

# 3 ACCA

THIRD AFRICA CONGRESS ON  
CONSERVATION AGRICULTURE  
5-8 June 2023 | Rabat, Morocco



# Production of annual forage legume mixtures under CA in Morocco

**Imane AMGHAR, PhD Student**  
**Hassan II Agronomic and Veterinary Institute Rabat**

Theme:  
Building a Resilient Future in Africa  
through Conservation Agriculture and Sustainable  
Mechanization



### Organizers



### In Collaboration with



### Gold Sponsors



### Silver Sponsors



### Bronze Sponsor



# Production of annual forage legume mixtures under CA in Morocco



## PLAN

**01** INTRODUCTION

**03** MATERIAL AND METHODS

**05** CONCLUSION

OBJECTIVES **02**

RESULTS AND DISCUSSION **04**

# Production of annual forage legume mixtures under CA in Morocco

1 Introduction

THE 3 PRINCIPLES OF CONSERVATION AGRICULTURE



# Production of annual forage legume mixtures under CA in Morocco

## 1 Introduction

### ADVANTAGES OF:



Protection of soil from water and wind erosion.



Reducing fuel, time and labor costs in the long term.



Improving water infiltration and conserving soil moisture.



Increasing crop yields per unit of fertilizer or manure applied. Long-term decreasing the amount of fertilizer per hectare.

# Production of annual forage legume mixtures under CA in Morocco

## 1 Introduction

### ADVANTAGES OF:

2  
Permanent soil cover with crop residues and live mulches



Protecting the soil from water or wind erosion.



Suppressing weeds.



Improving recycling of nutrients.



Improving organic matter accumulation and carbon sequestration

# Production of annual forage legume mixtures under CA in Morocco

## 1 Introduction

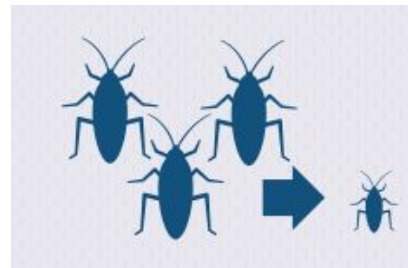
### ADVANTAGES OF:

# 3

Crop rotation and intercropping



Improving water use efficiency



Reduction of pest populations and plant diseases



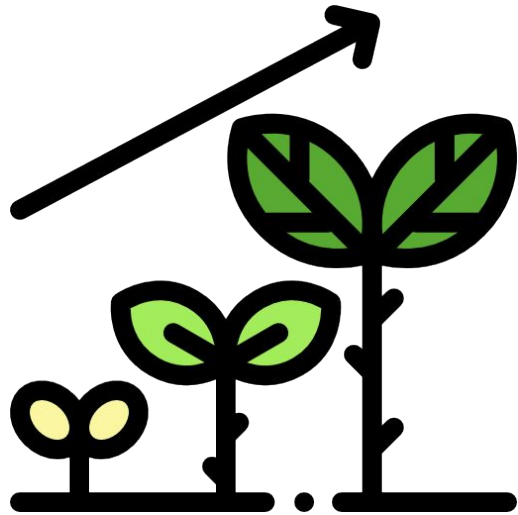
Increasing soil fertility and yield

# Production of annual forage legume mixtures under CA in Morocco

## 1 Introduction

### CA in Morocco

- An alternative strategy:
  - Increase wheat yields
  - Reduce soil degradation
- Caused by conventional tillage and excessive stubble grazing (Mrabet et al, 2003)



