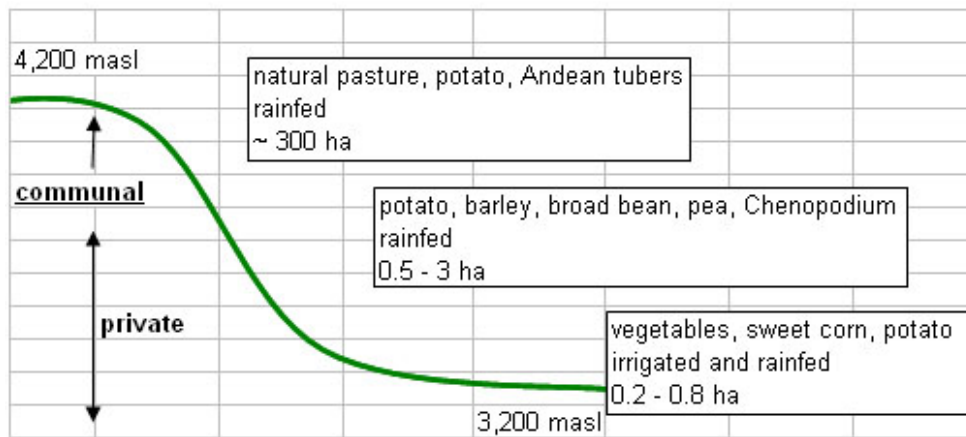


**Academic Frontier Research Project (AFRP) at  
Universidad Nacional Agraria La Molina (UNALM), Lima, Peru**

**PLAN OF ACTIVITIES 2005**

**Objectives**

A second five-year term of AFRP started in 2004 under the coordination of Tokyo University of Agriculture, with the participation of universities in 3 Southeast Asian countries and Peru. AFRP emphasizes the development and adoption of bioagents and more sustainable farming systems. In La Molina, research and extension work is focused on agronomic improvements to increase profitability and sustainability of horticultural systems, mainly the vegetable-growing sector of the central Andean highlands of Peru (Figure 1). The research findings, however, are not restricted to this area and may have broader implications for the horticultural sector in Peru, which is experimenting unprecedented growth rates on the export-oriented side. Moreover, sustainability is understood in a holistic manner requiring that socio-economic and nutritional aspects are given full consideration.



**Figure 1:** Outline of crops and farm size at different altitudes in Pucará, Mantaro Valley.

AFRP research in La Molina is guided by some general principles:

- Support for more sustainable horticultural farming systems in Peru through the introduction of new or adapted technologies (bioagents) that may be used in the transition to organic agriculture.
- Interdisciplinarity: researchers and students from the Faculty of Agronomy (3 departments) and Food Industries.
- Laboratory and on-farm participatory research and extension: research findings need to be assessed with farmers with the aim of obtaining an increased adoption of new or adapted technologies. As decided in AFRP, the aim is 10% or more adoption of key technological innovations that can characterize an alternative system.
- Research in the framework of rural development, aiming at understanding the farming systems and the farmers' choices, analyzing the implications of any technology proposed. Interaction with farmers should strive to strengthen farmers' organizations.
- Active student participation, mainly as BSc research thesis requirement (Figure 2)



**Figure 2:** Farmer Wenceslao and student Cecilia at their intercropping trial in Pucará, 2004.

### Research team

- Coordinator: Roberto Ugás, Department of Horticulture  
 Members: Saray Siura, Department of Horticulture  
 Walter Apaza, Department of Entomology – Phytopathology  
 Juan Guerrero, Department of Soils  
 Collaborators: Ritva Reppo, Faculty of Food Industries (human nutrition)  
 Liliana Aragón, Department of Entomology – Phytopathology (virology)  
 Jaime Delgado, Department of Horticulture (La Molina farm management)  
 Students: Thesis research as BSc requirement:  
 Since 2004: Manuel Lena, Pilar Kuriyama, Cecilia Ono  
 Since 2005: Enrique Haaker, Susana Dávila, Guillermo Huamaní  
 Farmers: Members of the Peasant Community of Pucará, Mantaro Valley

