REPORT

Independent Ex-Post Economic Rates of Return (ERR) Calculations for Projects from the Donations Fund for Agricultural Public Goods – MCA Honduras

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1. BACKGROUND

This report represents an analysis and re-estimation of the Internal Rates of Economic Return (ERR) of the projects financed through MCA Honduras's Donation Fund for Agricultural Public Goods (its acronym in Spanish, FDBPA).

The FDBPA represents one of the four activities of the Rural Development Project in Honduras; its aim is to broaden the goals of MCA's Rural Development Project, which are to increase productivity and improve the competitiveness of small- and medium-sized farms. FDBPA's main goal is to finance projects for the development of a market-oriented commercial agriculture, particularly in the horticultural sector. As a result, these projects supported by FDBPA should be public or semi-public goods.

For general definition purposes, a public good is a non-exclusive good or service that is not exhausted in its consumption; this means that all interested individuals may use the good, and that the use a person makes of that good or service does not exclude others' ability to consume the same good or service. Therefore, its supply from the private sector results unprofitable.

In the case of semi-public goods, they do not have to strictly satisfy all public good conditions, but they do provide some benefits that are non-exclusive and that make the Economic Rate of Return (ERR) to be larger than the Internal Rate of Financial Return (IRFR). In addition, for this type of goods, the private provision cost exceeds the private income to such an extent that the rate of financial return smaller than the cost of capital. As a result, the private sector is not interested in investing in the production of this type of goods or services.

In order to benefit from the FDBPA resources of MCA Honduras, the projects should register a minimum profit expressed as a 15% ERR or larger. In this report, the economic rates of return have been reviewed and recalculated for the projects that were concluded or that registered a considerable level of progress as of July 2010. It is worth noting that the measured impact at this point actually represents an intermediate measurement, since the ERR is calculated based onthe expected impact of the projects after 10 and 15 years of being implemented. Nevertheless, the considered projects are in their second or third year of implementation.

The structure of this report is as follows: Section 2 contains a summary of the methodology used to re-estimate the ERRs; Section 3 presents the results of the irrigation projects profitability analysis; Section 4 refers to the results of the EAP-Zamorano's Value-Added Project (VAP); Section 5 elaborates the status of the research projects whose progress level does not allow for a re-estimation of ERR as of the date of this report. Finally, Section 6 contains conclusions and recommendations.

2. METHODOLOGICAL GUIDELINES

The main point of the estimations in this report is to measure the increase in the beneficiaries' income that can be attributed to the implementation of the project. This is done by comparing the costs and benefits that result from the situation expected with the project, versus the estimated costs and benefits if the beneficiaries were to continue as they have been doing until now (trend situation, or situation without project).

2.1 Trend Scenario or Situation without the Project

These are the scenarios based on the project's diagnostic and justifications. The situations can vary, depending on the type of project. For example:

i. Farmers are producing without irrigation, which implies a forced choice of traditional methods, with low capital and manpower requirements, but also very little profit (Income – costs = earnings or profit).

ii. Producers use traditional varieties of seeds or seedlings, with very low yields or productivity, which results in very little profit or earnings.

iii. Producers are constantly affected by pests or crop diseases, which results in low productivity or in considerable losses in production, and results in economic losses or very low profits.

iv. Producers or beneficiaries receive low prices associated with their product's low quality (i.e., agricultural processors), or have little or no access to useful and timely information about the market for their products (i.e., crops and others).

2.1.1 Cost flow

This corresponds to the expenses that producers or beneficiaries incur associated with the activity of interest and before getting involved with the FDBPA project. These costs can be related to inputs and manpower. Some projects involve other variables such as equipment, while others will not affect the technological standard of production (i.e., project on access to market information).

2.1.2 Income flow

Similar to the costs issue, this corresponds to the income generated by the producer in the activity of interest. In the case of productive activities, income would be the direct result of the number of product units obtained, multiplied by the price that the producer received for every product unit .

2.1.3 Earnings or profit without the project

This is the difference between income and the costs obtained by the beneficiary before involving in the project supported by FDBPA/MCA.

