

Influence of cover crop management on sugar beet production

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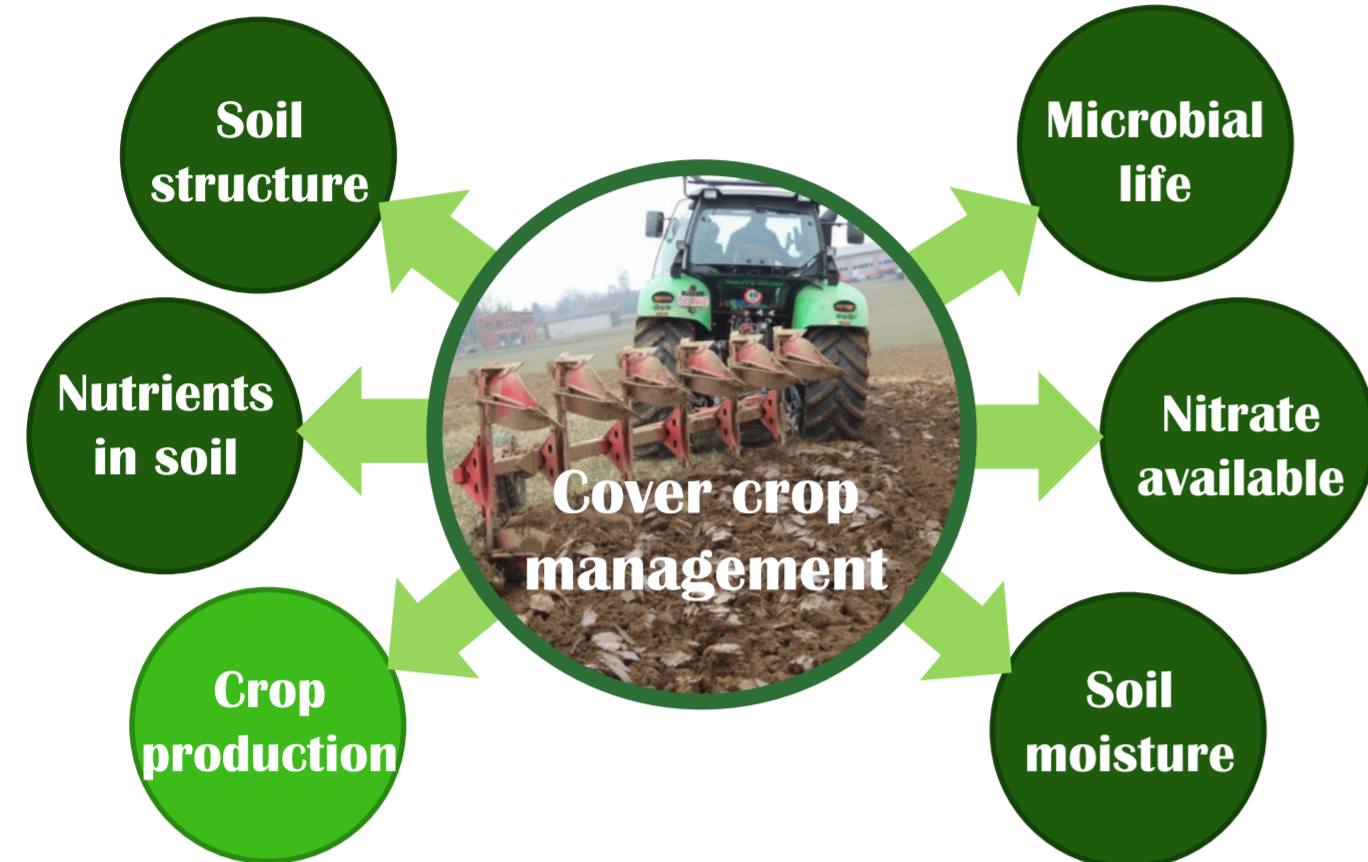
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Context

Cover crop = source of organic matter → Maintain soil fertility

The aim of our project is to **understand all major processes involved in cover crop management in the soil-water-plant systems** in silty loam soil and temperate climate.



In this context **we focus on beet production** from two different experimental field and weather conditions (2013 and 2014).

