

# Cultures de services en vignobles : gestion de l'enherbement pour l'entretien des sols et la fourniture de services écosystémiques en viticulture

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UMR System

- I. Introduction
- II. Services écosystémiques pour les sols viticoles
- III. Gestion des cultures de services
- IV. Exemples de travaux



# Les sols viticoles

Le sol est un élément central : terroir, AOP...

Viticulture = occupation des sols très exposée à l'érosion  
(*Garcia-Ruiz, 2010*)


Plusieurs facteurs en cause :

- Fertilisation, matière organique (*Coll et al. 2011, Salomé et al., 2016*)
- Désherbage chimique, mécanique, sols nus (*Le Bissonnais et Andrieux, 2007*)
- Plantation en coteaux
- Phénologie



# Les cultures de services


- Cultures non « commerciales »
  - Objectif = fournir des services écosystémiques
- ➔ Identifiées comme un levier de protection/conservation/restauration des sols (fertilité physique, fertilité chimique)
- ⚠️ Compétition avec la vigne pour les ressources (recherchée ou non)



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Review

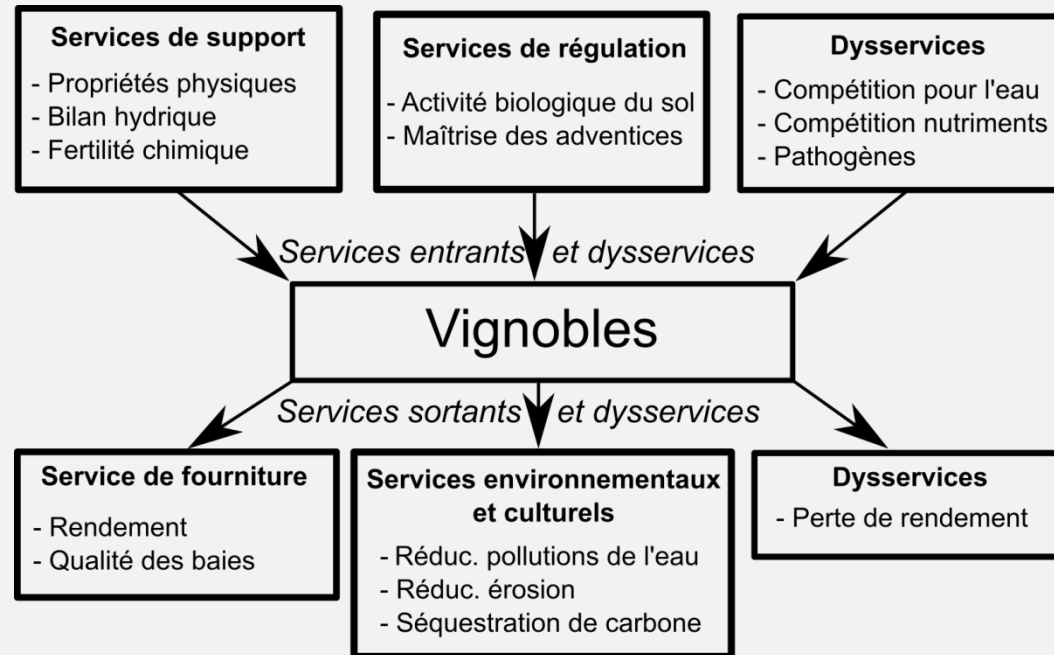
### Management of service crops for the provision of ecosystem services in vineyards: A review

Léo Garcia<sup>a,b,\*</sup>, Florian Celette<sup>c,\*</sup>, Christian Gary<sup>a</sup>, Aude Ripoche<sup>d,e,f</sup>, Hector Valdés-Gómez<sup>g</sup>, Aurélie Metay<sup>a</sup>



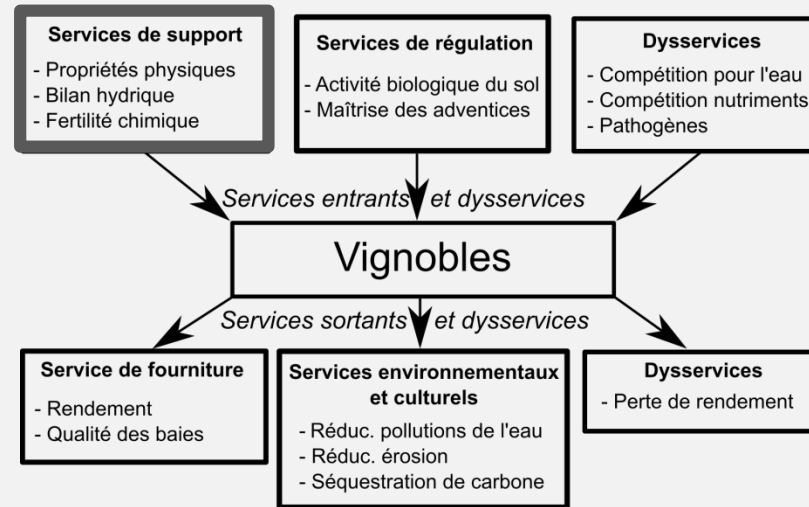
# Quels services pour les sols viticoles ?

→ Services « entrants » (inputs) et « sortants » (output) (Zhang et al. 2007)



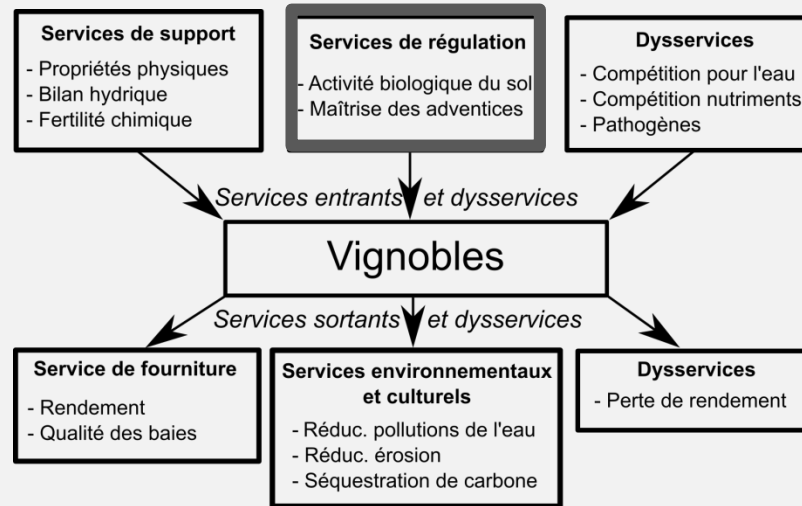
La notion de service écosystémique renvoie à la **valeur** (monétaire ou non) **des écosystèmes** [...] qui fournissent à l'humanité des biens et services nécessaires à leur bien-être et à leur développement

# Quels services pour les sols viticoles ?



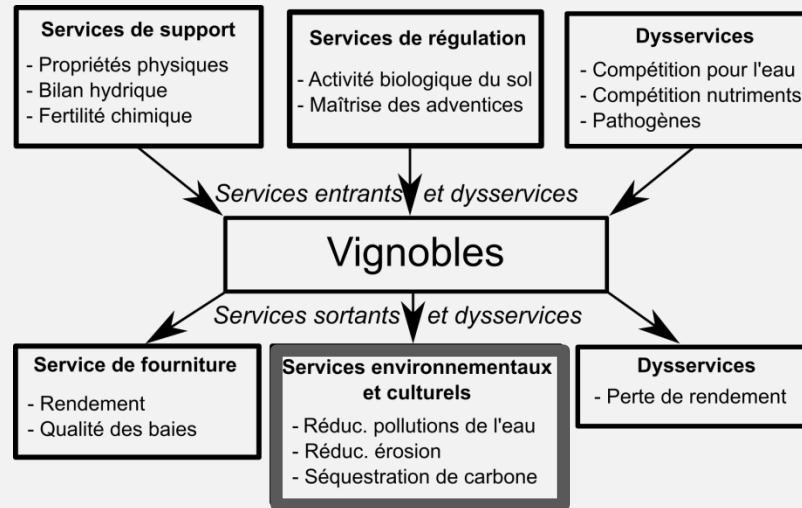
- Propriétés physiques
  - Stabilité structurale (*Dabney et al. 2001, Goulet et al., 2004*)
  - Compaction, densité apparente (*Polge de Combret-Champart et al. 2013*)
  - Infiltration de l'eau (*Wassenaar et al., 2005*)
  - Ruissellement & érosion (*Le Bissonnais et al. 2004; Novara et al. 2011*)
- Bilan hydrique (*Celette et al. 2008; Gaudin et al. 2010*)
- Fertilité chimique (*Fourie 2012, Patrick et al. 2004*)

# Quels services pour les sols viticoles ?



- **Activité biologique du sol** (*Coll et al. 2011, Cheng and Baumgartner. 2006, Steenwerth and Belina. 2008 a,b*)
- **Maitrise des adventices**
  - Abondance, infestation (*Gago et al. 2007*)
  - Composition des communautés (*Baumgartner et al., 2008; Steenwerth et al., 2016*)

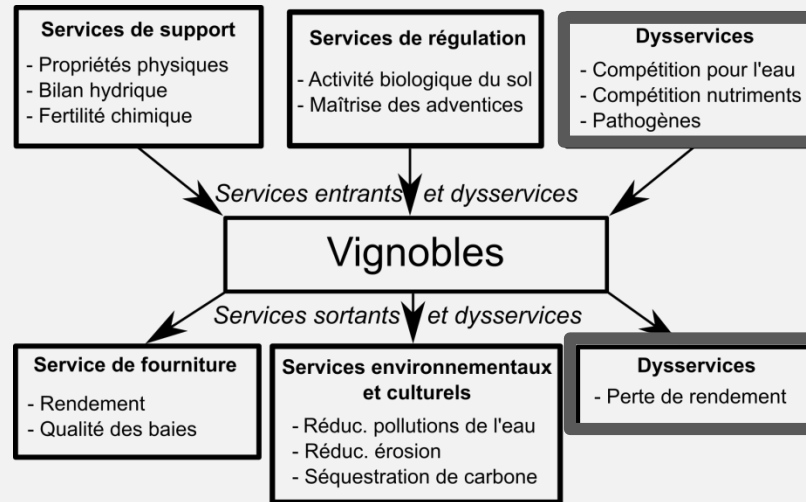
# Quels services pour les sols viticoles ?



