“Sustainable Perspectives of the production and consumption of quinoa in the Peruvian Altiplano” Project

Progress Report for the First Year
May 2010 to February 2011

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ABSTRACT

The project "Prospects for the Sustainability of the production and consumption of quinoa in the Peruvian Altiplano" is funded by the McKnight Foundation and implemented by the Research Center of Natural Resources and Environment (CIRNMA) in Puno, Peru.

The work performed in the crop year 2010-2011, was: To study the fertility of soils in areas of commercial cultivation of quinoa, to determine the degree of infestation of pests and diseases when quinoa cultivation is intensified, meet the nutritional status of families and quinoa producers and to strengthen the local capacities of those involved. Below is a summary of objectives (area) of the results achieved. The report covers the period May 2010 to February 2011.

The activities began with reviewing secondary information on the trends in demand and prices of quinoa, with the idea of evaluating how this scenario can affect production systems. At the same time, we analyzed the database of the CIRNMA program of organic quinoa (2006 to 2010). We succeeded in identifying pilot sites to work with and reflection-action groups. In analyzing the history of rotation (4 seasons) of 1061 plots (155 farmers), we were able to identify three systems of rotation (Traditional (T), Intensification 1 (IQ1) and Enhancing 2 (IQ2)). The results show that 25% have definitely changed their traditional system by intensifying to varying degrees. In the traditional rotation systems (T) 1200 m$^2$ of quinoa is planted on average, the IQ2 sow 2300 m$^2$ and IQ1 sow 3800 m$^2$. The trend of increasing the planted area displaces other crops.

Also in order to consider the effect of a change in the pattern of rotation, we have been monitoring the fertility of the soil, which is medium to low with deficiencies in nitrogen and phosphorus and low moisture retention capacity. This will continue until May 2011.

To analyze and incorporate production alternatives in production systems, we have been using the methodology of "learning by doing" and "knowledge that is acquired, knowledge that is applied." With six producers a total of one hectare of lupin was planted, 360 liters of boil were prepared (with addition of Biograd as organic fermentation accelerator), compost pits will be prepared with 4 groups that will produce more than 5000 kilograms, 100 liters of sulfate-calcium broth will be prepared with another five groups to prevent mildew problems. These areas serve as "demonstration plots."

Monitoring for pest infestation has had two evaluations. One was the phenological phase with four to six true leaves and panicle initiation. Preliminary results show that plots with intensified crop rotation systems (IQ1 and IQ2) have low population density of quinoa plants (60%), and high presence of weeds. As IPM strategies they have installed: predator protection, yellow sticky traps and pheromones for quinoa moth control. In general terms, plots with more intensification have a greater presence of predators due to the abundance of "weeds." In traditional rotation plots pests are low, contrary to sites with intensification.

It has been found that 70% of the production of quinoa and 40% of the potato production is destined for the market. To encourage consumption of these and other foods, we have developed courses and demonstration workshops. Also, they have been producing vegetables in the family greenhouse. The Project offered materials and the families contributed with labor and management. They have been producing eight species of vegetables since October 2010. Families report that the production of these
species allows access to fresh vegetables that they previously had to purchase. They also mention that it is children who benefit the most.

The above results (in process), are accompanied by the strengthening of local capacity: To do this, we are working with the reflection-action groups based on their own knowledge of production of organic quinoa, the vision of respect for the environment and sustainable production concepts, without neglecting their relationship with the market. An important task is centered around the electronic organization of information that has been generated in the project. We have defined research protocols at different levels, which allows for the accumulation of the information to generate monthly reports-products.

**PURPOSE:** To determine the extent to which the intensification of cultivation of quinoa as a result of increased demand affects the family production system from the standpoint of soil health and food security.

