

Effets et services environnementaux associés aux modalités de travail du sol

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Des motivations environnementales

Ex.:



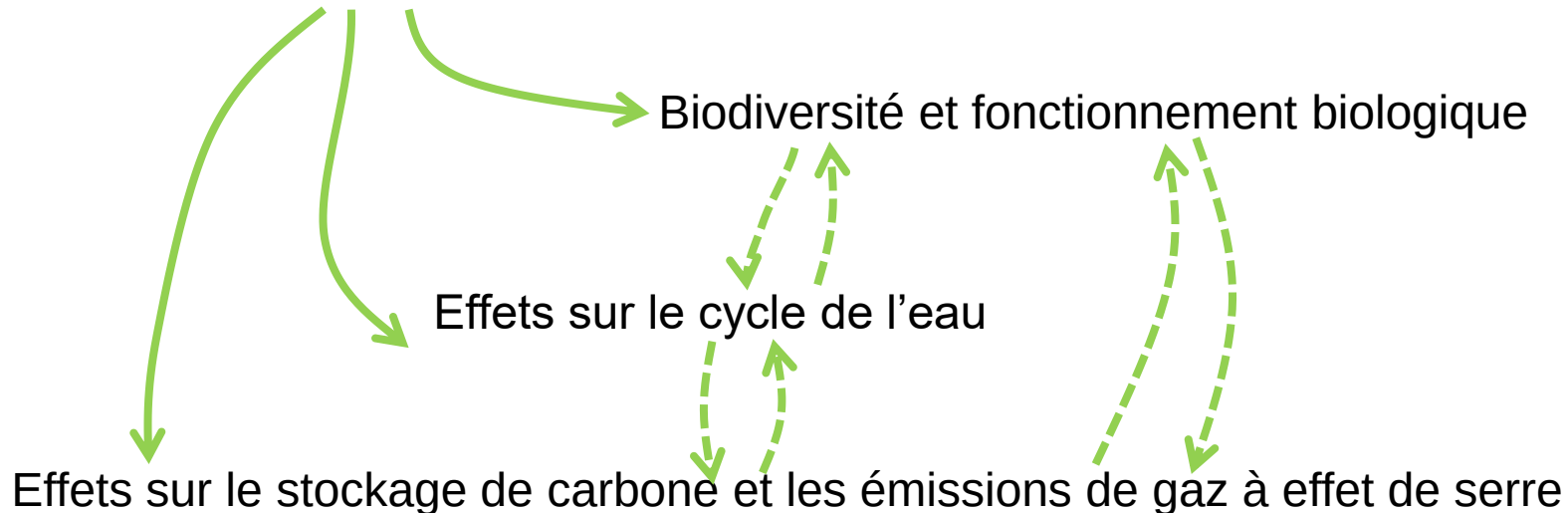
LES OBJECTIFS DE L'APAD

Contribuer à la prise de conscience des enjeux associés à la préservation des sols.

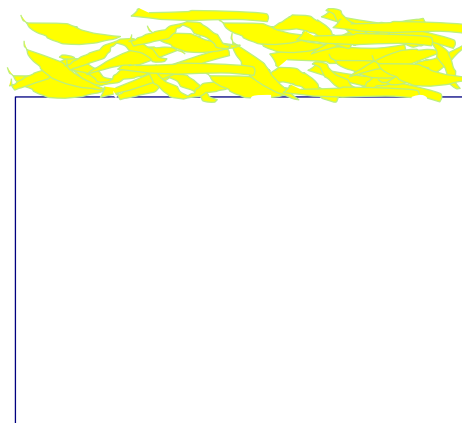
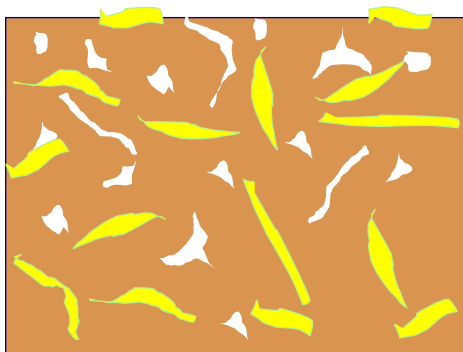
Établir l'Agriculture de Conservation des Sols, définie par ses 3 piliers, comme une agriculture porteuse d'avenir pour les citoyens, assurant une production de qualité, à un coût raisonnable tout en préservant l'environnement.

Accompagner la dynamique des agriculteurs en groupes APAD, pour progresser dans leur pratique de l'Agriculture de conservation des Sols.

Effets et services environnementaux?



Des profils de sol contrastés:



