Arable weeds in alley cropping agroforestry

Results of a first year survey

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● Weed management = a key-point to insure crop production
  → to avoid yield losses and other negative impacts
  → to prevent weed infestations for the following years

● Even more in alley cropping agroforestry?
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● Even more in alley cropping agroforestry?

Under-tree strip  Crop alley  Under-tree strip
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Even more in alley cropping agroforestry?

To design sustainable weed management for agroforestry, need to better know weed communities
Questions

1. Are the arable weed communities different in AF than in pure crop systems?

2. What is the impact of the uncropped vegetation strip on the distribution of weed communities in the crop alleys?
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2. What is the impact of the uncropped vegetation strip on the distribution of weed communities in the crop alleys?
Protocole: AF vs. pure crop

20-years-old experimental field in Restinclières (South of France)

2015: Barley
2016: Pea

Pure Crop
13 m width

AF walnut
Protocole: AF vs. pure crop

20-years-old experimental field in Restinclières (South of France)

Species and their abundance in 1m² plots

2015: 90 plots per system x 3 sessions
2016: 42 plots per system x 1 session
Results – Abundance

- Lower weed density in AF during the crop growth

2015 in barley
- AF
- Pure crop
Results – Abundance

- Lower weed density in AF for the spring sessions

- 2015 in barley
  - AF
  - Pure crop

- 2016 in pea in April
  - AF: 93 plants/m² ± 49
  - Pure crop: 126 ± 45
Results – Abundance

- Lower weed density in AF during the crop growth
Results – Composition

- Same most frequent species during crop growth
Results – Composition

- Same most frequent species during crop growth
Results – Composition

- Same most frequent species during crop growth
- But a greater diversity of low-abundant species in AF
Results – Richness at field scale

2015 (Cumul of March, May, Sept)

2016 (April)

Pure Crop

AF walnut

43 species

24 species

Vs.

84 species in crop
+ 66 species exclusive to the under-tree strip

Vs.

40 species in crop
+ 9 species exclusive to the under-tree strip

2015

2016

April

Cumul of March, May, Sept

Pure Crop

AF walnut
Questions

1. Are the arable weed communities different in AF than in pure crop systems?

2. What is the impact of uncropped vegetation strip on the distribution of weed communities in the crop alleys?
Protocole: weed distribution in AF

Restinclières (South of France)
2015 and 2016

AF walnut
20 years-old
13 m width

AF sorbs
20 years-old
13 m width

AF poplars
16 years-old
13 m width

Gers (South-West of France)
2016

AF timber mix
9 years-old
22 m width

AF timber mix
9 years-old
18 m width
Protocole: weed distribution in AF

Restinclières (South of France)

2015 and 2016

AF walnut
20 years-old
13 m width

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2016

AF timber mix
9 years-old
22 m width

AF timber mix
9 years-old
18 m width

2015: 7 quadrats (crop alleys + strip) x 18 repetitions
2016: 9 quadrats x 6 repetitions
Results – Species richness

- Species richness decreases when keeping away from the strip

Number of species per m²

plots

Walnut AF - 2016
Results – Species distribution

- Species richness decreases when keeping away from the strip
Results – Species distribution

- Species richness decreases when keeping away from the strip

Number of species per m²
Results – Abundance distribution

- No generic trend...
First conclusions and perspectives

1. Different weed communities in AF vs TA?
   → Same problematic weeds
   → but lower abundances and greater diversity in AF

2. Impact of uncropped strips on weed communities in AF?
   Work in progress
   Collaboration with French partners of AGFORWARD project to compare our results in 2016
First conclusions and perspectives

Perspectives

- Next year: a PhD student to work on the contribution of the uncropped strips in furnishing ecosystem services and disservices for the AF system
- Weed surveys to be continued
Thank you for your attention

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Results – Composition

PCoA: Bray-Curtis

Variation expliquée: Axe 1: 26% | Axe 2: 6%
Results – Composition

More difference of weed composition according to the crop species than between AF vs. pure crop.