**RESULT 1.** We have studied the fertility of soils in areas of commercial cultivation of quinoa.

**Activity:** 1.2. Characterization of crop rotation systems in places of commercial quinoa production (Review of secondary information)

**Responsible (s):** José Luis Soto, Enrique Valdivia

**Contributor (s):** Alexander Cuadros, Roberto Valdivia, Vanessa Galindo, Elva Campos, Selima Salcedo, Frida Espill

There are indications that in the highlands of Peru there have been changes in the traditional systems of crop rotation. One possible cause is the increased demand and price of quinoa nationally and internationally. In turn, this has led to increased planting areas and intensification of cultivation. The uncertainty and insecurity of production caused by climatic variations and the abandonment of traditional systems of crop rotation, is prompting many farmers to choose to grow quinoa several years in a row in the same plot. In light of this scenario we want to analyze the information in the database (BD) of farmers in CIRNMA’s organic quinoa program (2005 - 2010). We have the following objectives: a) Determine the history of crop rotation at the farm level by the producer in the project intervention areas, b) characterize the crop rotation systems in plots c) Select pilot sites to work in the field on soil, health and nutrition. The desk study work was conducted between May and July 2010, and initially explored the information in the database. Secondary information was reviewed from the individual files of producers in organic program. The information collected was organized in MS Excel, which allowed for clustering of plots by the grower previous to the definition of criteria like: type of production (organic-transition), history of rotation of the last four crop years, the base of the crop cell (potatoes, quinoa, barley, beans, fallow) and if the plot had certification in the crop year 2009-2010. Under these criteria we analyzed the records of 1061 plots that are the property of 155 farmers (66% and 34% organic and transition, respectively). Initially identified 10 different types of rotation, which were grouped into three sets of rotations: a) Traditional (T), which is characterized in that the plots followed the traditional pattern of rotation including the basic cells of crops (3 or 4) with a fallow for one to three years and maybe a planting of potatoes for two years. b) intensification of crop (IQ1), where the plots begin to experience the trend towards intensification of cultivation (based on potato and quinoa) with change in the rotation and
starting to plant the quinoa right after the fallow. c) Intensified crop and plot (IQ2), characterized in that both crops and the plot have been intensified in their use. The quinoa can be planted up to three or four years (for the four analyzed) and therefore rotation of the plot is headed toward the annual monoculture on a continuous or discontinuous manner.

Table 1: Identification of three crop rotation systems.

These three groups represent 74% of plots covered by the organic quinoa program. Consequently, the observed changes in crop rotation systems is that farmers are planting quinoa as the lead in the rotation and quinoa is also grown for two, three and four years in a row on the same plot. 25% of the studied plots have definitely changed their traditional system towards intensification to varying degrees. Regarding the planting areas compared between rotation systems, we have the traditional (T) that are planting on average 1200 m$^2$ followed by IQ2 with 2300 m$^2$ and IQ1 are those who sow in average 3800 m$^2$. The tendency to increase the planting area is greater in the more intensified systems, displacing other crops.

Activity: 1.3. Evaluation of soil fertility through enhancement of the quinoa crop in three agro-ecological zones of Puno.

Responsible (s): Selima Salcedo, Ángel Cari

Contributor (s): José Luis Soto, Roberto Valdivia, Alexander Cuadros, Elva Campos, Vanessa Galindo, Enrique Valdivia.

The proposed objectives for the activity were to evaluate soil fertility in plots with intensification of cultivation of organic quinoa (Chenopodium quinoa Willd.) in three agro-ecological zones, determine the effect of crop rotation system on the physical and chemical fertility ground and propose a management plan for the recovery and improvement of soil fertility for quinoa producers. The activity is being carried out in three production areas (Z1 = Cabana, Z2 = Cabanilla - Cabanillas and Z4 = Vilque - Mañazo) of the department of Puno. For the selection of parcels we reviewed the database of CIRNMA’s organic
program, based on criteria such as degree of intensification of crop rotation system and plantings. We selected 54 sites with different levels of intensification: Traditional (T), Intensified (IQ1) and Highly Intensified (IQ2). We have taken 18 samples from the rotation system. Once we selected and identified plots, we proceeded to do the field work for soil sampling. The sampling was conducted in September 2010 according to research protocol. The samples were analyzed in soil and water laboratory of the Faculty of Agricultural Sciences, UNA-Puno. The results of physicochemical analysis (characterization) show that 53% organic matter is classified with a medium level (between 2 and 4%). With reference to nitrogen to 100% of the samples are below 0.20% N, classifying content and low. For available phosphorus (P) we have that 48% of the samples are low (<6 ppm). The content of available potassium (K) reports that 55% of the samples have a high level (over 355 ppm). For reaction of the soil (pH) 79% of the samples range from extremely to moderately acidic (4.5 to 6.5), the remaining 12% are neutral (6.6 to 7.3), with electrical conductivity at 100% of normal soils (<2mmhos/cm). In relation to soil texture by 44% of the samples are sandy loam, clay loam 20% and only 19% are loamy, the remaining 17% belong to other textural classes. In summary, the studied soil fertility is low to medium deficient in nitrogen and phosphorus and low moisture retention capacity due to coarse texture. The fertility monitoring activity will continue in May 2011 as it plans to make a new analysis of soil samples from the selected plots to see the degree of utilization of nutrients according to rotation and crop grown in the 2010 campaign - 2011.