- Réduction des pollutions par érosion
- Dégradation des pesticides (*Alletto et al. 2010*)
- Séquestration de carbone (*Belmonte et al. 2016, Salomé et al. 2016*)

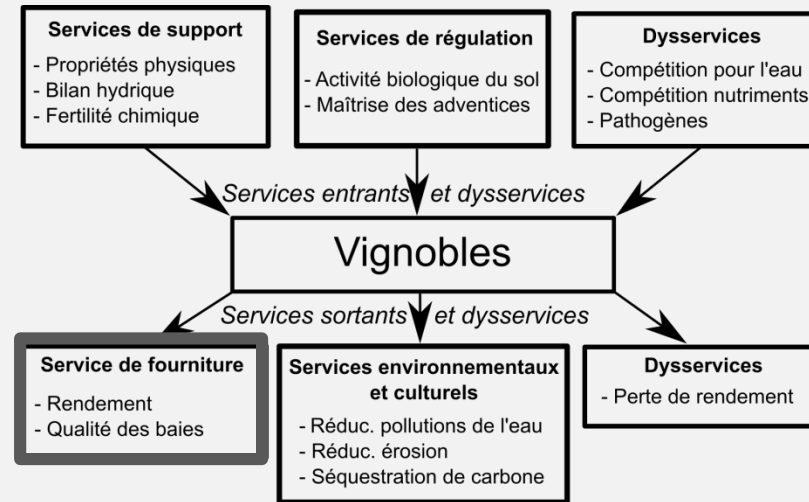


# Quels services pour les sols viticoles ?



- **Compétition pour l'eau** (*Celette et al. 2008*)
- **Compétition pour les nutriments (N)** (*Celette et al. 2009, 2013*)
- **Pathogènes du sol** (*Castillo et al. 2008; Hannah et al. 2003*)
- **Rendement**

# Quels services pour les sols viticoles ?



Régulation

Vigueur

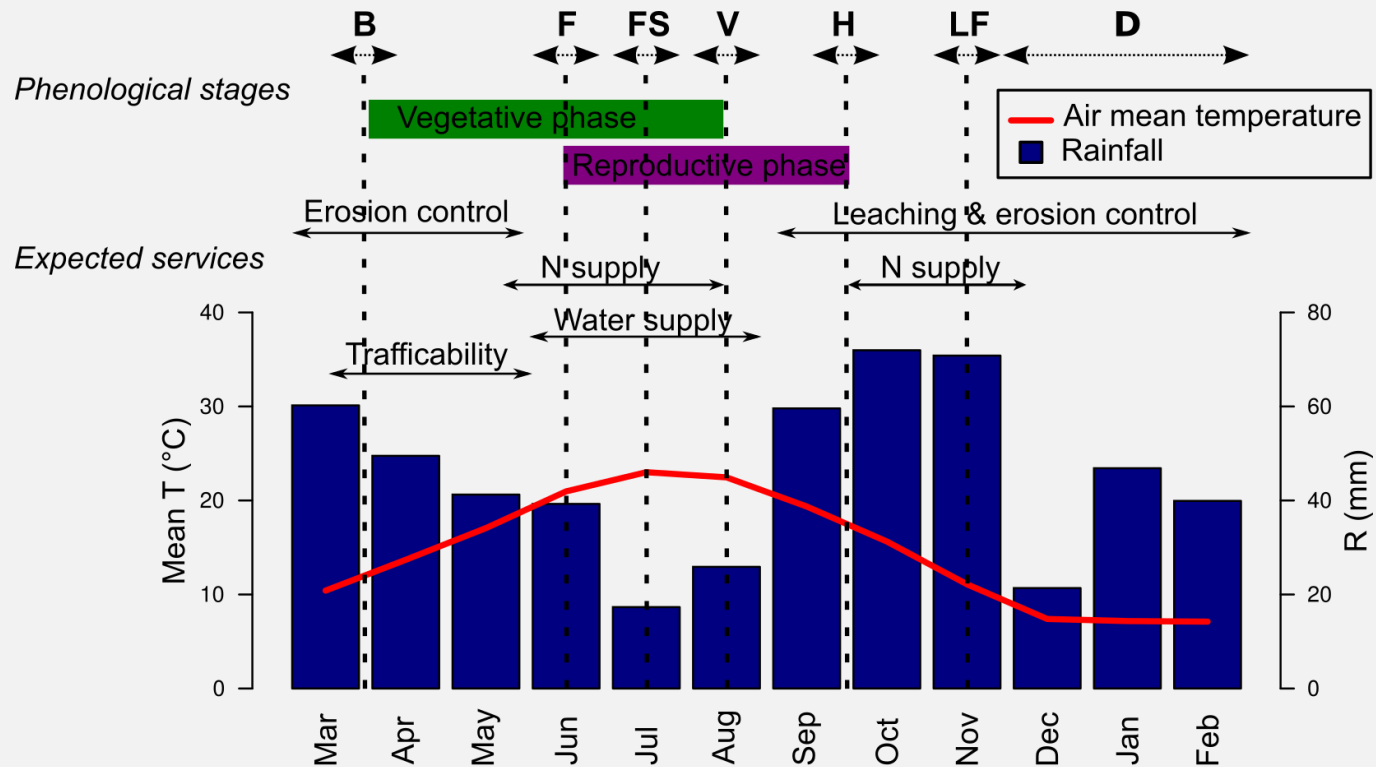
Rendement

Maladies

(Guilpart et al. 2017, Valdès-Gomez et al. 2011)



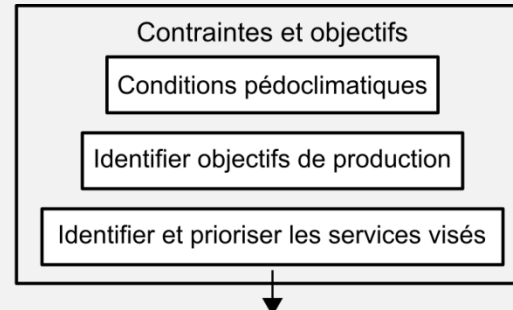
# Temporalité des services



## Nécessité de piloter les cultures de services

- Intégrer la temporalité des services (synchronisation des services avec les stades phénologiques de la vigne)
- Compromis avec dysservices

# Contraintes et objectifs



## Contraintes :

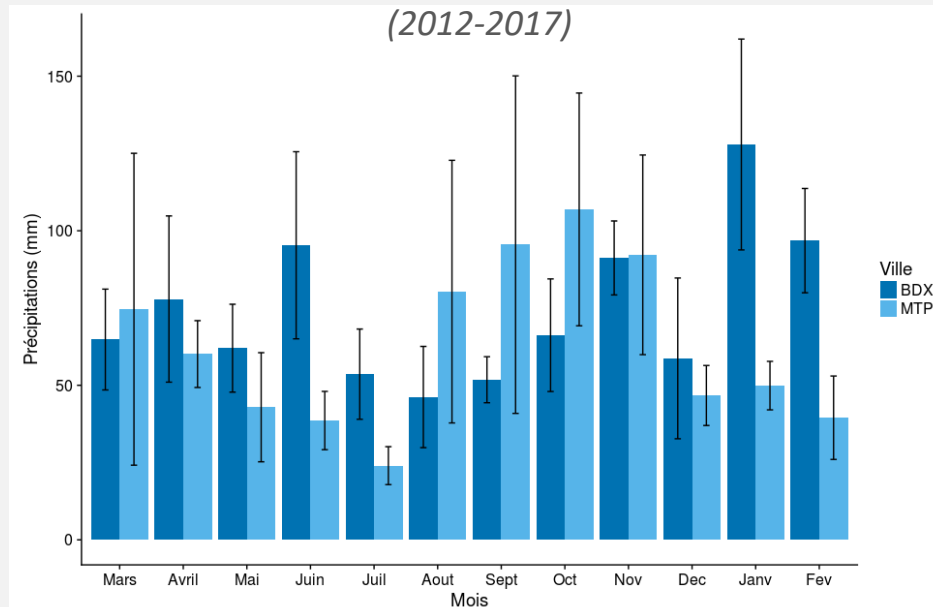
- Climat (fréquence des pluies, période...)
- Type de sols (profondeur, fertilité...)