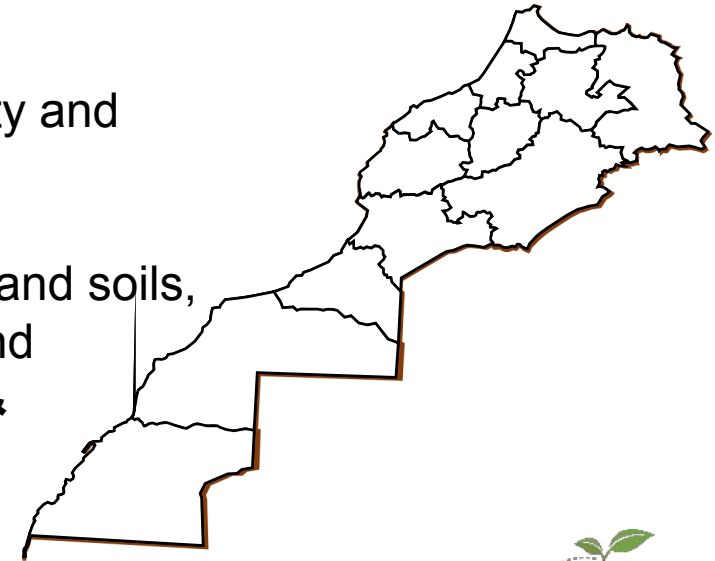
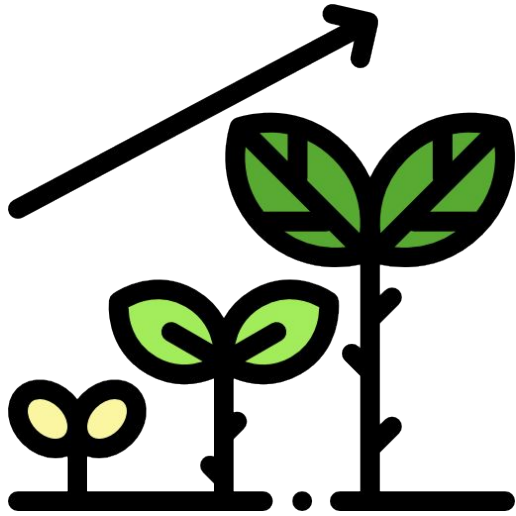


# Production of annual forage legume mixtures under CA in Morocco

## 1 Introduction

### CA in Morocco

- Intercropping of cereals and legumes in CA:
- Restore soil fertility, (Emile, J. C. et al., 2016), (especially in a Moroccan pedoclimatic context, characterized by arid and semi-arid areas).
- Ability to reduce weed pressure, improve soil fertility and structure (Moussadek et al., 2011).
- Reduce competition for biomass between animals and soils, intercropping increases protein yields of forages and improves their nutritional value. (Mupangwa, W., & Thierfelder, C, 2015).

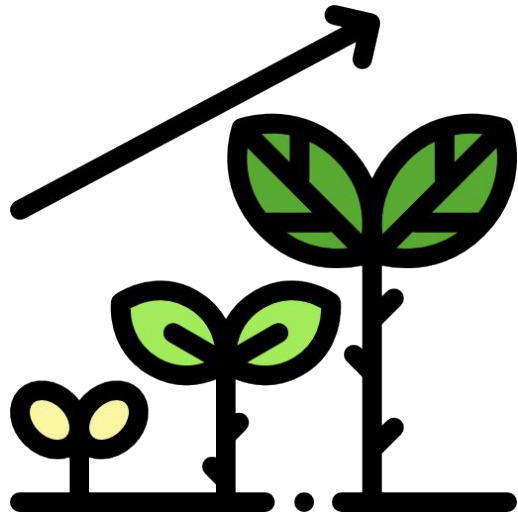


# Production of annual forage legume mixtures under CA in Morocco

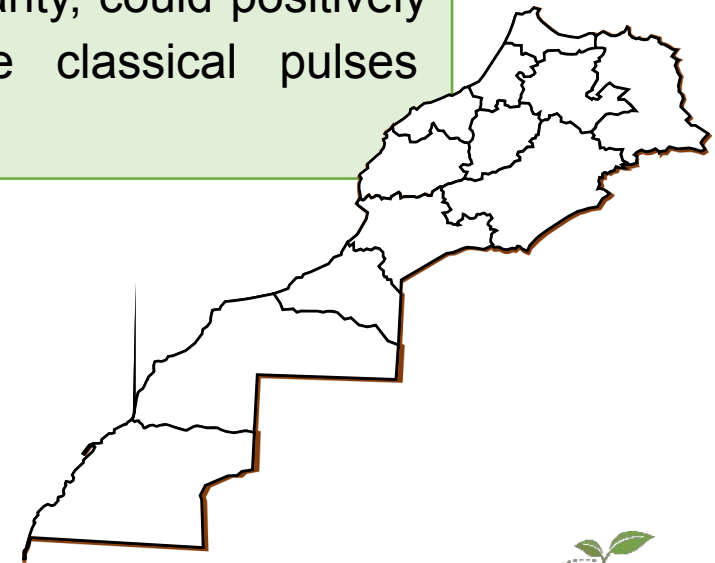


## 1 Introduction

### CA in Morocco



- Annual forages in the system, and **the interactions of the mixture**, based on functional complementarity, could positively affect **yield stability** compared to the classical pulses production as sole crops.