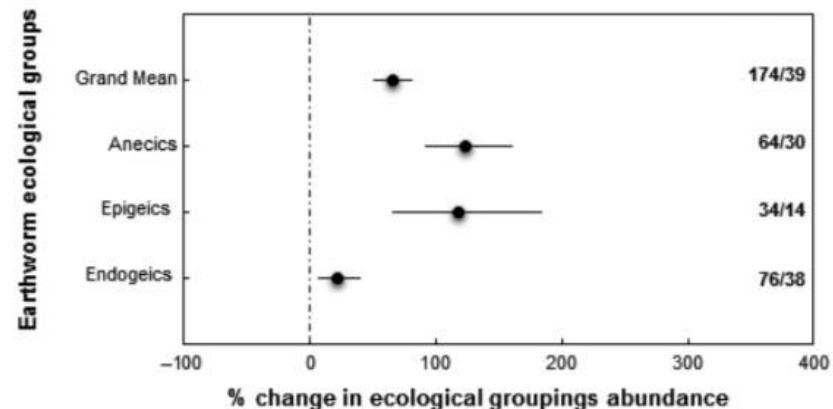
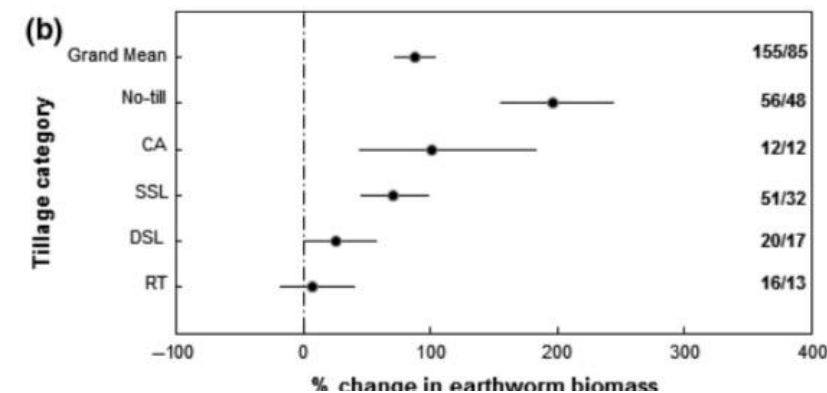
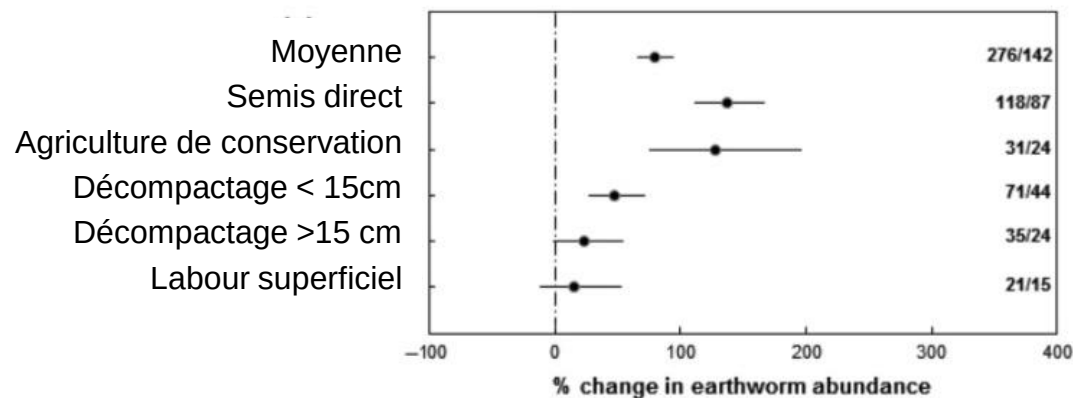
Paillis
Moindre perturbation
Porosité plus faible
Gradients



Non labour et vers de terre

Méta-analyse, 162 études,

Briones & Schmidt 2017



Effet sur les organismes

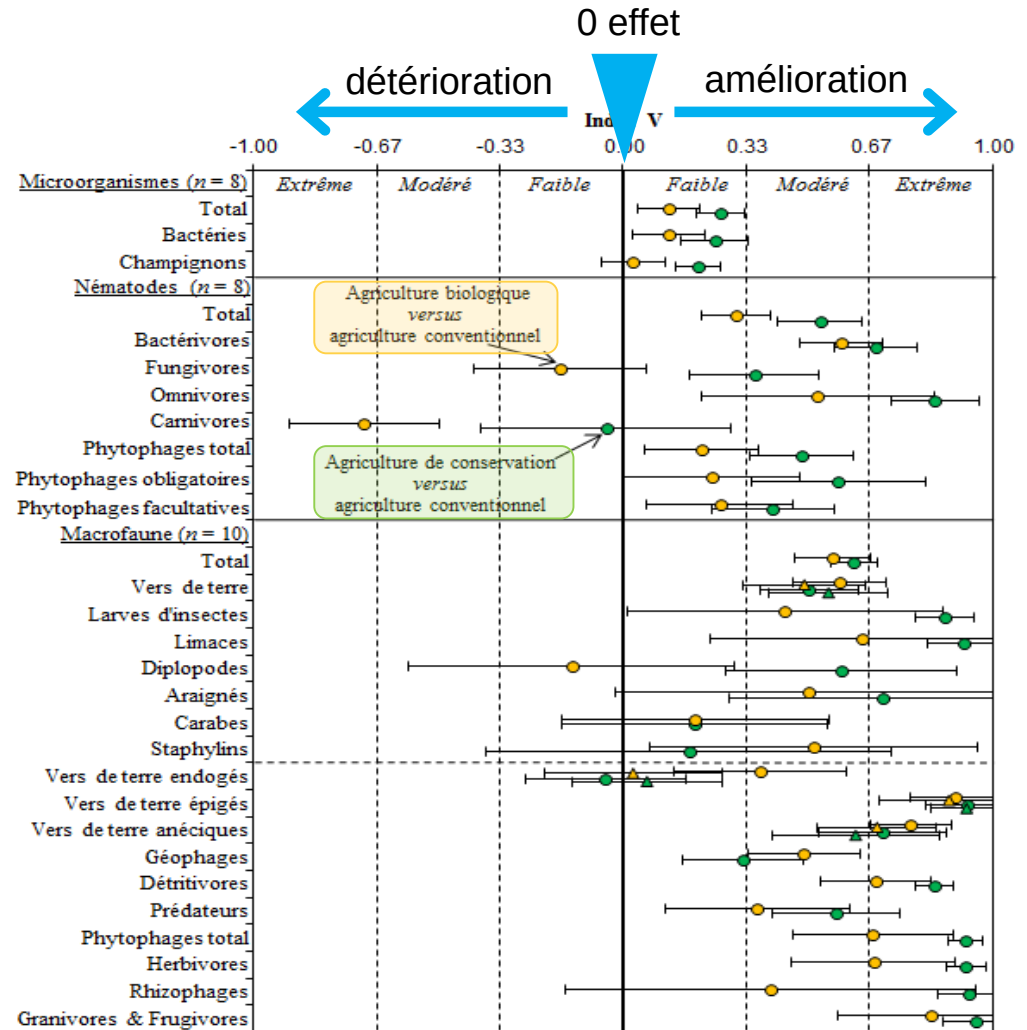
Essai La Cage, 14 ans de différenciation:

Henneron et al. 2015

Sensibilité :

- Taille des organismes
- Habitat
- Position réseau trophique

Durée de différenciation
(*Coudrain et al. 2016*)

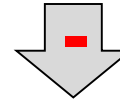


Des bénéfices du non labour via les organismes?