2.2 Scenario with the Project

2.2.1 Important Changes Enhanced by the Project

One of the main aspects to specify and quantify is the concrete change that the project has introduced to the activity developed with the beneficiaries. Some examples are:

- To increase productivity by x%;
- To diversify the planted area with more profitable products;
- To obtain increases of y% in the unit sale price received by the producer as a result of his better product quality or greater access to market information;
- To reduce losses by x% for protected production units or (on an equivalent fashion) an increase in profits for each unit of area protected from pest attacks or diseases, etc.

2.2.2 Cost flow

It quantifies the costs the producer or beneficiary faced while performing the activity under the conditions required by the project in order to implement it.

2.2.3 Income flow

Corresponds to the income generated by the producer or beneficiary once the activity is being developed under the conditions and characteristics specified by the project. In general, it is expected that this income would be greater than that obtained by the activity without the project as a result of the greater productivity or higher prices enhanced by the project.

2.2.4 Earnings or Profit with the Project

This is the difference between income and expected costs for the producers who participate in the project; that is, those who perform the activities according to the project standards that were presented to the MCA.

2.3 Estimate of Net Profits

This is the difference generated from subtracting the profits generated without a project from those generated with a project. Usually, during the first years this balance is negative, due to fact that the project investment is just starting to be carried out (i.e., performing studies before installing the irrigation network or laboratory, etc.), and during this period there is no impact on income. The projections on income and costs are made for a period of 10 to 15 years.

2.4 Internal Rate of Financial Return (IRFR)

The Internal Rate of Financial Return (IRFR) refers to the relationship between the cumulative costs flow (both MCA's support as well as beneficiaries' private costs), and the cumulative income flow during the projection years. Since the focus of this study aare the incremental costs and income (i.e., the difference between the situation with a project minus the situation without a project), this value is captured through the estimate of the project's Net Economic Benefit. Both expenses and income are expressed in market prices (financial prices) and converted to U.S. dollars at a rate of 19.00 Honduran lempiras to US$ 1.00.

The time values are updated to their equivalent in the Year Zero (Present Value in the base year) through the application of a discount rate. The IRFR corresponds to that discount rate with which the cumulative net economic benefits equal zero; that is, that in which the discounted cost flows equal the discounted income flows.

2.5 Internal Rate of Economic Return (ERR)

The data on market prices that serve as basis for estimating the IRFR in the previous section are adjusted to take into account the differences between income and financial costs, on the one hand, and opportunity costs of resources used on the other. In this case, the profit flows are re-estimated taking into account the strategy of increasing the income of producers or beneficiaries and their communities.[1]

In this sense, the Internal Rate of Economic Return (ERR) is computed by comparing the project's investment flows (support from MCA and beneficiary investments) to the net benefit flow expected given the Honduran production factors (basically the net earnings of the producers and the incremental increase

[1] This focus differs from the traditional focus of economic project analysis, in which the profit flows generally refer to the expected increase in the well-being of the consumers and which, as a result, are based in measurements of the benefit to the consumer (Consumer surplus) from estimates of demand elasticity; however, the focus adopted here is considered more appropriate as a function of the goals and type of benefits hoped for in the MCA Program.

in manpower).[2] That is, that the analysis of costs and income is made as a function of their respective opportunity costs.

Another important assumption in the analysis is that the supply generated will always equal the demand (Equilibrium), and that which goes to the internal market as well as that which is planted for export; and that the project's incremental impact on national production will have no effect on the prices determined by the market (the businesses or communities in the projects financed by FDBPA are price takers).

2.6 Sensitivity Analysis

For all the evaluated projects, a sensitivity analysis of results is presented, expressed in ERR terms, in light of simulated changes in important variables in the model such as changes in production yields, number of beneficiaries, and prices of the involved products.

