

Final Technical Report

Project Title:

Ecological and socioeconomic intensification of smallholder agriculture in the Andes

IDRC Project Number 106526

Research organizations involved in the study:

- Universidad Nacional Agraria La Molina - UNALM, Peru
- University of British Columbia - UBC, Canada
- Sociedad Peruana de Derecho Ambiental - SPDA, Peru

Location of study: Peru

By: *Roberto Ugás (UNALM) and Hannes Van den Eeckhout (UNALM), with contributions from Manuel Ruiz (SPDA), Eduardo Jovel (UBC) and the research team.*

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1. Executive Summary (2 page max.):

The overall objective of the project was "To increase food security of smallholder farmers by developing a more intensive and integrated action-research system including improved methods of collective germplasm conservation and management of Andean roots and tuber crops and promotion of highly nutritious indigenous vegetables. By studying the integration of these processes into already existing PGSs for organic production, ANPE farmers groups in two regions of Peru will intensify their farming systems and social networks with better opportunities for marketing, advocacy and dissemination".

Key advances, significant research findings, important outcomes and innovative outputs of the project can be summarized as follows:

As far as we know, based on our experience and literature search, our household survey linking the practice of agroecology with livelihood and food security assessment is the first of its kind in Latin America because of its size and scope, and one of the first worldwide. This does not come without difficult responses, where agroecological households perform worse than the conventional or when agroecological households perform better but still at lower levels than desired. Anyhow, these results show the power of the agroecological practice to improve livelihoods and food security.

Through our research and multi-actor collaboration, we have provided Cusco's university with the whole germplasm collection free of charge for further research and provided 5 peasant communities in Cusco and Cajamarca with a full collection of morphologically distinctive "varieties". This is a first step in the democratization of access to genetic resources and constitute a great potential for peasant communities in terms of additional tools to increase resilience of their farming systems, have better adaptation tools towards climate change, improve the nutritional outputs of their farms and have better possibilities for a stronger positioning in the marketplace.

Yields of native potato in peasant systems over 3,500 masl were found to be higher than previously reported (around 10 ton/ha). Secondly, yields obtained with peasant seed are statistically similar as those obtained with certified seed provided by INIA, the national agricultural research institute, and this will call for a revision of their current system for certified seed production. A thorough 2-year process of field schools and monitoring of individual farms with 3 peasant communities, led to the official registration of Peru's first individual peasant farmers as producers of non-certified potato seed.

Our work with underexploited vegetable crops has provided information not available before: (1) The high potential of local crops to be cultivated intensively in home gardens to produce leafy vegetables that are hardy, easy to produce, productive and nutritious; (2) the introduction and apparent adaptation to the highlands of kale, an introduced crop that is outstanding in terms of frost tolerance (the major limiting factor for vegetable production), nutrition and content of health-promoting substances like antioxidants; (3) the determination of appropriate methods for the home production of sprouts, vegetables that are exceptionally nutritious; (4) the first nutritional analysis conducted in Peru with leaves of novel vegetables like kale and the leaves of quinoa and kiwicha, which are well-known traditional crops grown for its seeds but not for its leaves; and (5) the release of Peru's first cultivar of leaf amaranth, derived from a weedy population.

Our experience has shown that plastic houses are an essential tool for the group production of high quality vegetables for the marketplace, particularly to supply restaurants or ecological farmer's markets,

and to produce off-season, but are still too expensive for individual households. Our project has introduced the concept of movable plastic tunnels (these microtunnels), a technique that is common in Asia and Europe but not in the Andes. We tested the technology with over 100 microtunnels in 4 districts of Cusco, all managed by women, and our results show a high potential for adoption.

The use of local plants as repellent of potato pests in storage is well known and documented. Our research, however, is new for the communities involved and, most interestingly, has been done not only with dry plant materials, as is traditionally done, but also with essential oils and other local materials. The results are promising in terms of pest repellence but also in the delay of sprouting, with high potential to reduce losses of potato during traditional storage. This is relevant not only to conserve potato seeds but also to prolong the storage life of potatoes for human consumption, a factor of great relevance for households in the very high Andes and in the beginning of the growing season, when food reserves are at its lowest.

Our action in market access has been very intensive: 274 farmers (76 % women) sold at farmer's markets supported by the project, of which 117 farmers were selling repeatedly. These farmer's weekly markets were initiated or supported in 5 cities, with an average participation of 63 farmers and 420 consumers per day. Four Provincial PGS Councils were established, led by municipalities, with 1084 farmers trained and 227 farmers granted a PGS certificate. Additionally, the first Latin American registered collective mark (*Frutos de la tierra*) for diversified ecological farmers was launched in 2013, in collaboration with other projects.

The current gastronomic boom in Peru is generally discussed in the framework of what is called the peasant-cook alliance, and gastronomy has become a powerful tool to raise awareness of peasant and biodiversity issues. It was found that the commercial partnership with restaurants stimulates the use of protected horticulture technologies and increases household consumption of vegetables, with great potential to increase supply and quality and to connect to other markets. However, the commercial connection between smallholders and restaurants is full of challenges and difficulties, and the real roles of restaurants need to be closely examined in economic terms. This research provides a framework for analysis not available before.

Our study (60 researchers, technicians and farmers in 7 countries of 4 continents) identified how PGS and other parallel social processes can trigger innovation and adaptation and improve livelihoods in rural areas. On the household level, the study revealed benefits such as cost savings, income and food availability, and personal empowerment including development of knowledge, skills and self-confidence. PGS is one of the most interesting social and marketing innovations, developed originally in Latin America, but in some cases (as in Peru) their sustainability is put into question since most are donor-funded experiences and disappear or enter an inactive stage when external funds are not available. This study provides insight on how stronger market and social linkages may help the PGS remain and deliver multifaceted benefits.

Activities specifically directed to the strengthening of ANPE's regional associations failed to achieve a significant increase in social capital as these associations are too dependent on external funding and often lack internal cohesion. The best results in improving social capital were found in the PGS in Bambamarca and the organic fairs in Cajamarca. Project activities related to market access were by far the most relevant as they better captured the interest of smallholders, but these are highly dependent on active and efficient intervention of the local governments.

Advocacy instruments of relevance for the promotion of more sustainable farming systems have been produced. We contributed with the production and translation of two documents by IFOAM: a position paper on the role of smallholder, as a contribution to 2014 International Year of Family Farming, and the Best Practice Guidelines for Agriculture and Value Chains, which are being actively used in international advocacy opportunities. On a national level, 2 public documents analyzed the relationship between ecological agriculture and traditional seed systems with regards to Peru's new law on seeds and intellectual property rights.

AGROECO has been particularly active in producing and publishing, sometimes translating into Spanish, various materials to make them available to farmers and consumers, and will continue in the coming months producing papers to be submitted to peer-reviewed journals.

2. The research problem (1 page max.):

As was stated in the project proposal, "poverty in rural areas of Peru is almost three times higher than in urban areas and in certain regions of the Andes it affects up to 80% of the population. Several organizations promote organic agriculture as a sustainable way to increase overall farm performance as it is known that organic farming has well-established practices that simultaneously mitigate climate change, build resilient farming systems, reduce poverty, and improve food security. Organic farming alone, however, can do little to improve livelihoods if interdisciplinary research is not conducted in a way by which ecological, social and economic aspects are taken into consideration in a participatory manner".

The overall objective of the project was "To increase food security of smallholder farmers by developing a more intensive and integrated action-research system including improved methods of collective germplasm conservation and management of Andean roots and tuber crops and promotion of highly nutritious indigenous vegetables. By studying the integration of these processes into already existing PGSs for organic production, ANPE farmers groups in two regions of Peru will intensify their farming systems and social networks with better opportunities for marketing, advocacy and dissemination".

The understanding of the research problem has certainly improved, as it is clear that interdisciplinary research alone is not sufficient to get the full benefits of agroecology and organic farming:

- Smallholder farming can be severely affected by the actions of local governments, sometimes at a higher rate than the national government, which has been the focus of advocacy efforts of the agroecological movement. New laws and regulations are surely important but it is the implementation at the local level that needs to be better analysed by farmer's organizations in order to build a working relationships with municipalities and with the regional and provincial offices of the national government. Moreover, smallholder farming also suffers by the informality and weaknesses of the Peruvian political system. Our project has lived this experience in a dramatic manner: the Calca province was the centre of our action and from the start but, firstly, it was obvious that the local farmer's organization lacked real associative life and was too dependent on few persons. In order to achieve the expected results, we had to move into direct action with smaller groups within the province, like women's groups and peasant communities. Secondly, the provincial government proved to be a highly unreliable partner in an overall analysis, but strong when it came to individual staff persons. For instance, the provincial PGS council was adopted by one the sections of the municipality, with good possibilities of becoming part of the municipal strategy for agricultural intensification. On

the other hand, the decision by the municipality to provide a small section of a newly built market to install what we called the service centre (to improve logistics and postharvest management of local ecological produce), as a joint venture between the municipality, the farmer's groups and the project, completely failed in spite of 2 years of intensive advocacy when the mayor was accused and prosecuted on corruption charges.

- Social capital is essential for the implementation of any strategy of agricultural intensification for smallholder farming, but perhaps even more with ecological farming. Several internal and external processes affect the viability of farmer's organizations and its ability to develop fruitful interaction with several actors. The strengths and weaknesses of the farmer's organizations linked to ANPE were made clear in the course of the project and required continuous adaptation of our work.
- Interdisciplinary action-research posed many challenges in the course of the project and not all farmer's and their organization are interested in engaging in such a process, particularly when they have been involved in several previous projects or when non-agricultural income has become of great importance, sometimes even more important than the agricultural income.
- The role of women in the project turned out to be of the greatest relevance, much more than expected when the proposal was prepared. Women groups and female farm leaders have been key collaborators and their requests and concerns had to be taken into account throughout the process. In the end, an extremely rewarding relationship was developed.
- Market forces proved to be very difficult to predict and monitor and it was clear that several alternatives had to be tested. For this reason, a complex set of possibilities were established, ranging from farmer's markets, specialized shops and conventional marketplaces, from PGS to a collective mark, from regional, provincial and village markets, among others.