- Porosité

- En pot:

Pontoscolex corethrurus Boyer et al. 2013



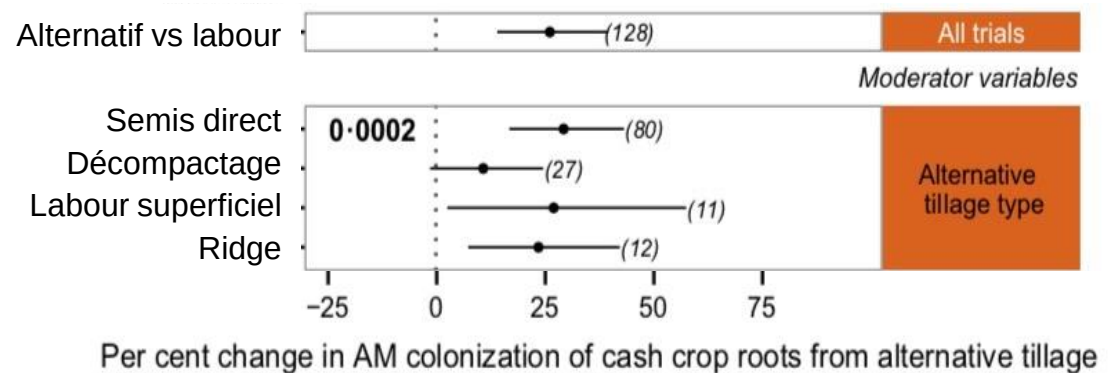
Nématodes phytophages

(*Heterodera sacchari* & *Pratylenchus zeae*)

