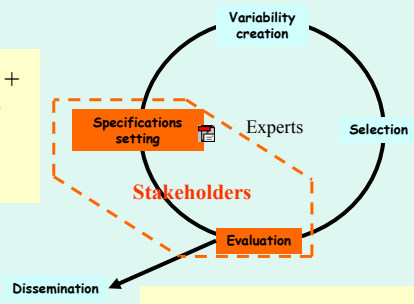
The system is satisfactory for all the actors (product homogeneity, traceability, fair price) but this is a « niche » market.

The integrated maize commodity chain



Actors involved in the Maize semolina breeding program.

Breeder (cooperative)

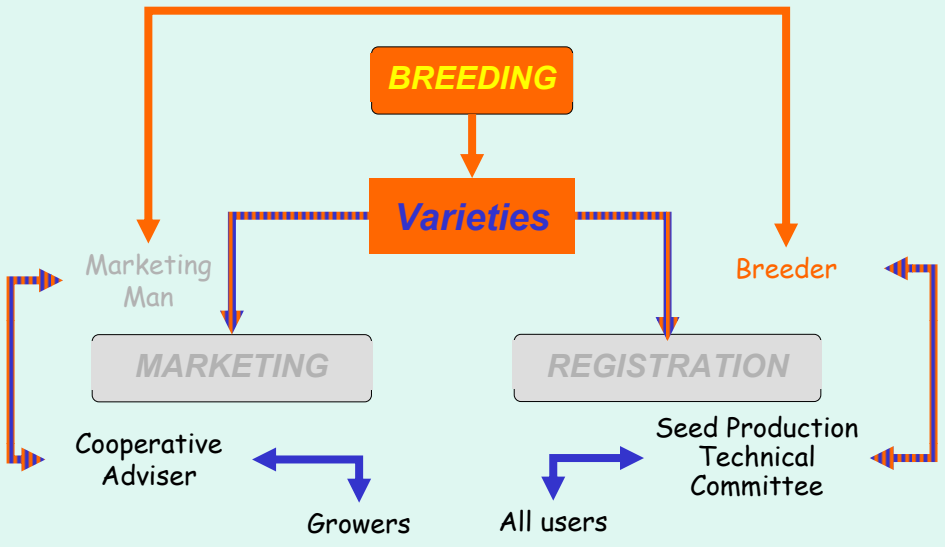


Breeder + ULIC + semolina factory (cooperative) + final users

Breeder + ULIC (cooperative) + producers (consultative)

Breeder + ULIC + semolina factory + storing organisms + producers (cooperative)

Maize breeding for semolina



Examples of breeding organisation in France

Maize (semolina)
(integration avoids marketing)

Soja bean
(small markets do not pay)

Dairy cattle
(a case of Participatory breeding)

Soja breeding

The example of a ***competitive open seed market***

Soja in Europe
Used for oil and animal feed (protein source):
• small acreage in France
• main poducer in Italy

Small seed market
• competition with US seed
• 50% seed produced on the farm (autogamous plant)

Requirements
• early and determinate varieties
• high protein value

Soja breeding

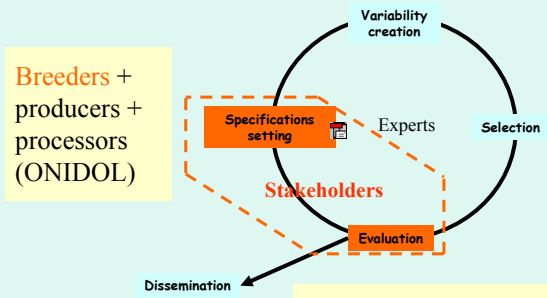
The actors involved in soja breeding

• producers as well as processors interests are represented by ONIDOL (professionnal association)
• Breeding is ensured by several private companies
• ONIDOL created a GIE (group of economic interest) for breeders to share common equipements

The system helped to initially boost soja breeding but with time it lost influence as being too costly as compared with its return (small market) and it prevents competition between private companies .

Actors involved in the Soja bean breeding program in France.