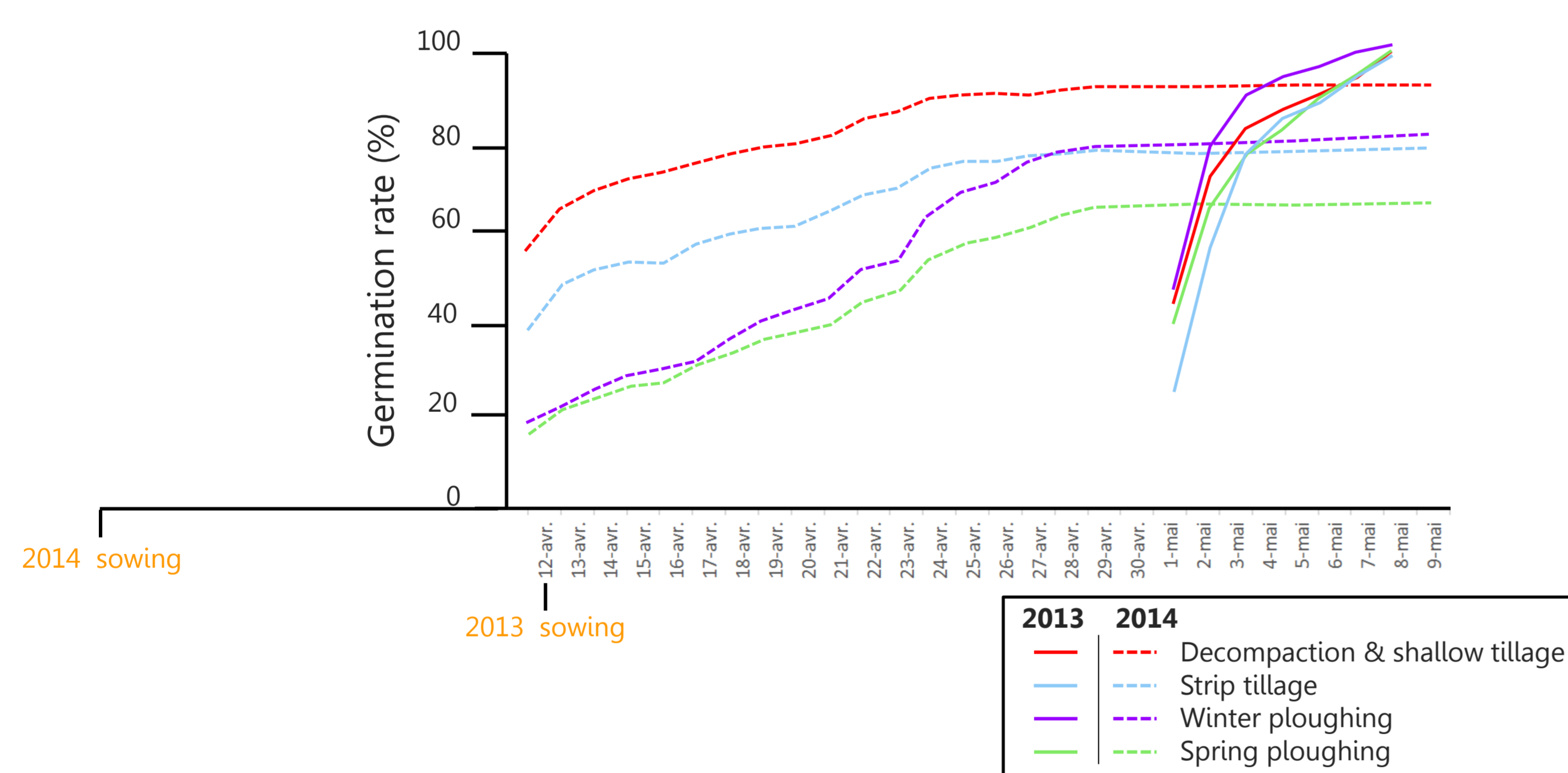
Results

Weather conditions

2013 : cold spring and dry summer
2014: warm and dry spring, rainy summer

Germination rate

No effect of modalities in both year BUT rate higher in 2013 and differences in the dynamics.
In 2014 : 7mm of rain in two days → crust formation particularly in ploughing plots.