Our overall assessment is that the general objective of the project has been achieved, as has been shown in the household survey reported in Annex 1. Agroecology alone, however, is clearly insufficient to sustainably improve the food security situation of the poorest sectors involved, particularly Quechua farmers in potato-based farming systems in the high Andes. Here, the role of governments needs to be reinforced so they can achieve their main responsibility, which is to assure all citizens the minimum requirements (i.e infrastructure, health and educational services) so they can develop a good quality of life.

3. Progress towards milestones (5 pages max.):

Milestones 1.1 through 1.7 refer to project planning, including personnel, permits, methodologies and protocols. All milestones were achieved and reported. The main deviation from the original plans was that the agreement between INIA and UNALM, in the framework of the new law on seeds was not signed since the specific regulations were not ready when necessary. Nevertheless, collaboration with INIA is on going and AGROECO will make available all germplasm information generated by the project as a contribution to the National Register of Native Potatoes.

Milestone 2.1: *Community participation in Cusco and Cajamarca formalized and assessment of regional association completed: formal agreement of collaboration established, participating communities of the Association of Productores Ecological (ANPE) organizations identified, and consultation implemented (UNALM).* Milestone achieved and reported, including a signed agreement with the participating farmers associations and peasant communities (Annex 35). Main changes from the original plan: (1) Specific efforts towards agreements and a working relationship with rural municipalities, particularly those of

Quispicanchi, Calca, Cusco, Bambamarca and Cajamarca, in order to support a network necessary for market activities like PGS, farmer's markets and microenterprise development; (2) In this reporting period it was evident that the initial focus to work with ANPE PERU as the main partner in the field required a change in order to reduce the dependence of the regional associations with regards to the head office in Lima and assure a project implementation closely linked to the needs and characteristics of the regions where we operated; (3) During the first two years of the project the political and social tension in Cajamarca, caused by conflicts due to the presence of large mining investments, prevented the project to fully implement its plans in that region. In the end, and always in consultation with IDRC, only a fraction of the research took place in Cajamarca.

Milestone 2.2 *Baseline survey results disseminated: participatory analysis and baseline survey report available and shared with all partners (UNALM).* The survey took place in 2012 and the report was available in 2013 (Annex 1a). In this period the UBC PI dealing with human nutrition left the project, which prompted the partial inclusion of the Instituto de Investigacion Nutricional (IIN).

Milestones 2.3 through 2.5 are process-related and were completed and several annexes provided in the annual report. Annexes 11, 38, 42 and 45 are related to these these processes.

Milestone 2.6: *Publication on research on seed systems, organic seeds, farmers' rights and intellectual property completed; identification of synergies contradictions and opportunities identified in the existing literature and through interviews with stakeholders (SPDA).* Milestone completed. Annexes 15 and 16. In the Year 3 report it was noted: "the growing season in our mostly rainfed potato agroecosystems goes from October-November to April-June. For this reason, throughout the report we will refer to certain activities or outcomes that may not be fully completed yet, but that are on their way in the field."

Milestone 3.1: *Nutritional assessment of population(s) finalized: Recruitment and Training manual produced, training of field team, survey conducted, analysis and assessment report to inform the overall project available, nutritional training module available (UBC, UNALM).* The nutritional research outlined on the original proposal was redefined and reduced in scope, which turned into a redirection of funds from UBC to SPDA to cover other expenses (broader baseline survey, position of technical coordinator). Some of the assessment was incorporated into the Household survey, which provided health and nutritional information on the status of the participant communities, and also in the 2014 comparative studies of the effects of the implementation of agroecological practices at household level, including food and nutrition indicators. The baseline survey was contracted to IIN (Annex 1a). Other nutritional aspects of the research and outreach activities are reported in Annexes 29, 30, 31 and 32.

Milestone 3.2: *International study on interrelationship between PGS, access to local markets and traditional seed systems available: Analysis of at least six case studies in at least three continents studying issues of sustainability of PGS completed and shared with ANPE and relevant stakeholders (UNALM).* Milestone completed and expanded (7 case studies in 4 continents) with final report released in 2014. Annex 23.

Milestone 3.3: *Participatory research on protected horticulture and processing of horticultural crops and Andean roots and tubers (ART) initiated: Rustic plastic houses and minimal processing facilities established in Cusco, Cajamarca and La Molina; trials with farmers agreed and initiated (UNALM).* Milestone completed (Annexes 17, 18 and 33, partly in 21). An important change was the decision to replace research with 40 family plastic houses with over 100 plastic microtunnels, which are cheaper and better

adapted to research in food security. A major setback for the project was the impossibility to establish the service centers (referred to as minimal processing facilities), which required the intervention of a third-party to assure location and building. Very long negotiations with the Municipality of Calca (Cusco) got into a decision from the mayor to destine a space in a newly-built market to establish the postharvest center and improve the reliability of local producers as suppliers of quality ecological produce. Unfortunately, an accusation, and later a conviction on charges of corruption, ended up with new elections in that province, too late to start over again.

Milestones 3.4 through 3.10 (except 3.7 and 3.9) deal with Andean roots research on germplasm, genetics, demonstration fields and biopesticides. Milestones completed and reported. This was the most extensive research subject in the project and is fully reported in Annexes 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 34, 41 and, partly, 38.

Milestone 3.7: *Training modules developed and implemented in Cusco and Cajamarca: Training manual developed, leaders of farming communities identified by ANPE and its regional associations and workshops delivered (UNALM).* Milestone completed through intensive efforts aimed at the strengthening and capacity building of participating farmer's organizations. Annexes 35, 36, 37, 38, 39 and 40.

Milestone 3.9: *Peruvian researchers training on genomics and biopesticides evaluation in Canada completed: Three Peruvian researchers' training on molecular techniques and biopesticides assessment in Canada ended (UBC).* Milestone completed with 3 UNALM researchers receiving training on molecular biology at UBC.

Milestone 3.11: *Gender appraisal implemented: Workshop and appraisal report completed (UBC).* Milestone completed. Gender issues were dealt with by UBC and UNALM. Annexes 38, 45 and 46.

Milestone 3.12: *Analysis of legal issues and public policy on seed systems, intellectual property, and farmer's rights completed, published and disseminated: Proposal and recommendation document to inform policy on seed systems and intellectual property produced (SPDA).* Milestone completed together with Milestone 2.6. Annexes 15 and 16.

Milestone 3.13: *Project activities reports, and educational material produced and disseminated, and scientific articles submitted for publication: Educational materials for farmers available (videos, training manuals, etc.) and scientific papers completed (UNALM).* Milestone completed with regards to educational materials in various topics relevant to project research and in various materials (print, video, radio): Annexes 2, 3, 9, 26, 27, 28, 31, 32, 36, 39, 40, 42 and 44. UNALM is currently taking care of a renewed webpage containing a repository of all information generated by the project. Project findings were presented in various events, particularly the IV Latin American Congress on Agroecology (UNALM, September 2013) and the Organic World Congress (to be held in Turkey, October 2014). Please see Milestone 4.11 for scientific papers.

Milestone 4.1: *Policy and legal frameworks at the local or regional levels respond more appropriately and accurately to farmers and organic producers specific interests and needs: Assessment report accomplished and recommendations document distributed to stakeholders, including local governments; assessment of linkages for sustainability between seed systems, participatory guarantee systems and markets available (SPDA).* Milestone completed: (a) One specific legal instrument enacted: Municipal Resolution 058-2013-MPC creating Cusco's Technical Commission on Food Security and Sovereignty; (b)

13 regional and provincial associations have newly revised, approved and/or registered statutes and Directive Council internal regulations, facilitating market access and advocacy capacities to members, with potential benefits for almost 300 families in Cusco and 1050 families in Cajamarca; (c) 3 formal agreements between farmer's associations and provincial/regional authorities celebrated to coordinate and promote specific actions (i.e. farmer's markets) at the local level.

Milestone 4.2: Report on organic production in Cusco and Cajamarca and market analysis for local biodiversity published: *Workshop with ANPEs and stakeholders implemented, market analysis on biodiversity assessment summarized and distributed to partners (UNALM).* Milestone completed. Annexes 19 and 20 present an overview of market activities in our project. Annexes 22 and 24 deal with the processes leading to guarantee systems (PGS and collective mark). Annexes 21 and 23 present research results. Annex 20 is a book chapter, published by a partner organization in early 2014 (available at: <http://mercadoscampesinos.com/peru/materiales/ferias-y-mercados-de-productores-hacia-nuevas-relaciones-campo-ciudad>). Results from our work on markets were and will be presented in technical meetings in Peru, Canada, Turkey and Iran during 2014.

Milestone 4.3: Gender participatory appraisal analysis and report completed: *Gender appraisal analysis report published (UBC, UNALM).* Milestone completed. One report (45) and one paper (46) finalized.

Milestone 4.4: Methods and protocols to identify drought and cold stress tolerant ART's completed, agronomic characterization and field screening/evaluation developed for ARTs and horticultural crops: *Assessment of drought and cold stress tolerant ART's finished, strategy and recommendation document produced and disseminated; identification of superior cultivars of potato, and other indigenous crops, for use by smallholder farms in Peruvian agriculture (UNALM).* At the end of 2012 it was clear that the full identification of drought and cold stress tolerant ART's could not be completed within the duration of the project and that the connection with food security was not well developed. Part of the funds allocated was used to support stronger work on seed banks (field schools and specific training leading to the registration as producers of non-certified seed) directly with farmers. Nevertheless, the work on cold stress has produced promising results (Annex 4) since 43 (Cajamarca) and 35 (Cusco) varieties (morphotypes) of native potatoes have been identified as tolerant to frost and/or late blight, which are severe limiting factors of potato production at high altitude. Superior cultivars of indigenous vegetables have been identified for leaf amaranth, reported in Annex 17. This includes the release of the first Peruvian cultivar of leaf amaranth (atacco 'Molinero'), as a contribution to food security with a hardy and highly nutritious vegetable suitable for home gardens.

Milestone 4.5: Characterized and field tested ART's genotypes produced and distributed among participants, novel sequences submitted to gene banks, and scientific papers submitted for publication: *Workshop and distribution of selected ART's implemented, novel sequences stored in gene banks; marker database established; scientific report and articles produced (UBC, UNALM).* Milestone completed. Annex 4 describes the pioneering process and main research results, by which a large germplasm collection of morphologically distinct native potatoes was directly given in custody to peasant communities. Annex 10 deals with traditional knowledge and ethnobotany of the peasant communities. Annexes 5, 6, 7 and 8 show the first results of morphological and molecular characterization of minor tubers (oca, olluco, mashua), part of which was conducted for the first time in Peru. Main change in this milestone is that the articles to be submitted to peer-reviewed journals are being written as this report is produced.

