Direct seeding in mulch cropping systems. Do they fit into farms of the mountainous area of Vietnam ?

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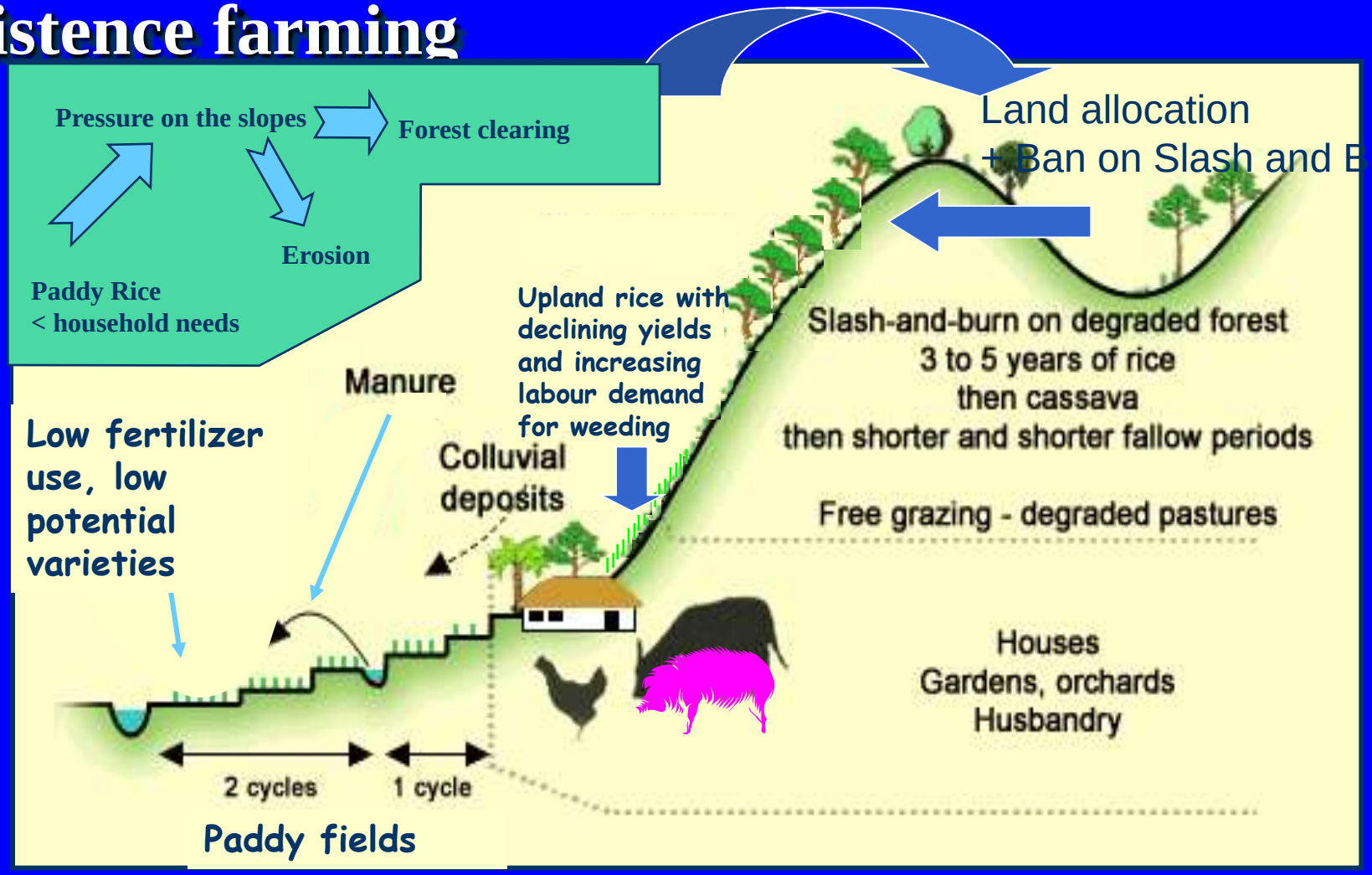
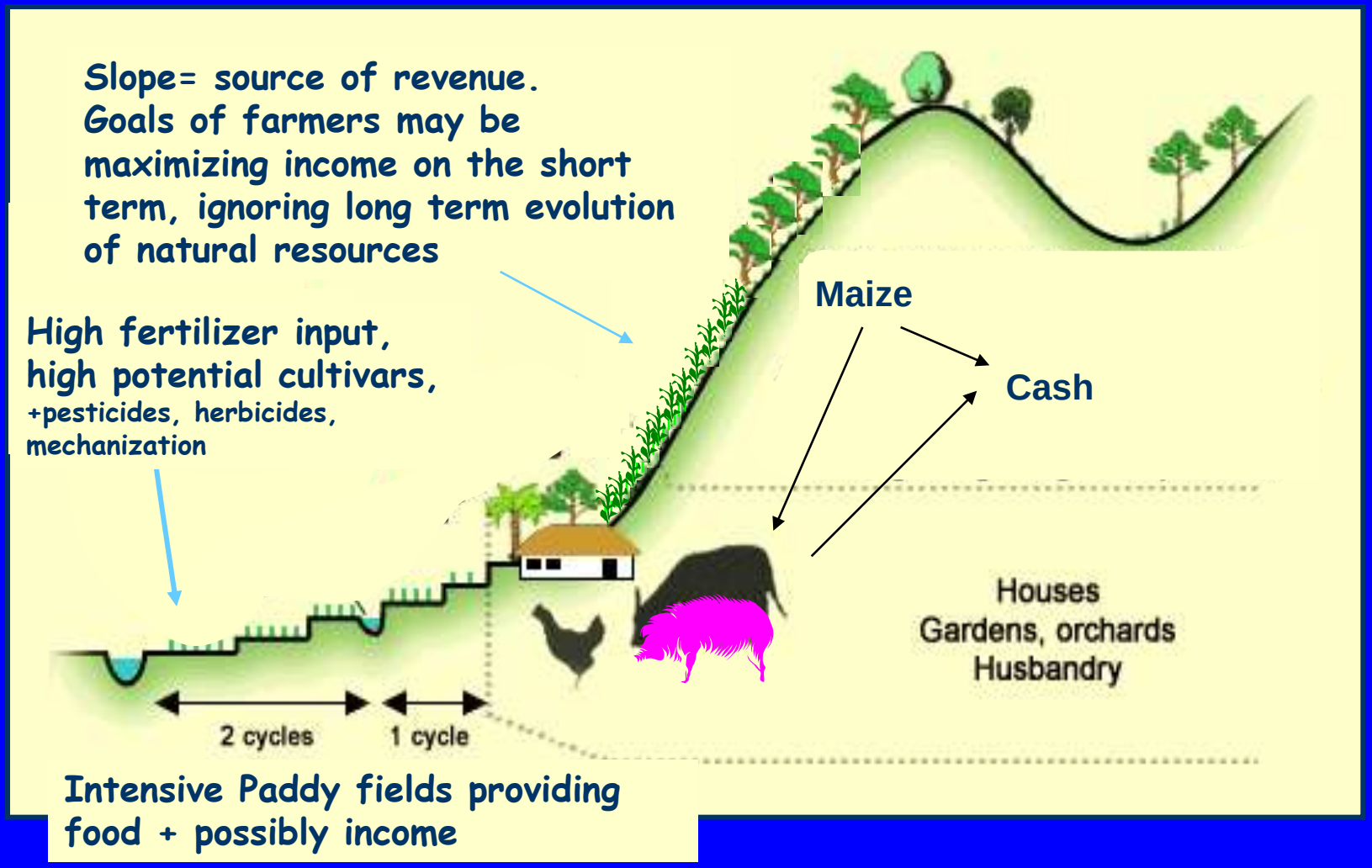
Agricultural systems: 1) in the context of subsistence farming



Agricultural Systems: 2) market oriented



Pressure on the slopes still existing, sustainability not ensured

Fragile Slopes under pressure

Cropping Systems with cover crops and / or mulch (DMC): a ticket to the doubly green revolution ?