Activity: 1.4. Dissemination and application of alternative technologies for the production of organic quinoa.

Responsible (s): José Luis Soto, Enrique Valdivia, Selima Salcedo, Vanessa Galindo, Elva Campos

Contributor (s): Cabana farmers groups, and Juli Cabanilla

The activity is being developed in the following communities (Phare, Collana Vizallani in the Cabana District, Tancuañá in Cabanillas and Ancoaque in July). The objectives proposed to develop the activity were: a) disseminate and promote alternative technologies for the production of organic quinoa in pilot groups for integrated pest management and improvement of soil fertility (organic manuring), b) Incentivize and encourage the development of bio-inputs (preparation of bio, compost, lime-sulfur broths and biopesticides) at the group and family level. To this end actions were taken to the promotion and dissemination with the installation of demonstration plots, demonstrations of methods and the production of organic fertilizers for soil improvement, crop productivity and disease control of quinoa. The methodology was based on principles of "learning by doing" and "knowledge that is acquired, skills that
are applied” where the producers and technicians set up and develop the different technological alternatives. For the work we organized five groups (average 15 families at each pilot site) and carried out the proposed activities. The results obtained are summarized in the following points: In six plots of six producers installed a total of one hectare of lupin, with the aim of incorporating green manure and improve the quality of soil in fallow and / or intensified plots. Producers are responsible for management of the plots. The incorporation was done when the crop is at 50% bloom (late March, mid April). To date, the plots are in good development with a plant height 30 to 45 cm. Additionally, they prepared 360 liters of biol, to which was added 120 liters Biograd is an accelerator in the organic fermentation, also in four pilot groups compost pits each of 2 m$^3$ will be prepared to produce more than 5000 kilograms of compost. Finally in five pilot sites they will prepare about 100 liters of lime sulfate broth to apply as a preventive in plots with mildew. In the pilot group where BIOGRAD was applied to the development of boil and compost, with the participation of the producers we evaluated the efficiency of the product in the reduction of organic fermentation time, by the nature of color and odor of biol and compost producers mentioned that the product is ready for use in the control (biol and compost without BIOGRAD), there is much expectation on the part of farmers to purchase the product from the company that manufactures and sells it, BIOTOP - Bolivia. The activity is still in process until the end of the cropping season.

Dissemination of technological alternatives “bio-products” for the production of organic quinoa (compost, biol, lime sulfur)

**Activity: 1.5. Taxonomic classification of soils in three production areas with different degrees quinoa crop rotation.**

**Responsible (s):** Angel Cari Salcedo Selima

**Contributor (s):** José Luis Soto

The event was held in order to know the soil characteristics to classify taxonomically and also assess the potential for greater use of the land. Representative sites were selected from the Organic Quinoa Program being implemented by the Research Center of Environment and Natural Resources (CIRNMA). The areas selected were: Z1 = Cabana, Z2 = Cabanilla and Cabanillas and Z4 = Vilque-Manizago which have been conducting the assessment and monitoring of soil fertility of plots dedicated to the production of organic quinoa with different degrees of plot and crop intensification in the crop rotation system identified. (Traditional, intensified and highly intensified). The field work consisted of open pits, the description of soil profiles, registering of landscape data like geography, terrain, erosion, drainage, permeability, surface runoff, slope, parent material and lithology. Soil samples were taken for the respective physical-chemical analysis (characterization) of the samples in water and soil laboratory of the INIA-Puno. The procedures were performed under research protocols. The final results show that there is variability among soil types sampled in the three areas evaluated. The soils are classified as Entisols, Inceptisols and Mollison (according to Soil Taxonomy 2010), the use capacity of the soils are as suitable for clean cultivation (potatoes, quinoa, barley, oats, beans, tarwi, wheat, alfalfa ) and low quality pastures (A3 and P3) with climate limitations. Since the fertility of the soil is medium to low in the Ap horizon (2.6 to 0.79% organic matter), 80% are sandy loamy soils, the parent material identified corresponds to the classes: alluvial river alluvial, residual and colluvium.
RESULT 2: The degree of infestation by pests and diseases has been determined when intensifying the cultivation of quinoa.