# Production of annual forage legume mixtures under CA in Morocco

## 2 Objectives

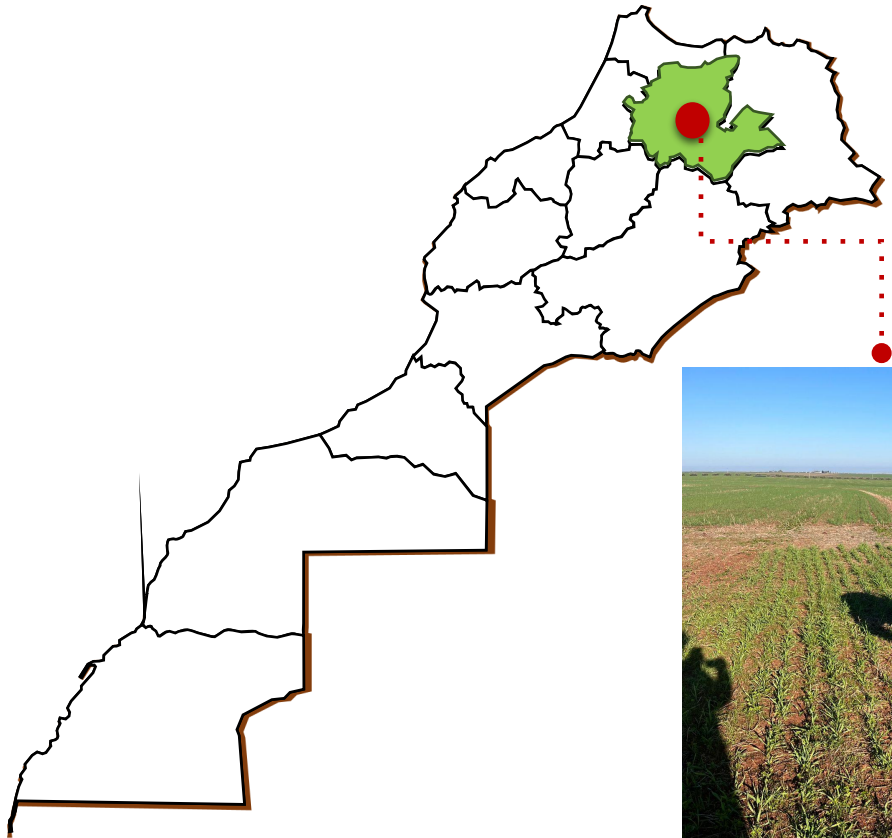
The objectives of this work can be formulated in three points:



- ✓ Evaluate the productivity of legumes and cereals in monoculture, and in association
- ✓ Evaluate the density of weeds in the pure culture and association
- ✓ Identify the best cereal-legume combinations

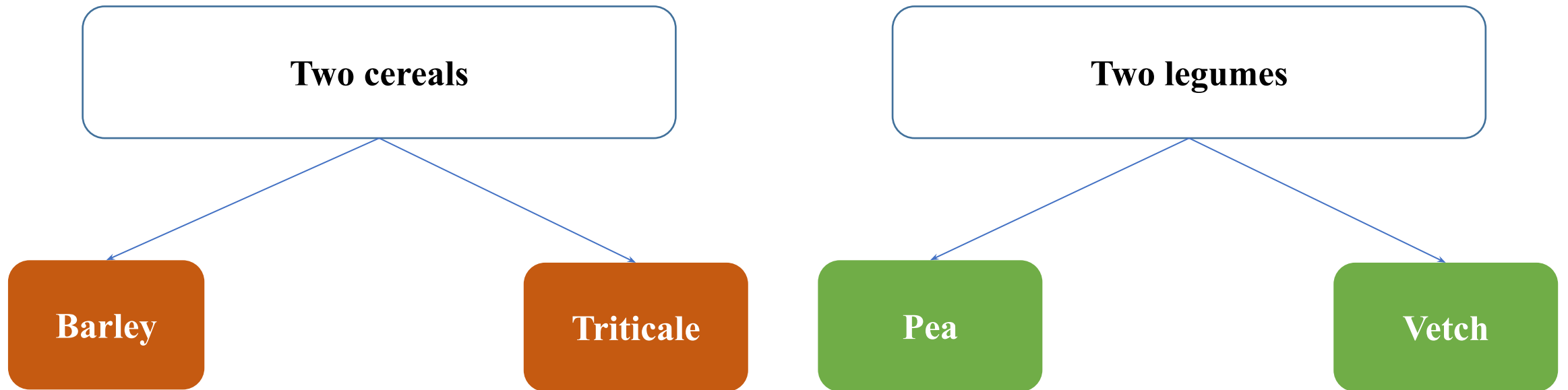
# Production of annual forage legume mixtures under CA in Morocco