Main functions of the proposed innovative cropping systems for slopes (review from O. Erenstein (2003) + KASSA project)

✓ Protect soil against erosion.	Broadly proven
✓ Improve nutrient cycling.	Environment x management dependent
✓ Improve soil structure.	Not many studies but all in agreement
✓ Produce forage.	Depends on species used and management
✓Reduce weed pressure.	Contradictory results
✓ Reduce labour requirements of CS.	Discussed

Known Limitations of DMCs

-Main crop / cover crop competition is critical

-Soil temperature is decreased due to mulch

-Insects and diseases favoured by mulch

-Free grazing animals during dry season

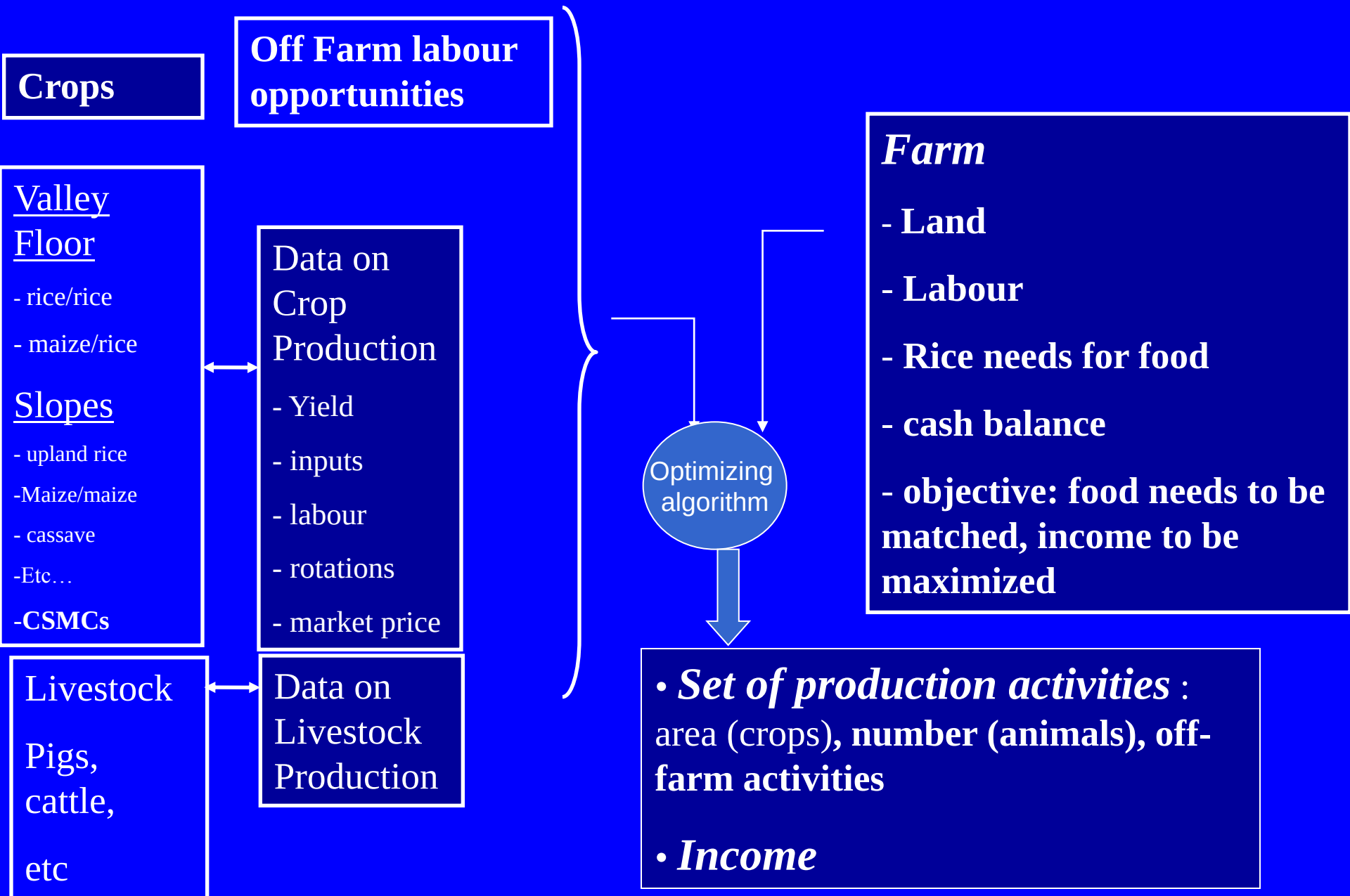
-Changes in the whole farm management

Objectives of our study

- Identify constraints to adoption of DMC
  - At farm level
  - Linked to technical and economical features
  - On a short term perspective
- What changes would favour adoption of DMC:
  - Adjustments of the technique
  - Economic Environment and subsidies

Case studies and experiments

Farm Household Model



Model building

- Typology of farms (constraints to adoption may vary among farms).
- Sampling: 15 farms / Site
- Detailed surveys in sampled farms
  - Identifying and characterizing cropping systems practiced
  - Characterizing farming system
  - Labour force allocation schedule
  - Cash flow
- Modelling representative & contrasted farm types
- Ensure simulated decision matches current set of activities of real corresponding cases
- Simulations: Testing hypothesis in terms of technical management and economic environment

Introduction of DMCs in simulated farms

- Market oriented farms: no adoption of any of the DMC in any of the simulated farms
- Subsistence farms: adoption on small areas of the farms (10-20%):
  - Farm with labor and cash availability adopt maize + mulch
  - Farm constrained in land and with high labour availability adopt maize + mulch and also upland rice + mulch
- Two factors limit adoption by farms in both sites
  - Extra labour needed at peak period
  - Extra need of inputs (fertilizer, mucuna seeds, seed pesticides)
- Additional factor limiting adoption in market oriented farms of Cho Don: Labour productivity is not increased by DMC

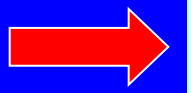
Testing technical adjustments

- Assuming labour requirements reduced by half:
  - Mulch collected earlier in the year, when not busy with other farm activity?
  - Less mulch?
- Assuming low cost DMC (cover crop seeds at no cost, P and K fertilizer levels at farmer's system level)

Combined reductions of labour and input requirements are needed to provoke a change in the results of simulations in favour of mulch techniques (CD + KL)