- In situ ? Demetrio et al. 2019

- Mycorhizes

Bowles et al. 2017





Alfred Gasler Oise, mars 2009



Madagascar Htes terres déc 2007



La Cage, Yvelines avril 2011



La Cage, Yvelines oct 2013



Ph Pastoureau, Sarthe, juin 2010



Alfred Gasler Oise, mars 2009



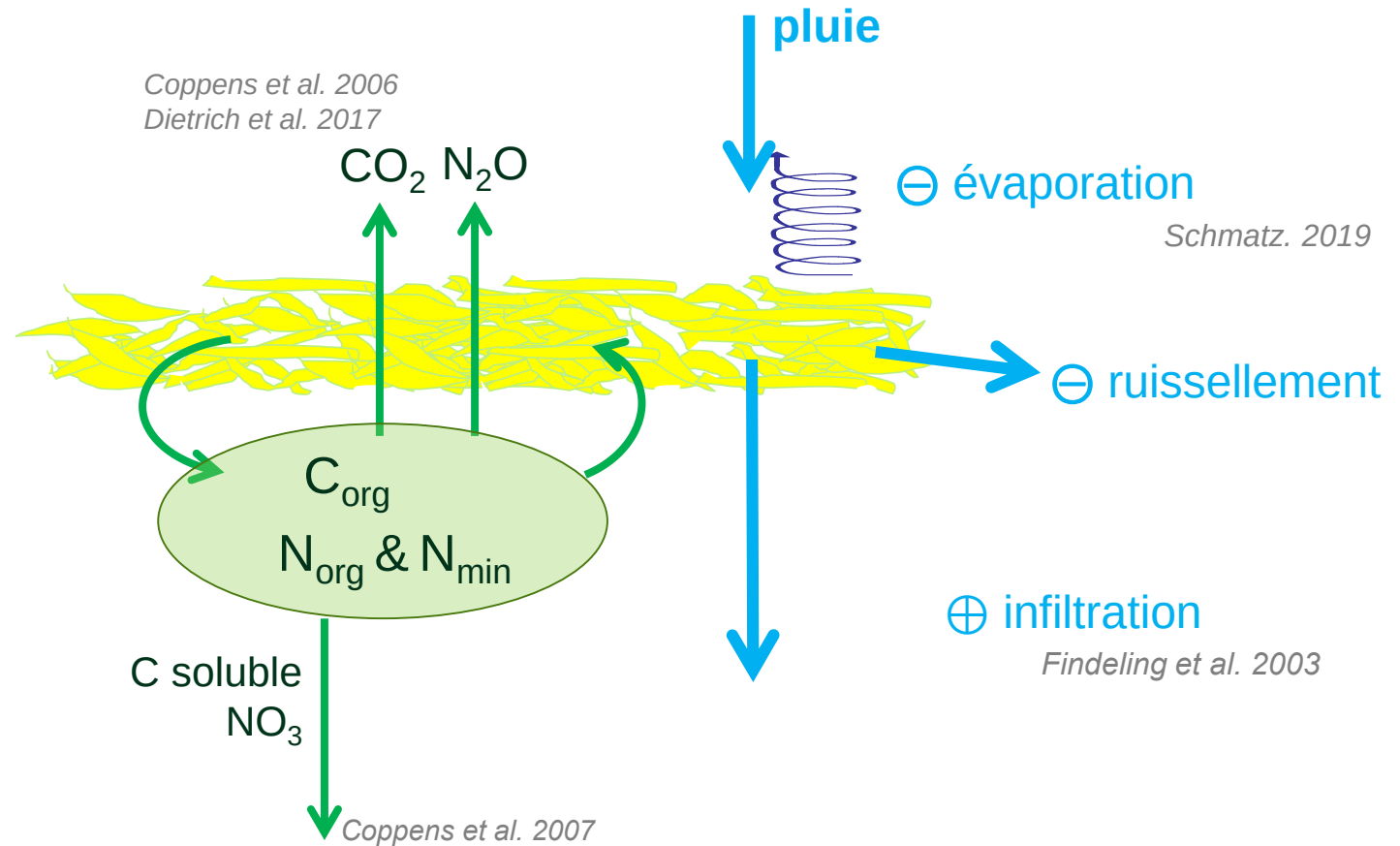
Madagascar Htes terres déc 2007



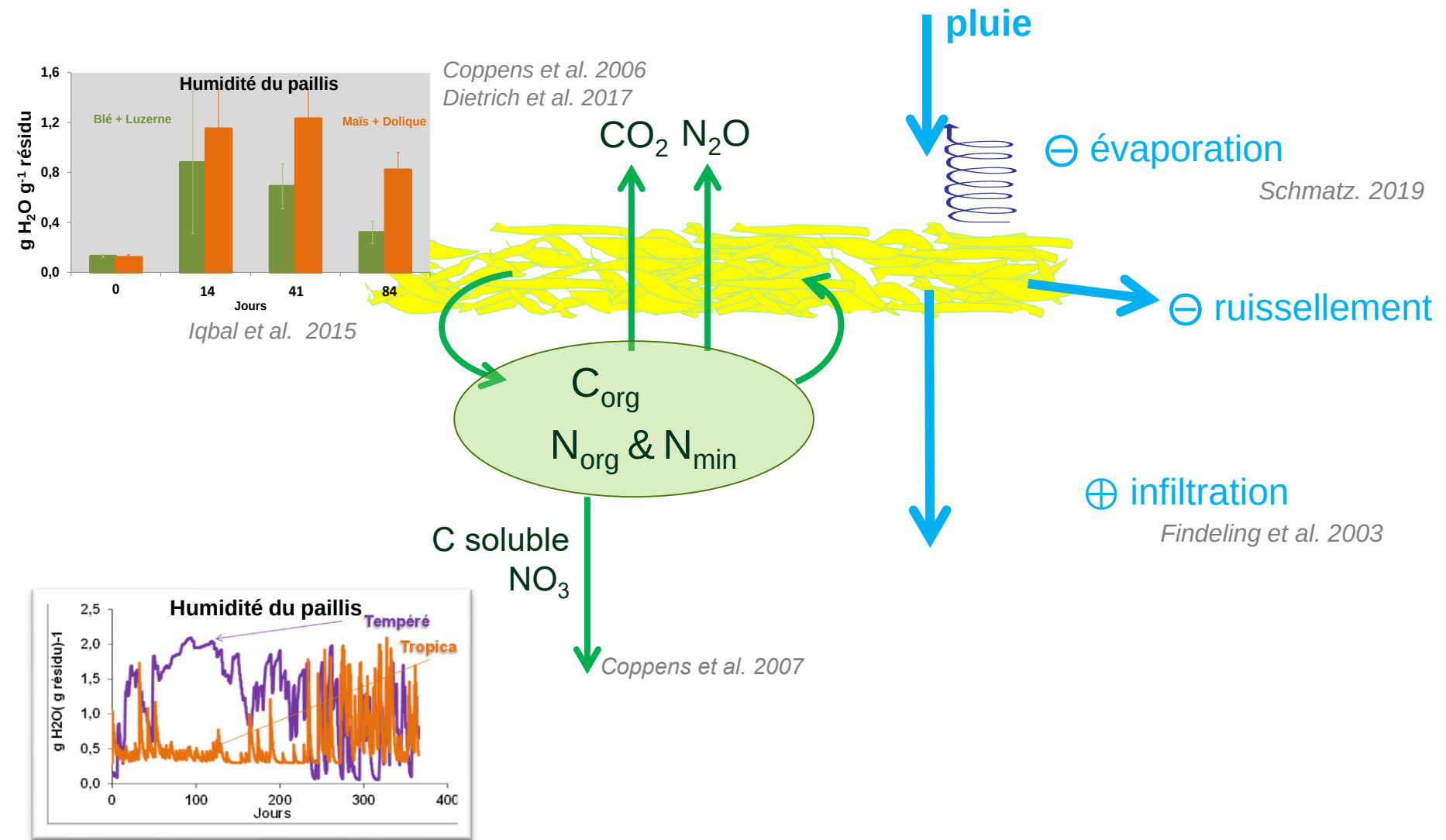
Travail et non travail en agriculture - Paris, 4 décembre 2019