Milestone 4.6: Laboratory studies and training on biopesticides completed, nutrition and chemistry

analysis of ART's finalized: *Report on the evaluation of potential biopesticides available, nutritional and chemical analyses report produced (UBC, UNALM).* Milestone completed. Annexes 30 and 34.

Milestone 4.7: Final assessment of nutritional status completed: *Survey and workshops on nutritional status of populations implemented. (UNALM).* Milestone completed. As reported before, it was decided that this end-line survey should be refocused in order to perform a larger household survey to analyze the effects of the agroecological model from a livelihood perspective. The survey was finalized in mid2014 and the first results are presented in Annex 1.

Milestone 4.8: Improvement in social capital, including gender equity and organization at the community level, leading to increase knowledge transfer amongst farmers and the implementation of sustainable organic farming techniques: *MAC research protocols and studies completed and published (UNALM).* A full report analysing social capital throughout various project actions is available as Annex 38 and, partly, in Annex 43. An MSc thesis on the subject of social capital is on its way in Cusco. Annexes 45 and 46 analyse gender issues with regards to food security and market access.

Milestone 4.9: Methodologies to establish and maintain Biodiversity and Traditional Knowledge registry developed and published; intellectual property tools developed and disseminated: *Draft guidelines for Biodiversity and Traditional Knowledge registry finalized, manual of "soft" Intellectual property protection completed and disseminated (SPDA, UBC, UNALM).* Milestone completed. Annex 9 reports on the agro-ecological register and interpretation center for agrobiodiversity established in Cusco. In addition to this, UBC is working on a dedicated webpage for a full repository of ethnobotanical information generated by the project, which will be linked to the agrobiodiversity center. Annex 26 is a manual for the use of geographical indications and collective marks, published and disseminated in training and capacity building sessions during various events and activities of the project. Annexes 25 (a paper presented in a conference in Thailand, 2013), 27 and 28 report on the process that led to ANPE's collective mark, launched in 2013 and the first of its kind (legally registered as a collective mark and covering a diversity of ecological products) in Peru and, probably, Latin America.

Milestone 4.10: Educational materials produced and training and capacity building for leaders of farming communities implemented in Cusco and Cajamarca: *Modules 5-8 tested and refined (UNALM).* Milestone completed. As reported earlier, the original objective of running a full training program was modified to focus on the strengthening of farmer's organizations, partially reported in Annexes 37, 38 and 43. Annex 39 is a Manual on access to local funding sources for farmers associations. Several other educational materials are mentioned throughout this report (Table 1 - column Outreach Highlights).

Milestone 4.11: Scientific articles produced and submitted for publication: *Scientific articles accepted for publication or in press and lay versions available (UBC, UNALM).* As discussed earlier with project officials, it was not possible to assure completion of this milestone given the fact that much of the farming systems research required a longer experimentation period in the rainfed areas of the Andes. At the end of the project 2 papers were submitted to peer reviewed journals (Annexes 11 and 46), one was published (Annex 25) and 12 papers will be finalized in the coming months, highlighted in bold in the column 'Research achievements' of Table 1.

Milestone 5.1: *ANPE's consultations and final report including recommendation produced: report on project assessment by ANPE available (UNALM).* **Milestone 5.2:** *Final assessment of farmers' attitude toward agricultural innovation promoted by the project available: farmers' recommendations regarding*

agricultural innovation accessible (UNALM). These milestones have not been completed in its entirety. Milestone 5.2 was partly dealt with during the preparation of the reports in Annexes 37, 38 and 43. The main reasons for this were the delay in research reports coming from the 2014 harvests (ending in June), major events that kept ANPE's leaders busy, the fact that the boards of the regional associations of ANPE in Cusco and Cajamarca have been closely participating in most project actions and key decisions, and so are well aware of major findings, and the decision to participate with a full workshop during the next National Encounter of Ecological Producers, which is expected to take place in December. In any case, UNALM's commitment towards a joint analysis of the project with ANPE is also based in the agreement that both organizations signed several years ago. In July and August project personnel visited both regions and intensive coordination took place in order to assure continuity of several of project actions. Reports of some project actions have already been shared with these regional boards.

Milestone 5.3: *Final nutritional status report, systematic ethno botany and crop system management compilation completed: final report on nutritional status published, systematic ethno botanical and crop systems management report available (UBC, UNALM)*. Several Annexes mentioned in previous milestones cover this milestone: among others, nutritional status (Annex 1), ethnobotany (Annexes 10 and 18), crop management (Annexes 12, 13, 14, 17 and 33). Ethnographic data was coded using qualitative analysis software (NVivo 10) it will be stored in at UBC. Both, the database and the qualitative data could be useful to inform potential publications, after the end of the project. The database containing the data resulting from ethnobotanical studies in participating communities is available on line – a sample of the database has been included in the report. The database also includes information of traditional knowledge related to agricultural practices.

Milestone 5.4: *Increase in the number of households that adopt food insecurity reduction strategies with emphasis on the consumption of Andean crops and organic farming: on-going community monitoring systems on seed and crop conservation practices and organic farming operating in alliance with local governments; comparison with baseline information (UNALM)*. Milestone completed. A monitoring system is linked with the PGS established, and the local governments and farmers' associations are in control of the monitoring systems (Annexes 22). The collective mark also requires a monitoring of farming systems (Annex 24). Comparison with base line information is being done in the context of the 3 papers deriving from the household survey reported partly in Annex 1. Public sector involvement related to native potato seed and germplasm was established with the PACTA platform (Annexes 14 and 41). The figures related to participating farmers are summarized in Table 1, including direct actions with a grand total of 889 households and 1,084 farmers participating in capacity building activities.

Milestone 5.5: *Local traditional knowledge and biodiversity registry completed and in operation; IP policy recommendation produced and registration process initiated: biodiversity and traditional knowledge registry process finalized; recommendation document on policy charges submitted to government agencies (SPDA)*. Milestone completed: Annex 9. In Annex 10 reference is made to a secondary data based housed in UBC webpage. Annexes 15 and 16 contain an analysis of legislation and recommendations with regards to implementation. Annexes 37 and 43 contain an analysis of practice and recommendations regarding the relationship between farmers' organizations and local governments.

Milestone 5.6: *Organic farmers positioned to use a wide range of legal tools and instruments to identify and take advantage of market opportunities for their organic production: regional data base of ANPE's members in Cusco and Cajamarca completed and published, along with relevant stakeholder alliances and agreements; and, increased support from local governments for sustainable marketing strategies*

(UNALM). Milestone completed. Annexes 19, 20, 21, 22, 23 and 24 show research results and a systematization of data generated in the Market access component. The databases of ecological producers are the PGS databases kept by the Provincial PGS Councils, an innovation promoted by the project. Annexes 37, 38 and 43 deal with the different ways in which farmer's organizations deal with advocacy and try to build a working relationship with local governments.

Milestone 5.7: *Project findings, educational materials, and peer reviewed articles produced: website updated, videos, reports, and scientific articles available (UNALM).* Milestone completed, except for the updated website, which will be available before the end of 2014 when more internal reports can be made public (after data is used to finalize papers and other documents). Scientific articles will continue to be produced throughout year 2015. Table 1 provides an overview (Outreach Highlights) of the various communication materials produced and available through the current website.

Milestone 5.8: *Final research team and stakeholders' consultation meeting: final reflections assessment and recommendations document (UNALM).* Milestone completed. It was decided not to organize a single final meeting but rather to have several smaller meetings with specific topics to discuss with stakeholders. This process is reflected in the systematization reports available and reported in Table 1 and elsewhere. This is also related to what we reported under Milestones 5.1 and 5.2.

4. **Synthesis of research results (10 pages max.):**

The following are the specific objectives by component, as stated in the grant agreement:

1. **C1: Conduct** a participatory inventory of genetic diversity and cultivars under diverse adverse conditions, **apply** new screening protocols to discover germplasm with novel stress-tolerance mechanisms, **intensify** production through improved techniques of organic farming and protected horticulture, **evaluate** Andean plants with potential uses as organic pesticides, and **determine**, nutritional potential of germplasm and minor fruit species with commercial and cultivation potential.
2. **C2: Generate** innovative information on Andean seed and crop conservation based on KAP and MAC analyses and **develop** a participatory monitoring system in ANPE's local communities
3. **C3: Identify** key conditions for market integration of agroecological producers and **determine** the conditions for developing regional markets as a strategy for increasing revenues in a context of gender equity
4. **C4: Validate, implement and assess** a participatory capacity-building strategy for agroecological production leaders
5. **C5: Gather** evidence for supporting the continued use, exchange and sale of organically-produced native crops and seeds by facilitating the use of alternative legal, policy and incidence tools and *sui generis* mechanisms to support conservation of genetic diversity and enhance organic production at the local level; **improve** the advocacy capacities of ANPE.