Activity: 2.1. Evaluation of insect pests and diseases, crop intensification areas of quinoa (Chenopodium quinoa Willd.)

Responsible (s): Elva Campos, Rosario Bravo, José Luis Soto

Contributor (s): Producers of organic quinoa in the three study areas

The objectives proposed for the development of the evolution of insect pests and diseases in intensive farming areas were: a) to determine the population fluctuations and damage caused by insect pests and diseases due to the change in the rotation of the quinoa crop at household level in three areas of production of organic quinoa, b) whether the key and secondary insect populations have increased due to the trend toward monoculture and c) quantify the damage caused by insects and diseases in the cultivation of quinoa in family plots. The activity is being carried out in 27 plots of quinoa in three production areas Cabana = Z1, Z2 = Cabanilla and Cabanillas and Z4 = Vilque and Mañazo. The parcel identification was based on secondary information (BD) from the CIRNMA organic quinoa production program, the selection criterion was the type of crop rotation traditional and intensified. To make assessments of the parcels have been considered phenological stages (four to six leaves and panicle initiation, ripening and harvesting). The field-level assessments are made by the shaking of plants sampled per plot on a tray and with the help of entomological material. It quantifies the presence of insects present. On February 15th, two evaluations were undertaken, the first one was for plants that were in phenological phase with four to six true leaves (100% of plots) and the second in phenological stage of panicle initiation (55% of plots). Preliminary results show that the presence of populations of phytophagous (insect pest) in this stage of cultivation has occurred in low populations in the three areas of production. The largest population of insect pests was the average of 0.5 to 7.5 individual trips per plant, followed by the presence of earthworm populations (average 0.5 to 1 individual / plant). In smaller quantities and only in two areas, the kcona kcona quinoa moth population was present (average of 0.5 individuals per plant). Other phytophagous insects insects were present in lower populations and are not significant: even the phytophagous reported are below the thresholds of economic damage. In terms of biological controller populations the presence of carabid population (about 0.2 to 1.2 individuals per plant in the three areas of production) is pronounced, followed by the population of spiders and staphylinidos and finally the presence of ladybug populations in a very small number. In relation to the presence of disease, due to persistent rains in January and February 2011, in plots located in plains, the presence of Mildew (Peronospora farinossa) is noted. Furthermore, plots of quinoa in intensified rotation systems (IQ1 and IQ2) have low population density of quinoa plants (60%), and has the presence of weed species such as the turnip Brassica campestris, Chiriro Bidens pilosa, Chijchipa Tagetes mandonii and Kora or wild mallow Malva sylvestris. The study is ongoing, the results will be presented at the end of the crop year (June 2011).
Activity: 2.2. Strategies for Integrated Pest Management programs to strengthen organic quinoa production.

Responsible (s): Vanessa Galindo, Rosario Bravo, José Luis Soto

Contributor (s): Producers APROAT, APROAP, APROQUIV, APROQUIM.