## 3 Material and Methods



# Production of annual forage legume mixtures under CA in Morocco

## 3 Material and Methods

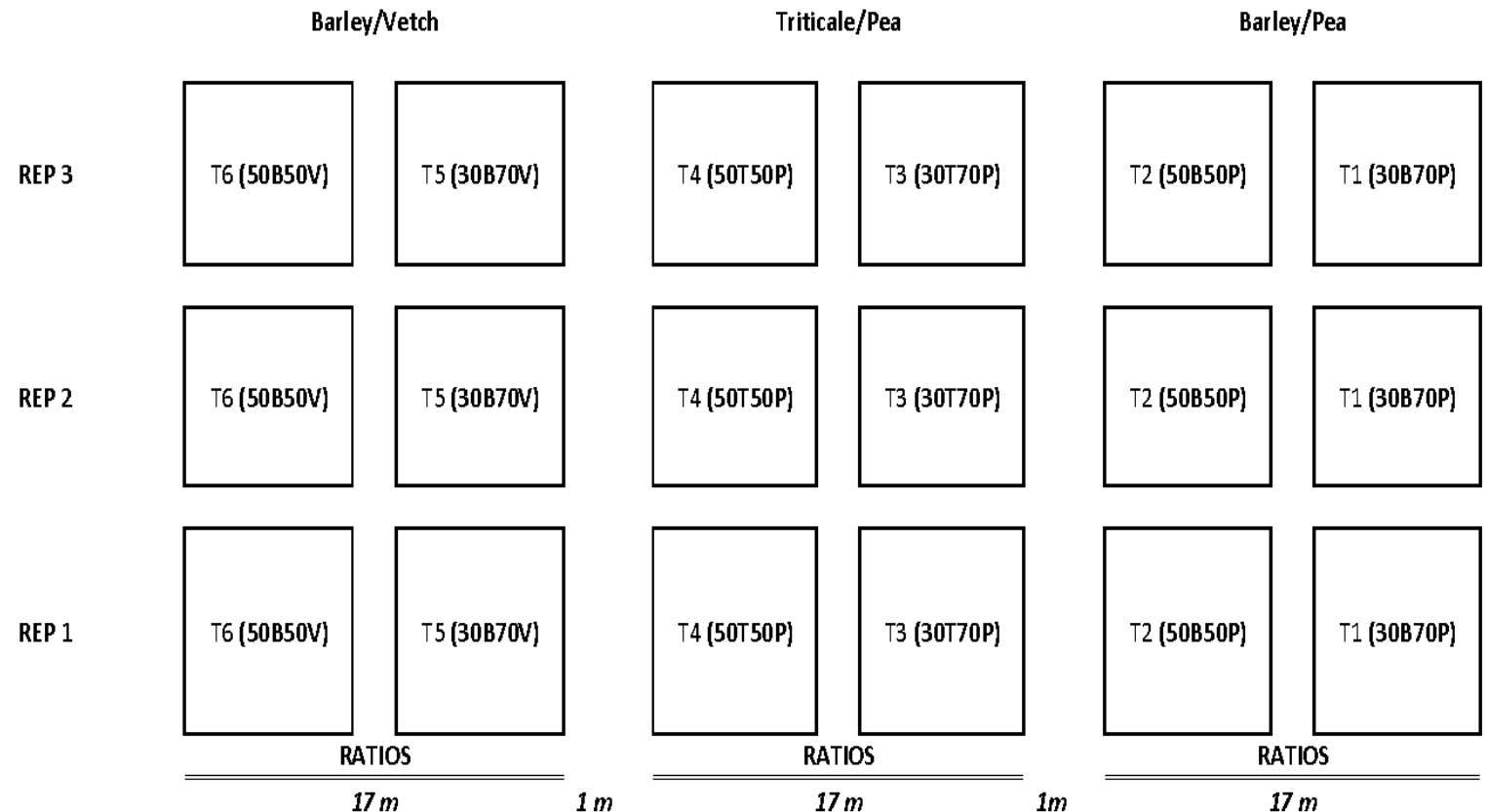


# Production of annual forage legume mixtures under CA in Morocco

## 3 Material and Methods

1. Cereal 50% of full rate + Legume 50% of full rate;
2. Cereal 30% of full rate + Legume 70% of full rate.

- Barley/peas in a ratio of :  