Table 1 provides a comprehensive summary of main project achievements, organized in each of the 5 dimensions of food security. For each dimension, the key food security objectives are dealt with showing the research and/or development achievements, as well as outreach highlights, where relevant. We believe that the results of our project are better explained in the 5 dimensions of food security, as they help to understand the different contributions and challenges posed by the implementation of an agroecological model with smallholder agriculture in the Andes. AGROECO did not conduct research

TABLE 1: SUMMARY OF AGROECO ACHIEVEMENTS AND RESEARCH RESULTS

KEY FOOD SECURITY OBJECTIVES	PROJECT ACTIONS	RESEARCH ACHIEVEMENTS	DEVELOPMENT ACHIEVEMENTS	OUTREACH HIGHLIGHTS
OVERALL PROJECT ASSESSMENT				
Understanding the connections between agroecological farming systems and vulnerability to food insecurity	Farmers supported in their practice of agroecological methods (multi-actor collaboration).	<p>Livelihood and food security assessment (household survey n=451 in 3 Andean regions) comparing agroecological and conventional farms and families in similar farming systems. First survey of its kind and size in Latin America.</p> <p>Annexes 1, 1a</p> <p>Papers to be submitted to peer-reviewed journals: 3</p> <p>KEY RESULTS:</p> <p>Statistically significant differences for the following variables show improved performance of agroecological households as compared to conventional ones:</p> <p>FOOD SECURITY: higher perception of increased food availability and diversity; increased perception of good family health.</p> <p>WOMEN: longer schooling period of the mother; stronger role of women in deciding household expenditures; higher percentage of women leading farmer's organizations.</p> <p>FARMING SYSTEM: more new crops planted; higher use of own seed; lower perception of "exhausted" soils; lower perception of increase of soil erosion; higher number of households with planted trees; higher perception of water free of contaminants; higher use of pressurized irrigation systems.</p> <p>ECONOMY AND SCALE: higher number of economic activities; stronger market connections; higher perception of increased household income; higher participation in farmer's organizations; higher perception of farmer's organizations being "useful to access markets".</p> <p>SERVICES AND SUPPORT: lower percentage of households without external support; higher access to public programs and private credit; higher percentage of family members that returned to the farm after having migrated.</p>	<p>Direct activities with 889 family farmers operating in 2,122 hectares under ecological management (average 2.4 ha/farming unit). Support for the implementation.</p> <p>1,084 farmers trained in agroecological methods for crop production (at least one PGS training session)</p>	<p>- Key household survey results to be included in a bilingual IFOAM booklet to be distributed in the COP20 event (Lima, December 2014); oral presentations at Organic World Congress (Turkey, October 2014).</p> <p>- Overall project outreach: 8 articles published in LEISA Revista de agroecología, reaching an estimated audience of 10,000 readers per issue in Latin America.</p> <p>Annex 2</p>
Capacity-building in food security issues	Project staff, key partners and network of collaborators trained in food security and agroecological issues	<p>- 9 Lead researchers;</p> <p>- 36 BSc and MSc thesis in the following fields: agronomy, molecular biology, ethnobotany, nutrition, social capital, gender.</p> <p>KEY RESULTS:</p> <p>See below according to the 5 dimensions of food security.</p> <p>See Questionnaire for details of figures and persons.</p>	<p>- 76 professional and technical staff, including consultants;</p> <p>- 1,670 farmers (of which 47% women, 19% under 35 y.o.);</p> <p>- 57 local government staff;</p> <p>- 63 NGO and private sector;</p> <p>- 180 students of 7 universities and technical institutes.</p>	<p>- 12,000 consumers exposed to project actions at least once.</p> <p>- Collaboration on IFOAM Best Practice Guidelines for Agriculture, translation into Spanish. Annex 3</p>
THE 5 DIMENSIONS OF FOOD SECURITY				
1. AVAILABILITY: The existence of enough food of good quality				
Increased food production and resilience of potato-based peasant cropping systems	Native potato diversity	<p>Establishment of a large germplasm collection of native potatoes and minor tubers from the Cusco region as a basis for fundamental and applied research leading to conservation and intensified use.</p> <p>Annex 4</p> <p>Papers to be submitted to peer-reviewed journals: 2</p> <p>KEY RESULTS:</p> <p>- Largest collection of Cusco native potatoes assembled by the project and kept at local university (3,501 accessions of native potatoes and 638 of other tuber crops (oca, mashua, olluco).</p> <p>- Morphological characterization during 3 growing seasons and statistical analysis to reduce duplicates and analyze genetic relationships.</p> <p>- Genetic analysis with tools of molecular biology in Peru and Canada laboratories.</p> <p>- 509 distinct native potato traditional varieties from Cusco identified after botanical and molecular analysis and will be the basis of the most updated catalogue of native potatoes from that region of world importance for the crop. Additionally, a parallel process in Cajamarca identified 450 varieties out of a collection of 1,364 accessions, but other studies were not as complete as for Cusco.</p> <p>- Diversity studies of 944 accessions of minor Andean tubers.</p> <p>Annexes 5, 6, 7, 8</p>	<p>- Seed of 509 distinct native potato ecotypes returned to 4 peasant communities in Cusco. In a parallel process, 450 varieties from the region of Cajamarca was returned to 1 peasant community.</p> <p>- Project research will support the National Register of Native Potatoes, still in its infancy in spite of having been initiated in 2008.</p> <p>- An interpretation center for biodiversity issues established with a peasant community in Cusco, to be run by a youth group. Linked with this center is a Register of Agrobiodiversity, to collect all project findings and make them available to a wider audience. Annex 9</p>	<p>- 233 families from 37 districts providing seed material in Cusco; 153 families from 4 peasant communities participating in the conservation of the collection. 4 public agrobiodiversity activities in Cusco and Lima.</p> <p>- Policy brief</p>

		<p>Ethnobotany and traditional knowledge (survey n = 94). Annex 10 KEY RESULTS: Participating communities exhibit knowledge of local crops and agricultural practices but the decline of knowledge depth and practices was observed. Even when the use of local plants and cultural resource continue playing a key role in the daily activities, these appear relegated to older generations.</p> <p>Review of molecular tools for potato breeding Annex 11 Paper submitted to a peer-reviewed journal: 1 KEY RESULTS: Review of genetic markers that have been published for various abiotic and biotic traits in potato, summarizing the potential of these molecular tools when studying complex traits (cold, drought and viral tolerance).</p>	
	<p>Native potato seed improvement</p>	<p>Comparison of seed production systems and seed quality. Annexes 12, 13 Papers to be submitted to peer-reviewed journals: 1 KEY RESULTS: - Officially certified seed of native potato and traditional peasant seed performed substantially similar, with no statistical differences in yield and plant health at high altitudes in Cusco but not at lower altitude in Cajamarca. These results call for a revision of the seed certification system. - At lower altitudes, use of farm synthetic chemicals outyields traditional or organically managed native potatoes while at higher altitudes the difference is minimal. Promotion of organic methods should take into consideration variations needed in different farming systems. - Novel methods of potato seed propagation tested for the first time in 4 peasant communities, with statistically significant differences with regards to preferred type of substrate for microtuber propagation (vermicompost, which can be produced in the region).</p> <p>An analysis of legislation affecting smallholder seed conservation and innovation. Annexes 15, 16 KEY RESULTS: New regulation on seeds (June 2012) provides a basis for the inclusion of indigenous seed systems in the formal public structure for seeds but the challenges remain in the implementation. For the first time in history, the recognition of farmers seed systems may support local seed production, improve access to quality seed and develop local seed markets, but a more integrated legal system is required, combining breeder rights with on farm conservation of genetic resources and compensation mechanisms.</p>	<p>- 68 Quechua peasants trained on organic seed production (graduates of the first farmer field school with 17 sessions and 93 participants in 3 peasant communities in Cusco, a total of 204 hours). - This was the basis for the first Peruvian registration of 3 Quechua farmers as producers of non-certified potato seed. - Novel propagation methods (microtubers, cuttings) introduced in these peasant communities. - All the above may provide the foundation for the establishment of community seed banks for native potatoes, an objective that was not achieved during the project implementation and would require much adaptation with regards to similar systems in India or Cuba.</p> <p>Annex 14</p> <p>Two policy analysis published</p>
<p>Increased food diversity and production by women and stability in the supply of vegetable crops</p>	<p>Open field and protected production of nutritious vegetable crops</p>	<p>Comparative studies of underexploited leafy vegetable crops. Annex 17 Papers to be submitted to peer-reviewed journals: 1 KEY RESULTS: 5 cultivars belonging to 3 species of Amaranthus were grown in two locations of Cusco. Highly significant statistical differences have shown for the first time the great potential of kiwicha, a traditional pseudograin crop, grown as vegetable crop at high densities in homegardens, with very high yields of over 8 kg/m², more than any other known vegetable crop. With a very high nutrient content, these results provide insight into a rapid, easy and culturally-acceptable way to produce more nutrient-rich vegetables.</p>	<p>4 women groups involved in organized production of vegetables, based on 3 new plastic greenhouses, for home consumption and to supply local markets and restaurants. 224 training sessions with a total group of 46 persons accounting for a total of 896 hours.</p>

		<p>Release of the first Peruvian cultivar of leaf amaranth for home vegetable production.</p> <p>KEY RESULTS:</p> <p>With a foundation on previous research of several crop generations, with final work in La Molina and Cusco, atacco "Molinero" is the first Peruvian variety of a vegetable crop derived from a weedy population and specifically obtained for a nutritional purpose. Seed is already available for farmers and the general public (urban agriculture).</p>		
	Home production of sprouts	<p>Determination of methods for home production of sprouts.</p> <p>KEY RESULTS:</p> <p>Specific methods determined for 11 plant species (type of seed, seed density, disinfection) for which seed production is possible in Peru.</p>	12 training activities for a total audience of 800 persons.	
	Edible wild plants	<p>Participatory and botanical identification of wild plants as food: survey and culinary witness observation (n = 26).</p> <p>Annex 18</p> <p>Papers to be submitted to peer-reviewed journals: 1</p> <p>KEY RESULTS:</p> <p>47 wild edible plant species and fungi identified in a peasant community of the Calca district.</p>	26 elders and women engaged in participatory research.	
2. ACCESS: People have enough resources to purchase appropriate and nutritious food				
Intensified value chains leading to higher income for ecological smallholders	Short-marketing chains Annexes 19, 20		<p>274 farmers (76 % women) with at least one participation in organic fairs supported by the project, of which 117 farmers were selling repeatedly.</p> <p>Farmer's weekly markets initiated or supported in 5 cities, with an average participation of 63 farmers and 420 consumers per day.</p>	<p>- Book chapter on the overall market approach of the project.</p> <p>- Policy brief.</p>
		<p>Potential and challenges for the connection of smallholder women vegetable producers and the gastronomic sector.</p> <p>Annex 21</p> <p>Papers to be submitted to peer-reviewed journals: 1</p> <p>KEY RESULTS:</p> <p>The relations between local actors and how they add to this commercial partnership are examined, describing types of buyers and intervention models to reveal main incentives, best practices, bottlenecks and recommendations along this short value chain. It was found that the commercial partnership with restaurants stimulates the use of protected horticulture technologies and increases household consumption of vegetables, with great potential to increase supply and quality and to connect to other markets.</p>	14 women regularly supplying vegetables to restaurants in Cusco and 10 connected to other projects	
			3 Peru's first Quechua peasants registered as potato seed producers.	
			220 farmers trained in issues related to marketing activities	
			2 shops for ecological products in Cusco and Cajamarca, where 300 farmers are directly and indirectly selling their products or raw materials	
			130 farmers participated in 5 annual national or regional fairs or trade shows	
		90 farmer leaders and local authorities participated in national or regional capacity building and knowledge sharing events with regard to market development		
Intensified social capital leading to a stronger placement	Implementation of PGS Annex 22		<p>- 4 Provincial PGS Councils established, led by municipalities</p> <p>- 1084 farmers trained in PGS guarantee systems</p> <p>- 227 farmers granted a PGS certificate</p>	Policy brief