photos © C. Chenu

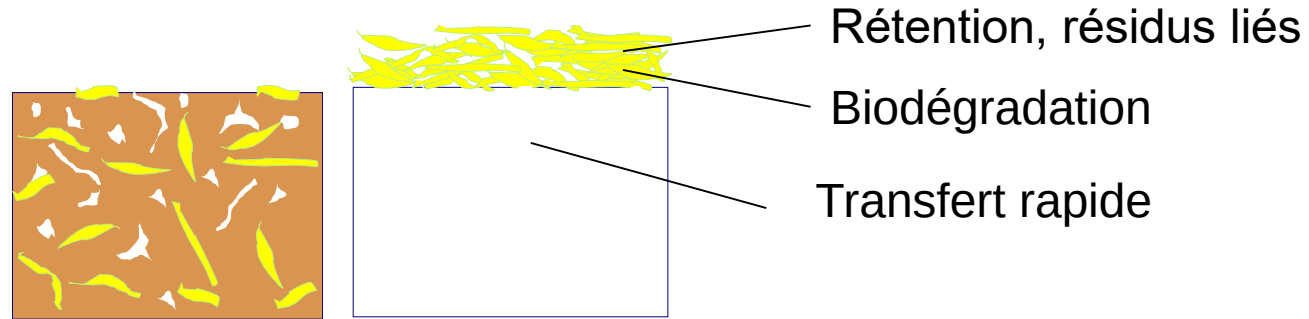
Rétention et transferts d'eau



Rétention et transferts d'eau



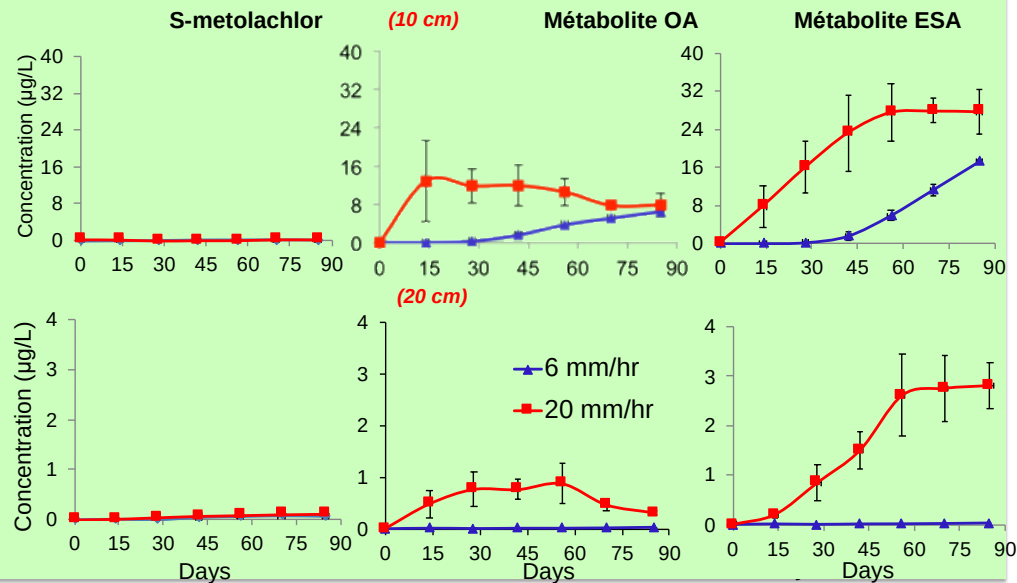
Qualité de l'eau



Maïs et Dolique
Sol limoneux



S metolachlor (sol sous le mulch)

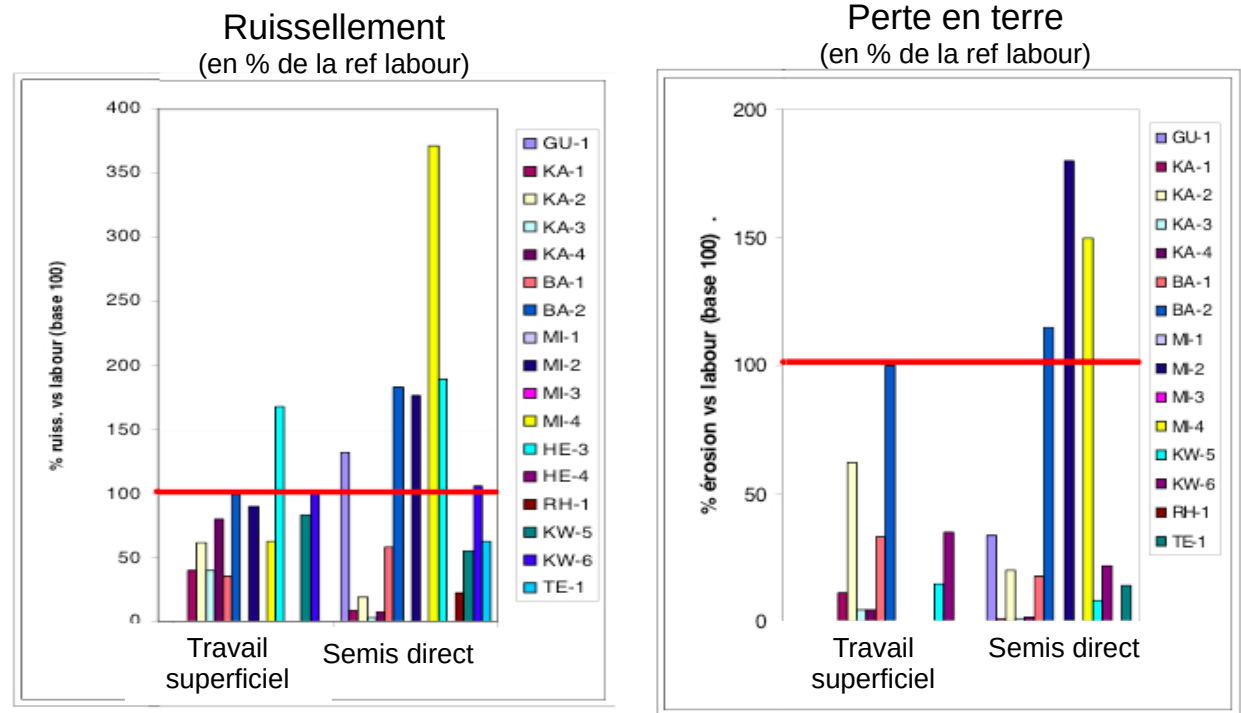


Aslam et al. 2015, 2018

Conséquences sur le ruissellement et l'érosion

☑ en agriculture de conservation (Palm et al. 2014)