The activity is being carried out in three areas of program production of organic quinoa CIRNMA (Z1 = Cabana, Cabanilla = Z2, Z4 and Mañazo Vilque). The development objectives of the activity is to assess the efficiency of some participatory components of Integrated Pest Management (IPM) in plots with different rotation systems, compare area-efficiency production of IPM practices, and encourage and strengthen skills of such practices among families producing IPM quinoa, through focus groups and demonstration plots. Nine demonstration plots of organic quinoa with different rotations systems are being implemented (Traditional = T, Intensified = IQ1, and IQ2 = Highly intensified). The plots were planted by farmers in an area of 500 m², using a variety Salcedo INIA. We propose to install five components of IPM: a) yellow traps, b) pheromones, c) biocides, d) lime sulfur broth, and e) protection for predators). Field evaluations are conducted every 15 days, in accordance with the phenological stages of the crops and if the populations of insect pests or diseases that affect productivity warrant or exceed the economic injury level the management proposal begins. Preliminary results until the 15th of February are: we have installed four strategies from the proposal: protection of the only predators seen as preventive to install yellow sticky traps (100% of plots), despite not having populations of over six individual moths per plant, we have installed to verify their efficiency in monitoring and demonstration for farmers: instead only in one plot has been installed ethological control strategy "pheromone" is also of a demonstrative and monitoring character, we have found that although not specified for *Eurysacca quinoae* but rather species *Symmetrischema tangolias* to control potato tuber moth, shows the level of efficiency for the pest in quinoa. For control of downy mildew disease a homemade soup of lime sulfate was applied because in all fields under because it is reported based on evaluations that about 15% damage from mildew in plots located in plains and that are poorly drained. On the other hand, the evaluations show that in plots with more intensified cultivation of quinoa there is an increased presence of predators such as carabids, spiders and ladybugs we are assuming it is due to the amount of wild plants (weeds) that have provided protection to these species. Regarding the presence of insect pests in the three areas, low populations are reported; in plots with the traditional rotation the presence of pests is virtually nil. The opposite is true in plots with high intensification which highlights the presence of trips and earthworms nonsignificant populations of quinoa moths *kcona kcona* and aphids. Implementing the pheromone strategy we recorded an average of 12 moths in two stages of evaluation. In summary we can say none of the pest has reached the threshold of economic damage. The yellow traps are good for catching pollilia of quinoa but also capture biological controls thus the pheromone strategy is more efficient. The study continues the process until the end of the cropping season.
RESULT 3. The nutritional status of farming families of quinoa has been determined in relation to levels of production and sale of this product.

Activity: 3.1. Analysis of the distribution and use of food production in quinoa producing families.

Responsible (s): Frida Espill, Jose Antonio Tovar

Contributor (s): Families involved, Enrique Valdivia

The activity is being carried out in five communities in the provinces of Puno (Puno, San Román, Lampa and Chucuito), four production zones (Z1: Cabana, Z2: Cabanilla and Cabanillas, Z3: Juli, Z4: Tiquillaca, Vilque and Mañazo). Their objective is to analyze the distribution and use of food production. To select the families we reviewed the database of the CIRNMA Puno organic program, based on criteria such as the prominence of crop rotation type and production area. Ten families were selected according to type of crop rotation (T: Traditional, IQ1: Intensification of crop and IQ2: Intensification of crop and plot), they showed their agreement to be participants in the study. With these families we have been developing files with case studies which contains general information on the household, agricultural and livestock production and production destination. Information is collected based on the time of cultivation: planting (September-December) and farming practices (December-February) of the quinoa crop year 2010-2011. Preliminary results show that average families are made up of 5 people, grow from 2 to 5 different types of food (quinoa, potatoes, cañihua, beans and wheat) products as part of their food basket, each family has 1.7 hectares on average and they are areas for food crops, as to the fate of production, the families of the traditional rotation system of production generally use all of their crops for home consumption (90%). It is also known that all families at one time of year to sell their products (potatoes, quinoa) in the markets to buy food staples, according to data collected 70% of the production of quinoa and 40% of potato is intended the market. With the money they receive from the sale of food families purchase foreign food products mainly energy dense ones such as rice, noodles, sugar, bread, oil, which are relatively inexpensive for the family budget. In terms of the use of the harvested products, they are mostly used in traditional dishes such as porridge, Peske, kispiño, Pishu based on quinoa, soups, wheat, quinoa, etc, as part of family meals as food times (breakfast, lunch and dinner). It should be noted that at the time of planting food preparation focuses mainly on the cold foods for the time of day, being composed mainly of potatoes, potato flour, meat and tojtos based on wheat flour. The study continues the process until June 2011.
Activity: 3.2. Characterizing food intake in quinoa farming families.

Responsible (s): Frida Espill, Jose Antonio Tovar

Contributor (s): Families producers, Enrique Valdivia

For the implementation of activity five communities in four production zones have been selected (Z1: Cabana, Z2: Cabanilla and Cabanillas, Z3: Juli, Z4: Tiquillaca, Vilque and Mañazo). The stated goal is to analyze the distribution and use of production, of the food grown, for the selection of families we reviewed the database of the CIRNMA organic program. Based on criteria such as the prominence of the type of crop rotation and production area, ten families were selected according to type of crop rotation (T: Traditional, IQ1: Intensification of crop and IQ2: Intensification of crop and plot). With these families we have been collecting survey information using tools such as the 24-hour recall for the types and frequency of consumption of food available in their homes. The application of the tool is planned for four seasons (planting, cultural practices, harvesting, post harvest and time of no crops-dry season) for the crop year 2010-2011. As of February 15th, information was collected from the first two periods. Preliminary results show that in families the percentage of consumption of macronutrients by season is deficient as well as the consumption of protein and fat as opposed to carbohydrate intake, which is higher than recommended, mainly in monosaccharide such as starch, the ingestion of protein varies between 33.7 y 93.3 g (planting-Cabana, Vilque-cultural labors), which represents an average of 63.7%, the principal source of protein in lamb and to a lesser degree dairy, egg, quinoa and beans.