## Objectifs :

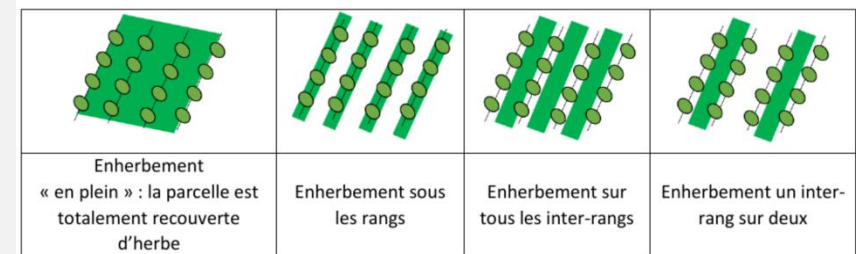
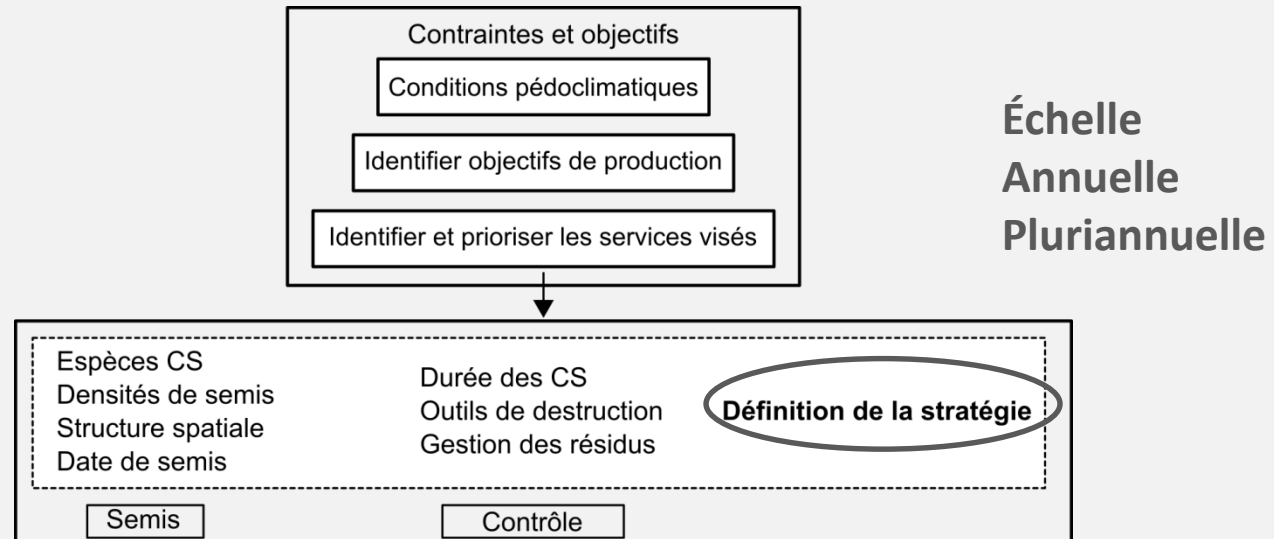
- Production (rendement, qualité vs. IGP/AOP...)
- Services (portance ? Engrais vert ? MO ?)



Précipitations moyennes  
(2012-2017)



# Définition de la stratégie

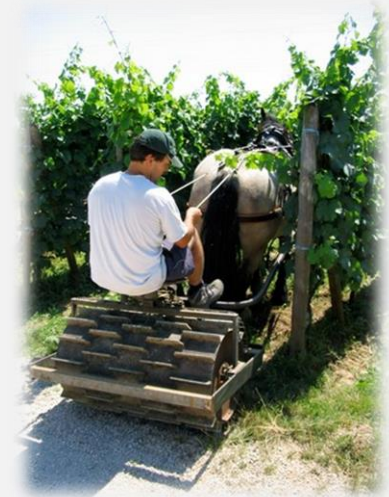
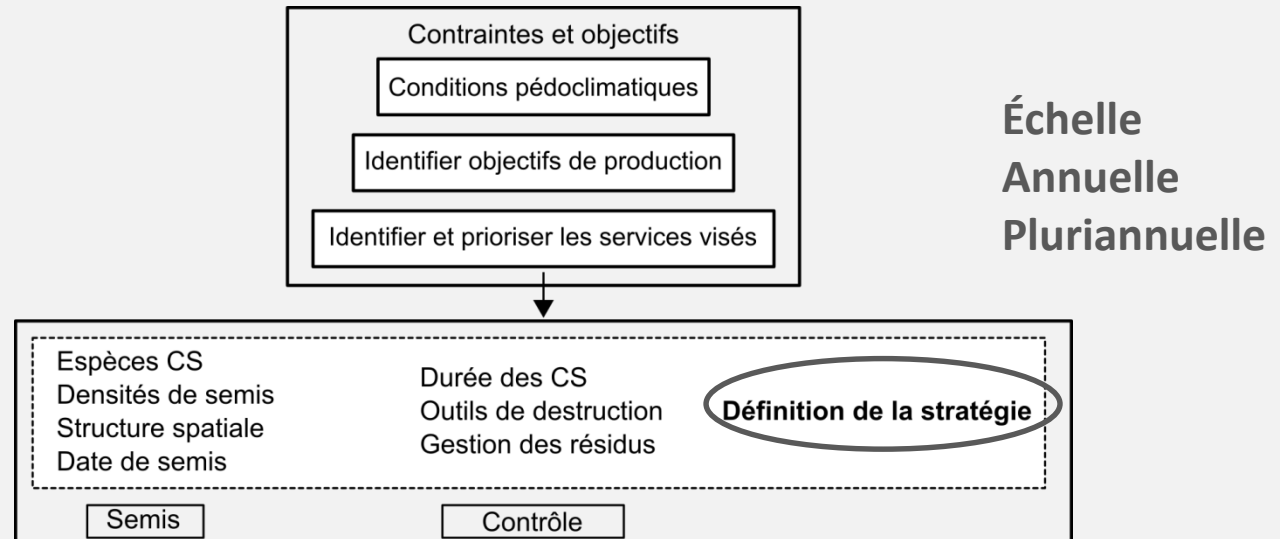


(Frey 2016)

## Implantation :

- Choix de l'espèce ou mélange (*Tribouillois et al. 2016*)
- Date de semis (post-vendange, printemps, été...)
- Densité
- Structure (total, IR, 1 IR/2, largeur des bandes...)

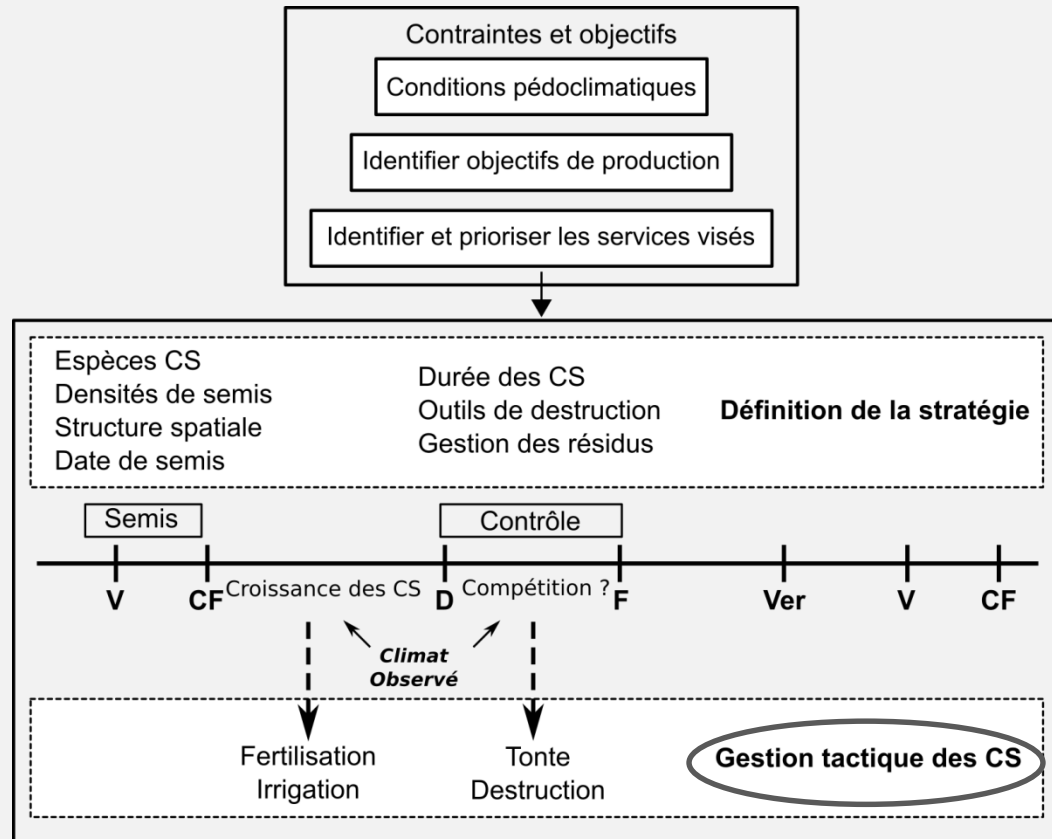
# Définition de la stratégie



## Destruction :

- Période (débourrement, floraison...)
- Outil (grobroyeur, rouleau...)
- Résidus (enfouis, mulch...) (*Coppens et al. 2006*)

# Pilotage des cultures de services - Gestion tactique



Gestion tactique :

- Irrigation/fertilisation (biomasse, production de graines) (Fourie et al. 2005)
- Tontes/destructions (stress ?)