of ecological products in the marketplace		<p>Global PGS study (7 countries) analyzed conditions for PGS sustainability. Annex 23 Papers to be submitted to peer-reviewed journals: 1 KEY RESULTS: Over 49,000 small operators are involved in PGS worldwide. The study identified how PGS and other parallel social processes can trigger innovation and adaptation and improve livelihoods in rural areas. On the household level, the study revealed benefits such as cost savings, income and food availability, and personal empowerment including development of knowledge, skills and self-confidence.</p>	60 researchers, technicians and farmers in 7 countries of 4 continents involved in research regarding the sustainability of PGS and its interaction with social processes.	- The study will be published in English and Spanish and presented during the Organic World Congress, Turkey October 2014.
	<p>Development of a collective mark Annex 24</p>		<p>- First Latin American registered collective mark (Frutos de la tierra) for diversified ecological farmers launched in 2013, in collaboration with other projects. - 76 producers authorized to use the collective mark.</p>	<p>- 185 farmers trained in intellectual property rights and collective mark. - Frutos de la tierra website in ANPE PERU homepage - Presentation Asia-Pacific Symposium, Thailand 2013. Annex 25 - Practical guide on geographical indications and collective marks. Annex 26 - Two brochures. Annexes 27, 28</p>
3. UTILIZATION: Sufficient energy and nutrient intake as the result of good care and feeding practices, food preparation, diversity of the diet and intra-household distribution of food.				
Increased nutritional value of food	<p>Nutritional value of indigenous and introduced vegetables.</p>	<p>Determination of nutritional content of leaf amaranth and Brassica leaves and analysis of the effects of altitude and location. Annex 29 Papers to be submitted to peer-reviewed journals: 2 KEY RESULTS: Underexploited vegetable crops from the genus Amaranthus and Brassica proved to be very good sources of vegetable protein and dietary fiber, which are essential for a good nutrition. These are hardy crops that can be easily grown in Andean homegardens. Their role as source of iron and its potential in the fight against anemia still needs to be analyzed with regards to bioavailability.</p>		
	<p>Nutritional value of native potatoes.</p>	<p>Determination of antioxidant content of selected native potato varieties. Annex 30 KEY RESULTS: Potato is an excellent source of carbohydrates and have good quality protein. In addition, the vitamine C and anthocyanins are important health promoting compounds and the native potatoes studied in this research, especially those with red or blue colour in the flesh, could be considered as good resources of these compounds. Cooking did not reduce the content of anthocyanins, on the contrary, there was an increase of these compounds in boiled potatoes.</p>		
Improved food habits	<p>Nutritional and culinary training</p>		75 farmers and 450 consumers participated in nutritional and culinary training.	<p>- 1 book published. Annex 31 - 35 radio programs aired to an estimated audience of 5,300 each program and a 20-minute video on food security issues narrated in the Quechua language. Annex 32</p>
4. STABILITY: Availability and access to food at all time, reducing the effects of regular or unexpected crisis				
Reduced food production shocks	<p>Cold-resistant varieties of native potatoes</p>	<p>Evaluation of a very large collection of native potatoes for cold and late blight tolerance. Annex 4 KEY RESULTS: 43 (Cajamarca) and 35 (Cusco) varieties of native potatoes identified as tolerant to frost and/or late blight, which are severe limiting factors of potato production at high altitude.</p>	Seed of these tolerant varieties supplied to the participating peasant communities for further on farm trials.	

	Cold-resistant vegetable crops	Adaptation of kale and other cold resistant or perennial vegetables in Lima and Cusco. KEY RESULTS: Top performer among 72 vegetable crops tested in Lima and Cusco, kale, a leafy vegetable introduced by the project with European and Canadian seed, showed outstanding tolerance to frost. After two years the plants eventually flowered and produced seed, a sign of adaptation to the local conditions. Further research and use will provide a hardy and highly nutritious leafy vegetable to complement the Andean food system during the dry and cold season, when food supplies diminish.	11 families growing kale in Cusco	Local cooks involved in culinary trials with kale and outreach activities.
	Microtunnels for protected vegetable production.	Study on the perceptions of women regarding adoption of microtunnel techniques (n=46) and agronomic evidence. Annex 33 Papers to be submitted to peer-reviewed journals: 1 KEY RESULTS: Key challenges and opportunities to promote protected horticulture are analyzed. The study concludes that in this region, where frosts occur every year, microtunnels are a valid technology for smallholder women, with potential to diversify and increase production of vegetable crops throughout the year, improving the stability of supply.	104 microtunnels implemented with women in 2 provinces of Cusco	
Reduced food postharvest losses	Native potato postharvest	Anti-sprouting, anti-microbial and insecticidal properties of plants from Cusco region of Peru to benefit potato tuber storage Annex 34 Papers to be submitted to peer-reviewed journals: 1 KEY RESULTS: Muña and eucalipto essential oils volatiles reduced sprouting in potatoes with statistical significance. Essential oils volatiles showed antifungal properties. Damages by potato tuber moth to potatoes layered with eucalipto and muña were reduced statistically significantly. The most dramatic drop of 98.2% with application of mechanical barrier fresh eucalipto sawdust. Results show advantages of covering tubers in the storage with muña and eucalipto plants.	4 community storage houses implemented in peasant communities of Cusco (3) and Cajamarca (1) for reduced postharvest losses and as an asset towards community seed banks and coordinated community sales.	
5. INSTITUTIONS AND SOCIAL CAPITAL: Empowerment of smallholders and their organizations, improved networking and advocacy				
A more enabling environment for food security improvement among smallholders	Farmer's organizations		- Agreement with peasant communities to conduct and evaluate the project. Annex 35 - Mid-term report to communities and farmers associations. Annex 36	
		Analysis of the relations between an ecological farmers association and local food security strategies in Calca province. Annex 37 KEY RESULTS: Membership in a farmer's association in Calca seem to have limited impact on household food security, in spite of active participation in outreach events and farmer-to-farmer programs. Limitations are more related with access to all members of the association and insufficient collaboration with local actors.	11 Provincial and 2 Regional associations of ANPE revised and updated their legal registration as a basic condition for proper management, access to credit or projects and advocacy.	
		Analysis of social capital throughout project implementation Annex 38 KEY RESULTS: The impact of the various project activities was analyzed. The best results in improving social capital were found in the PGS in Bambamarca and the organic fairs in Cajamarca. Project activities related to market access were by far the most relevant as they better captured the interest of smallholders. Activities specifically directed to the strengthening of ANPE's regional associations failed to achieve a significant increase in social capital as these associations are too dependent on external funding and often lack internal cohesion.	32 farmer leaders from 11 provincial farmer's associations completed a modular course on access to local funding and business plan development	- Manual on access to local funding sources for farmers associations. Annex 39 - An analysis of 2004-2010 farmer training activities of ANPE PERU. Annex 40
	Advocacy, particularly for municipal action, and multi-actor collaboration		PACTA, a public-private platform to support on farm conservation of germplasm collections returned to peasant communities. Annexes 14, 41	

		A university experimental station in transition to certified organic agriculture. Annex 42
		Collaboration for Peru's first Municipal Commission on Food Security, Cusco
		Advocacy and its contribution to the agroecological model in Peru: AGROECO's intervention at the municipal level. Annex 43 KEY RESULTS: Advocacy at the municipal level is considered a key aspect of agroecological development, particularly to gain support for marketing activities and introduce issues related to food security in the local government's plans. Project actions in different provinces are analyzed and main challenges are discussed. Cusco's pioneer Municipal Commission on Food Security can be a good example for rural municipalities.
		Municipal leadership in 4 Provincial PGS Councils (Calca, Quispicanchi, Bambamarca and Espinar). Annex 22
		Support for the successful establishment of Cajamarca's Regional Commission for Organic Production (COREPO) and further election of a participating farmer as representative at the national commission (CONAPO).
		Collaboration on IFOAM Position Paper on the Role of Smallholders in Organic Farming, translation into Spanish. Annex 44
Understanding the role of women in food security at the household level	Gender analysis	Gender relations and stressors determinants in the context of food security among smallholder farmers in the Peruvian Andes. Annex 45 KEY RESULTS: Determinants of gender relations and stressors in the context of food security remain poorly understood. The most important stressors to affect agricultural production were related to environmental and/or climatic events for all communities. Gender was not found to make a significant difference in food security of the whole family during scarcity months. However, during abundance months, male-led households were more likely to eat enough and higher quality food. Gender, governance and market: theoretical reflections on practical experiences in the AGROECO project. Annex 46 Papers submitted to peer-reviewed journals: 1 KEY RESULTS: This article is a theoretical reflection on results from the AGROECO Project concerning sexual division of labor in high-Andean communities, women's empowerment and marketing strategies. It is argued that women's empowerment initiatives could be more effective if projects do not promote competition between women and men for the same activities, without exacerbating gender based conflict.

about a specific technology but rather on a set of technologies and practices, at the farm level and at the society level, individual and collective, in order to better understand the potential and limitations of the agroecological model (some call it a new paradigm) with regards to food security and livelihoods in the high Andes of Peru.

Table 1 also shows how the project's original research plan required adjustments and adaptations that were not fully foreseen in the initial planning stage. For this reason, additional objectives have been achieved as a result of new or modified activities.

