

SAADA

Supporting Agrobiodiversity in Mediterranean Agroecosystems to improve Drought Adaptation

ABSTRACT

In a context of increasing aridity, the ecological intensification of water use is a challenging issue in Mediterranean rainfed agroecosystems. The SAADA project targets the functional agrobiodiversity as a means to design of crop mixtures and agroforestry systems with high water-use efficiency.

Keywords : 1. Exclu de la photothèque

Year : 2016

Project number : 1605-057

Type of funding : AAP

Project type : AAP OS

Research units in the network : AGAP

Start date : 2017-09-01

End date : 2019-12-31

Flagship project : no

Project leader : Karim Barkaoui

Project leader's institution : CIRAD

Project leader's RU : SYSTEM

Budget allocated : 140000 €

Total budget allocated (including co-financing) : 140000 €

Funding : Labex

GOAL

We evaluated whether genetic and functional diversity of crops can promote high yields through the complementary resource use in crop mixtures, especially water under water-limited conditions. To identify the most beneficial combinations of crop varieties and traits, we investigated the rich agrobiodiversity of the traditional rainfed agroecosystems in the Pre-Rif region (Northern Morocco) and tested a large range of crops mixtures. We aimed at identifying the genetic and functional determinants (plant traits) of improved crop mixtures and agroforestry systems.

RESULTS

Four main activities have been conducted during the project: (i) we synthesized nearly 20 years of research on wheat and faba bean agrobiodiversity and (ii) we surveyed 72 traditional olive-based agroforestry systems in the Pre-Rif region (Morocco); (iii) we tested 220 different wheat varietal mixtures (France) and (iv) 100 wheat + faba bean associations (Morocco) in field experiments. We reveal that agrobiodiversity of wheat and faba bean is particularly high in the Pre-Rif region with a wide variation of phenotypic traits and yield, especially for faba bean (62 varieties). Agrobiodiversity has been managed by network of farmers with a high rate of local seed selection and sharing. In the same region, we showed that agroforestry systems based on olive, cereals and legumes have a higher level of resource-use efficiency compared to monocrops, especially those with faba bean for which productivity increases by almost 70 %. Similarly, productivity increased in wheat varietal mixtures (+ 4 %) and wheat+faba bean associations (+12 %), especially under water-limited conditions. Although the varietal composition had a significant impact on overyielding, traits like plant height, leaf and root morphology of monocrops

only explained a modest part of it. We stress that the phenotypic plasticity of traits within crop mixtures should be better accounted for in future research.

PERSPECTIVES

The SAADA project initiated a series of research work on crop phenotypes in crop mixtures and agroforestry systems which aim to define relevant traits to select and their source of variation (e.g., european projects D4DECLIC, BIODIVERSIFY).