## Zoom sur quelques espèces



*Vicia villosa*

+



*Plantago coronopus*

+



*Phacelia tanacetifolia*

+ Spont + Wsol

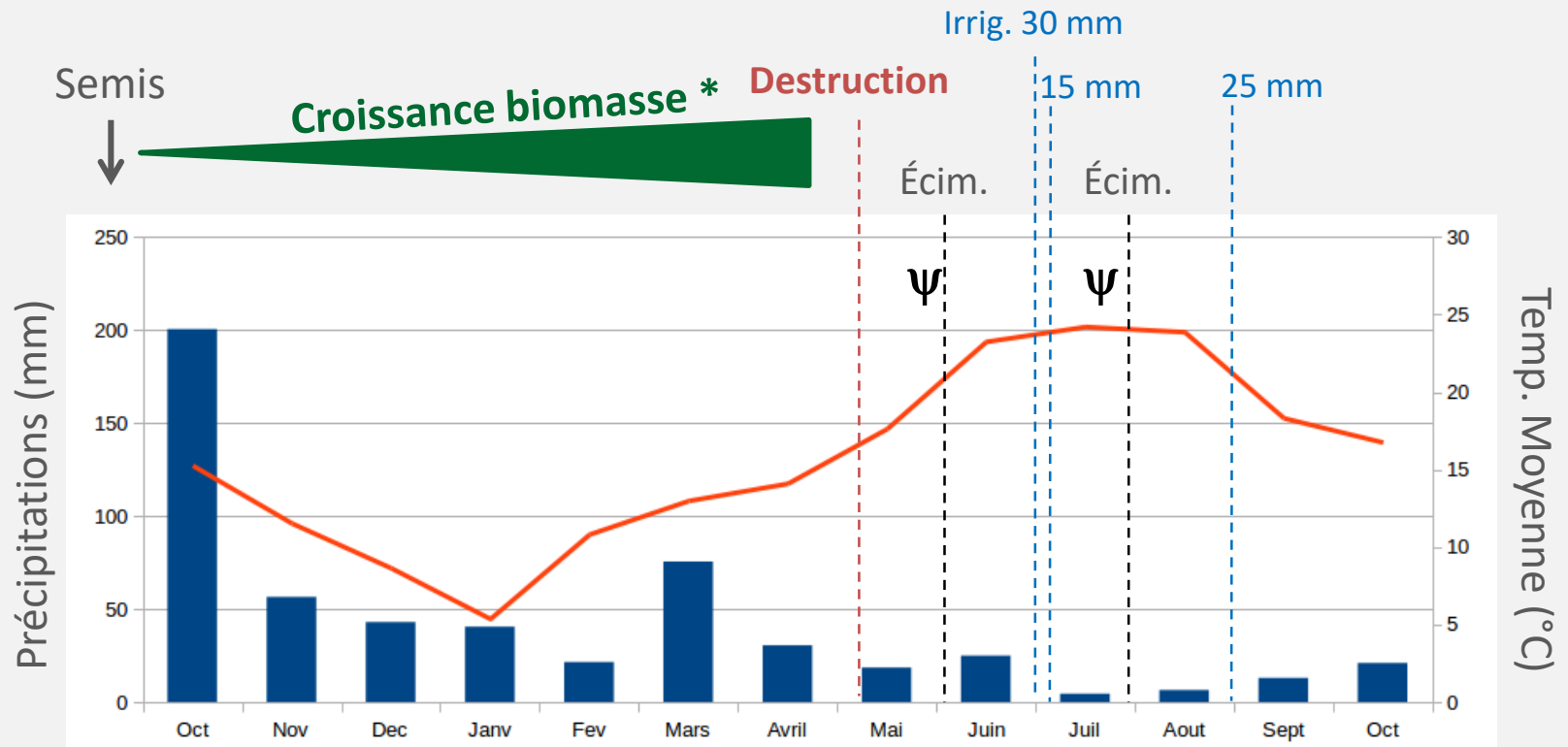
### Suivi sur vigne :

- Potentiels de base x2
- Biomasses écimées x2
- Rendement, composantes du rendement
- Qualité des jus



# Itinéraire technique 2017

$\Psi$ : potentiel de base



\*

Vesce : 14 t/ha

Plantain : 4,88 t/ha

Phacelie : 3,76 t/ha

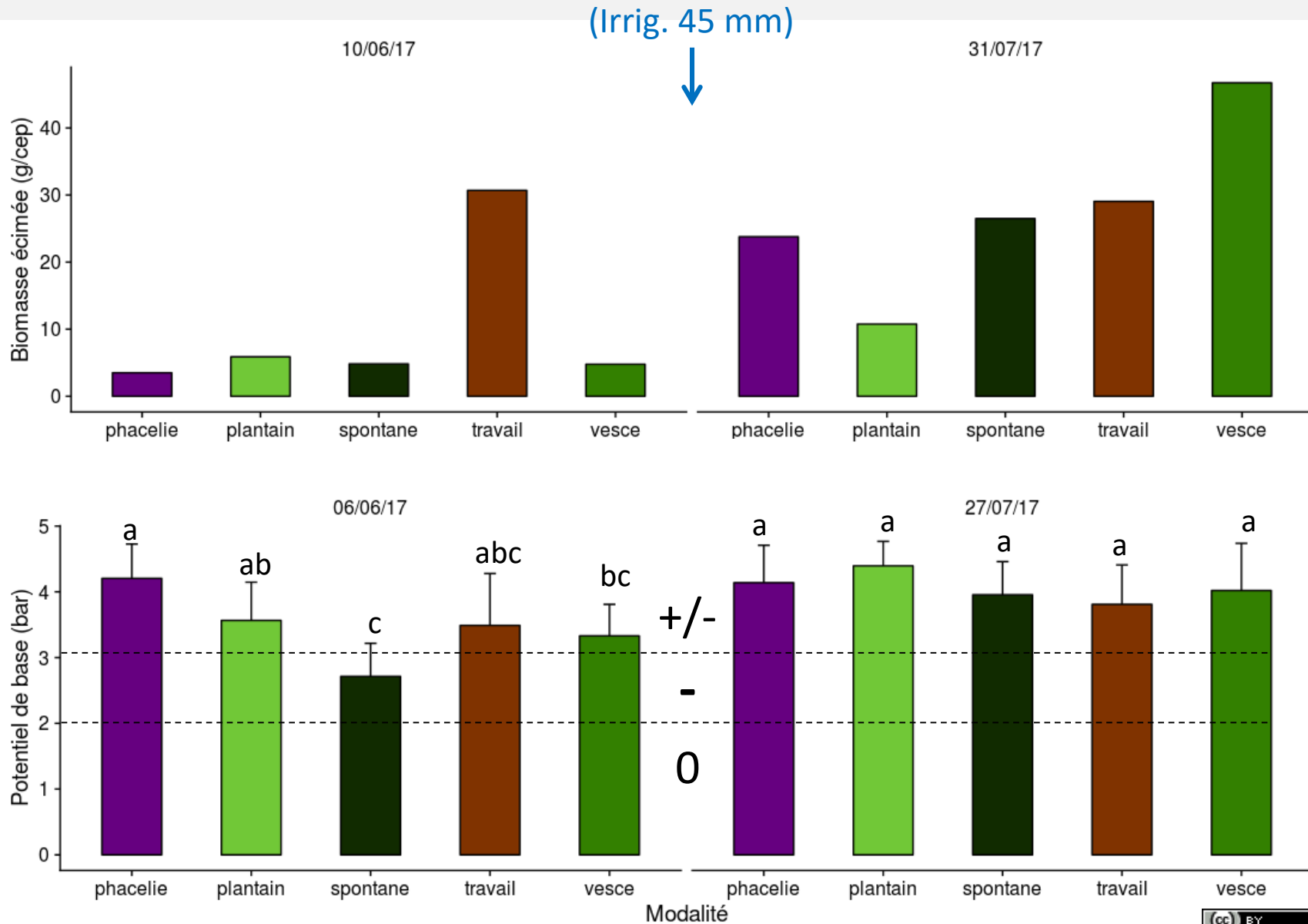
Spont : 2,31 t/ha

↑  
Débourrement

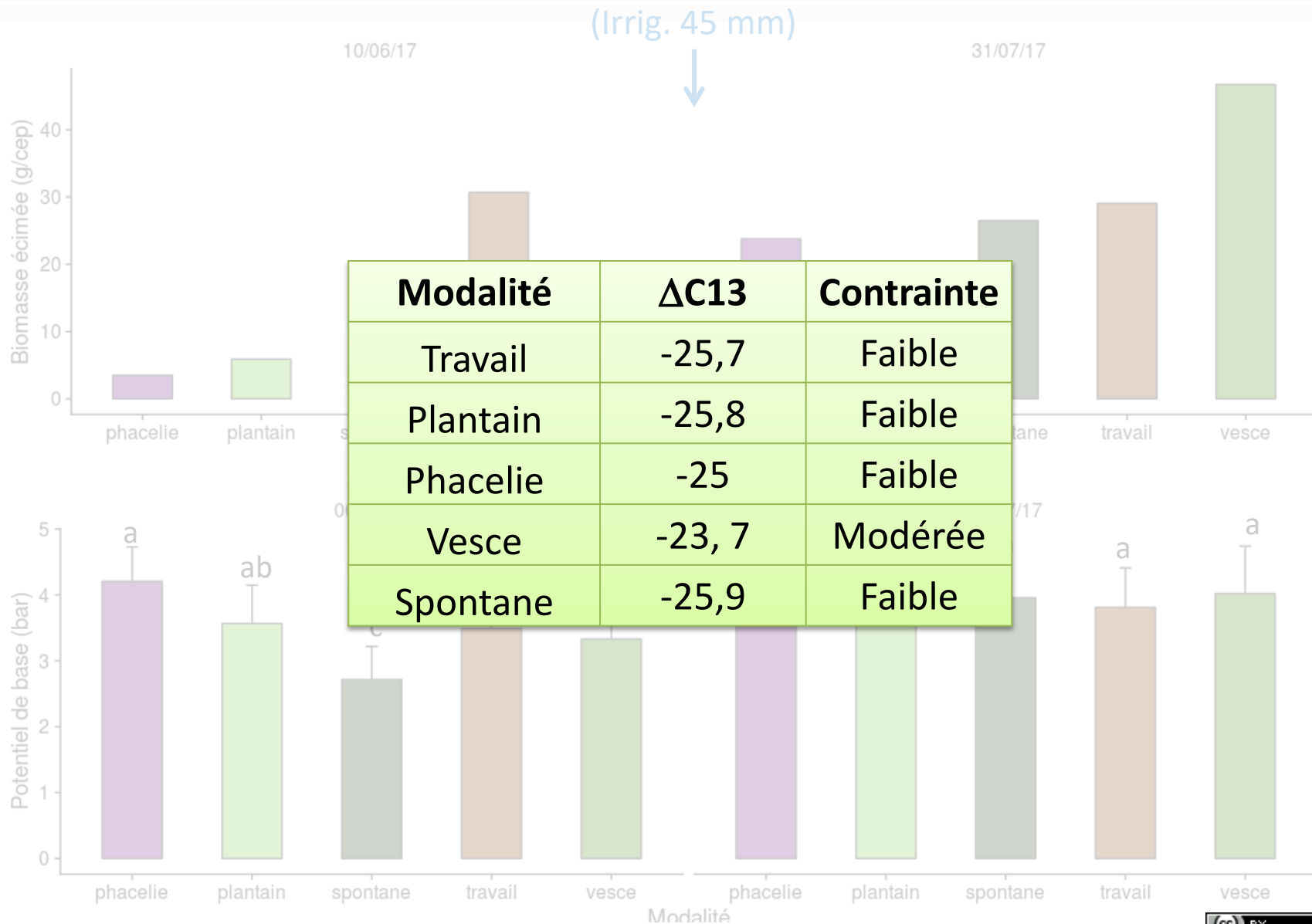
↑  
Flo.

