OVERSEEDING A CEREALS AND PROTEIN CROP MIX IN ESTABLISHED ALFALFA : WHICH IMPACTS ON WEEDS AND PRODUCTION ?

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Alfalfa is a sensitive crop to weed soiling during the winter. This study investigates the impact to overseeding a mix of cereals and protein crop at the autumn to weed development during the winter and to the alfalfa annual production. In 2022 and 2023, six trials were carried out in west of France on established alfalfa.

Objectives

The objectives of these trials were to **investigate the impact to overseed** cereals and protein crop mix **in alfalfa on weed pressure** and **annual production.**

Treatments and Experimental design

	Treatment name	Overseeding and type of Mix (seeds/m²)	Harvest strategy	Weeded
M1	Early Ctrl	No Overseeding	Early	No
M2	Classic Ctrl	No Overseeding	Classic	No
M3	Weeding Ctrl	No Overseeding	Classic	Yes
M4	Seeder Ctrl	Seeder alone	Classic	No
M5	Early Clover Mix	Rye(150)/Com. V.(20)/C. Cir.(110)	Early	No
M6	Early Faba. Mix	Rye(100)/Com. V.(25)/Faba.(10)	Early	No
M7	Classic Faba. Mix	Rye(100)/Com. V.(25)/Faba.(10)	Classic	No
M8	Classic rye fertilized	Rye(300) + 2x45 kg N/ha [1]	Classic	No

D = Weeded, ND = Not weeded
Alf. = alfalfa, C. Cir. = Cirmson Clover, Com. V.= Common Vetch, Faba. = Faba bean
[1] Fertilization strategy (M8): 45 kg N/ha at 200 °C days from 01/01 + 45 kg N/ha 3 weeks later

6 trials :

- ARVALIS and CAPDL trials on forage production : 3 to 5 harvests a year, inter-row of alfalfa 12 to 20 cm.
- FNAMS trials on alfalfa seed production : 1 forage harvest and 1 seed harvest, inter-row of 50 cm.

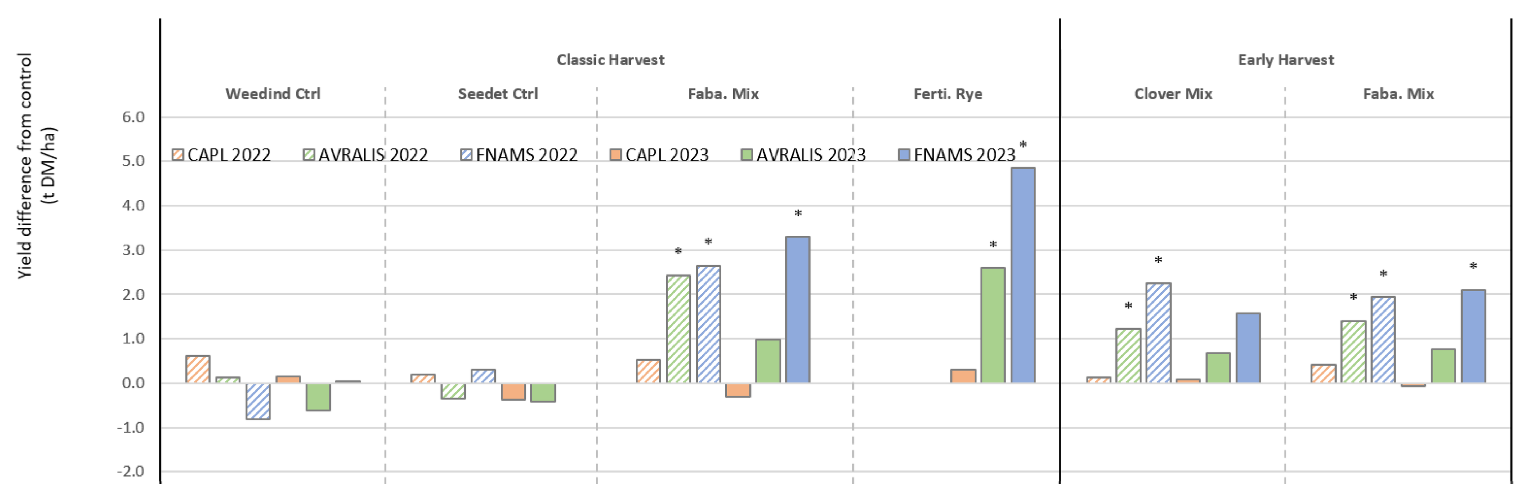
Experimental Design : blocs with 3 or 4 replicates.