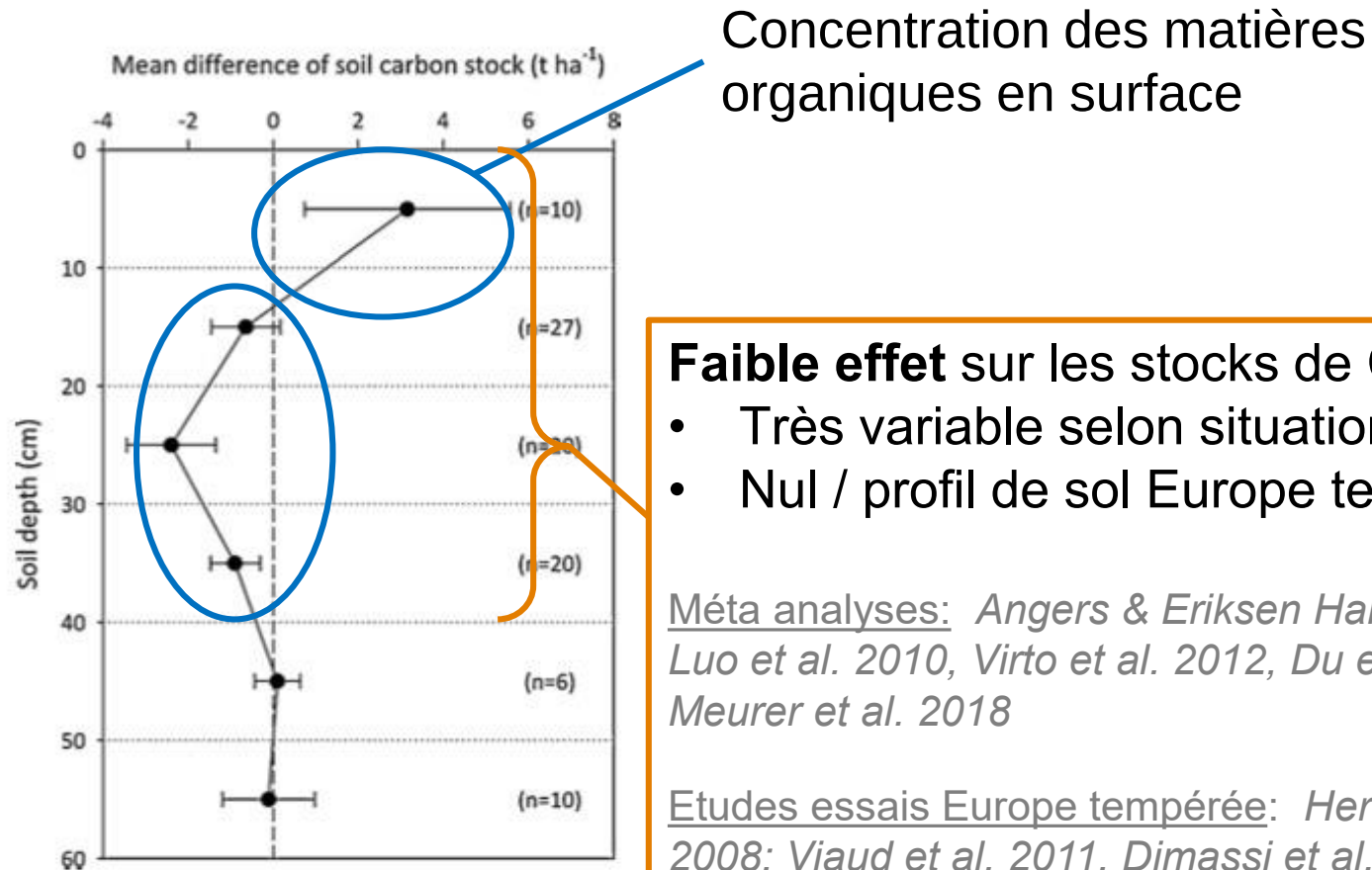
Synthèse d'expérimentations sous pluie simulée en conditions et sols tempérés:
Bonafos et al. 2007, Etude ADEME



Stockage de carbone dans le sol



Stockage de carbone dans le sol en semis direct / labour



Faible effet sur les stocks de C

- Très variable selon situations
- Nul / profil de sol Europe tempérée

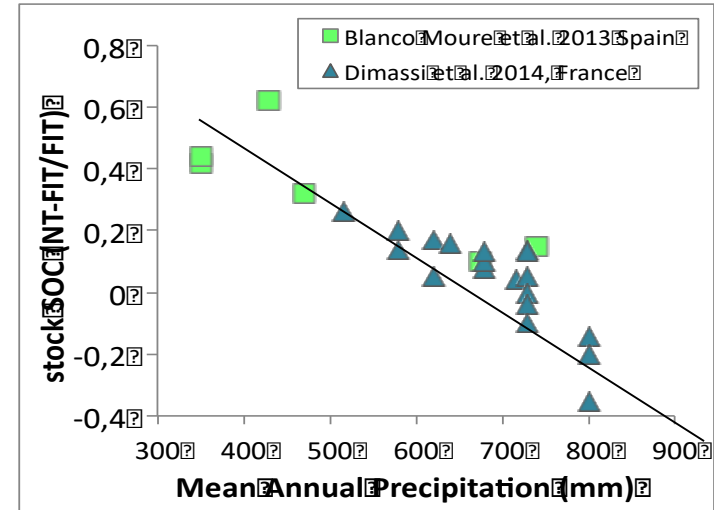
Méta analyses: Angers & Eriksen Hamel 2008, Luo et al. 2010, Virto et al. 2012, Du et al. 2017, Meurer et al. 2018

Etudes essais Europe tempérée: Hermle et al. 2008; Viaud et al. 2011, Dimassi et al. 2013, 2014, 2014, Van den Putte et al. 2012.

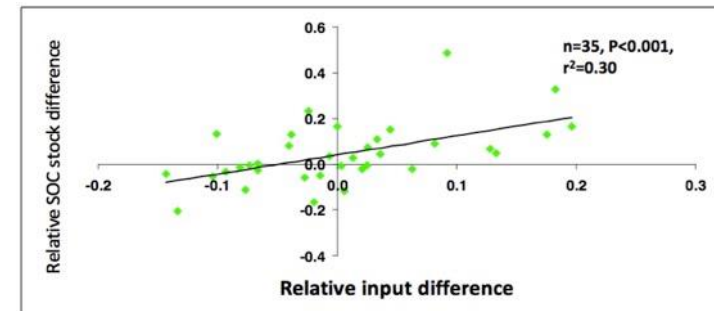
Luo et al. 2010

Déterminants du stockage de carbone dans le sol en semis direct/labour

- Pas de corrélation texture du sol
- Effet du climat : humide tempéré << sec
- Dépend des entrées de carbone au sol