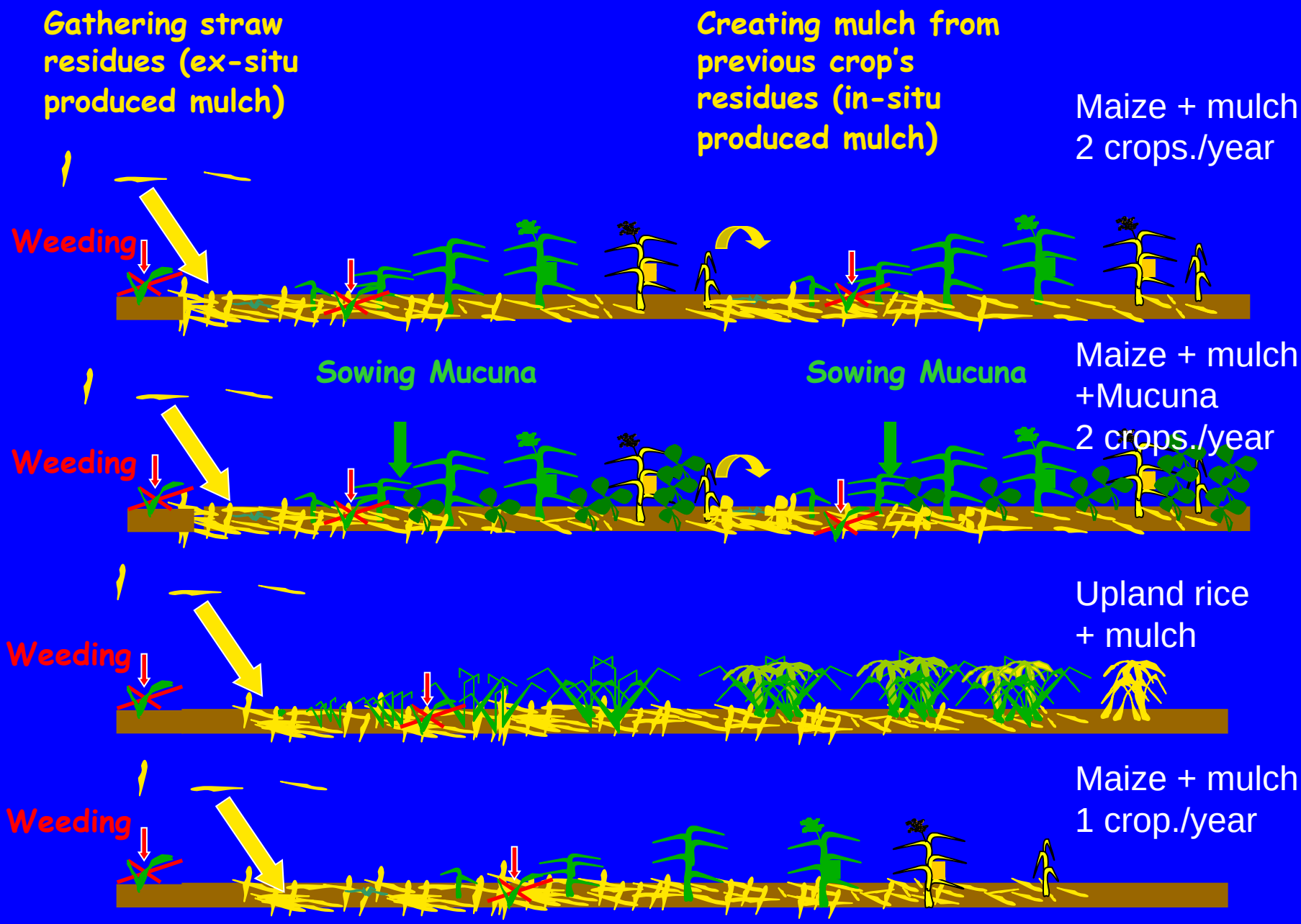
Conclusions

- Method:
  - better understand low adoption of DMC
  - helped identify what improvements have to be made to the technique
  - suggested that diversity of farms may result in variations in “adoptability” of the proposed innovations
- Need to refine the analysis:
  - Accounting for long term evolution of agronomic performances with/without DMC
  - Comparing DMC with other conservation systems
  - Accounting for variations of agronomic performances of DMC across environments



Modelling CS x environment interactions for upland rice and maize

Cropping systems introduced in the simulations



Results from farm modelling

- Farm resources in land, labour and cash vary greatly between farms
- Opportunity cost high in Chodon for any farm, lower in Dien Bien, in relation with
  - Off farm activities
  - Livestock production
- Choosing to buy rice with money from pigs fed with maize is a “stable” option for market oriented farms (model solution not changed when rainfed rice yields increased by 30%)

Testing changes in economic environment

Changes in the opportunity cost of labour:

- ↘ Wages → maize ↗ but no CSMC due to lack of cash (more pressure on slopes)
- ↗ Wages → maize replaces rice in lowland (CD); KL: maize with CSMC replaces upland rice (better labour productivity)

- Subsidies to promote the CSMC:

Discussions with farmers

Ranking of constraints to adoption of DMC

1. Cost of seeds / cuttings for cover crops
2. Labour for collecting mulch
3. Pests infestation in mulch systems
4. Cover crop becoming weeds
5. Herbicides costly and dangerous