As for the fate of production, the purchase of food obtained in markets and local fairs, it is mainly energy rich foods such as rice, noodles, sugar, bread, oil that are obtained with the money from the sale of food products, such as quinoa and potatoes. With respect to the diversity of the diet, they did not consume from all of 12 recommended food groups. It has been demonstrated that more biological value foods such as quinoa, cañihua are replaced by foods such as rice, noodles, which translates as more yto fill the stomach and relieve hunger. The activity also remains in progress.

Activity: 3.3. Promote consumption of local foods and vegetables for the family.

Responsible (s): Frida Espill, Jose Antonio Tovar

Contributor (s): Families of pilot groups in communities, Elva Campos, Vanessa Galindo Selima Salcedo, Jose Luis Soto.

Nutrition education is essential to promote the consumption of foods rich in nutrients as part of a varied diet that is healthy and adequate. In this sense the purpose of the activity is to a) reassess and promote the use of local produce and vegetables, b) developing new formulations based on quinoa, cañihua, use of vegetables to diversify the food preparation at the household level, and c) strengthen the knowledge on issues related to food and human nutrition through training courses and workshops aimed at producing
demonstration(s) of quinoa in communities in the districts of Juli, Cabana and in Cabanilla in seven communities (Ancohaque, Yacari Tishchuro, Yacari Tuntachahui and Pucara Sullicani in Juli, PHARE and Vizzallani in Cabana, Tancoaña in Cabanilla). These events were developed through participatory approaches, use of slides, preparations and group exhibitions. As a result of the activity we can highlight the following points. There were 10 training courses, which covered five topics: a) The food groups, b) The food pyramid, c) healthy eating, d) the volume of consumption of vegetables and e) Eat healthy live healthy (slideshow.) We also developed about 20 demonstration workshops for developing new recipes based cañihua using quinoa flour and flakes, where participants prepared cakes, breads, cookies. The vegetable-based preparations were: quinoa tortillas with sautéed spinach, chard and red pepper, potato stuffed with quinoa and Swiss chard, spinach pie, pumpkin chili, salads, beets, radishes, drinks and juices (beet soda, quinoa with apple). Around 100 producers(s) of quinoa participated, with 66% women. A noteworthy aspect is that the producers of four communities in the Juli area to learn new ways to prepare food with quinoa and vegetables attended two fairs: ISPALLA - 2010 organized by the town of Juli and ALTAGRO Fair 2011 organized by CIRNMA where they exhibited and participated in the competitions, at the end of each event they sold their products. In conclusion we can say that both the training and demonstration workshops have led to interest participants in the areas of nutrition, especially in the preparation of new recipes to diversify the diet at the family level according to the availability and access to food and inputs for the preparations.