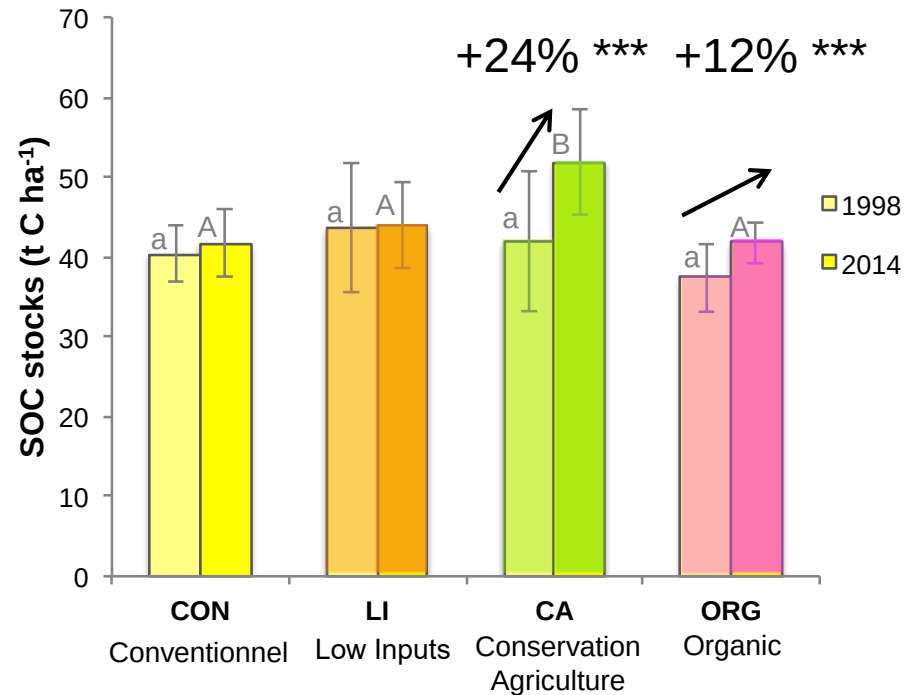
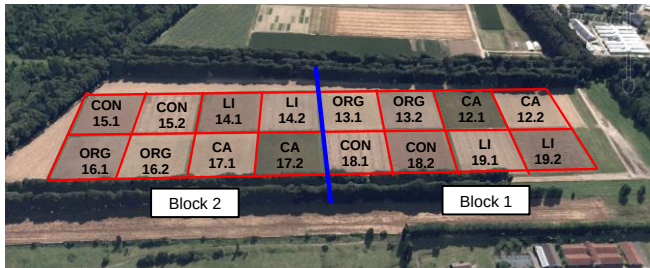
Dimassi et al. 2014



Virto et al. 2012

Stockage de carbone en agriculture de conservation

Essai de La Cage (INRA)



Autret et al. 2016

Stockage de carbone en agriculture de conservation

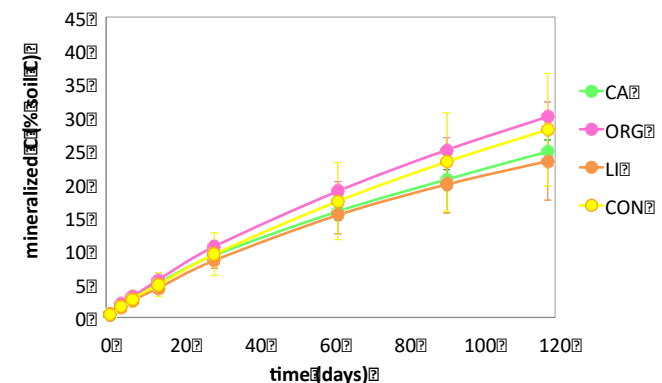
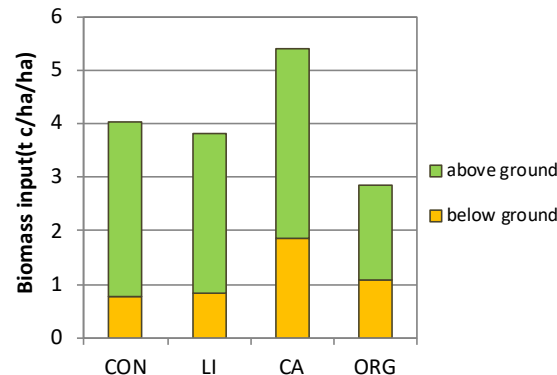
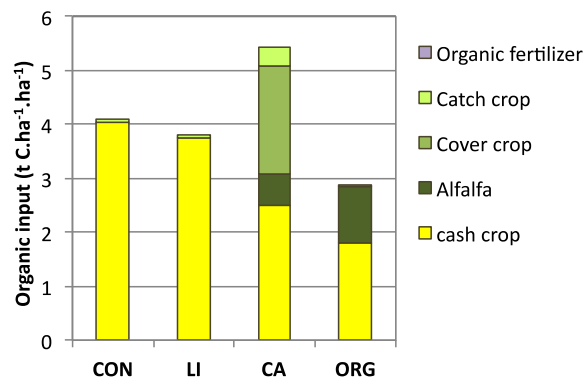
Essai de La Cage (INRA)



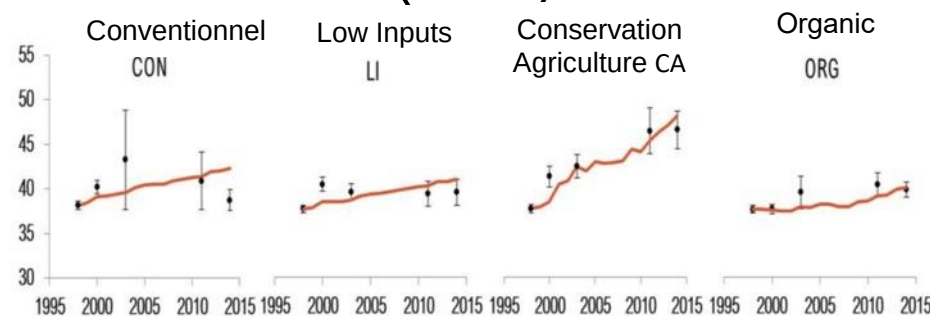
■ Entrées organiques au sol



■ Sorties : minéralisation du C



■ Modélisation (AMG)