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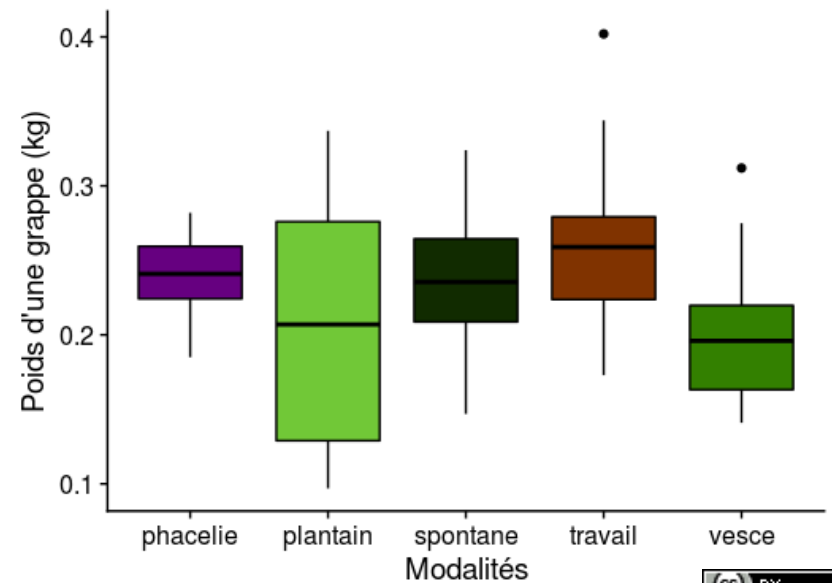
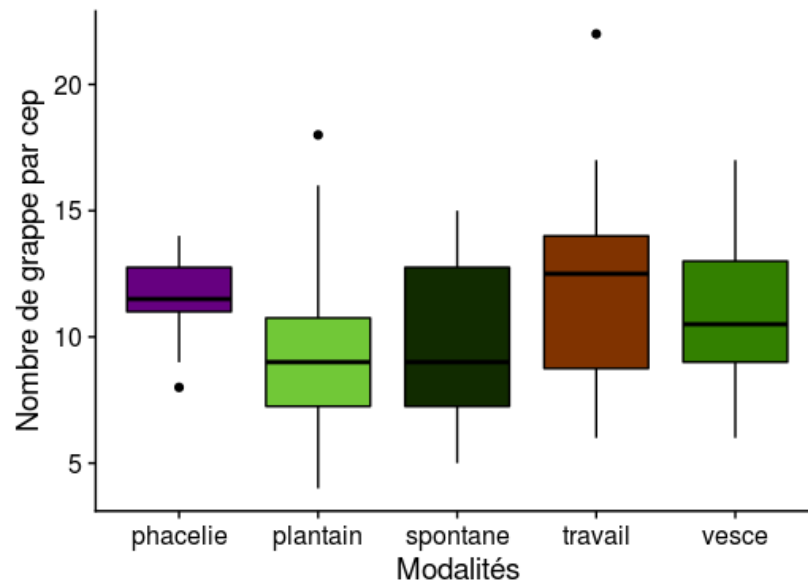
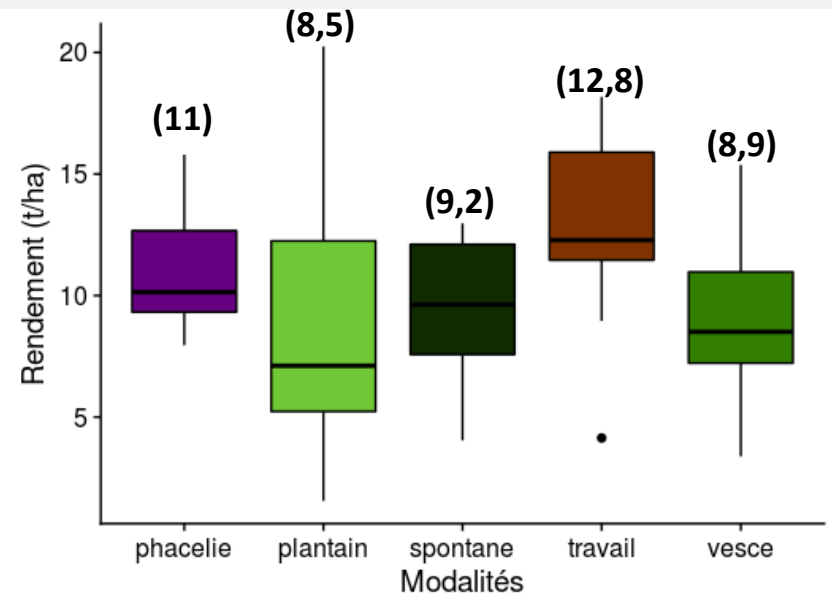
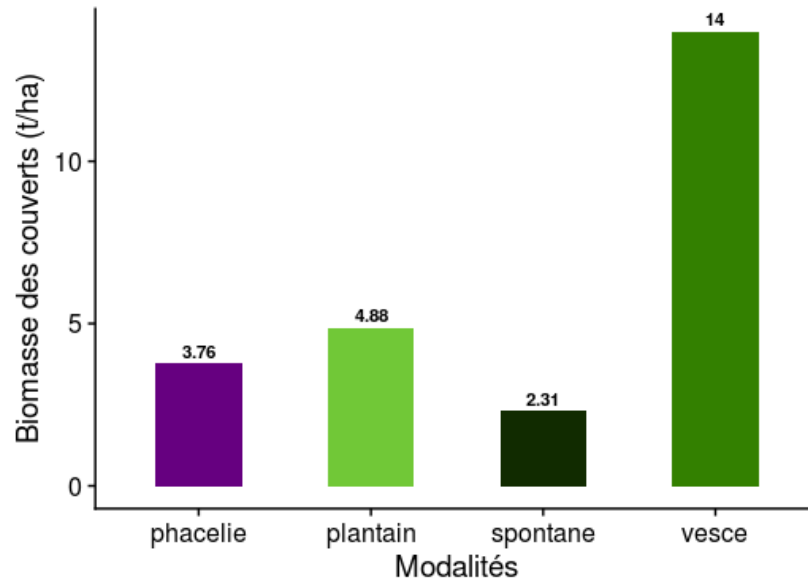
# Vigueur et contrainte hydrique