Training and demonstration workshops on nutrition and preparation of new recipes

**Activity: 3.4. Promote production of vegetables for consumption at household level.**

**Responsible(s):** José Luis Soto, Elva Campos, Selima Salcedo, Vanessa Galindo, Frida Espill, Roberto Valdivia

**Contributor(s):** Carmen Guerra, Elmer Ventura, Enrique Valdivia, families of the pilot group of Phar-Cabana.

The activity was implemented in the community of Phare Cabana District, as a pilot-experimental study involving quinoa producers, they are involved in project activities and the ones who showed interest for the production of vegetables. The objectives were to promote horticultural production and facilitate the availability of these products locally, to generate knowledge in the production of new plants (vegetables to supplement the area of nutrition activities (workshop demonstration), and contribute to the improvement and diversification of food for the family. With the support of the project (agrofilm, eucalyptus sticks, vegetable seeds) and as a counterpart of the producers (labor and local materials) will installed a family greenhouse of 55 m². Since October 2010 they have produced eight species of vegetables (zucchini, cucumber, beets, radishes, chard, lettuce, tomato and green beans). The direct beneficiaries are nine families and 25 families are indirect beneficiaries of the pilot group Vizallani. They have already done the first harvest, the production reported by area of 7 m² / plot is as follows: 64 heads of lettuce, more than 60 kilograms of vegetables, their destination was home consumption (distribution among households), demonstration workshops in the nutrition area (food preparation) to the families of Phare and Vizzallani and sale of surplus 50% of production at the fair in Juliaca. Families involved the production of these species mentioned that it allows them to have fresh vegetables which they used to buy mainly at fairs and are now convinced that they can produce in the greenhouse and it is children who are making the most of it because they can eat the tomato and cucumber straight out of the garden. This activity is complemented by the activities of demonstration workshops where families train and share new ways to diversify their diet with the addition of vegetables.
RESULT 4. Strengthening local capacities

Activity: 4.1a. Strengthening local capacities, training workshops for farmers, postgraduate students and technicians.

Responsible (s): José Luis Soto, Vanessa Galindo, Elva Campos, Selima Salcedo
Contributor (s): Farmers in pilot groups and Juli Cabana

In order to improve technical – production skills of farmers, to develop and incorporate new knowledge in the production of quinoa (integrated pest management-MIC) between September 2010 and mid-February 2011, using participatory methodologies we have has training theoretical courses and practical demonstrations of methods and technical talks aimed at producing quinoa with the selected pilot group, we used various visual tools such as PowerPoint presentations, videos, flipcharts, group dynamics and demonstration plots. The events were held in eight communities (Phare, Vizallani, Collana in the district of Cabana; Tancuaña in Cabanilla; Ancoaque, Yacari Tisnachuro, Yacari Tuntachahui, Pucara Sullicani in July) where the Project works. As a result 125 farmers (50 males and 75 females) were trained on the following topics: systems of crop rotation and soil texture, soil life, plants that fix nitrogen in the soil, selection and quality seeds, integrated pest management in quinoa, insect pests and biological control, life cycle of the quinoa moths, mildew in quinoa, lime sulfur stock preparation, biol and improved compost, soil preparation, installation and management vegetables (planting, irrigation, cultural practices and harvesting) pest and disease control in greenhouses family. To complement the theoretical knowledge and concepts set by the participants, they did practices through demonstrations of the group dynamics method that allowed them to understand the topic. As well as induce reflection about a problem or improvement, as well as, enabled further explanation, and exchange ideas and traditional knowledge among the participants according to their daily practical field experiences and involvement in similar events. For which we conclude that it has strengthened the skills of farmers for the production of organic quinoa on proper management with vision to sustainable production, has also spread new knowledge and technologies available for production without affecting production systems level plot.

Another aspect to be highlighted as part of this activity is the participation of postgraduate students and technicians in developing training events between July 2010 and January 2011 (Table 6), the project's technicians participated in eight events (workshop courses, meetings, conferences and seminars) locally organized, as well as those organized by the Community Internship Program Collaborative Crop Research Mcknight.

No. and Name of activity: 4.1.b. Course development workshop for food and nutrition projects.
Responsible (s): Ricardo Dávila (UNSA - Arequipa), Angela Lavalle (Dietitians Association of Peru - Region VII - Puno).
Contributor (s): Enrique Valdivia (CIRNMA)

Under the agreement between the College of Dietitians of Peru, Region VII Council - Puno and CIRNMA. The objective was to train and strengthen the skills of professionals and alumni in human nutrition for the preparation of nutritional food projects. Course was conducted workshop on "Preparation of food and nutritional projects." The development of the event was under the theoretical-practical approach. The first part of the course covers conceptual issues, methodology, identification of project ideas, diagnosis, planning matrix, and sustainability indicators in the second part, work in mixed groups (men and women) in order to design and develop project proposals. Attended by 45 participants, who in a participatory and dynamic way based on life experiences and project ideas developed strategies to address nutritional problems. These lines of work proposed as priorities are: a) Causes and effects of child malnutrition; b) Effect of provision in pre-school lunch boxes, and c) Improving the nutritional status in families Chuchito zone. Also in this workshop will be analyzed and discussed as malnutrition is a major cause of low productivity of individuals.