Breeder (GIE)



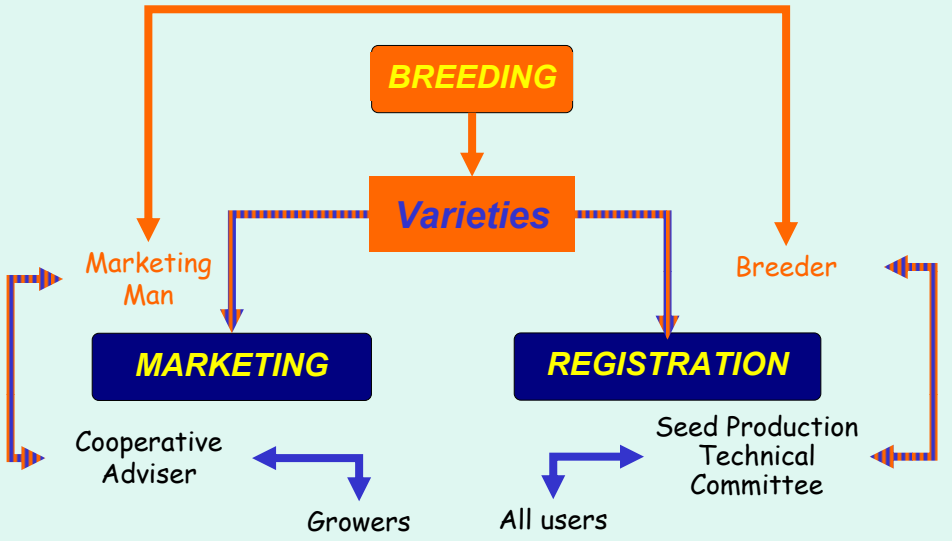
Breeders + producers + processors (ONIDOL)

Breeder (private)

GIE (multisite experimentation)
CTPS (official)

Private companies (breeders + marketing men)
Cooperative advisers

Soja breeding



Examples of breeding organisation in France

Maize (semolina)
(integration avoids marketing)

Soja bean
(small markets do not pay)

Dairy cattle
(a case of Participatory breeding)

Cattle breeding
(milk)

A ***participatory*** genetic improvement schem

Milk in France
Important economic stakes, industrial use
Individual and descendance selection (selfing not possible)

The improvement schem is different on the male and female
80% farmers participate to breeding

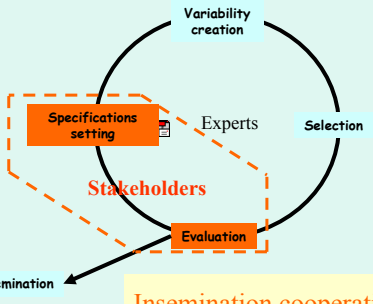
Requirements
- milk yield per cow
- fat percentage (genetic character)

Quite heavy to manage and costly to run

Actors involved in dairy ***bulls*** breeding in France.

UPRA
(union for the improvement of animal races):
- farmers
- dairy factories
- research
- extension services
- ministry of agriculture

Insemination cooperative
Farmer



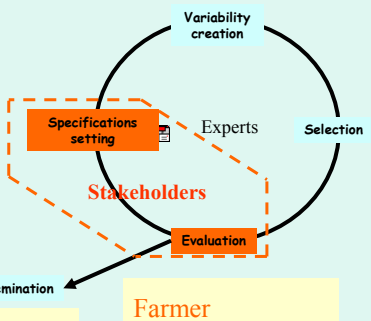
Insemination cooperative
Research

Insemination cooperative
Research

Milk controler
Farmer

Actors involved in dairy *cows* breeding in France.

Insemination cooperative
Farmer



Farmer

UPRA
Milk controler
Farmer

Farmer (local)

Farmer
Milk controler
Research

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Three ways of organising plant breeding

And plenty more questions ...