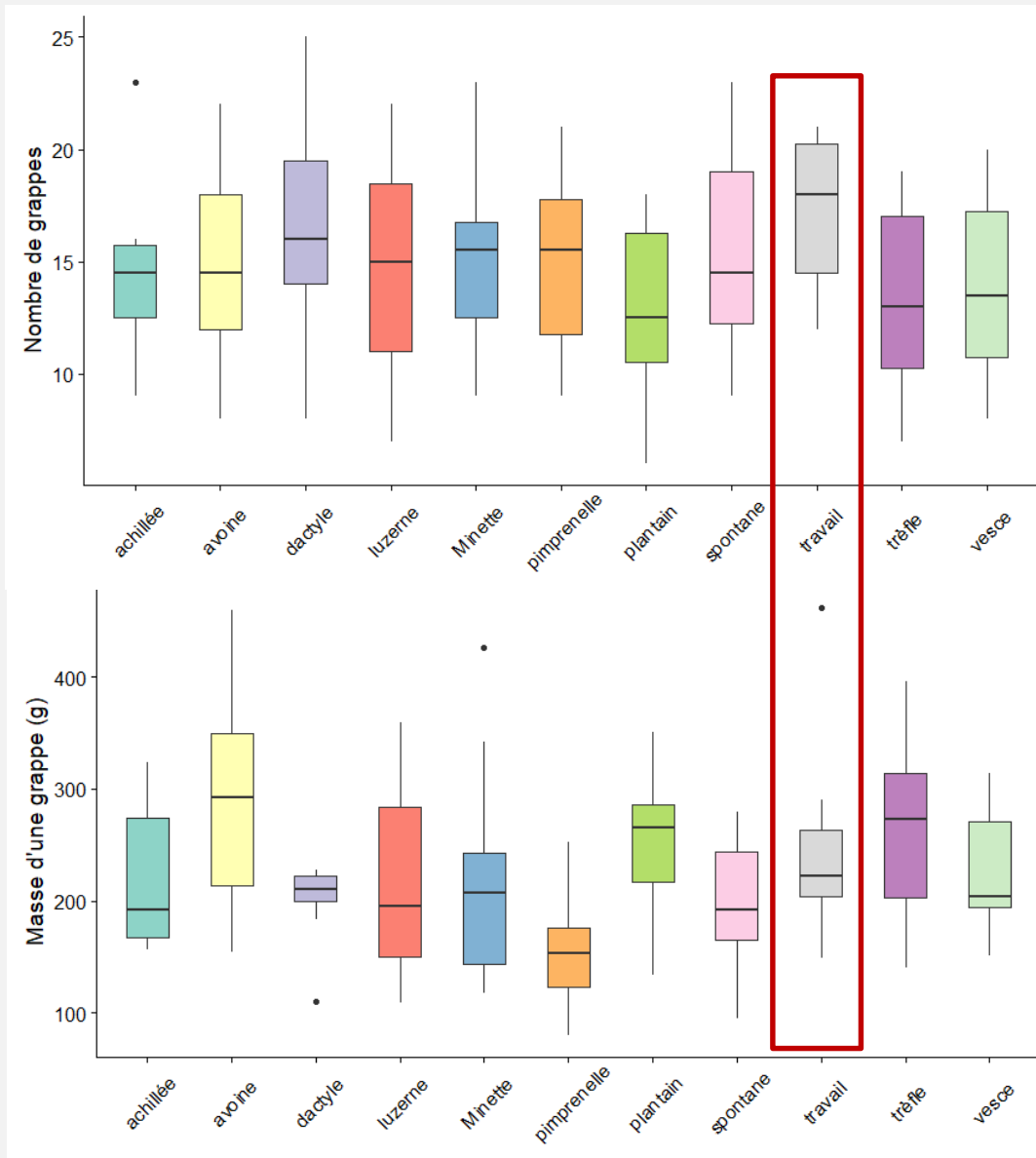
# Vigueur et contrainte hydrique



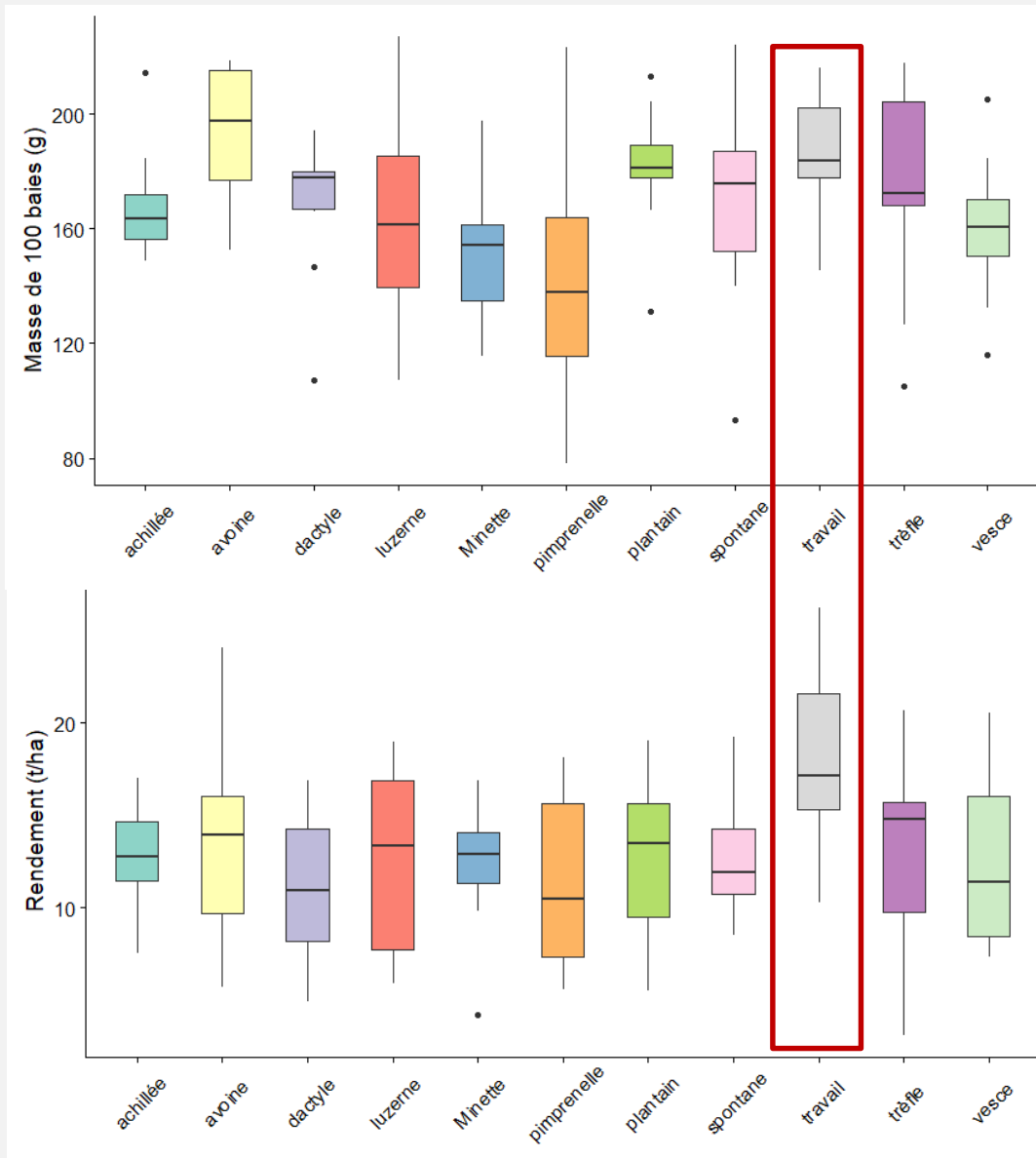
# Fortes différences de biomasse pour un RDT équivalent