### Research locations



**Figure 3:** Map of Peru and locations

Research for AFRP at La Molina is conducted at the following locations (Figure 3):

**Laboratory and experimental fields:** UNALM campus at La Molina:

- Vegetable Crops Research Program
- Laboratory of Phytopathology, Greenhouse and Diagnosis Clinic
- Laboratory of Microbiology
- Laboratory of Food Analysis
- Laboratory of Horticulture

**On-farm research:** Peasant Community of Pucará, located in the Mantaro Valley, near the city of Huancayo, in the central Andean highlands (*sierra central*) of Peru. In 2005 contacts are being developed with farmers in other vegetable-growing areas of the central highlands for comparative purposes, including exploratory surveys in Chupaca and Tarma.

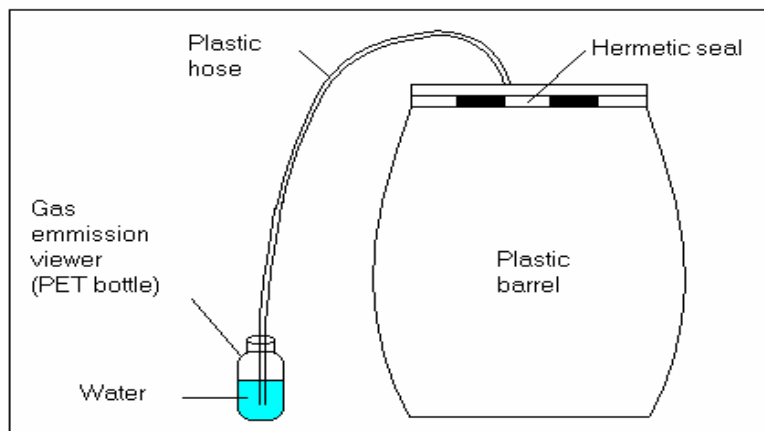
**Lines of research**

**AFRP Team 2:** Studies on microorganisms in La Molina:

- a) Biological control of *Phytophthora* blight in pepper (sweet, paprika, others)
- b) Identification of local antagonistic isolates of *Trichoderma* spp
- c) In vitro, greenhouse and field experiments
- d) Development of practical methods for the use of *Trichoderma* spp, together with management of the crops (irrigation, ridge height, planting density)
- e) Consideration of Coastal and Highland agricultural systems

**AFRP Team 4:** Contributions towards the understanding of Pucará, a rare Andean horticultural system and the adoption of alternative technologies:

- a) Studies on the multiple cropping (intercropping) of vegetable crops in Pucará.
- b) Determination of crop budgets and farming systems analysis with the use of farm questionnaires and surveys.
- c) Introduction and reintroduction of vegetable crops and cultivars:
  - Development of *Amaranthus* as an easy growing and highly nutritious leafy vegetable, including local weedy types and introduced cultivars.
  - Trials with new vegetables and cultivars for the main crops, particularly green pea, lettuce, bunching onion, radish, spinach and cabbages.
  - Cultivation of Andean mint (*Mintostachys* spp.) in order to reduce the pressure on wild plants.
- d) Research and extension for the promotion of the use of biol (a farm-made liquid fertilizer and growth promoter produced through the anaerobic fermentation of organic matter, Figure 4) and other sources of organic matter to improve soil and plant nutrition and reduce the use of chemicals.
- e) Use of protected agriculture (plastic tunnels) to improve vegetable production at high altitudes or cool season.



**Figure 4:** Barrel-type system for farm production of biol.

## **Plan of research 2005**

The following are the trials and surveys planned for the year 2005; meanwhile, research started in 2004 is being finalized and reports are being prepared:

### **AFRP Team 2**

#### **1. Resistance of different *Capsicum* species against root rot diseases caused by *Phytophthora capsici***

Objectives: Evaluate the level of resistance of nine cultivars of *Capsicum* species against the root rot caused by *Phytophthora capsici*.