Yield

	Decompaction Shallow tillage		Strip tillage		Spring ploughing		Winter ploughing	
	2013	2014	2013	2014	2013	2014	2013	2014
Beets yield (t/ha)	80,8	86,7**	79,8	83,4**	79,9	86,9**	81,4	94,4**
Sugar yield	15,12	15,17***	15,12	14,88***	15,08	15,45***	15,34	16,9***
Sugar yield (t/ha) at 16%	94,5	94,9***	94,5	93,0***	94,3	96,6***	96,1	105,6***
Sugar (%)	18,72	17,51	18,94	17,82	18,88	17,78	18,88	17,89
αN	0,79	0,74*	0,81	0,81*	0,92	0,83*	0,80	0,86*
K	3,35*	3,02	3,22*	3,01	3,20*	2,82	3,14*	2,91
Na	0,20	0,24	0,19	0,24	0,21	0,23	0,20	0,24

Significant codes : P < 0,01 ****, P < 0,05 ***, P < 0,1**; colors for different statistical group

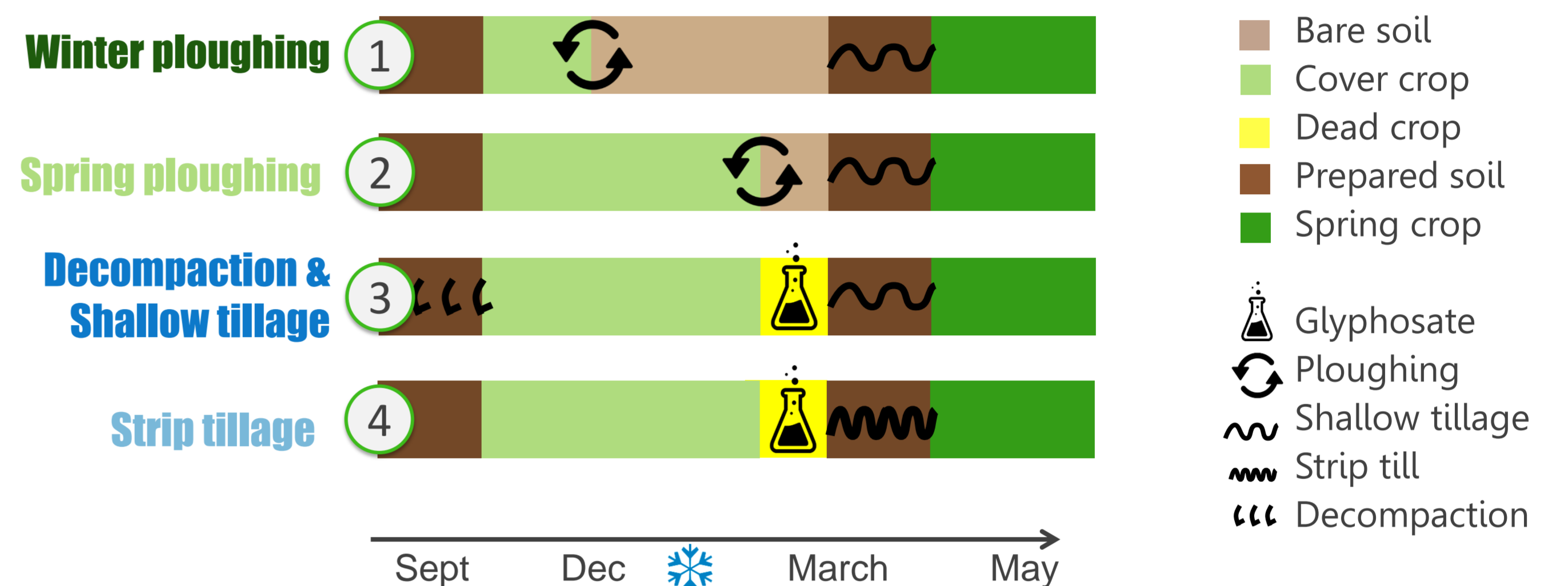
Weeds

- 2013:**
- Difference between decompaction (low) and ploughing (high)
 - Importance of rotation on rapeseed occurrence
 - Diversity in weeds higher in strip tillage
- 2014:**
- Slight effect (P=0,055) of tillage on weed occurrences.
 - Higher quantity in strip tillage

Methods

Two field with same protocol but delayed by one year.
Contrasted cover crop managements :

