Current coupled innovations for glyphosate-free agricultural systems

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Deadlock situations

From what point of view?
Restricted to technical solutions
Techniques and tools tested and developed in experimental fields

(Pannacci et Tei, 2014 ; Guerra et al., 2022 ; Jiao et al., 2022)

Issues linked to the withdrawal of glyphosate :
Weed and plant cover management
Agricultural equipment
Labor and work time
Increased costs

(Alcántara-de la Cruz et al. 2021 ; Wynn et Webb 2022)

Systemic innovations emerging on farms to break the deadlock

Deadlock in vineyard and in annual crops

Slopping or terrace vineyard

Low-till cropping system

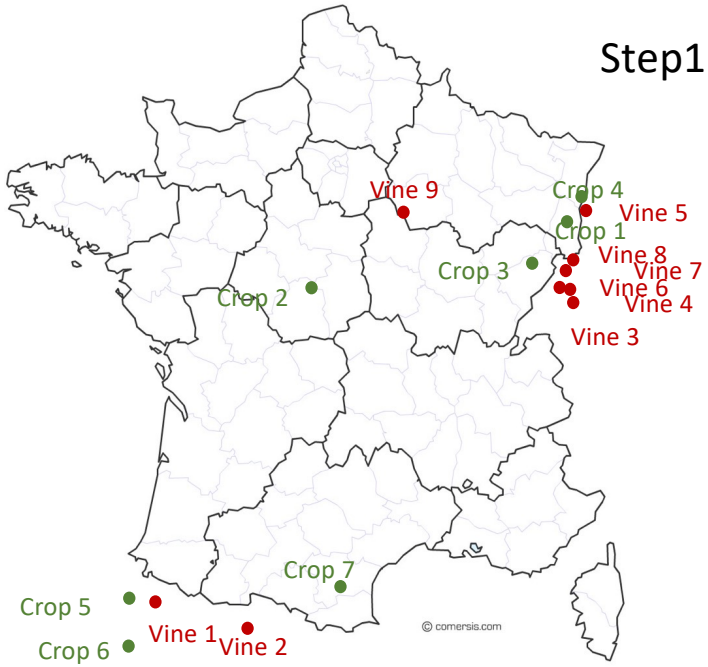
Sunflower with cover crop of clover

Reboud et al. (2017)

Photos: P. Malanski, B. Chauvel

What innovations enable winegrowers to eliminate or reduce the use of glyphosate in dead-end situations?

How do farmers manage innovations to eliminate the use of glyphosate in dead-end situations?



Step1: We identified 16 cases

Step 2: We performed semi-structured interviews 16 semi-conducted interviews

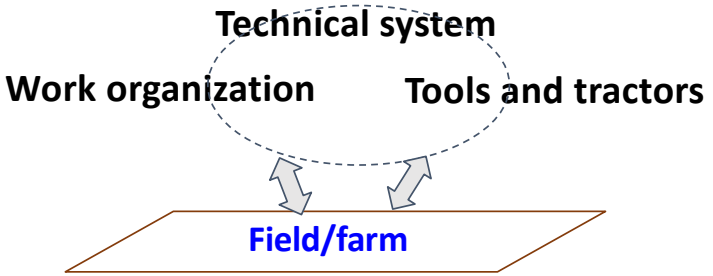
7 cropping systems

9 vine systems

Step 3: We analyzed the systemic nature of innovation

With conceptual framework of coupled-innovation

Meynard et al., 2017; Sebilotte, 1974; Madelrieux et Dedieu, 2018; Lucas et al., 2018; Salembier et al., 2021



Step4: We built typologies

Result #1: We characterized five types of innovation on collective action that supported farmers' access to key levers in weed management

Share
- Ressources
  - ✓Equipment
  - ✓Land
  - ✓Herd
- Labor
  - ✓Shared employee
- Technical management decision
  - ✓collective decision in a common crop rotation

+ Access to agricultural service

+

+ Develop a new resource
- self-building an equipment adapted to sloppy vineyards

Result #2: We identified three types of innovation on equipment to perform weed management

Flexible use of an tool

- a seed drill for sowing on straw and on cover crop

+

Combining tools to perform two tasks at the same time

+

+

Designing and building a new tool

- under-vine mowing tool for terraced vineyard

Result #3: Three types of coupled innovations in vineyard and in cropping systems

