

# Agronomic Education and Credit for Purchasing Fertilizer Bring Environmental and Social Benefits for Coffee Growers

By Reiles Zapata and José Espinosa

Depletion of soil fertility leads to loss of productivity and erosion of the economic capacity to purchase fertilizer required for restoration. Such was the case for farm families in Peru relying on coffee production as their major income. An innovative program developed by an important coffee-exporting company overcame credit barriers for purchasing fertilizer. IPNI assisted by providing agronomic education on best management practices for high yields. The result was improved coffee yields and quality, increased family income, and numerous social and environmental benefits.



Between 1940 and 1950, many small farmers migrated from the highlands of Peru to the northeastern Amazon piedmont to cultivate coffee as a means to improve their standard of living. The activity resulted in small farms located over moderately fertile soils on steep slopes. These families have earned a living from coffee production for many years. Second and third generations of these families found a way of exporting the coffee produced by local farmers through small companies. Comercio & Cia, an example of such an enterprise, has been very successful in marketing Peruvian coffee in the United States and Europe. Beginning in 1994, the company experienced significant growth and now has an important share of coffee exports from Peru. Being part of the coffee production system in its area of influence, Comercio & Cia witnessed the constant decline of yields in its own fields and in the fields of local producers.

## Social and Environmental Effects

Low yields were the common denominator of this coffee production area of Peru. It was observed that one of the main limiting factors was nutrient depletion from the fields which were fertilized only with plant and animal residues. Very limited mineral fertilizer was used in coffee production in the area. Constant yield decline drove yields to less than 10 qq of parchment coffee per hectare. On top of low yields and poor income, secondary effects of soil mining were evident.



Effect of soil nutrition depletion on coffee growth and yield.

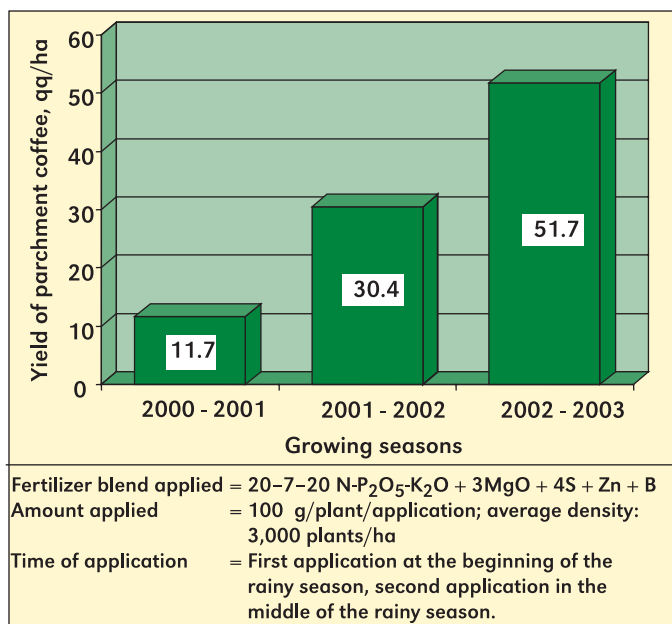
Low income did not allow savings and consequently producers could not invest in farm improvement. This condition reduced family stability and increased the problems associated with poverty. This vicious cycle continued until growers were forced to abandon farms in search for new land to start the cycle again. Soil degradation was evident due to the negative nutrient balance. Biomass production was low and soil cover was poor, exposing the soil to active erosion (see photo below left). The social conditions of the farmers were deteriorating along with the environment. The system was not sustainable and a radical change was necessary.

## Agronomic and Social Assessment of Yield Recuperation

In 1997, Comercio & Cia started to evaluate the possibility of improving coffee yields through agronomic management of the crop. A group of technicians...with knowledge of the agronomic, economic, and social conditions of the producers...was assembled. It was evident that the basic agronomic limiting factor was the progressive soil depletion due to the continuous coffee production without replenishing the nutrients exported with the harvested coffee beans. The residues produced on the farms (pruning material, residues from fruit processing, and animal manures) were not sufficient to maintain high, profitable yields. It was essential to replenish soil nutrients with the use of fertilizers and to maintain the crop through good management practices such as trimming and adequate shade management. Field studies like the one presented in **Figure 1** demonstrated the significant effect of fertilizer application on coffee yield.

The fertilizer rate used in this experiment came from well known uptake data in the literature and nutrient uptake studies conducted by the project (data not shown). Based on this information, the project yield goal was set for 40 to 60 qq of parchment coffee per hectare. This is a realistic yield goal for coffee grown under 30 to 50% controlled shade, a situation which is prevalent for the coffee growing conditions of the area. The experiment presented in **Figure 1** was designed to test

**Abbreviations and notes for this article:** ha = hectares; qq = quintals (in the context of this article, quintal = 100 lb or 45 kg).



**Figure 1.** Effect of fertilizer application on the yield of parchment coffee at Loma Santa, Jaén, Peru.

the effect of this defined nutrient rate on coffee yield over a 3-year period. Knowing that the soils were depleted of nutrients, it was expected that the response would be evident in the second and third year. It was important to demonstrate a yield response to fertilizer application, but it was more important to demonstrate the yield potential after the plant stands regain the supporting biomass which is lost as a result of constant nutrient depletion. Timing and form of fertilizer application were also studied. IPNI was actively involved in the basic agronomic training of the technicians of the project and collaborated in the field research as advisor and provider of information.