Stakeholders analysis (SA)

Aim:

. To describe the problem, its limits and those who feel concerned (R. Ramirez)

Three categories of SH:

- ⌫ **the *primary* SH** *(beneficiaries, they have interests in the situation and may be impacted by the expected results)*
- ⌫ **the *key* SH** *(they have sufficient power to influence the project results)*
- ⌫ **the *intermediate* SH** *(they interfere with the situation)*

d'après ODA, 1995

Systemic representation

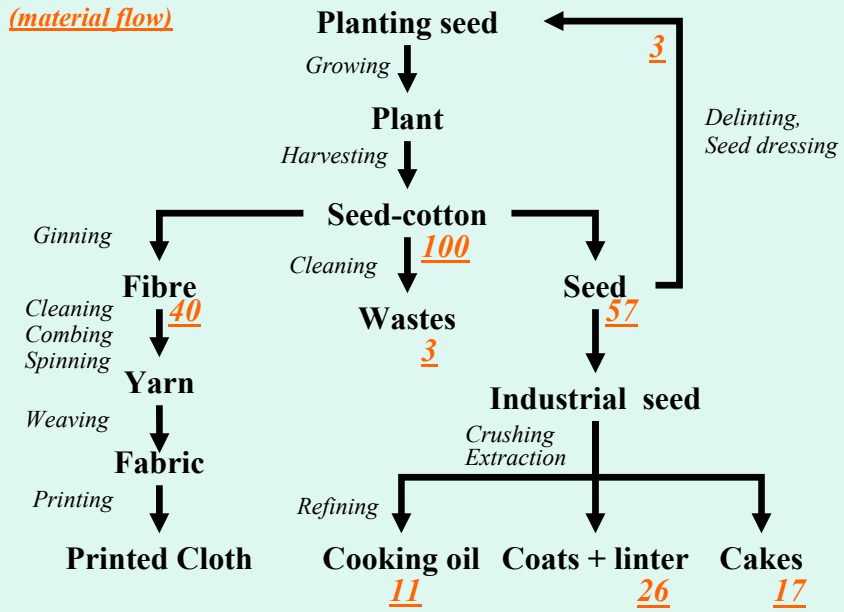
Aim:

Facilitate the identification of the relevant actors in a given situation.

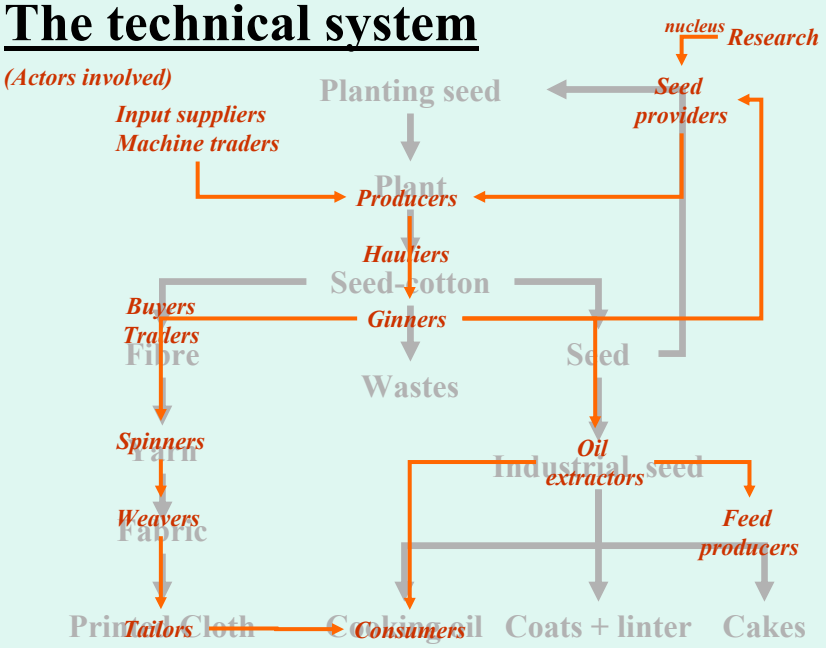
Three possible threads:

- ⌫ **the *technical* system** *(processus et échanges de produits ou d'information)*
- ⌫ **the *economical* system** *(échanges de biens et services ou de capitaux, accords, contrats etc.)*
- ⌫ **and the *political* and *social* system** *(acteurs, pratiques et stratégies)*

