

# Agreement on Agriculture

*Hassan II Academy of Science and Technology, Morocco  
Brazilian Agriculture Research Corporation (Embrapa), Brazil.*





*The aim of the framework is to strengthen the relations between Embrapa and Moroccan institutions to promote technical and scientific cooperation.*



Brazilian and Moroccan researchers with the President of the Hassan II Academy of Science and Technology at the meeting in Rabat to consolidate the cooperation agreement between both countries.

# R & D Project on Biofertilizers

*Development and production of bacterial biofertilizers  
for inoculation and improvement of food legume  
productivity in Morocco.*

## *Overall objectives*

*This project aims to replace chemical fertilizers with bacterial biofertilizers, inoculated in legume seeds, in order to reduce the use of chemical fertilizers. This will contribute to reduce the adverse impact of soil and underground contamination and contribute to a more sustainable and environmentally friendly agriculture.*

*The long term goal is to make available to farmers a wide range of innovative microbial inoculants that may provide various additional functions at both plant nutrition and bioprotection levels.*



## The project

Grain legumes are an important part of the Moroccan diet. Legumes can fill a large part of protein requirement of the poorer population. Paradoxically, the national production of pulses can no longer satisfy the needs of local consumers and Morocco passed in the last twenty years from exporting to importing these grains. The area sown with grain legumes declined over the years, being replaced by cereals and other more economically interesting crops. Recurrent drought in the last years, disease occurrence, low mechanization, and other factors contributed to this decrease. This decline also resulted in the abandonment of cereal/legume crop rotation, substituted by monocultures based on cereals. In these circumstances, high yields are dependent on intensive and continuous use of chemical fertilizers and pesticides, leading to environmental impacts such as groundwater pollution, soil depletion, loss of diversity, imbalance of natural matter cycles and untold effects on human health.

The reintroduction of legumes in cropping systems is now a priority in Morocco in order to preserve soil quality and to establish sustainable production systems. The ecological and economic interest in these species lie in their property to fix atmospheric nitrogen in symbiosis with rhizobium type bacteria, which can meet most of the nitrogen requirements of legumes. In addition, the development of these crops will help to meet the needs for plant proteins in human and animal diet, improve soil organic nitrogen content and save money by significantly reducing the use of polluting chemical fertilizers, thus contributing to a sustainable development of agriculture and rural regions.

The collaboration with Brazilian researchers from the Brazilian Agriculture Research Corporation (Embrapa) will enable Moroccan researchers to benefit from their expertise and have access to the most recent inoculation techniques used in Brazil, one of the largest producer and user of microbial inocula in the world.

An economic study conducted by a leading specialist in agricultural economics will assess the economic and environmental benefits that can be obtained through the use of grain legume biofertilization.

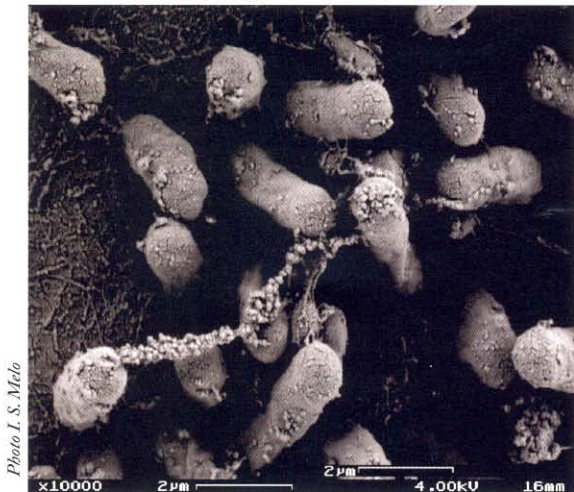


Photo I. S. Melo

*Bradyrhizobium* colonizing soybean root. The bacterium fixes nitrogen and increases plant growth and yield.



*One interest of Embrapa is to access the Moroccan technology in micropropagation of palm plants. The Brazilian semi-arid region of the Northeast has excellent conditions for cultivation of date palm. Date palm is an dioecious , auto-crossed, perennial monocotyledon. Male and female plants are not identifiable until flowering, which takes several years. Moroccan scientists have developed a tissue culture technology suitable for micropropagation of selected plants. This method will be available to Embrapa's researchers and will shorten the selection of female plants.*



Date palm trees (*Phoenix dactylifera* L.) Grown in Northeast, Brazil

## *Laboratory Involved*

### *Morocco*

*Laboratory of Microbiology and Molecular Biology, Faculty of Science, Rabat  
(Profs Jamal AURAG, El Bekkay BERRAHO, Fatiha BRHADA & Abdelkarim FILALI  
MALTOUF);*

*Laboratory of Microbiology, Unit of improvement and utilization of plant genetic resources,  
INRA, Rabat  
(Dr. Imane THAMI ALAMI);*

*Mohamed BOUGHLALA, Agro-economist.*

### *Brazil*

*(Brazilian Agriculture Research Corporation - Embrapa)*

*Laboratory of Environmental Microbiology of Embrapa Environment, Jaguariúna, SP.  
(Dr. Itamar Soares de Melo);*

*Laboratory of Microbiology of Embrapa Soybean, Londrina, PR.  
(Dr. Mariângela Hungria).*



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