Harvest strategy :

→ Early = initiation stage of alfalfa (mid April).
→ Classic = budding stage of alfalfa (early May).
→ Next harvest : budding stage, 5 to 7 weeks growth.

Weeded M3 : Chemical for ARVALIS and CAPDL trials, mechanical for FNAMS trials.

Yield difference from control at first cut



	Classic harvest - control yield (t DM/ha)	Early harvest - control yield (t DM/ha)	ETR (CV)
CAPDL 2022	4.95	3.61	0.53 (11.4%)
CAPDL 2023	4.88	3.47	0.20 (4.7%)
ARVALIS 2022	4.85	3.21	0.31 (6.4%)
ARVALIS 2023	5.27	3.55	0.40 (7.8%)
FNAMS 2022	4.58	2.35	0.49 (10.7%)
FNAMS 2023	2,69	2.49	0.71 (16.6%)

*ANOVA with Tukey's test for each trial (α = 0.05). * = significantly different from control (same harvest strategy).*

Classic harvest :

+ **Faba bean mix :** Significant gain on **3/6 trials** ranging from **2.44 to 3.29 t DM/ha.**
Fertilized Rye : Significant gain on **2/3 trials** ranging from **2.60 to 4.84 t DM/ha.**

Early harvest :

+ **Clover mix** : Significant gain on **2/6 trials** ranging from **1.22 to 2.25 t DM/ha.**
Faba bean mix : Significant gain on **3/6 trials** ranging from **1.41 to 2.10 t DM/ha.**

+/- **No effect was observed in the CAPDL trials** : cereal and protein crop mixtures established well but did not survive the winter.

+ **Annual performance :**

- The improvement persists in the annual forage yields.
- Seed yield of alfalfa was unaffected (FNAMS Trails).

Weed biomass difference from control at first cut

	Classic harvest - control weed biomass (t DM/ha)	Early harvest - control weed biomass (t DM/ha)	ETR (CV)
CAPDL 2022	0.70	0.66	0.31 (8.6%)
CAPDL 2023	0.11	1.11	0.27 (48.5%)
ARVALIS 2022	1.83	1.39	0.40 (47.6%)
ARVALIS 2023	2.05	1.12	0.94 (68.6%)
FNAMS 2022	0.51	0.20	0.17 (57.3%)
FNAMS 2023	1.04	1.52	0.57 (48.9%)

*ANOVA with Tukey's test for each trial (α = 0.05). * = significantly different from control (same harvest strategy).*

+/- **No clear effect of overseeding on weed control.**
No statistical test was significant : data were highly variable.

Nutritional quality

- **Crude Protein decrease** with cereal and protein crop ranging form :
  - 2 to 4.5 pts for early harvest.
  - 3 to 8 pts for classic harvest.

- **UFL** (Milk Feed Unit, INRAE net energy system for lactation) **decrease** ranging from 0.02 to 0.08 UFL/kg DM.

Conclusion

+ **Overseeding cereals and protein crop can provides:**
  - **Early harvest :** a gain of 1.22 to 2.25 t DM/ha, with a decrease of about 2 percentage points in crude protein (CP) and a reduction of 0.04 UFL/kg DM.
  - **Classic harvest :** a gain of 2.44 to 3.29 t DM/ha, with a decrease of about 3 percentage points in crude protein and a reduction of 0.06 UFL/kg DM.

+ Overseeding rye and fertilizing it provided higher gains (2.6 to 4.8 t DM/ha), but the nutritional quality of the first harvest was lower (-8 pts CP and -0.12 UFL/kg DM).

+/- The expected weed control effect of overseeding was not observed.

+/- Higher success rates were observed in alfalfa seed production, but further studies are needed to improve implantation success in forage alfalfa.

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