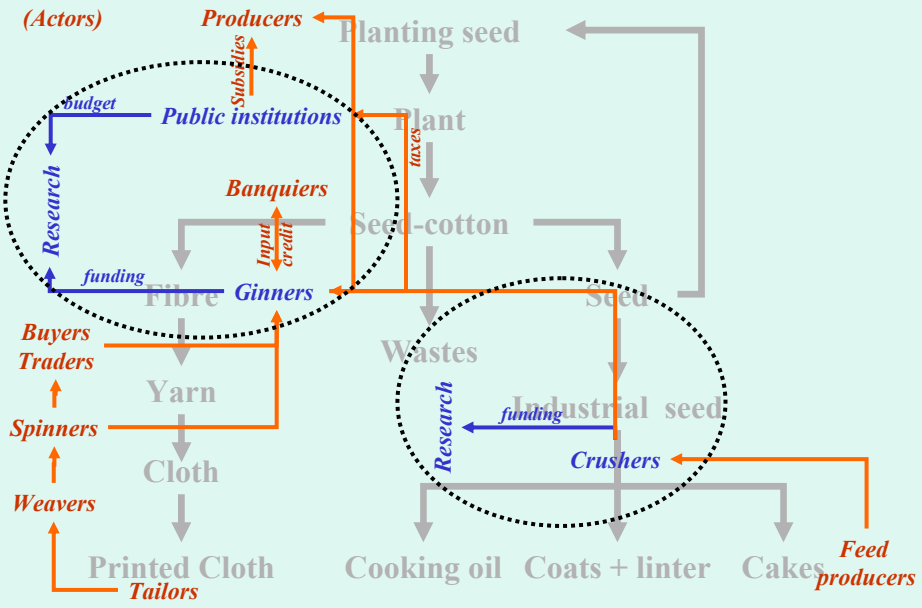
The commodity chain for cotton



The technical system

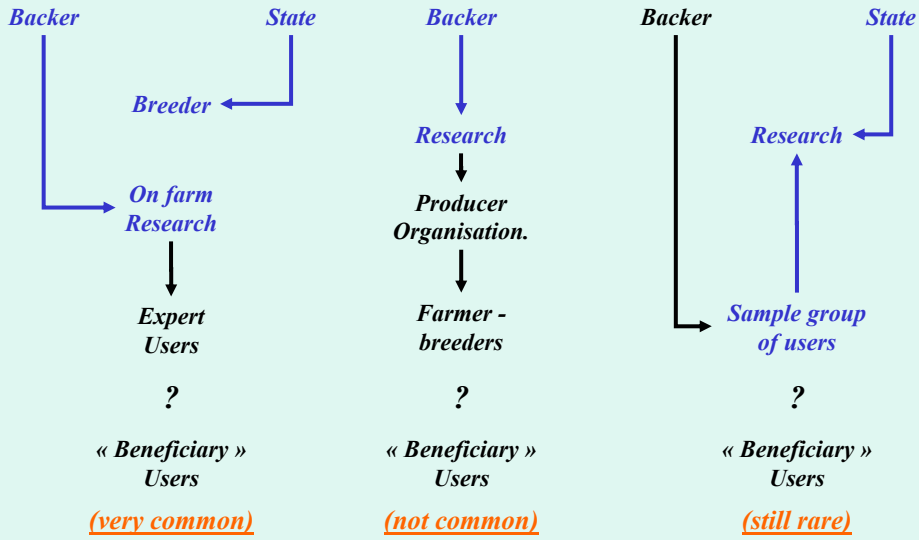


The economic flow



Simplified representation of funding

3 common PPB situations



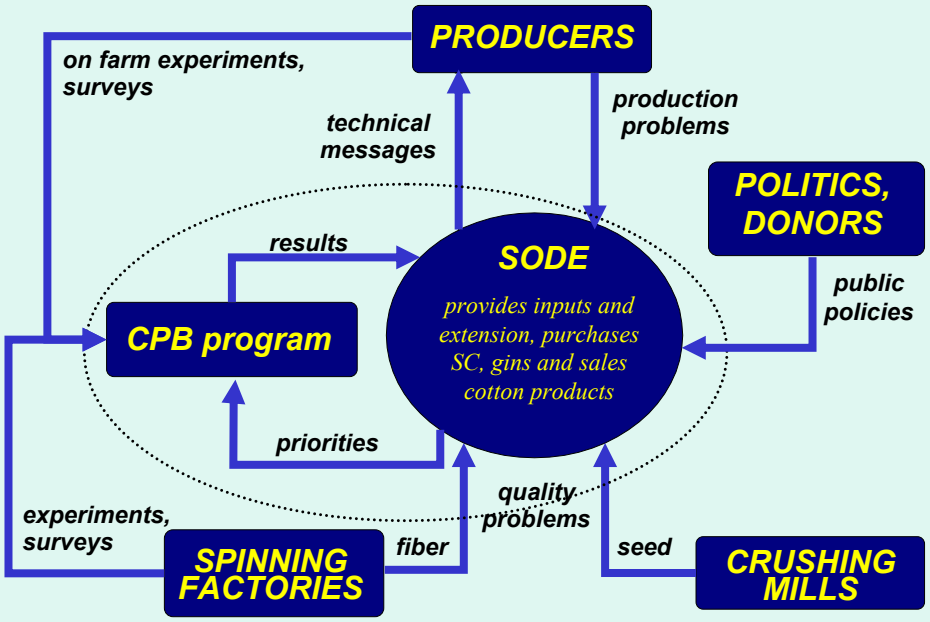
There is a need to actualize the representations

Cotton in Benin

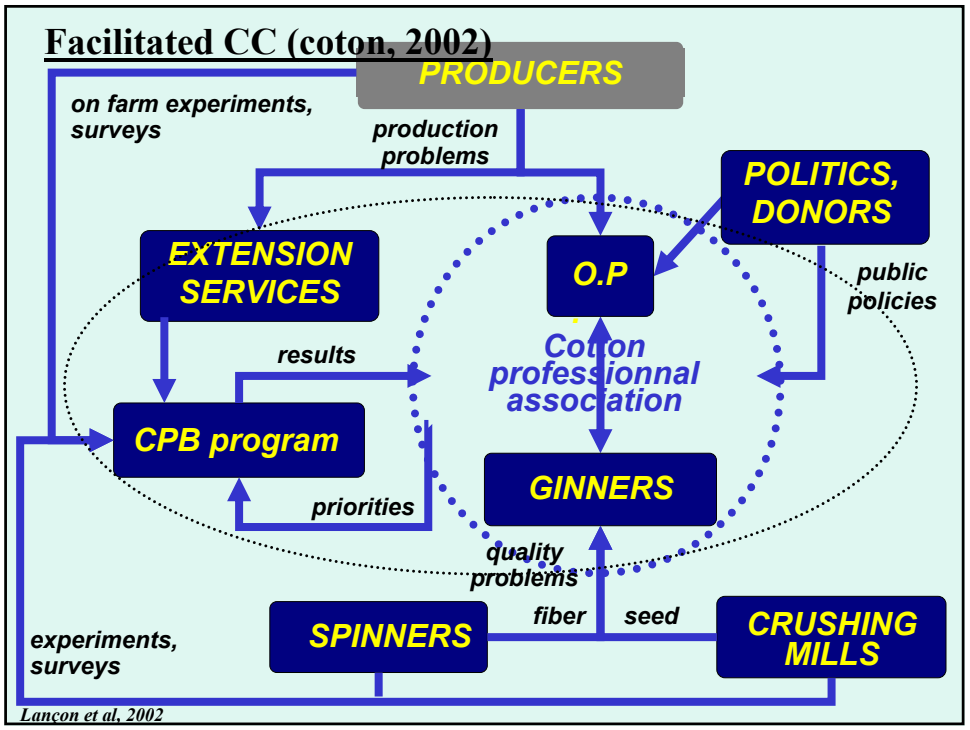
The system description must take into account new *informations*

- **about the actors themselves,**
- **their changing *relationships* as a consequence of organisational changes .**

Integrated CC (coton, 1990)



Lançon et al, 2002



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The breeder may be free to choose the beneficiaries

Liens entre sources de financement, enjeux, obligation de résultats variétaux et niveau d'implication des acteurs dans 4 programmes de sélection.