(30%, 70%) and (50%, 50%)
- Triticale / Pea in a ratio of :  
(30%, 70%) and (50%, 50%)
- Barley/Vetch in a ratio of:  
(30%, 70%) and (50%, 50%)



# Production of annual forage legume mixtures under CA in Morocco

## 4 Results and discussion

### o Barley/pea mixtures in Meknes

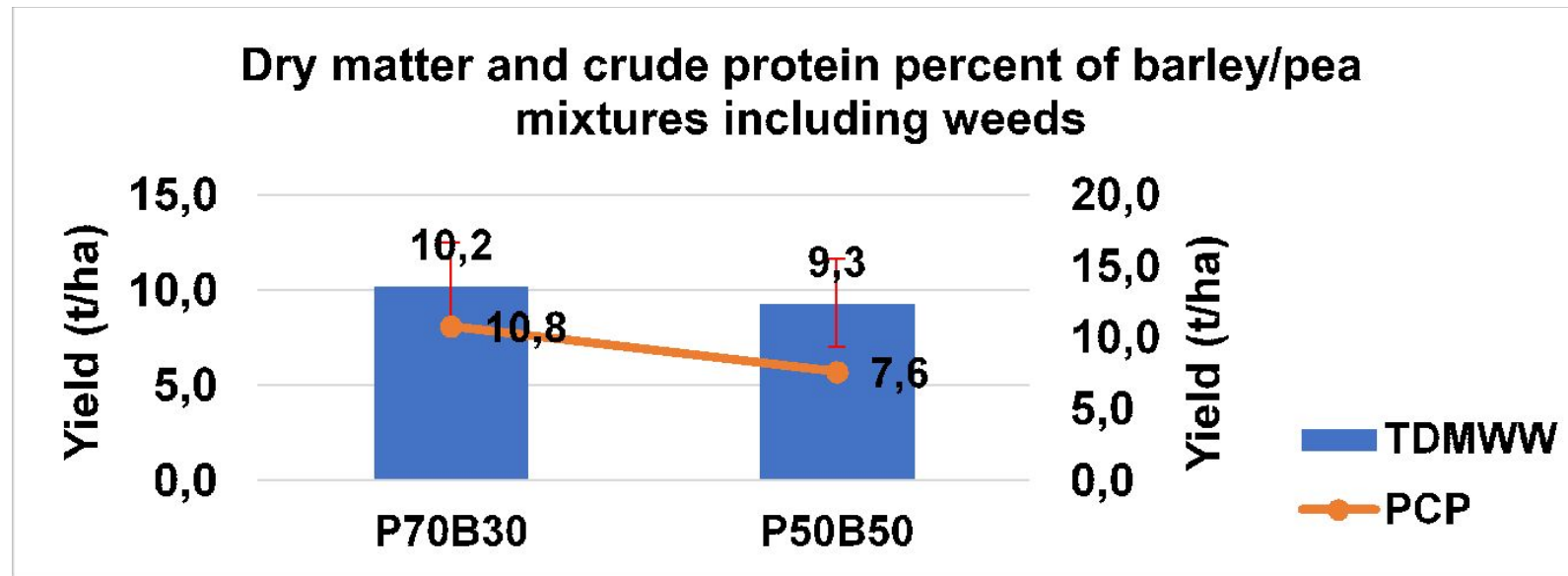


Figure 1: Dry matter and crude protein percent of barley/pea mixtures including weeds