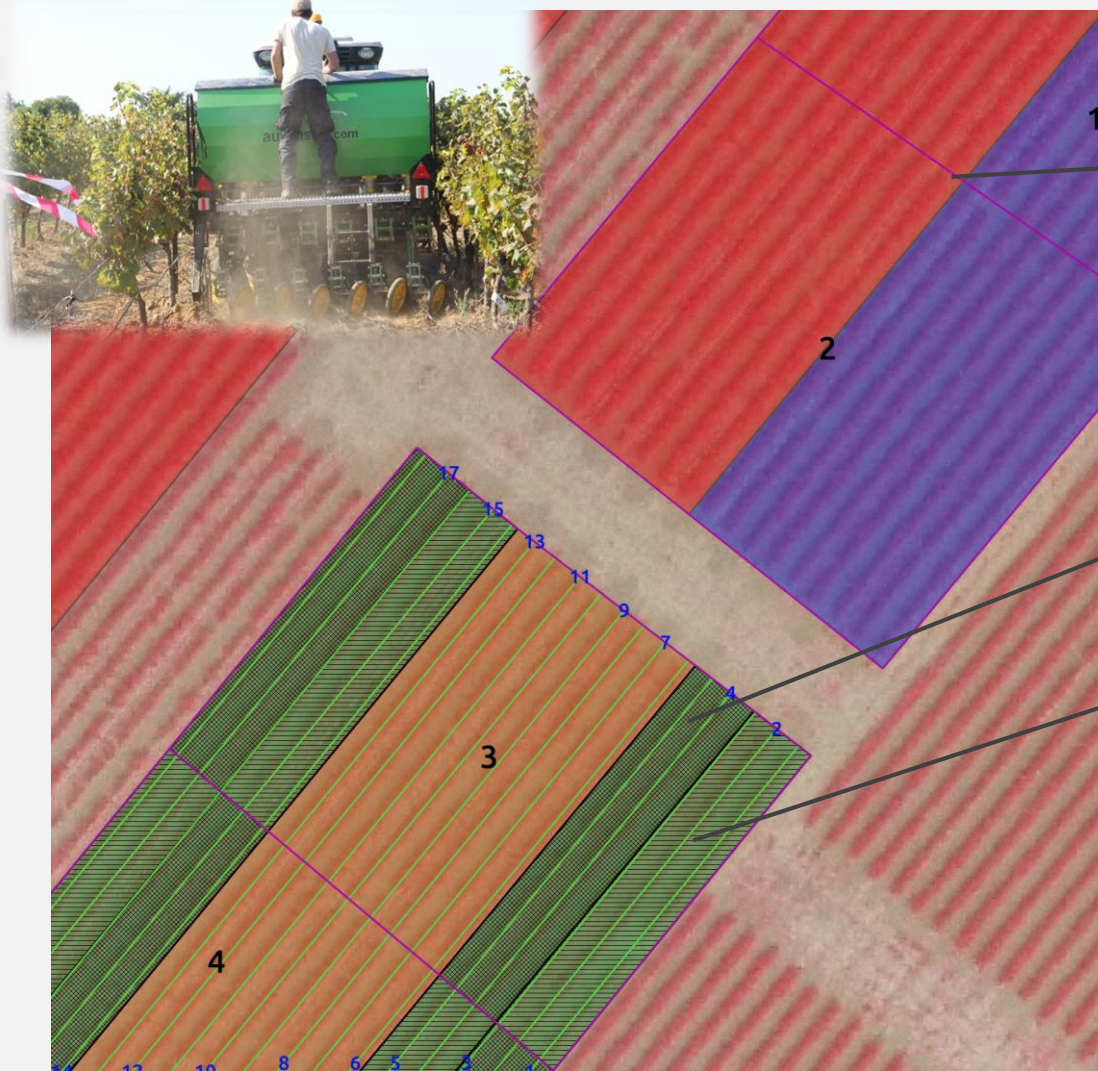
# Rendement en 2018



# Rendement en 2018



# Pilotage d'un engrais vert



→ Témoign spontané

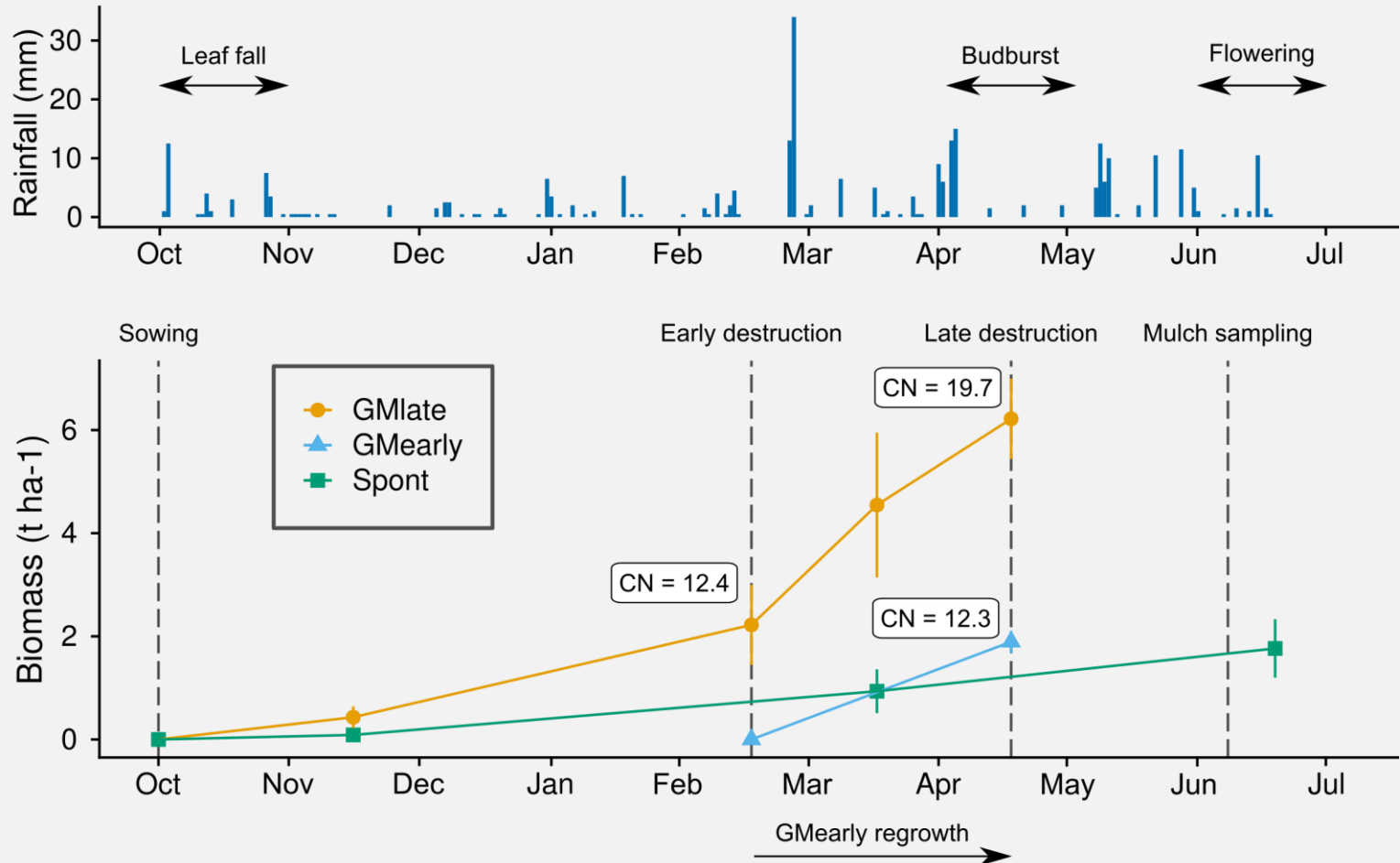
Féverole « DF »  
 Destruction février  
 Repousse  
 Destruction avril

Féverole « DA »  
 Destruction avril





# Restitutions de biomasse contrastées

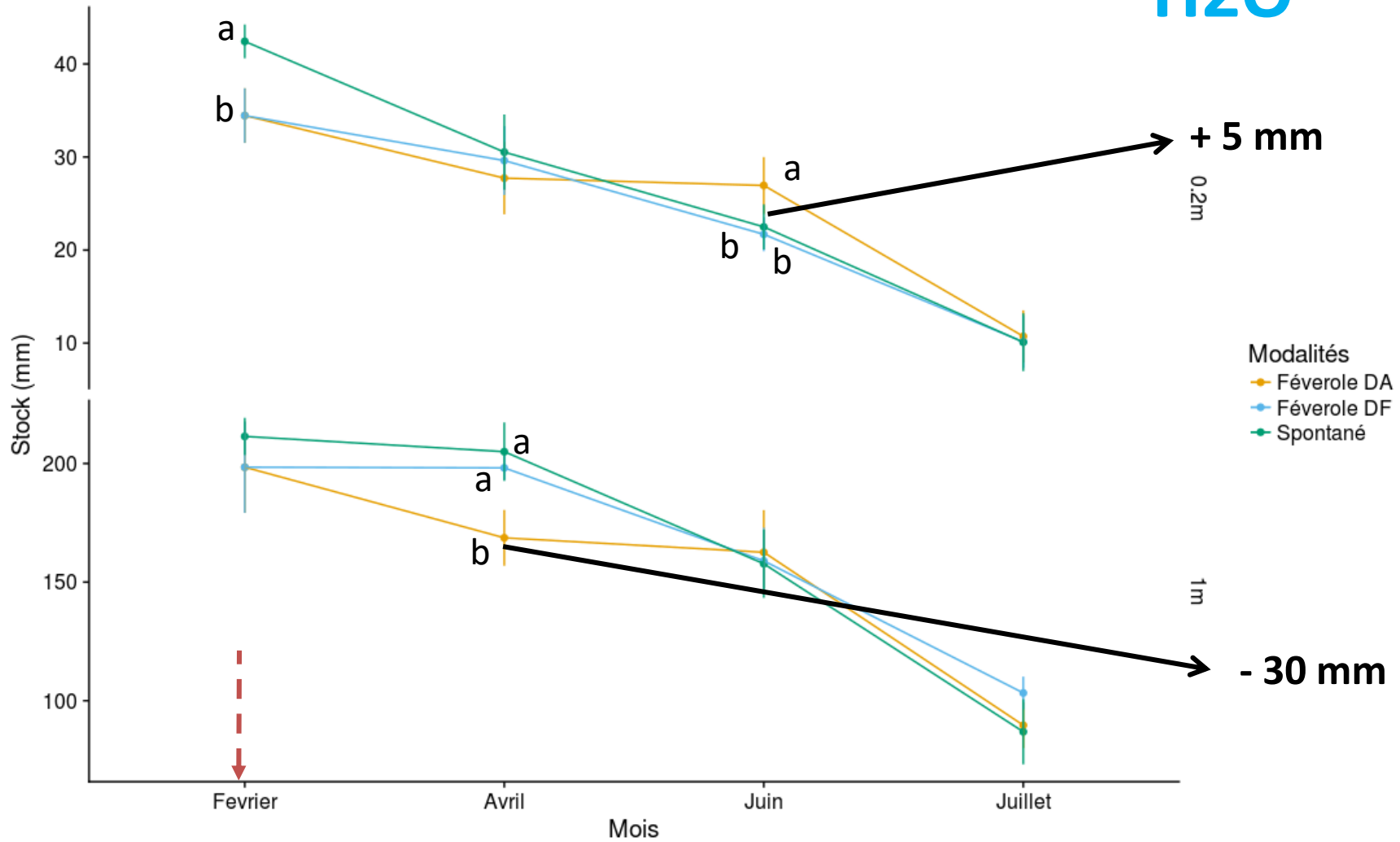


2 types de restitution :

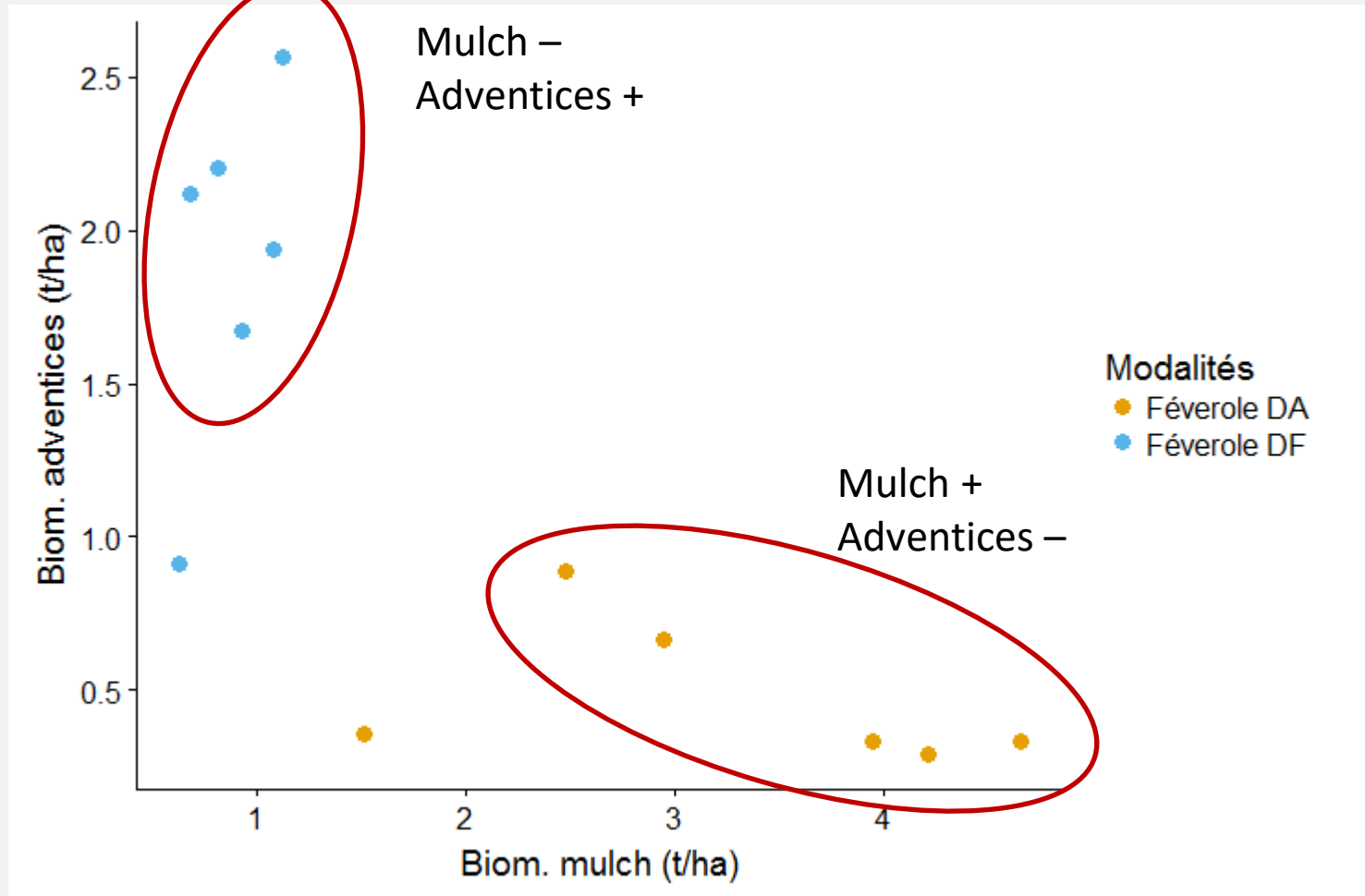
- 2 apports ~2 tMS, C/N = 12
- 1 apport ~6 tMS, C/N = 20