It was demonstrated that coffee yield and quality were dependent on the nutrient and crop management fitted for the area. However, external factors made the situation even more dramatic. International coffee prices fell in 1999 and coffee producers of the world had to face the worse price crisis in 100 years. The fall of international prices translated into reduction of local prices and Peruvian producers found themselves in an even worse situation. Under these conditions, yield level was more important than ever. Farmers had witnessed the effect of good agronomic management on production and there was interest to improve coffee fields (see photo above). Several farmers declared their fields organic with the hope of obtaining a better income with the price difference of the organic coffee in front of the conventionally grown coffee. Nevertheless, low yields made this type of production also unprofitable despite the price incentive.

The research conducted in the area of the project had been able to demonstrate that the solution to the declining yields of coffee was relatively simple from the agronomic standpoint. Making inputs, mainly fertilizers, available to the farmers was the key thing needed to increase and make coffee production profitable in the



**Low coffee production** with poor crop management and without fertilizer application (left), in contrast with the abundant production in fields with good crop management and fertilizer application (right).

area. However, the project was also able to determine that the social condition prevalent in the area was perhaps the main limiting factor of coffee production. Poverty derived from low yielding fields did not allow farmers to invest in fertilizers. Government intervention in the area was minimal and private banks did not provide credit to small farmers due to the high risk involved and the lack of legal ownership documentation of the farms which could serve as collateral. It was clear that improving coffee production in the area was more than agronomy.

### The Family Program

Comercio & Cia decided to initiate an ample project with small farmers to achieve the proven possible yield increments. The need was evident for designing a project to help farmers organize and legalize their land, to make credit for fertilizer available, to train farmers in the agronomic management of the crop, and to organize the chain of production so harvested coffee could be sold in a secure way and at a fair price.

The Family Program was then born under the slogan: **“More and better coffee to strengthen the family in harmony with the environment.”**

One of the most important factors of the project was to make credit available to the families who join the program. This credit was provided without interest for 3 consecutive years to the farmers who joined the program the first year. The time frame was based on the expected yield response of stressed coffee fields growing in nutrient depleted soils. The collateral was the production which was to be sold to the company at standard price.

The objective of the Family Program is to recuperate soil fertility to increase coffee production and to improve family income through balanced fertilization, best crop management practices, generation and efficient use of farm residues (leaves and trimmed branches, pulp from fruit processing and animal manures), rational use of natural resources (soil, water, forest), and reforestation. The Family Program officially initiated activities during the 2003-2004 coffee growing season with producers who summed a total area of 950 ha of land under coffee. The farmers did not commit all land



**Development** of the Family Program: a) community organization; b) training; c) fertilizer availability; d) fertilizing coffee; e) effect on plant growth; f) plentiful production.

under coffee to the program and requested credit to fertilize only part of the coffee fields. The program effectively covered a total of 450 ha. After all, this was a new project and much was heard about the allegedly negative effect of fertilizer use by many different organizations of the region. For this reason, the use of fertilizers by a small group of farmers generated much discussion and controversy. The opponents indicated, among other things, that the use of fertilizers would only degrade the soil more. Obviously, this did not happen and the families in the program enjoyed high coffee yields. Observing the benefits of the fertilizer and crop management on yield, the farmers committed all their coffee fields to the program and new requests to join the program were received. The program expanded rapidly and 7,500 ha of coffee production belonging to 2,500 households were committed for the 2005-2006 cycle.

### Benefits of the Family Program

This totally private program evolved to comply with the social responsibility of the community which observed and supported the initiation and development of Comercio & Cia. The program has exceeded initial expectations. International coffee price has reached acceptable levels and this has made the program more valuable. Farmers obtain excellent yields and receive



**The Family Program** has a favorable effect on the environment. Nutrient depletion eliminates soil cover and degrades the environment (left). Crop and shade management and fertilizer use promote growth, accumulate residues, and improve soil fertility and biodiversity (right).

good prices. The effect of the program in the community has been evident and the program will continue expanding to other coffee growing areas of the Peruvian northeast. The tangible effects of the program are economic, social, and environmental. The economic benefits can be summarized in the following aspects: higher production of coffee with better bean quality and cup quality, resulting in higher income which improves the profitability of the households and promotes savings and investment (**Table 1**).

**Table 1.** Average yields and prices of coffee during 2006 in the northeast coffee producing area of Peru.

Type	Average yield, qq/ha	Average price, US\$/qq
Family Program	30	80
Organic	10	87

The social benefits are the strengthening of the economic and affective unity of the family, implementation of basic sanitation and better schooling driven by better household income, and reduction of emigration to other fragile zones to produce coffee or emigration to enlarge poverty belts around cities. Finally, the environmental effect of the program is undisputed. The vigorous growth of the coffee plants not only produces more fruit yield, but it also produces abundant biomass which is left in the field for recycling after trimming. Higher yields also result in higher amounts of pulp from the processing of the fruit which also comes back to the field for recycling. All of this increases soil organic matter and promotes the recuperation of soil fertility. The abundant cover with leaf litter and trimmed branches protects the soil against erosion. The nutrients applied to the soil also feed the shading trees of the coffee fields. Shade grows vigorously, creating a good habitat which promotes biodiversity. An important effect of the program on the environment is that people can make a living on the farm, reducing the deforestation of new sites to produce coffee (**see photos below left**).

### Conclusion

The Family Program has demonstrated that a complete program of rural development can lead to effective crop management that increases coffee yields in socially marginal areas lacking governmental and private attention. The current good international coffee prices make production very profitable. However, if prices were to go down again due to shifting international conditions, the only way to attenuate the situation would be through efficient crop management which can maintain high yields. **BC**

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