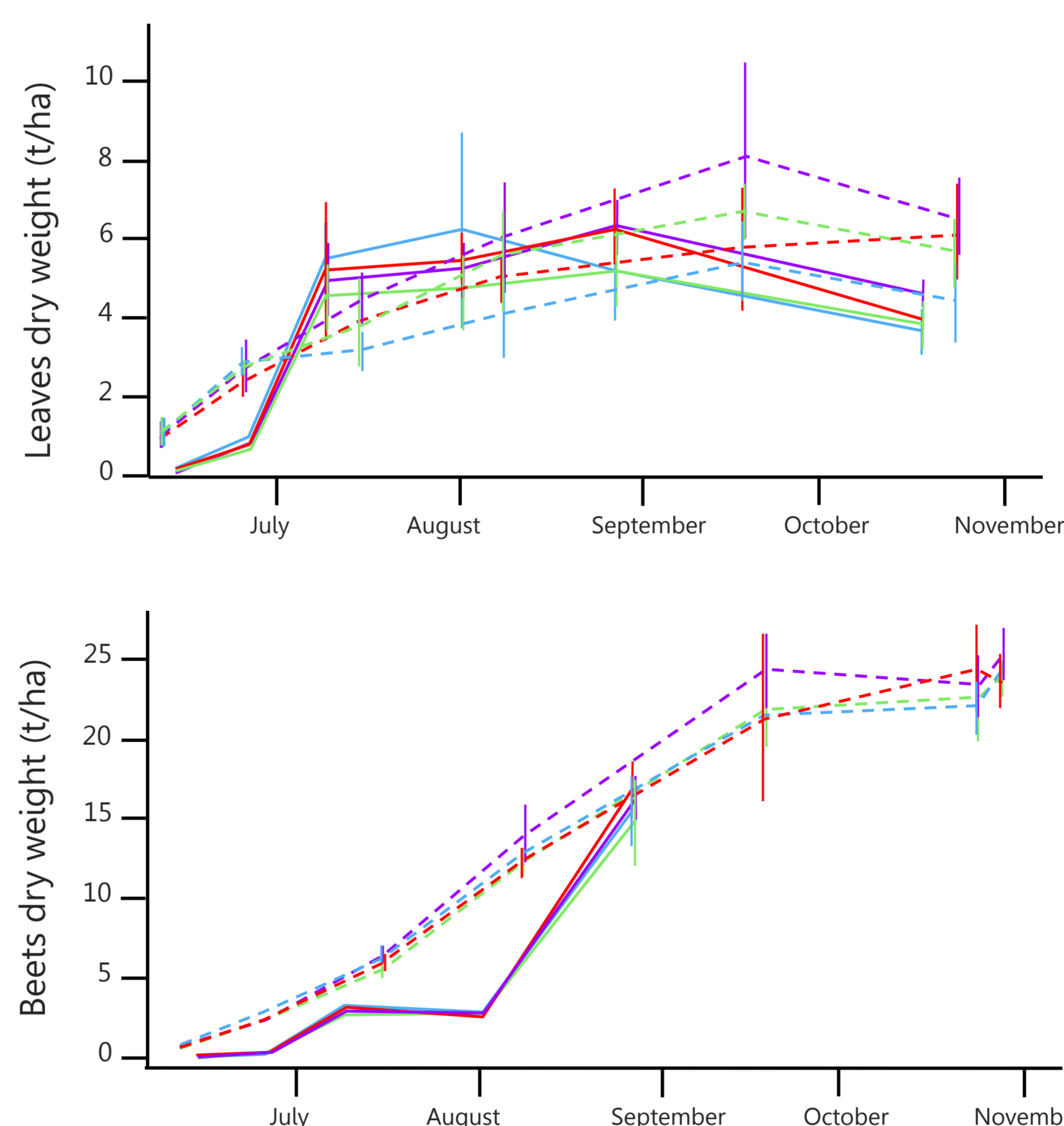
- Time of intervention: winter ↔ spring
- Intensity of tillage: plow ↔ reduced tillage
- Cover crop destruction mode: physical ↔ chemical
- Main crop soil preparation: 100% ↔ 30% disruption
- Crop residue placement: -25 cm ↔ -10 cm ↔ top soil



Cover crop

2013: 1,4 t/ha buried in winter ploughing, 1,1 t/ha in other treatments → frost
2014: 1 t/ha buried in winter ploughing, 2 t/ha in other treatments → mild winter

Leaves & beets growth



Conclusions

- Weather conditions and soil humidity are crucial during sowing period
- Strip tillage is quite technical, not user friendly
- Weather conditions have major impact on crop production
- Difference observed on sizes and shapes on beets during growing season did not impact yield
- Higher yield in winter ploughing in 2014
- No significant differences in 2013
- Tillage has great impact on weed occurrences → importance of knowing cultural past.

In order to fully understand the impact of cover crop management on crop production, further years of experiment are needed due to the high importance of weather on crop development.