**TDMWW:** Total Dry Matter Yield of the mixture With Weeds

**PCP:** Percent Crude Proteins

# Production of annual forage legume mixtures under CA in Morocco

## 4 Results and discussion

### o Barley/vetch mixtures in Meknes

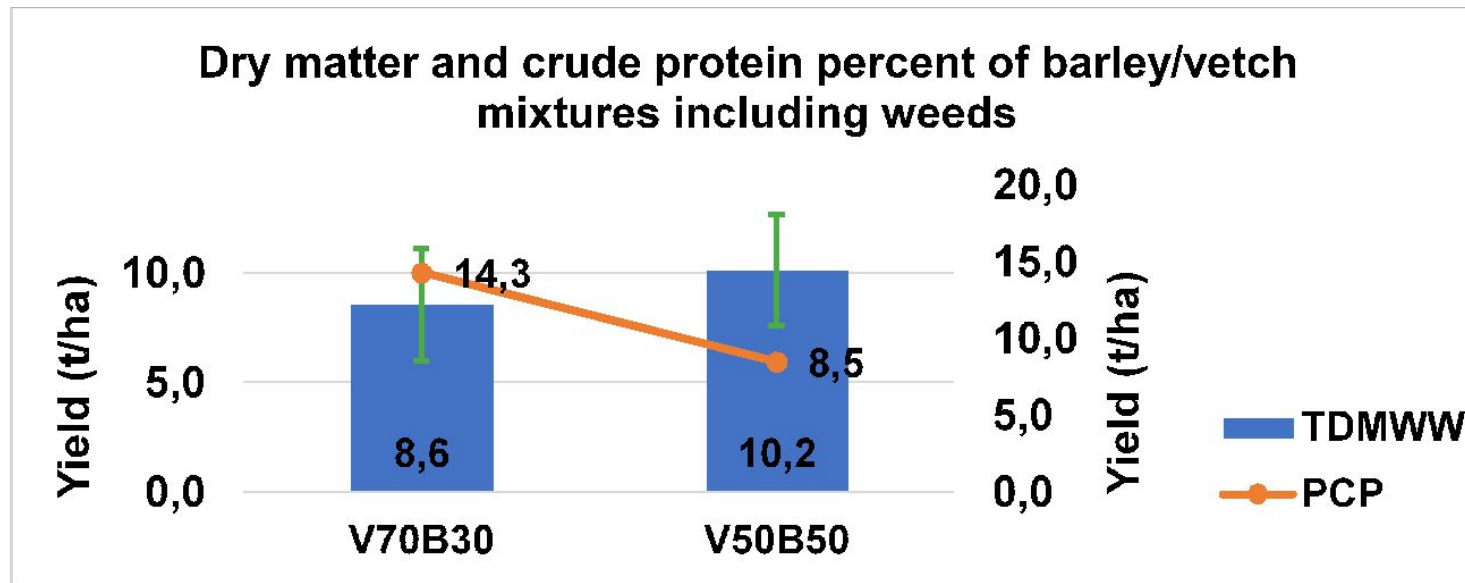


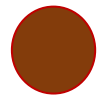
Figure 2: Dry matter and crude protein percent of barley/vetch mixtures including weeds

**TDMWW:** Total Dry Matter Yield of the mixture With Weeds

**PCP:** Percent Crude Proteins



# Production of annual forage legume mixtures under CA in Morocco



## Results and discussion

- *Total weed density observed March 24, 2021, in forage mixtures in on-farm experiments in Meknes in 2020-21.*