Researchers: Walter Apaza

Students: Guillermo Huamaní

Location: La Molina

Method: Trial under green house conditions

#### **2. Use of calcium in plant nutrition and *Trichoderma viride* antagonist for the control of root rot of pepper caused by *Phytophthora capsici***

Objectives: To try different calcium sources and its effect on root rot of pepper caused by *Phytophthora capsici* and to evaluate the interaction between *Trichoderma viride* and calcium fertilization.

Researchers: Walter Apaza

Students: To be defined

Location: La Molina

Method: Trial under field conditions

#### **3. Crop rotation to reduce primary inoculum of *Phytophthora capsici* in La Molina**

Objectives: This study will give us data of which sequence of crop rotation may reduce primary inoculum of *Phytophthora capsici*.

Researcher: Liliana Aragón y Walter Apaza

Students: To be defined

Location: La Molina

Method: Trial under field conditions.

#### **4. Production of *Trichoderma harzianum* `suppressing compost`**

Objectives: To investigate on different doses of *Trichoderma harzianum* inoculum

Researcher: Liliana Aragón and Walter Apaza

Students: To be defined

Location: La Molina

Method: Trial under field conditions.

#### **AFRP Team 4**

##### **5. Influence of different sources of farm manure and plastic tunnels on the growth and productivity of two species of vegetable amaranth from the Andes and Southeast Asia under organic management**

Objectives: To analyze the interaction between cultivars, source of manure and protected cultivation on the growth and productivity of vegetable amaranth

Researchers: Roberto Ugás

Students: Enrique Haaker

Location: La Molina

Method: 2 separate field trials with complete randomized block design

##### **6. Influence of different sources of farm manure on the nutritional value of two species of vegetable amaranth from the Andes and Southeast Asia under organic management**

Objectives: To determine the effects of cultivation practices on the nutritional value of vegetable amaranth

Researchers: Roberto Ugás, Ritva Reppo

Students: To be defined

Location: La Molina

Method: Laboratory analysis with samples extracted from trial 5.

##### **7. Effects of the application of biol on yield and quality of spinach**

Objectives: Evaluate the efficiency of biol on yield and quality of spinach and in terms of profitability.

Researchers: Saray Siura

Students: Susana Dávila

Location: La Molina

Method: Field trial in an organic field.

##### **8. Effects of the application of biol on yield and quality of bunching onion in Pucará**

Researchers: Saray Siura and Juan Guerrero

Students: To be defined

Location: Pucará

Method: Trials in farmers' fields.

##### **9. Influence of treatments with biol on the germination of seed of different vegetable crops**

Researchers: Saray Siura and Juan Guerrero

Students: To be defined

Location: La Molina and Pucará

Method: Laboratory and farm trials with farmers in Pucará.

**10. Crop budget analysis of the main crops (valley and slope) in the peasant community of Pucará and comparative survey of three vegetable growing areas in the central highlands**

Objectives: To deepen the understanding of the economic constraint in horticultural systems in the central highlands of Peru

Researchers: Roberto Ugás

Students: To be defined

Location: Pucará, Chupaca and Tarma

Method: Farmer survey with questionnaires and non-structured interviews.

**11. An analysis of the vegetable intercropping patterns in Pucará**

Objectives: To understand the ethnobotanical knowledge related to intercropping and determine agronomic and economic constraints.

Researchers: Roberto Ugás

Students: To be defined

Location: Pucará

Method: Farmer survey with questionnaires and non-structured interviews.

In conjunction with the research and trials outlined, some outreach activities are to be conducted in Pucará: these include field days, workshops and field visits, aimed mainly at the promotion of the use of biol.



**Figure 5a.** Students Manuel Lena, Enrique Haaker and Susana Dávila at the Vegetable Crops Research Program during a break of their research on the cultivation of vegetable amaranth and the use of biol (BSc thesis advisors: Saray Siura and Roberto Ugás). **Figure 5b.** Former student Yosip Quino at his field trial with *Trichoderma viride* for controlling *Phytophthora capsici* in sweet pepper. La Molina (BSc thesis advisor: Walter Apaza).

La Molina, June 2005.