# Dynamique d'assèchement des profils

## H<sub>2</sub>O

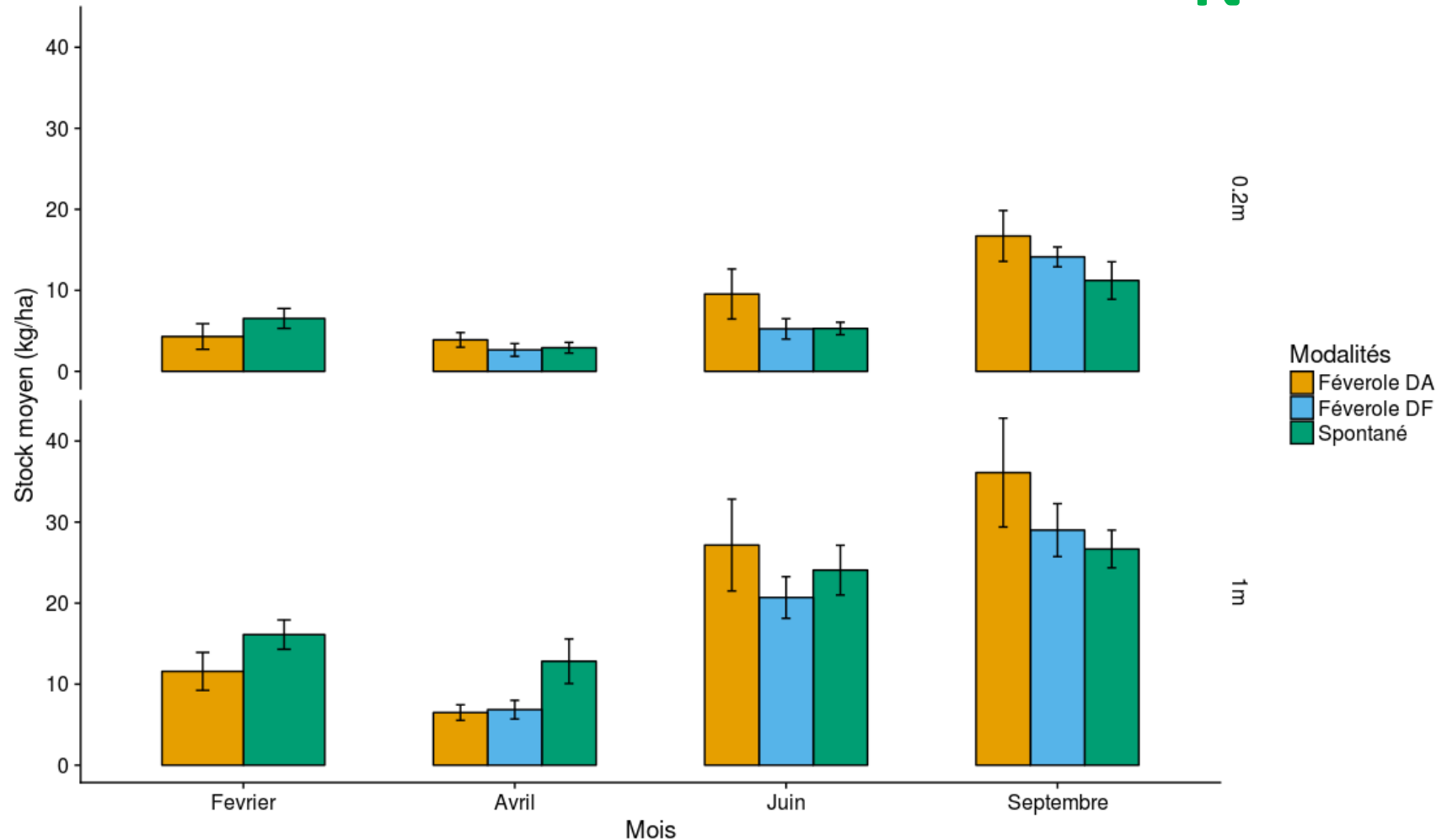


# Contrôle des adventices à floraison

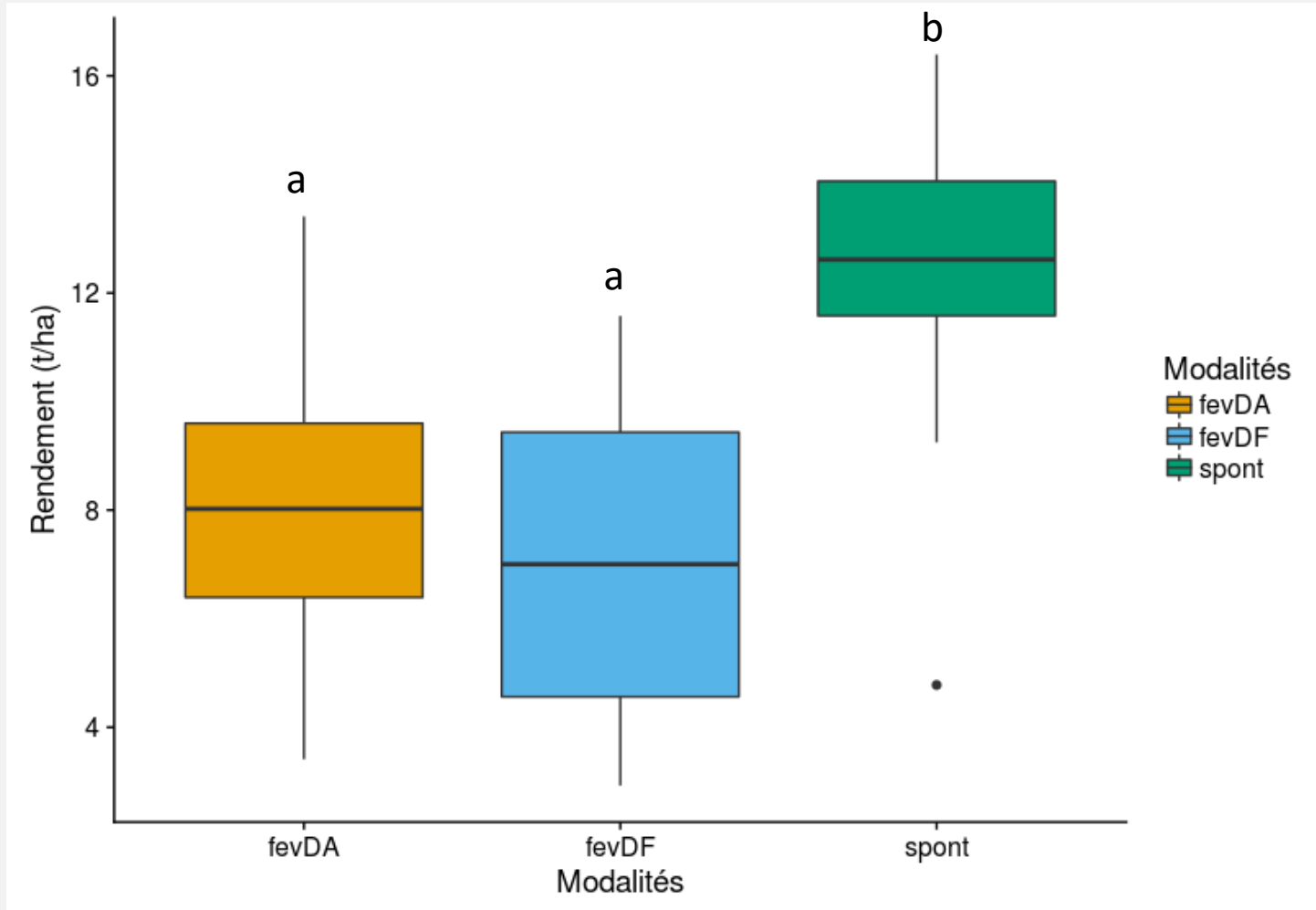


# Dynamique de minéralisation

N



# Rendements



## Éléments de conclusion

- Nombreux services rendus par les CS
- Risques de dysservices (ex: compétition H<sub>2</sub>O, N)

Choix des services

Temporalité

Niveau de compromis

Gestion des cultures de services

- Objectifs/contraintes
- Stratégie
- Gestion tactique

- Approche relativement générique (arboriculture, grandes cultures...)



**CIMS : Des Cultures Intermédiaires Multi-Services pour une production agroécologique performante**

**4 & 5 octobre 2017 - Toulouse (Auzeville)**

=> Nombreuses perspectives de recherche sur la gestion des cultures de services

Merci pour votre attention



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