Focus on vineyards

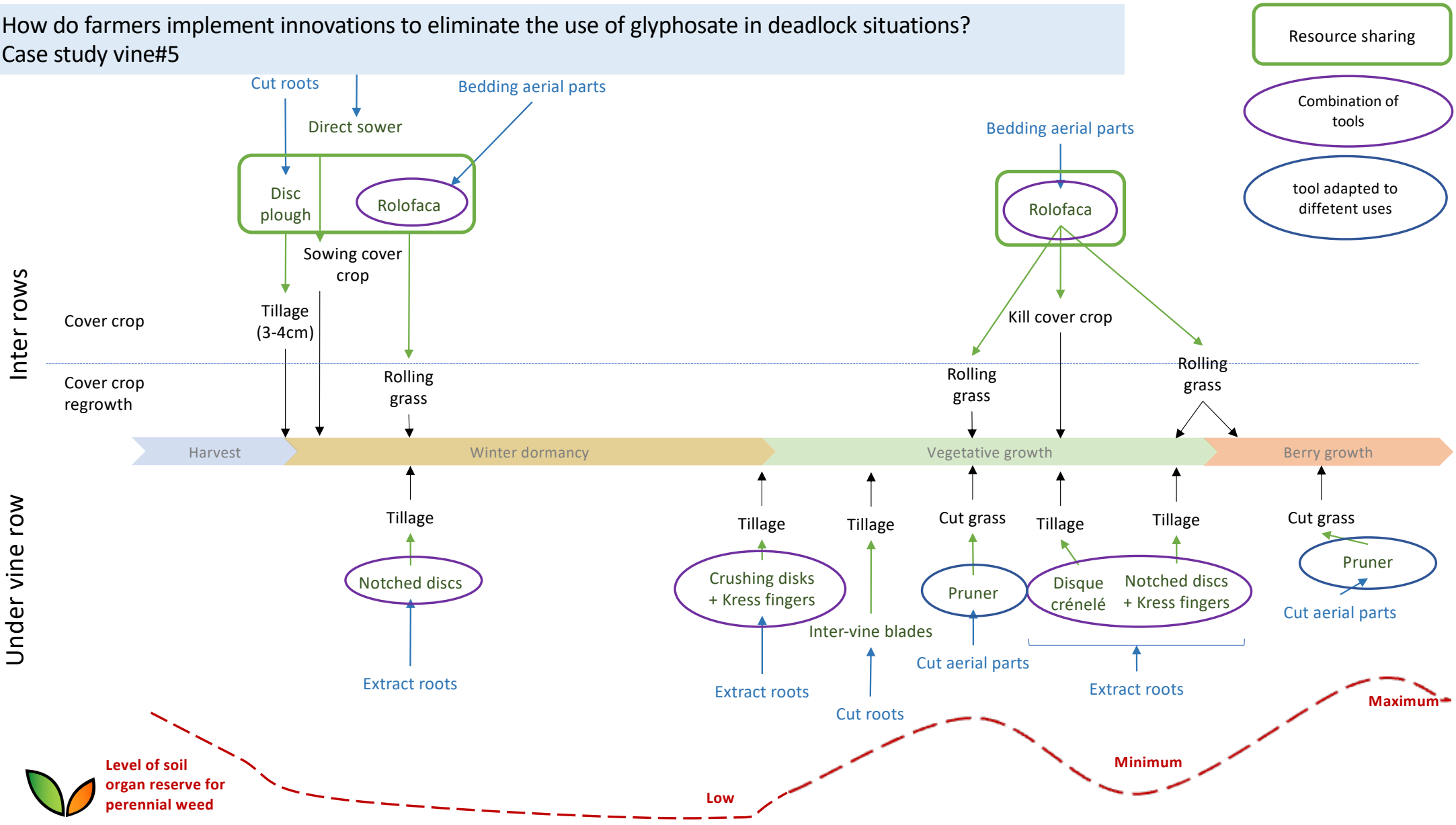
Type#1: Management on moderate slopes with repeated weed control using a shared range of tools (5 cases study).

Type #2: On steep slopes, weed control is achieved by spot treatment with combined cover crop tool. (2 cases study)

Type #3: Minimize soil disturbance with self-built tools adapted to terraces (2 cases study)

Photo: P. Malanski

How do farmers implement innovations to eliminate the use of glyphosate in deadlock situations?
Case study vine#5



Discussion

New knowledge about glyphosate-free weed management in **two** deadlock situations: sloping or terraced vineyards and conservation agriculture

An invitation to redesign cropping systems to implement alternatives to glyphosate use

An invitation to consider the agronomic conditions for implementing alternatives to glyphosate and genericity of characterized couples innovations

Methodological advances in the study of innovations coupled with innovation tracking

Take home message

Innovations to deadlock agricultural system existed on farms

Coupled innovations decribed deal with combining innovation about tools + agricultural management in the field + work organization

Perspectives

=> Develop research to reduce and remove technical and socio-economic locks to the elimination of glyphosate use on farms

=> Inspiration to redesigning agricultural system for the agro-ecological transition and to adapt climate change on farms

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