These are the key objectives per each dimension of food security, as they were developed as the project was being implemented in response to internal and external modifiers:

OVERALL PROJECT ASSESSMENT

- Understanding the connections between agroecological farming systems and vulnerability to food insecurity
- Capacity-building in food security issues
- 1. AVAILABILITY:** The existence of enough food of good quality
 - Increased food production and resilience of potato-based peasant cropping systems
 - Increased food diversity and production by women and stability in the supply of vegetable crops
- 2. ACCESS:** People have enough resources to purchase appropriate and nutritious food
 - Intensified value chains leading to higher income for ecological smallholders
 - Intensified social capital leading to a stronger placement of ecological products in the marketplace
- 3. UTILIZATION:** Sufficient energy and nutrient intake as the result of good care and feeding practices, food preparation, diversity of the diet and intra-household distribution of food.
 - Increased nutritional value of food
 - Improved food habits
- 4. STABILITY:** Availability and access to food at all time, reducing the effects of regular or unexpected crisis
 - Reduced food production shocks
 - Reduced food postharvest losses
- 5. INSTITUTIONS AND SOCIAL CAPITAL:** Empowerment of smallholders and their organizations, improved networking and advocacy
 - A more enabling environment for food security improvement among smallholders
 - Understanding the role of women in food security at the household level

Table 2 provides a glimpse of the relative weight of the specific objectives as approved in the grant agreement per each dimension of food security. In literature and practice, the understanding the dimensions of food security have varying interpretations: the dimensions of Availability, Access and Utilization are of general use, while Stability has been added in recent years as a separate dimension in order to be able to make a finer analysis of the situation at household level and in a longer period of time. Finally, Institutions and Social Capital (*Institucionalidad*, in Spanish) is generally presented as the framework for analysis and action. We propose here to add Institutions and Social Capital as a fifth dimension on its own, taking into consideration that it is central to the agroecological movement and it is also where we can identify great opportunities for improvement that impact all the other dimensions.

Table 2: Relative weight of project action per specific objective in each dimension of food security

RESEARCH COMPONENT	SPECIFIC OBJECTIVES IN GRANT AGREEMENT	OBJECTIVES PER DIMENSION OF FOOD SECURITY (see Table 1)									
		Increased food production and resilience of potato-based peasant cropping systems	Increased food diversity and production by women and stability in the supply of vegetable crops	Intensified value chains leading to higher income for ecological smallholders	Intensified social capital leading to a stronger placement of ecological products in the market	Increased nutritional value of food	Improved food habits	Reduced food production shocks	Reduced food postharvest losses	A more enabling environment for food security improvement among smallholders	Understanding the role of women in food security at the household level
C1	Conduct a participatory inventory of genetic diversity	XXX	--	--	X	X	--	XX	X	X	XX
	Apply new screening protocols to discover germplasm with novel stress-tolerance	XXX	--	--	--	--	--	--	--	--	--
	Intensify production through organic farming and protected horticulture	--	XXX	XX	XX	X	X	XX	--	X	X
	Evaluate Andean plants with potential uses as organic pesticides	--	--	--	--	--	--	--	XXX	--	--
	Determine the nutritional potential of germplasm	X	X	--	--	XXX	X	--	--	--	--
C2	Generate information on Andean seed and crop conservation based on KAP and MAC	XX	--	X	XXX	--	X	XX	X	XX	X
	Develop a participatory monitoring system in ANPE's local communities	--	--	XXX	XXX	--	--	--	--	XX	--
C3	Identify key conditions for market integration of agroecological producers	--	--	XXX	XX	--	X	--	--	XX	X
	Determine the conditions for a strategy for increasing revenues with gender equity.	--	--	XXX	XX	--	--	--	--	XX	XX
C4	Validate, implement and assess a participatory capacity-building strategy for agroecological production leaders.	XX	XX	XX	XX	--	XX	X	X	XX	X
C5	Gather evidence for supporting organic native crops and seeds with alternative legal, policy and incidence tools and <i>sui generis</i> mechanisms	X	--	XX	X	--	--	--	--	XX	--
	Improve the advocacy capacities of ANPE	X	X	XX	XX	--	--	X	X	XX	--

Note on strength of the connection: XXX=strong; XX=significant; X=minor; --=little or no connection.

This has been a complex and, because of the social and political nature of the intervention in two regions of Peru, also a difficult one. The final nature of its contributions to science and development will continue to be understood as the results are shared and analyzed with different stakeholders (farmer's organizations, development community, academics, donors), several papers are finalized and submitted

to international peer-reviewed journals and more reports are made public. We expect to use these results to influence policy-making at the local, national and international levels. We envision the following results to have the greatest potential to influence practitioners, researchers and policy-makers:

1. As far as we know, based on our experience and literature search, our **household survey linking the practice of agroecology with livelihood and food security assessment** is the first of its kind in Latin America because of its size and scope, and one of the first worldwide. The size and distribution of the samples have allowed us to derive preliminary conclusions with statistical significance that shows sometimes very clear advantages for the agroecological households. There are several comparisons available when certified organic, "sustainable" or fairtrade commodity production is concerned (i.e. coffee or banana), but apparently none with non-certified traditional farmers, sometimes referred to as "organic by default". This does not come without difficult responses, where agroecological households perform worse than the conventional, for example in terms of sanitary services or participation in irrigation committees, or when agroecological households perform better but still at lower levels than desired (i.e. food availability). Anyhow, these results show the power of the agroecological practice to improve livelihoods and food security, but require a thorough analysis with regards to its costs and requirements, taking into consideration that most agroecological respondents have been or are participating in agroecological projects that are funded by donors, in a situation of governmental absence or weakness, corruption and/or social turmoil.
2. Cusco is the world's top region in terms of **native potato diversity** but, strange as it may seem, there is no publicly available catalogue or database of that diversity. Moreover, germplasm is not available to researchers or peasants and, if it is, it comes at a high price in terms of bureaucracy and other costs. Through our research and multi-actor collaboration, we have provided Cusco's university with the whole germplasm collection free of charge for further research and provided 5 peasant communities in Cusco and Cajamarca with a full collection of morphologically distinctive "varieties". As far as we know, this is the first time this happens in Peru and is the result of great effort to, first, characterize the whole collection with botanical and molecular techniques in Peru and Canada and, secondly, assist the peasant communities in the management of this highly valuable germplasm, including the establishment of a public-private partnership through the PACTA platform. We are, however, aware of the challenges ahead of these communities and other stakeholders. It is clear that the peasant communities will have to deal with several factors in order to make the best possible use of this collection, but we are sure that this is a first step in the democratization of access to genetic resources and constitute a great potential for peasant communities in terms of additional tools to increase resilience of their farming systems, have better adaptation tools towards climate change, improve the nutritional outputs of their farms and have better possibilities for a stronger positioning in the marketplace, particularly with the gastronomic sector and short marketing chains.
3. The comparison of productivity when influenced by **seed quality** has provided unexpected results with statistical significance. First, yields of native potato in peasant systems over 3,500 masl are higher than previously reported (around 10 ton/ha). Secondly, yields obtained with peasant seed are statistically similar as those obtained with certified seed provided by INIA, the national agricultural research institute. Even though less than 1% of potato production in Peru is obtained with certified seed, the intention of the new law on seeds is to have this increased in a very short time. Our results have already been shared with INIA and this will call for a revision of their current system for certified seed production. In this same issue, we have conducted a thorough 2-year process of field schools and monitoring of individual farms with 3 peasant communities, that led to the official registration of

Peru's first individual peasant farmers as producers of non-certified potato seed. This should be the first step in the establishment of community seed banks, but our project has shown the enormous difficulties behind this objective and the little correspondence with similar processes that we studied, namely those of Cuba and India.

4. Our work with **underexploited vegetable crops** has provided information not available before: (1) The high potential of local crops to be cultivated intensively in home gardens to produce leafy vegetables that are hardy, easy to produce, productive and nutritious; (2) the introduction and apparent adaptation to the highlands of kale, an introduced crop that is outstanding in terms of frost tolerance (the major limiting factor for vegetable production), nutrition and content of health-promoting substances like antioxidants; (3) the determination of appropriate methods for the home production of sprouts, vegetables that are exceptionally nutritious; (4) the first nutritional analysis conducted in Peru with leaves of novel vegetables like kale and the leaves of quinoa and kiwicha, which are well-known traditional crops grown for its seeds but not for its leaves; and (5) the release of Peru's first cultivar of leaf amaranth, derived from a weedy population.
5. **Protected horticulture** (particularly plastic houses) is well known in the Andes of Peru and Bolivia but very often their sustainability is put into question and the landscape is often dotted with abandoned plastic houses, or they are used for other purposes, like storage or houses for small animals like guinea pigs (cuy). Our experience has shown that plastic houses are an essential tool for the group production of high quality vegetables for the marketplace, particularly to supply restaurants or ecological farmer's markets, and to produce off-season, but are still too expensive for individual households. Our project has introduced the concept of movable plastic tunnels (these microtunnels), a technique that is common in Asia and Europe but not in the Andes. We tested the technology with over 100 microtunnels in 4 districts of Cusco, all managed by women, and our results show a high potential for adoption. UNALM's close relationship with ANPE will allow us to continue testing and promoting microtunnels for the production of vegetables, particularly during the dry and cold season, mainly for home consumption but also for the marketplace.
6. The use of local plants as repellent of potato pests in storage is well known and documented. Our research, however, is new for the communities involved and, most interestingly, has been done not only with dry plant materials, as is traditionally done, but also with essential oils and other local materials. The results are promising in terms of pest repellence but also in the delay of sprouting, with high potential to reduce losses of potato during traditional storage. This is relevant not only to conserve potato seeds but also to **prolong the storage life of potatoes** for human consumption, a factor of great relevance for households in the very high Andes and in the beginning of the growing season, when food reserves are at its lowest.
7. Our action in **market access** has been very intensive: 274 farmers (76 % women) sold at farmer's markets supported by the project, of which 117 farmers were selling repeatedly. These farmer's weekly markets were initiated or supported in 5 cities, with an average participation of 63 farmers and 420 consumers per day. Four Provincial PGS Councils were established, led by municipalities, with 1084 farmers trained and 227 farmers granted a PGS certificate. Additionally, the first Latin American registered collective mark (*Frutos de la tierra*) for diversified ecological farmers was launched in 2013, in collaboration with other projects.