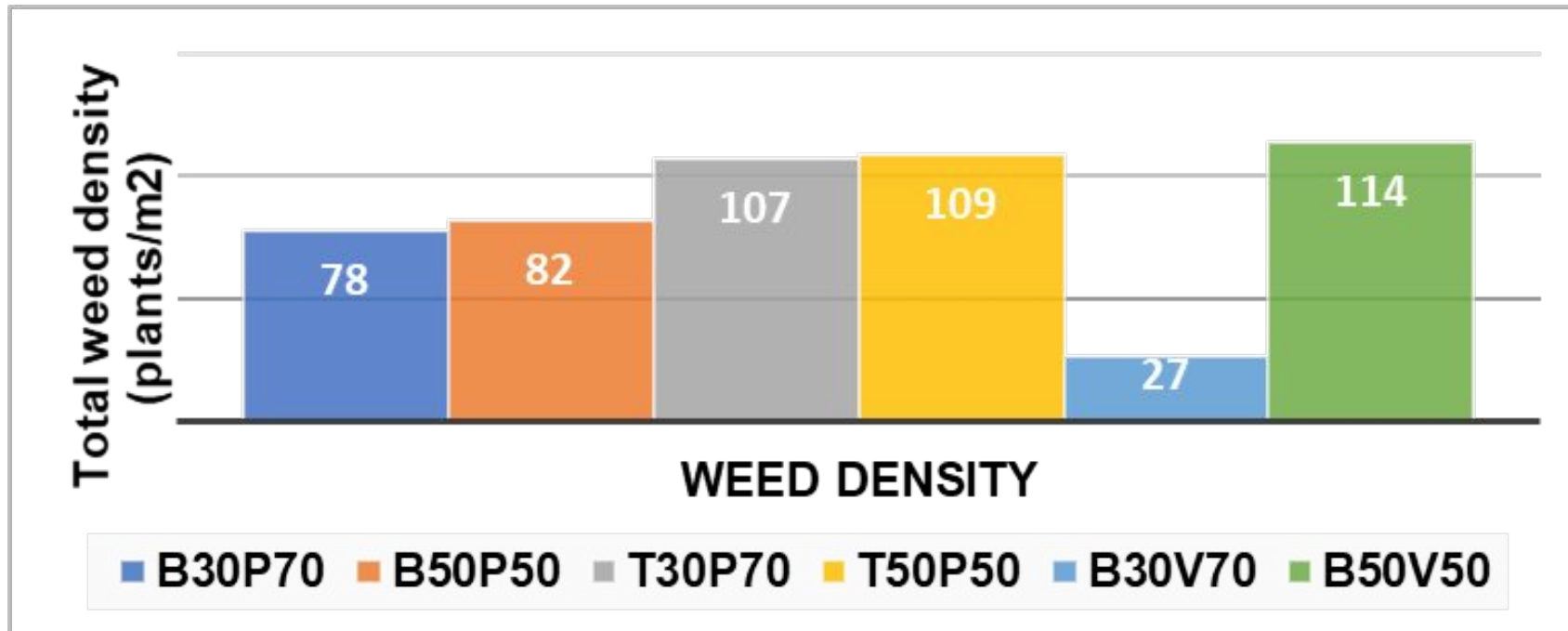


Figure 3: weed density observed in forage mixtures in on-farm experiments in Meknes in 2020-21.

# Production of annual forage legume mixtures under CA in Morocco

## 5 Conclusion

- ✓ With the mixture **P70B30**, farmers can benefit from **10 T/ha of dry matter and higher crude protein**, which are important for livestock nutrition.
- ✓ The mixture **V70B30** allows the farmer to get **a higher protein percentage** for the livestock.
- ✓ The mixture **B30/P70** mixture offers the most effective weed control and the highest crude protein content. Farmers can include **B30/P70** forage mixture in their rotation to **reduce weed pressure** for wheat or other grain crops.

# Production of annual forage legume mixtures under CA in Morocco

## References

- Mrabet, R., et al. "No-tillage technology: research review of impacts on soil quality and wheat production in semiarid Morocco." *Options Méditerranéennes* 60 (2003): 133-138. <http://om.ciheam.org/article.php?IDPDF=4600053>
- Emile, J. C., Coutard, J. P., Forel, E., & Stephany, D. (2016, March). Développer les associations annuelles céréales-protéagineuses dans les systèmes fourragers. In *Les Journées de l'AFPF* (pp. 247-p). <https://hal.science/hal-01594796>
- Moussadek R., Mrabet R., Zante P., Lamachere J.-M., Pepin Y., Le Bissonnais Y., Ye A., Verdoodt L., Van Ranst E., 2011a – Influence du semis direct et des résidus de culture sur l'érosion hydrique d'un vertisol méditerranéen. *Can. J. Soil Sci.*, 91 : 627-635. [https://www.researchgate.net/publication/266209263\\_Effets\\_du\\_travail\\_du\\_sol\\_et\\_de\\_la\\_gestion\\_des\\_residus\\_sur\\_les\\_proprietes\\_du\\_sol\\_et\\_sur\\_l'erosion\\_hydrique\\_d'un\\_Vertisol\\_Mediterraneen](https://www.researchgate.net/publication/266209263_Effets_du_travail_du_sol_et_de_la_gestion_des_residus_sur_les_proprietes_du_sol_et_sur_l'erosion_hydrique_d'un_Vertisol_Mediterraneen)
- Mupangwa, W., & Thierfelder, C. (2015). Cereal and legume intercropping in smallholder Conservation Agriculture (CA) systems. <https://repository.cimmyt.org/bitstream/handle/10883/4262/bulletin%2014.pdf?sequence=1&isAllowed=y>