Le stockage additionnel peut être expliqué uniquement par les entrées de C additionnelles au sol, sans changement de vitesses de minéralisation du C

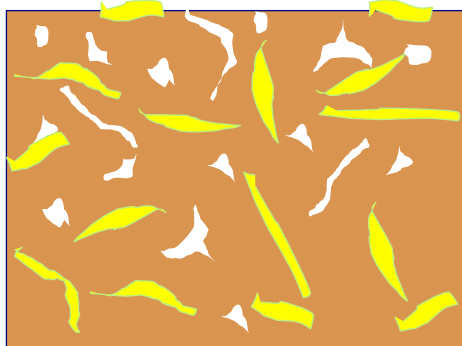
Autret et al. 2016

Autret et al. soumis

Stockage additionnel de C: processus

De nombreux processus en interaction, affectés par le climat, la nature des paillis:

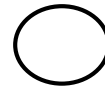
Climat sec:



1- décomposition plus lente dans le paillis *Coppens et al. 2006, Giacomini et al. 2007..*



2- $T^{\circ} <$ et humidité $>$ *(Balesdent et al. 2000; Oorts et al. 2007)*



3- MO physiquement protégée *(Puget et al. 1995, Besnard et al. 1996, Six et al. 2000, 2002, ...)*

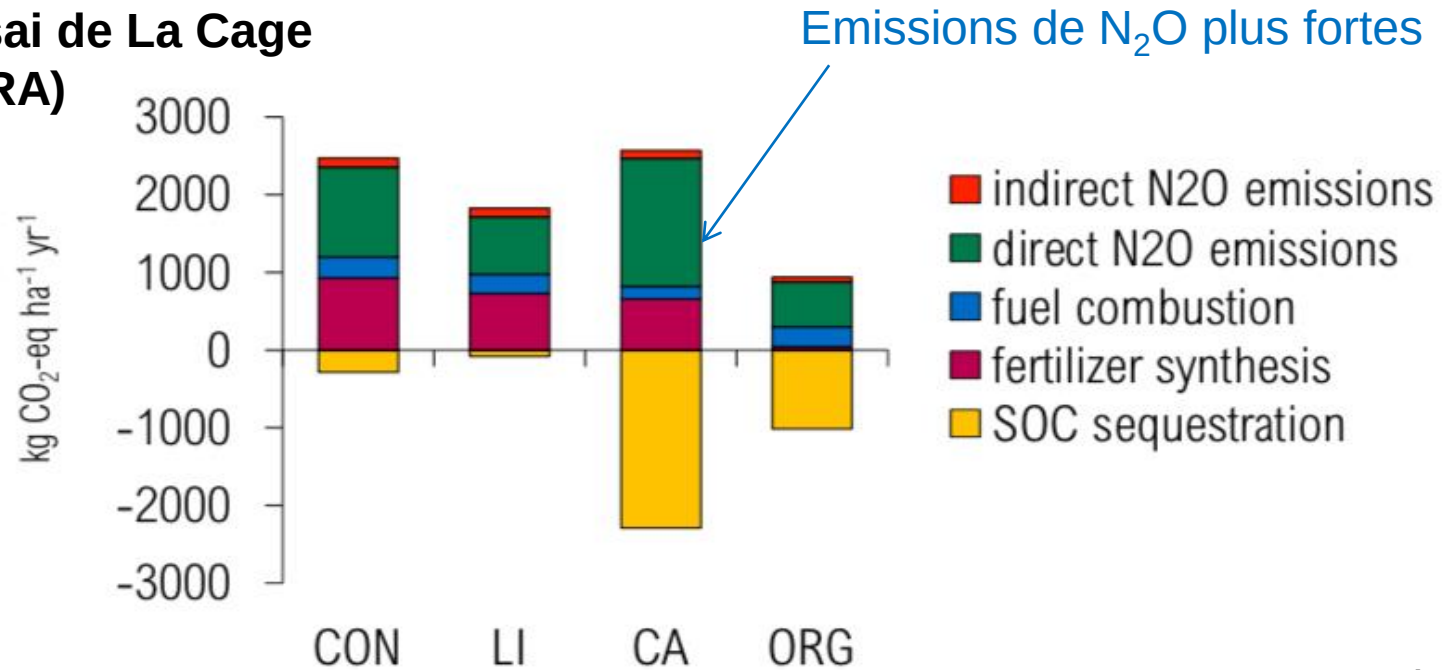
4- moins d'incorporation et transfert: - de protection *(Gregorich et al. 2009)*

Bilan émissions de gaz à effet de serre

Méta-analyse émissions N_2O paillis > résidus incorporés *Shan & Yan 2013*

Méta-analyse émissions N_2O labour vs semis direct: pas de $\neq$ *van Kessel et al. 2013*

Essai de La Cage (INRA)



Bilan net GES
 CO_2eq

Autret et al. 2018

Conclusion Effets et services environnementaux associés aux modalités de travail du sol

Des effets importants: pratiques de travail du sol, qtité & qualité résidus
de récolte, climat, type de sol

Des compromis à gérer:

Stockage de carbone

Réduction de l'érosion

Abondance et diversité organismes

Rétention d'eau

Emissions de N₂O

Tassement

Ravageurs (limaces,
fusarioses)

Des volants d'action :

Exportation/restitution des résidus de récolte, chaulage

Couverts végétaux

Merci pour votre attention

Principales références citées:

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Ainsi que :

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