8. The current gastronomic boom in Peru is generally discussed in the framework of what is called the peasant-cook alliance, and gastronomy has become a powerful tool to raise awareness of peasant and biodiversity issues. There are some national studies with regards to the contribution of gastronomy to rural development, but in general terms. We have analyzed the relations between local actors and how they add to this commercial partnership, describing types of buyers and intervention models to reveal main incentives, best practices, bottlenecks and recommendations along this short value chain. It was found that the commercial partnership with restaurants stimulates the use of protected horticulture technologies and increases household consumption of vegetables, with great potential to increase supply and quality and to connect to other markets. However, the **commercial connection between smallholders and restaurants** is full of challenges and difficulties, and the real roles of restaurants need to be closely examined in economic terms. This research provides a framework for analysis not available before.
9. Over 49,000 small operators are involved in PGS worldwide. Our study (60 researchers, technicians and farmers in 7 countries of 4 continents) identified how **PGS and other parallel social processes** can trigger innovation and adaptation and improve livelihoods in rural areas. On the household level, the study revealed benefits such as cost savings, income and food availability, and personal empowerment including development of knowledge, skills and self-confidence. PGS is one of the most interesting social and marketing innovations, developed originally in Latin America, but in some cases (as in Peru) their sustainability is put into question since most are donor-funded experiences and disappear or enter an inactive stage when external funds are not available. This study provides insight on how stronger market and social linkages may help the PGS remain and deliver multifaceted benefits.
10. The analysis of **social capital** was not originally foreseen, as we were more interested in knowledge systems from an academic point of view. The project practice, however, required intensive action with different types of farmer's organizations, which led to a comparative analysis of this capital, which is fundamental in a successful implementation of agroecology. Activities specifically directed to the strengthening of ANPE's regional associations failed to achieve a significant increase in social capital as these associations are too dependent on external funding and often lack internal cohesion. The best results in improving social capital were found in the PGS in Bambamarca and the organic fairs in Cajamarca. Project activities related to market access were by far the most relevant as they better captured the interest of smallholders, but these are highly dependent on active and efficient intervention of the local governments.
11. **Advocacy instruments** of relevance for the promotion of more sustainable farming systems have been produced. We contributed with the production and translation of two documents by IFOAM: a position paper on the role of smallholder, as a contribution to 2014 International Year of Family Farming, and the Best Practice Guidelines for Agriculture and Value Chains, which are being actively used in international advocacy opportunities. On a national level, 2 public documents analyzed the relationship between ecological agriculture and traditional seed systems with regards to Peru's new law on seeds and intellectual property rights.
12. AGROECO has been particularly active in **producing and publishing**, sometimes translating into Spanish, various materials to make them available to farmers and consumers. Because of the innovations they represent, 3 outputs can be highlighted: (1) a manual for the preparation of proposals to public sources of funding; (2) a book dealing with underexploited vegetables and their

nutritional properties; and (3) a video and a 35-sessions radio program, both narrated in the Quechua language in order to make them available to the most food insecure people in the Andes. All project materials are being uploaded into a renewed webpage hosted at UNALM's website.

13. Research based on the findings of the project will continue in the coming months and will produce at least 12 additional **papers to be submitted to peer-reviewed journals**. Some this will contain a multidisciplinary analysis of the findings from different components, as disciplinary research was required in the 3 growing seasons in the Andes, which ended in June 2014. Additionally, we expect around 30 BSc and MSc thesis to be defended in 3 Peruvian and 1 Canadian universities during years 2014 and 2015.

5. **Synthesis of results towards AFS Outcomes (5 pages max.):** (summarized information contained elsewhere in this report):

1. **New technologies and/or farming systems and practices.** How has the project developed new and improved agricultural technologies and/or farming systems and practices that increase food production? (e.g. technologies and innovations; staple crops; crop-livestock interactions; agricultural water management; new seeds and plants).
 - The project provided Cusco's university with the whole germplasm collection of native potatoes free of charge for further research and provided 5 peasant communities in Cusco and Cajamarca with a full collection of morphologically distinctive "varieties". As far as we know, this is the first time this happens in Peru and is the result of great effort to, first, characterize the whole collection with botanical and molecular techniques in Peru and Canada and, secondly, assist the peasant communities in the management of this highly valuable germplasm, including the establishment of a public-private partnership through the PACTA platform.
 - 68 Quechua peasants trained on organic seed production (graduates of the first farmer field school with 17 sessions and 93 participants in 3 peasant communities in Cusco, a total of 204 hours). This was the basis for the first Peruvian registration of 3 Quechua farmers as producers of non-certified potato seed. Novel propagation methods (microtubers, cuttings) introduced in these peasant communities.
 - With a foundation on previous research of several crop generations, with final work in La Molina and Cusco, atacco "Molinero" is the first Peruvian variety of a vegetable crop (leaf amaranth) derived from a weedy population and specifically obtained for a nutritional purpose. Seed is already available for farmers and the general public (urban agriculture).
 - 47 wild edible plant species and fungi identified in a peasant community of the Calca district.
2. **Dietary diversity & nutrition.** How has the project contributed to dietary diversity/balanced diets, particularly for women and children? (e.g. food safety practices and regulatory frameworks; food fortification; local nutritional needs)
 - 5 cultivars belonging to 3 species of Amaranthus were grown in two locations of Cusco. Highly significant statistical differences have shown for the first time the great potential of kiwicha, a traditional pseudograin crop, grown as vegetable crop at high densities in homegardens, with very high yields of over 8 kg/m², more than any other known vegetable crop. With a very high nutrient content, these results provide insight into a rapid, easy and culturally-acceptable way to produce more nutrient-rich vegetables.

3. Engagement of Canadian researchers with Southern researcher organizations (for CIFSRF-funded projects only). Is there increased use of Canadian knowledge and resources to address environmentally sustainable agricultural productivity and nutrition problems in developing countries?

- Canadian researchers were instrumental in research dealing with molecular biology tools for characterization of native potatoes, ethnobotany, biopesticides and gender.

4. Research groups. How has the project contributed to stronger research groups for improved food security policies and decision-making?

- 9 Lead researchers; 36 BSc and MSc thesis in the following fields: agronomy, molecular biology, ethnobotany, nutrition, social capital, gender; 76 professional and technical staff, including consultants; 1,670 farmers (of which 47% women, 19% under 35 y.o.); 57 local government staff; 63 NGO and private sector; 180 students of 7 universities and technical institutes.

5. Food distribution. How has the project contributed to more equitable food distribution for food security? (e.g. more equitable access to quality food)

Livelihood and food security assessment (household survey n=451 in 3 Andean regions) comparing agroecological and conventional farms and families in similar farming systems. First survey of its kind and size in Latin America. Statistically significant differences for the following variables show improved performance of agroecological households as compared to conventional ones:

FOOD SECURITY: higher perception of increased food availability and diversity; increased perception of good family health.

WOMEN: longer schooling period of the mother; stronger role of women in deciding household expenditures; higher percentage of women leading farmer's organizations.

FARMING SYSTEM: more new crops planted; higher use of own seed; lower perception of "exhausted" soils; lower perception of increase of soil erosion; higher number of households with planted trees; higher perception of water free of contaminants; higher use of pressurized irrigation systems.

ECONOMY AND SCALE: higher number of economic activities; stronger market connections; higher perception of increased household income; higher participation in farmer's organizations; higher perception of farmer's organizations being "useful to access markets".

SERVICES AND SUPPORT: lower percentage of households without external support; higher access to public programs and private credit; higher percentage of family members that returned to the farm after having migrated.

6. Food processing and storage. How has the project contributed to improved post-harvest food processing and storage techniques for food security?

- Muña and eucalipto essential oils volatiles reduced sprouting in potatoes with statistical significance. Essential oils volatiles showed antifungal properties. Damages by potato tuber moth to potatoes layered with eucalipto and muña were reduced statistically significantly. The most dramatic drop of 98.2% with application of mechanical barrier fresh eucalipto sawdust. Results show advantages of covering tubers in the storage with muña and eucalipto plants.
- 4 community storage houses implemented in peasant communities of Cusco (3) and Cajamarca (1) for reduced postharvest losses and as an asset towards community seed banks and coordinated community sales.

7. Risk-mitigation. How has the project contributed to better risk-mitigation for food security? (e.g. mechanisms that cope with the impacts of climate change, and other shocks such as food price volatility)

- 43 (Cajamarca) and 35 (Cusco) varieties of native potatoes identified as tolerant to frost and/or late blight, which are severe limiting factors of potato production at high altitude.
- Top performer among 72 vegetable crops tested in Lima and Cusco, kale, a leafy vegetable introduced by the project with European and Canadian seed, showed outstanding tolerance to frost. After two years the plants eventually flowered and produced seed, a sign of adaptation to the local conditions. Further research and use will provide a hardy and highly nutritious leafy vegetable to complement the Andean food system during the dry and cold season, when food supplies diminish.
- Key challenges and opportunities to promote protected horticulture were analyzed: a study concluded that in this region, where frosts occur every year, microtunnels are a valid technology for smallholder women, with potential to diversify and increase production of vegetable crops throughout the year, improving the stability of supply.

8. Access to resources. How has the project contributed to improved access to resources for food production and security? (e.g. land tenure, extension and credit, market access)

- 32 farmer leaders from 11 provincial farmer's associations completed a modular course on access to local funding and business plan development and a manual was published.

9. Income generation. How has the project contributed to improving vulnerable/poor people's ability to purchase more and better quality food, in particular for the benefit of women and children?

- 4 women groups involved in organized production of vegetables, based on 3 new plastic greenhouses, for home consumption and to supply local markets and restaurants. It was found that the commercial partnership with restaurants stimulates the use of protected horticulture technologies and increases household consumption of vegetables, with great potential to increase supply and quality and to connect to other markets.
- 274 farmers (76 % women) with at least one participation in organic fairs supported by the project, of which 117 farmers were selling repeatedly.
- Farmer's weekly markets initiated or supported in 5 cities, with an average participation of 63 farmers and 420 consumers per day.
- 4 Provincial PGS Councils established, led by municipalities; 1084 farmers trained in PGS guarantee systems; 227 farmers granted a PGS certificate.
- First Latin American registered collective mark (Frutos de la tierra) for diversified ecological farmers launched in 2013, in collaboration with other projects; 76 producers authorized to use the collective mark.
- An international study identified how PGS and other parallel social processes can trigger innovation and adaptation and improve livelihoods in rural areas. On the household level, the study revealed benefits such as cost savings, income and food availability, and personal empowerment including development of knowledge, skills and self-confidence.

10. Policy options. How has the project influenced the development and implementation food security policies?

- Support for the successful establishment of Cajamarca's Regional Commission for Organic Production (COREPO) and further election of a participating farmer as representative at the national commission (CONAPO).
- Collaboration on IFOAM Position Paper on the Role of Smallholders in Organic Farming, translation into Spanish; collaboration on IFOAM Best Practice Guidelines for Agriculture, translation into Spanish.

11. Information and Communication Technologies (ICTs). Has the use of ICTs contributed to increase access to information and improved food security for the most vulnerable? (e.g. equitable use of technologies, such as radio, television, telephones, computers, and the Internet).

