An Economic Study of Agricultural Crop Potential and Post-harvest Issues in Traditional Andean Agricultural Systems: Report of The Cusichaca Trust Socioeconomic Investigation to an Anonymous Donor

July/September, 2001

Peru has a growing population, yet farmers are abandoning agriculture and moving to overcrowded cities. The majority of Andean farmers grow a limited range of crops, often on unirrigated land that is left fallow for periods of up to 12 years. The natural ecology of the entire Andean highland region is being threatened by the indiscriminate use of chemical fertilizers, insecticides and herbicides. In order to provide an economically viable alternative and food security an affordable and sustainable approach to rejuvenating highland agriculture is needed.

The purpose of this project was to assess of the economic viability of incorporating food legumes in bi-annual rotations and post-production improvements for terraced agricultural systems as part of longer-term actions to the wide-scale rehabilitation of ancient Andean agricultural systems in Ayacucho and Apurimac. The reported period is from August 2000 to July/September 2001.

Feasibility study of bi-annual cropping in irrigated terraces

Participatory survey of current agricultural practices in irrigated and non-irrigated terraces. A detailed list of cropping patterns and agronomic practices for different situations of irrigation regimes and terraces will be documented using open-ended questions. Labor investment and decision-making by gender were part of the description of the agricultural systems. 80 households were interviewed in Larcay, Soras, Pomacocha and Pampachiri during December 2000 and January 2001. The project has begun to document socioeconomic issues of terrace agriculture in Pampachiri and other sites where CT has rehabilitated terraces (Cusichaca Trust 2000a, 2000b and 2001; Kendall y Rodríguez, 2001; Rodríguez y Kendall, 2001b). Clarification of the interaction between water and land property rights and the communal actions necessary to make irrigated terracing sustainable has been initiated (Rodríguez y Kendall, 2001a).

Ex-ante analysis. Partial budgets were developed for the agricultural crops present in terrace agriculture, including the costs of terrace/channels maintenance and rehabilitation, costing the value of labor inputs of the community. The crop budgets were grouped to assess the economic feasibility of the rehabilitation of a hypothetical 500 ha in Pampachiri over a period of 20 years. This is considering that at the present time there is no hard data to evaluate the performance of such systems. The results showed that when all the benefits associated with the employment required for rehabilitation and marketing of produce is secured (an assumption) the benefit cost ratio over a 20-year period exceeded 1.15. The stream of benefits are 15% over costs—paying very low wages to the farmers. So there is no real improvement to the farmers unless one goes for biannual cropping. The spreadsheets containing the assumptions and technical

coefficients of crops under biannual cropping could be eventually used and enriched to perform further analysis with better quality information.

Caveats. The information used to feed the spreadsheet models to assess the feasibility or irrigated cultivation needs to be increased in quality. Several variables in the survey of 80 households need to be verified because of the large variation in the sub-samples. More emphasis would have been desired in the property rights and collective action of water used for irrigation, and its relationship with the likelihood of the adoption of technological innovations in the terrace systems. The relationship between agriculture and livestock in the different ecological floors and seasonality needs to be documented in the four Districts. These topics were subsequently begun to be investigated by Tom Nickalls in August – September 2001.

Marketing and processing constraints

A survey was conducted to determine the current level of production and marketing practices and constraints of the main crops in the area (maize, barley, wheat, and potatoes). The demand of local labor, transportation means and costs per kilometer were estimated. It was estimated that 25-30% of the price paid by the final consumers of agricultural products is due to transportation costs. There is no contracting and there is no defined marketing strategy, mostly due to the fact that the surplus production is marketed to meet cash flow requirements of the household. An entrepreneurial strategy needs to be developed, the know-how and incentives for raw material/crops processing are lacking. There is a need for the articulation of the present demand of agricultural products in the consumption centers with the organized production (Rodríguez y Rossi, 2000). If this does not exist, it is unrealistic that financial resources for the rehabilitation of terraces could be paid off.

Caveats. Traditional crops are not very competitive due to low prices, poor yields and lack of price differentiation based on quality of the produce. There is little research or information available regarding the agro ecological options available in different ecological floors, the crop sequence and thus, crop rotations that could have better chances of performing well. The introduction of nitrogen fixing crops in the crop sequence could ameliorate the need for mineral fertilizer but still remains to be seen if traditional faba bean, the only cash crop present at Pampachiri, is sold at acceptable prices in large consumption centers. Early maturing faba bean varieties are badly needed to develop economically viable crop sequences. Food legumes are very susceptible to diseases if not rotated with cereals. It is acknowledged that these limitations cannot be resolved without a concerted effort of public and private institutions.

Seminars

A first one-day workshop was conducted in Ollantaytambo in August 2000 to address the socioeconomic aspects of terrace rehabilitation “Retaking the agricultural future in Pumamarca y Choquebamba”, chiefly to discuss local development problems being experienced in bringing rehabilitated terrace systems by CT to full production potential.