Funding origin	Stakes	Need for impact †	Liberty towards beneficiaries ‡
International donor	Political / knowledge	-	+++
Public funds	Knowledge	=	+
Commodity chain	Economical?	++	~ 0
Seed sale	Economical	+++	0

† we only consider breeding results, *ie* varieties adopted by the users
‡ regarding the partners choice and the organisation of participation

d'après Ipotési, 2002

Three kinds of breeder-users relationship

Three main possibities.

Actors role	Relationship mode		
	Private	Public	Partnership
Actors involved	*Client - Supplier*	*Beneficiary – State – Service – Taxpayer*	*Partners*
Who evaluate the risk (decides)?	Breeder	State or Breeder	Partners (breeder, backer, users) jointly evaluate and share decisions risks and benefits
Who takes the risk (finances)?	Breeder	User	
Who évaluate the results (adopts)?	User	User and Breeder	
Who profits or loses (cashes)?	Depending on the power balance between breeder and user	Depending on the power balance between state and user	

d'après Lançon et al, 2004

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Impertinente questions

Why such an unanimous attraction towards farmers participation to research?

Who profits from PPB?

What is the cost of participation and who benefits from it?

And more scientific but not less challenging ones

- In the poorly controled growing environments, how maintaining the genetic ***diversity*** while increasing the cropping system ***performance***?
- How (limits) improving a cropping system performance without improving the level of ***inputs*** (energy, water and nutrients)?
- How understanding and promoting in the breeding programs the ***indigenous*** know-how or knowledge?

Stakes

Pourquoi une soudaine unanimité sur la participation des paysans à la recherche ?

- Intérêt stratégique conjoncturel
- Leçons des échecs du passé (révolution verte, « développementisme »…)
- Constitution d'OPA organisées

A qui la sélection participative profite-t-elle ?

- Aux sélectionneurs institutionnels : meilleure connaissance de la demande, meilleure image de leur métier, "sous-traitance" de certaines étapes de sélection
- Aux paysans et aux autres acteurs : acquisition de compétences pour la négociation, meilleure prise en compte de leurs besoins)
- Aux deux : gains génétiques locaux supérieurs grâce à l'interaction génotype x milieu de culture, vente aux tiers des produits de la création commune

Combien coûte et à qui rapporte la participation ?

- Coûts spécifiques et répartition entre les institutions, les structures partenaires, les groupes sociaux et les individus participants
- Revenus potentiels : gains génétiques, impacts économiques, sociaux
- Revenus réels et externalités : confiance accrue entre les acteurs, transfert de compétence à l'origine d'une dynamique entreprenariale créatrice de richesse)

Trois questions sur la méthode

Comment faire vivre une dynamique participative ?

- Identifier, reconnaître et promouvoir l'intérêt de tous les acteurs, au niveau individuel et collectif
- Contractualiser les liens
- Pratiquer la transparence des objectifs et des résultats

Quels dispositifs de concertation et de sélection ?

- Organiser les dispositifs de concertation entre les acteurs
- Comment mieux exploiter la complémentarité entre sélection en station et sélection délocalisée
- Quels dispositifs pour valider, diffuser et valoriser le matériel génétique créé en partenariat ?

Quelles structures génétiques ?

- Si on fait l'hypothèse que la diversification variétale est acceptable
- Meilleure gestion du milieu avec des variétés phénotypiquement différentes : exploitation des micro-variations de la parcelle, complémentarité des cycles, complémentarité des résistances etc ?
- Incorporation de gènes allogamisants chez les plantes autogames ?

Et deux questions en forme de défi

Dans les milieux faiblement artificialisés, le maintien d'une diversité génétique est-il compatible avec l'accroissement de la productivité agricole ?

- Comment générer des systèmes reproductibles et capables de produire plus ou mieux grâce au maintien d'une forte diversité génétique : qualité des produits, adéquation temporelle de l'offre de la culture par rapport à la demande des consommateurs etc.

Comment décrire, comprendre ET UTILISER les savoirs endogènes ?

- Peut-on utiliser les savoirs endogènes pour améliorer les pratiques des sélectionneurs ?
- Inversement, les connaissances modernes peuvent-elles rendre les pratiques traditionnelles plus efficaces ?