- An interpretation center for biodiversity issues established with a peasant community in Cusco, to be run by a youth group. Linked with this center is a Register of Agrobiodiversity, to collect all project findings and make them available to a wider audience.

12. Gender. How has the project considered women's specific needs in the design of the research, participation of women in the research, and potential impact of research on women? How has the project: a) improved women's access to and control over income?; b) reduced women's drudgery or workload (time spent) in agriculture?; and/or c) improved women and children's access to adequate and diversified diets?

- Women led all the research on underexploited vegetables, microtunnels and market access through farmer's markets and restaurants.
- Determinants of gender relations and stressors in the context of food security remain poorly understood. The most important stressors to affect agricultural production were related to environmental and/or climatic events for all communities. Gender was not found to make a significant difference in food security of the whole family during scarcity months. However, during abundance months, male-led households were more likely to eat enough and higher quality food.

13. Environment. How has the project tested for and contributed to environmental sustainability? (e.g. Has the project affected the environment? If so, are contributions environmentally sustainable?)

- The whole project was based on the intensification of smallholder agriculture with techniques and processes of ecological agriculture, which avoids the use of harmful chemicals and increases the food output per piece of land.

6. Problems and Challenges (1 page):

The project faced several problems and challenges:

Reduction in the size and involvement of the Canadian research team: we would have expected a stronger involvement of the UBC team but this was not possible for several reasons. Two main fields of research were conducted by UBC (molecular biology and ethnobotany and gender) and it was possible to train 3 Peruvian researchers at UBC. The change in the composition of the UBC team meant the loss of a PI in nutrition, and this was covered by involving a leading research institute in Peru as well as a researcher on food composition at UNALM. Besides, these changes required a transfer of funds from Canada to Peru, with the inherent delays and administrative complications.

Refocus of the involvement of farmer's organizations: the original intention was to have all field coordination with the National Association of Ecological Producers (ANPE, a third party organization in the project). Early in the project, however, it was clear that this was leading to a centralization of activities, delays in the field and lack of empowerment of regional and provincial farmers associations. For these reasons, the project refocused its intervention and made the regional associations of Cusco and Cajamarca its main partners in the field. This change was not free of conflict. Additionally, this perspective was introduced in the PGS setup and provincial PGS councils (rather than national and regional) were established for the first time in the country.

Difficulties in the integration of different disciplines and components: in a complex and ambitious project, dealing with livelihoods rather than with specific technologies or processes, the multidisciplinary perspective was very often difficult to achieve, putting more pressure on the general coordination at UNALM. This has to do with several factors, including the necessary changes that were introduced (caused by the unavoidable reorientation when working with smallholders), the lack of training or desire to deal with different disciplines, and the challenges when dealing with some regional organizations whose agenda is established by donors or by the national association.

Refocus of Component 4: early in the project it was evident that the original objective in this component required a change, in order to make our capacity-building activities more relevant for the specific research in different areas. One PI at UNALM left the project and all capacity-building activities were coordinated either by Component 2 or determined on a case by case basis.

Major difficulties in the coordination and involvement with local governments: bureaucracy, inefficiency, severe delays in decision-making and corruption were among the problems faced, particularly in activities related to market access or logistics, that require municipal intervention. In spite of this, the project managed to establish close and fruitful relations with key municipal staff in all provinces, although with ups and downs caused by the unstable political scenario in Peru. This is also related with the fact that Cajamarca suffered from deep social unrest caused by the opposition to mining projects, which led to the cancellation or reorientation of activities by the project in that region.

Reporting: we are very well aware that the project was unable to deliver reports in a timely manner.

Project setup: three main partner organizations, each of which managing its own budget, did not help to establish a coordinated vision and planning. Basically all of the fieldwork in the regions was implemented by UNALM and the activities by UBC and SPDA were sometimes not sufficiently discussed or coordinated.

7. Recommendations (1 page):

From an administrative point of view we believe that projects of this nature require a more central administration so that all partner institutions work more closely towards a common vision and coordination in the field. In spite of this, we are deeply satisfied of the achievements and the working atmosphere among researchers and all collaborators. We want to acknowledge the decisive support received by the IDRC officials in charge of our project.

List of annexes: research reports and publications

	Subject	Type	Language	Public?
Annex 1	Agroecology and rural livelihoods: Desirable or real effects on food security among smallholders in the Peruvian Andes? Preliminary report of a household survey.	Draft paper	ENG	No
Annex 1a	Report of the AGROECO Baseline household survey	Research report	SPA	No
Annex 2	LEIS Agroecology magazine for Latin America: a communication partner to spread out the stories of success of the AGROECO Project	Published material	SPA	Yes
Annex 3	Best Practice Guideline for Agriculture and Value Chains (IFOAM – SOAAN)	Published material	SPA	Yes
Annex 4	Final technical report of Component 1 – Andean Tubers	Activity report	SPA	No
Annex 5	Genetic diversity analysis of cultivated ocas (<i>Oxalis tuberosa</i> Mol.) in the Cajamarca Region using microsatellite markers (thesis)	Research report	SPA	No
Annex 6	Analysis of Genetic Variability of Cultivated Ocas (<i>Oxalis tuberosa</i> Mol.) in the Cajamarca Region (thesis)	Research report	SPA	No
Annex 7	Morphologic and molecular characterization of Mashua (<i>Tropaeolum tuberosum</i> Ruiz and Pavón) in the departments of Cuzco and Cajamarca (thesis)	Research report	SPA	No
Annex 8	Genetic diversity analysis in Olluco (<i>Ullucus tuberosus</i>) in the Cajamarca Region using morphologic descriptors and AFLP (thesis)	Research report	SPA	No
Annex 9	The local Agrobiodiversity and Traditional Knowledge Register: the case of the AGROECO Project	Activity report	SPA	No
Annex 10	Ethnobotany and traditional knowledge	Research report	ENG	No
Annex 11	Molecular tools for potato breeding	Submitted paper	ENG	No
Annex 12	Influence of seed quality and agronomic management in native potato peasant farming	Draft paper	SPA	No
Annex 13	Comparative study of certified seed and farmer's seed yields in three production systems, in the communities of Huancco Pillpinto, Poques and Yana Huaylla, province of Calca, Cuzco	Research report	SPA	No
Annex 14	Final report of the native potato seed management plan	Activity report	SPA	No
Annex 15	Intellectual property on seeds and its implications for family agriculture in Peru	Published material	SPA	Yes
Annex 16	The new seed regulation and its implications for family agriculture in Peru	Published material	SPA	Yes
Annex 17	Intensive production of Amaranth leaves of nutritional value in protected horticulture in Cuzco	Draft paper	SPA	No
Annex 18	Identification and Ethnobotany of wild food plants as a contribution for food security in the peasant community of Janac Chuquibamba, Cuzco	Research report	SPA	No
Annex 19	Access of ecological smallholder farmers to local markets: systematization report	Activity report	SPA	No
Annex 20	An experience of involvement of organic Andean producers with local markets in short distribution channels	Book chapter	SPA	Yes
Annex 21	Opportunities and challenges for the commercial linkage between organic smallholders and the gastronomic sector in Cusco (Peru)	Research report	SPA	No
Annex 22	Implementation of Participatory Guarantee Systems (PGS) in the regions of Cuzco and Cajamarca	Activity report	SPA	No
Annex 23	Global comparative study on interactions between social processes and participatory guarantee systems	Research report	ENG	No
Annex 24	Pilot phase of the collective mark Frutos de la tierra	Activity report	SPA	No

File name	Subject	Type	Language	Public?
Annex 25	A collective mark to improve local value chains for Peru's smallholder organic products (FAO-IFOAM Asia Pacific Congress paper)	Published paper	ENG	YES
Annex 26	Practical Guide for producers and farmers: Collective Marks and Designations of Origin	Published material	SPA	YES
Annex 27	Frutos de la tierra, collective mark for rural agroecological development	Published material	SPA	YES
Annex 28	Collective mark Frutos de la tierra: rules of use	Published material	SPA	YES
Annex 29	Calculation of the nutritional value of underexploited wild and cultivated leaf vegetables in Lima and Cuzco	Research report	SPA	NO
Annex 30	Anthocyanins, anthocyanidins and vitamin C of Andean coloured potatoes (<i>Solanum tuberosum</i>)	Research report	ENG	NO
Annex 31	40 Old and new vegetables to diversify your diet and nourish yourself better	Book	SPA	YES
Annex 32	Food security radio programmes and videos: overview	Published material	SPA	YES
Annex 33	Evaluation of the potential for adoption of microtunnels by women horticulturists in Cusco	Research report	SPA	NO
Annex 34	Anti-sprouting, anti-microbial and insecticidal properties of plants from Cusco region of Peru to benefit potato tuber storage	Research report	ENG	NO
Annex 35	Prior Informed Consent agreement with the National Association of Ecological Producers of Peru, ANPE PERU, and its regional organizations in Cuzco and Cajamarca, peasant communities and producer associations, participants in AGROECO Project	Agreement	SPA	YES
Annex 36	Processes and field progress 2011–2012	Published material	SPA	YES
Annex 37	Agroecology development in the Andean region in the south of Peru: analysis of relations among organic producer associations and local food strategies	Research report	SPA	NO
Annex 38	Analysis of social capital through actions of the AGROECO Project	Research report	SPA	NO
Annex 39	Access to funding sources for organic family agriculture: manual for leaders and directors of producer associations	Book	SPA	YES
Annex 40	Training experiences oriented to organic farmers. ANPE Peru 2004–2010	Assessment report	SPA	YES
Annex 41	The commitment of Kayra	Agreement	SPA	YES
Annex 42	Conversion Plan to organic farming of the UNALM Horticulture Research Programme – El Huerto	Activity report	SPA	YES
Annex 43	Advocacy and its contribution to the agroecological model in Peru: AGROECO and its intervention at the municipal level	Research report	SPA	NO
Annex 44	The Role of Smallholders in Organic Farming (IFOAM Position Paper)	Published material	SPA	YES
Annex 45	Determinants of gender relations and stressors in the context of food security among smallholder farmers in the Peruvian Andes	Research report	ENG	NO
Annex 46	Gender, governance and market: theoretical reflections on practical experiences in the Ecological and socio-economic intensification for food security in smallholder agriculture in the Andes (AGROECO) project, Peru	Submitted paper	ENG	NO