Technical, agricultural, social and organizational, as well as socioeconomic aspects, were addressed in talks and discussions. Some 60-community members from 4 communities in the Ollantaytambo district took place and participated in the discussions.

A two-day workshop entitled *PreHispanic Agroecological Infrastucture—Sustainability, Justification and Competitiveness of Irrigated Terrace Rehabilitation* was conducted on 26 and 27th June in Chivay, Arequipa. In this workshop there was participation of farmers, NGOs, Programa Nacional de Manejo de Cuencas Hidrológicas y Conservación de Suelos (PRONOMACHS) and the International Center for Agricultural Research in the Dry Areas. A research report, presenting partial results of the socio-economic research at Pampachiri were presented and discussed (see Rodríguez and Kendall 2001a). A major achievement of this seminar was that the socio-economic issues of terrace rehabilitation were incorporated into the general development scope of CT and its partners. Previous work of CT did not include these issues explicitly. The interaction between agriculture practiced in the terraces and livestock production systems is now explicitly acknowledged. Also, there is an explicit need for the valorization of terrace agriculture to provide environmental services (soil and water conservation, and biodiversity) that eventually leads to higher demand for tourism.

Follow-up seminar in Pampachiri (November 2001). There are several issues that require follow up of some of the themes discussed in the workshop in Chivay: 1) the role of migration and the export of agricultural products, 2) crop and livestock interaction, 3) training for masons and 4) assessment of land and water distribution in areas to be rehabilitated (see below) and 5) extension programs that could lead to commercialization.*[See Director's Annual Report 2001 – where the November Seminar is described and progress on these issues]

Further socio-economic studies undertaken by Tom Nickalls

Further studies were undertaken by Tom Nickalls in August and September 2001 to check data collected and assumptions made in earlier studies. In this report areas of terraces and land use were analysed using aerial photos and a greater emphasis was placed on consulting local farmers, on project implementation and on social rather than only economic aspects. The findings of this study were presented in the report "Socio-Economic Study for Irrigation Canal and Terrace Rehabilitation for the Pampachiri and Larcay Districts of the Chicha-Soras Valley" (Nickalls, 2001a). The main conclusions of this report were that lack of collaboration for the canal project suggests that farmers are not fully convinced of potential benefits and that for project success great emphasis must be placed on the "software" issues of community organization, demand for irrigation and motivation to collaborate. Reasons for low perceived benefits were put forward as the present low income received for staple crops; the low prestige of traditional irrigation due to the low social status of Andean culture in Peru and the lack of links with the main economic activity of animal husbandry. It was recommended that rehabilitation of canals be complemented by initiatives in irrigated pasture and fodder so that project benefits are greater and more obvious to farmers who own animals. Other recommendations for project implementation were given including a recommendation for further studies and collection of data to quantify the economic benefits of irrigated

pasture and fodder as well as crop production. Information on irrigation water availability are presented in a separate report (Nickalls, 2001b).

In Summary. The socioeconomic studies carried out during the last 12-months have helped understand not only the economic feasibility of bi-annual cropping but the complexity of the agricultural and livestock systems that operate in Pampachiri, Larcay, Pomacocha and Soras. There are numerous constraints that limit the competitiveness of crops grown in terraces, from biophysical to economic and cultural. As CT unfolds its comprehensive development actions in Pampachiri and adjacent Districts, some of the socioeconomic issues will be further clarified and the needs for training in new areas (marketing and agro ecological agriculture) will be more defined. But the socioeconomic investigation *per se* has opened areas of applied research that are part of the paradigms of sustainable development. Nurturing of these areas will yield fruitful contributions and allow generalizations on mountain development.

Future perspectives. There will be a follow up seminar next November in Pampachiri. A small publication will bring together the results of the socioeconomic research and the seminars. The research will be extended to adjacent Chalhuanca and Aymaraes Province where PRONOMACHCS has invited CT to work, as a result of the seminar at Chivay. *.[See Director's Annual Report 2001 – where the November Seminar is described and progress on these issues; also paper attached "Socio-Economic Issues in the Rehabilitation of Irrigated Terrace Systems in the Peruvian Semiarid Andes".

(Prepared by Ann Kendall, Cusichaca Trust Director and Abelardo Rodríguez, Project supervisor, ICARDA, Lima, Perú), September 2001 (*updates and attachments)

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[1] A modified versión of this paper will be presented at the II Encuentro sobre Historia y Medio Ambiente, Sesión 17 del Congreso de Historia Económica de Buenos Aires "Transferencia de técnicas, modos de producción y usos del agua en Europa y en América Latina". Huesca, España, 26-27 de Octubre, 2001.