No. and Name of activity: 4.2. Formation of discussion groups - action for the development of participatory workshops.
Responsible (s): José Luis Soto
Contributor (s): Groups of farmers, Elva Campos, Vanessa Galindo, Selima Salcedo, Frida Espill.
The event was held in communities in the districts of Cabana and Juli. The objectives were: to organize focus groups to analyze participatory action-the context of production and consumption of quinoa, identify potential problems in production to establish priorities for action for the pilot groups, promote the
exchange of knowledge and experience between farmers and technical input to improve the productive
development of quinoa in pilot sites. Using participatory methodologies in workshops and group meetings we
gathered information and analyzed the problems of production of quinoa. Attended by 77 farmers in four
communities (Phare and Vizallani in Cabana: Ancoaque and Yacari Tuntacahui in July). Four
workshops were conducted to diagnose the problems of the production of quinoa and based on the
results we adjusted the intervention of the tasks at the level of research and field work. The main
problems identified were: the area of Cabana, a) soil, b) seeds c) fertilizer d) climate, e) pest, f) disease. For Juli zone: a) climate b) markets, c) pests, d) storage, e) weed, f) harvest. In both areas the
most important crop is quinoa is followed by potato. In Juli there is a greater diversity in the number of
crops (nine) compared to Cabana (four crops). Additionally, ten meetings were held with the reflection-
action group to discuss the problem of crop rotation systems and the intensification of crop fields and
households. We shared the information generated in the project resulting from the analysis of rotation
systems and their future consequences that may affect the family production system familiar in terms of
soil degradation. A product of the analysis was proposing a search for alternative solutions based on
experimentation at the plot level in pilot groups. One of the first actions determined by the farmers is
experimenting with green manure, composting, production of bio-inputs to control pests and
diseases. Each of these has been installed and is under evaluation.

Reflection-action groups, making the diagnosis and rebuilding the rotation system practiced

**Activity: 4.3. Electronic organization of project documents (Documents and Data Warehouse ADD)**

**Responsible(s):** Alexander Pictures  
**Contributor(s):** Enrique Valdivia, Roberto Valdivia, Jose Luis Soto, Vanessa Galindo, Elva Campos Espill Frida; Selima Salcedo.

In order to improve information gathering systems of different activities and areas of work of the project
"Prospects for the Sustainability of the production - consumption of quinoa on the Peruvian Altiplano" a
Data and Documents Warehouse (ADD) was developed and implemented. Initially the structure was
designed to organize work folders in the manager's personal computer that stores the information
generated in the project cycle (general, information workspace that provides essentially the same
information concerning: protocols, products , tools, and database number) later in the task force
discussed the structure of the system and the same technicians were trained to use the ADD. As a result
we have monthly reports, products, information gathered at field level as evaluations, records, support
tools and photographic records are delivered by the experts in electronic information is stored in the
personal computer and server.

**Activity: 4.4. Development of training and dissemination material**

**Responsible(s):** José Luis Soto, Elva Campos, Selima Salcedo, Vanessa Galindo and Frida Espill. (Technical Team)  
**Contributor(s):** Roberto Valdivia and Rosario Bravo

To meet the objective of this activity, the technical team during the first year has prepared the following
documents:
Cope with challenges

As results of the first year of the project, we analyzed in detail the different crop rotation systems with different degrees of intensification of both the plot and the crop producer families program CIRNMA organic quinoa. This analysis led us to reflect at the level of technicians and producers on the negative consequences of this system in an effort to meet the growing demand for quinoa, without considering future consequences. For the quinoa producing areas, a proper management of soil resources and prevention of an increase in pests and diseases is needed. Furthermore, families need to reorient the family consumption, favoring a proper diet. The dissemination of the information discussed on the intensification of cultivation will raise awareness at the producer level.

In the project intervention area there are many development institutions to support farmers in various productive sectors, using different methodologies and ways of working, in most cases handouts and / or paternalism and circumstances that provide inputs to capture the attention of beneficiaries, distorting the work towards sustainability of the productive activity. This project intervention seeks to raise the self-esteem of families.

During this first year of project implementation in the communities, they have experienced a decrease in family involvement in organized activities, some suggest that the project shouf deliver something tangible, that the families are no longer interested learning. Another factor is the availability time, training is seen as something intangible, but there are innovative farmers who do value acquiring and sharing new knowledge based on participatory methodologies and the inter-agency coordination provide allies in order to achieve the objectives.