



CONTEXT

CAMA Project adopted a participatory approach to identify and study a set of conservation agriculture practices and innovations in farmers' fields. Focus groups were organised to discuss about the technical needs and questions of farmers on conservation agriculture under Mediterranean conditions, resulting in **four key priorities**:

1. **Weed control**
2. **No Till Seeding**
3. **Crop fertilization**
4. **Crop rotation and Cover crops**

The project tested and measured some of the innovations in farmers' fields. The goal of this task was to quantify technical obstacles to productivity in conservation agriculture under Mediterranean conditions.



WORK DONE IN CAMA PROJECT

To characterize the agronomic performances of the technical itineraries implemented by farmers, a method called Diagchamp[®], developed by Arvalis, was used on cereals. "Diagchamp" is based on an experimental approach: it is not *analytical* (where the modalities of one or two factors are compared, all other things being equal), but *diagnostic* (considering a whole cropping system with several interacting factors that are not controlled), trying to understand and explain the phenomena that are occurring, as a doctor would with a patient. All along the campaign, fields measurements (soil nitrogen residues and moisture, wheat biomass, yield and yield components) were realized by the technicians, completed by crop modelization (CHN model) to characterize nitrogen and water stress. The modelization also allows to quantify the gap between fields 'measures and a climatic potential biomass, to identify yield losses due to other limiting factors than the climate (weeds, nitrogen fertilization...).



RESULTS

The main results are presented in the following table, summarized by themes

Theme	CAMA learning	Futur prospect
Theme 1 : weed control	<ul style="list-style-type: none"> • Positive effect of crop rotation (legume) • Glyphosate dependency 	<ul style="list-style-type: none"> • Economic market should be more developed for crop diversification • Alternatives to glyphosate ?
Theme 2 : seeding	<ul style="list-style-type: none"> • No significant yield differences between No Tillage and Conventiounal Tillage • But more risks of limiting factors in No Tillage • Reduction of compaction risks with crop rotation and plant cover 	<ul style="list-style-type: none"> • Nitrogen mineralization dynamic in No Tillage. • Accessibility to machines
Theme 3 : crop fertilization	<ul style="list-style-type: none"> • No very big differences in fertilization strategies in Conservation Agriculture. • Positive impact of legumes as previous crop in situations with nitrogen stress. 	<ul style="list-style-type: none"> • Decision support tools need to be more better configured for Mediterranean and CA agriculture conditions. • Nitrogen residues dynamics in relation to Mediterranean climate and CA specifies
Theme 4 : crop rotation	<ul style="list-style-type: none"> • Semi permanent cover to have soil covered in summer. • Genotypes adapted to CA 	<ul style="list-style-type: none"> • Genetic selection of semi permanent cover to minimize competition with crop. • Define ideotypes adapted to CA

- **On weed management**, a positive effect of crop rotation was noticed, especially to control *Lolium*, thanks to herbicides rotation. There is also a positive effect of pluriannual legume as previous crops (onobrychis, alfalfa) for cereals due to mowing and weeds exportation out of the field. About herbicides uses, Glyphosate remains essential in no-till systems and efficient to manage weeds.
- **On seeding**, some data have demonstrated a positive effect of plant cover and crop rotation on soil compaction under conservation agriculture. No significant yield differences have been noticed in generally between conventional tillage and minimum tillage or direct sowing.
- **On crop fertilization**, the experiments have not demonstrated differences on nitrogen efficiency comparing type of fertilizers (ammonium, urea or urea with inhibitor) on wheat, but investigations must be continued. In any cases, legume as previous crops seems to improve nitrogen nutrition in situations with low fertilization possibilities due to the climatic or socio-economical context.
- **On crop rotation**, the observation is established of the difficulty of covering the soil in summer in Mediterranean conditions. Semi-permanent cover seems to be an interesting innovation to be tested and adapted in other countries than France.

CAMA PROJECT FACTSHEET



Agronomic innovations to reduce limiting factors in conservation agriculture in the Mediterranean Area



CONCLUSIONS AND RECOMMENDATIONS

In summary, some technical itineraries have been identified to secure conservation agriculture in Mediterranean area. The development of these innovations will require working on socio-economic levers like economic market for crop diversification or accessibility to machines and inputs. To develop and progress in conservation agriculture more fields experiments are necessary around Mediterranean area on common questions but worked with adaptations according to each local context:

- **Crop rotation possibilities to control weed and improve nitrogen nutrition.**
- Measurements to have a better understanding of **dynamic of soil nitrogen residues** in Conservation Agriculture under Mediterranean conditions.
- **Decision Support Tool to manage efficiently fertilization** in Mediterranean conditions;
- Identify species and genotypes adapted to arid conditions for semi-permanent cover (in relation with grazing) and crop cultivated under conservation agriculture.

References

Deliverable 3.3 - *“Diagchamp field notebook”*: main interventions, problems and diagnostic steps of the Diagchamp are noted during the innovation testing

Deliverable 3.4 - *Global innovation fields analysis, results and lessons learned*

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