2.7 Specific Comments on the Evaluated Projects

For purposes of facilitating the methodological development and obtaining valid conclusions, the following was taken into consideration:

- For purposes of the analysis, the 15 projects have been classified in three types: i) Irrigation (10 projects); ii) Value Added-Microbusinesses (1); and iii) Research and technology (4), which includes the OIRSA-MOSCAMED project.
- Due to the different level of advancement of the projects being implemented, the re-calculation of the ERR for the irrigation projects is based on the three projects that had ended their first implementation phase or were very close to completing it by July 2010. This first phase represents the ending of the works to be executed with the project and the beneficiaries' incorporation. In the projects in which the total number of predicted beneficiaries had not yet been reached, the number of beneficiaries that had been actually reached as of the time of this analysis was taken into account, and future incorporations were assumed until attaining the expected goal by year 3 of the project's implementation, approximately.
- The value-added project type is represented by a single project, which is carried out by EAP-Zamorano and that was concluded in July 2010. Consequently, the evaluation is based on this single project.

[2] Estimated as the incremental cost of manpower in market prices resulting from the implementation of the project, minus the value in shadow prices or shadow wages for manpower.

- Regarding the research projects, since the progress for projects of this type as of July 2010 covered mainly the laboratories' set-up activities and the creation of the biological items and basic genetic material required in the project the ERRs were calculated maintaining the assumption and goals originally proposed by the project designers, adjusting only the start-up times for the beneficiaries' incorporation. These projects should be evaluated once they have registered further progress on meeting surface-area and number of incorporated producers or beneficiaries goals.

3. IRRIGATION PROJECTS

3.1 General Comments

In order to construct an average scenario for MCA Honduras's irrigation projects, simple means were estimated for planted surface area, costs returns, and number of producers involved. For data on farm cultivation, the costs and technological standards (functions of production) used were developed by FINTRAC, which is responsible for implementing the Farmers' Training and Development Activity, for the MCA Honduras Program (EDA-MCA-H).

In order to estimate product prices on this second measurement of progress, the prices reported by the project implementers were used, and for items with no price reported, local market prices were assigned, estimated as 70% of the wholesale prices reported by SIMPAH in mid-August 2010 at San Pedro Sula's plaza. We confirmed that the estimated prices were consistent with those reported individually by one of the projects.[3] When the product appeared in both scenarios, the same prices were used both for the scenario with a project and for the situation without a project.

3.2 Specific Comments, by Project

Global Village Project - PAG1

In the first scenario, this project expected to irrigate 30 *manzanas* [where 1 manzana = 1.72 acre = 0.7 hectare = 6,972 square meters] and target 50 producers. However, by the second year of implementation, the project reported an area of 45 *manzanas* and 120 producers targeted[4]. Additional costs for installing irrigation systems are not reported because it is assumed that this expansion is absorbed by the start-up costs or by additional support from producers. [5]

On its last monitoring report, this project reported returns of 6,000 pounds/tarea [where 1 tarea = 0.1554 acre = 628.8 square meters] of carrots; 3,000 pounds/tarea of broccoli, and 6,500 pounds/tarea of lettuce.

[3] Some projects explicitly report prices of some products and not of others. In most cases, income is directly indicated, without specifying the price.

[4] As of June 2009 (18 months after implementation), the project reached 50 producers, as was forecast in the monitoring and evaluation plan. However, in terms of deliverables, the project had to reach 120 connected producers. In order to attain this goal, the end date was extended to January 11, 2010, which also allowed the project to surpass the goal of irrigated area (MCA-Honduras).

[5] It is clear that there were no additional contributions from the FDBPA/MCA. In the event that additional capital contributions on the part of the beneficiary institutions had existed, the ERR would be slightly overestimated, given that said investment would not be considered in the project's outgoing flow of investment.

This generates returns per manzana of 96,000 pounds of carrots, 48,000 pounds of broccoli, and 104,000 pounds of lettuce, using 16 *tareas* per *manzana*.[6]

ADRA - Community Irrigation Project

This project also reported exceeding the initial goal of 136 hectares, to 152 hectares under irrigation. In addition, the expected number of producers was 270, and now 355 are benefited. No additional investment costs are reported for expanding the irrigation system. If additional costs were not considered, the project's profitability would result overestimated.

Further, and contrary to what was reported by PAG1, ADRA would obtain lower returns from the promoted horticultural plots, meaning 16,520 pounds/manzana of broccoli, 25,550 pounds/manzana of cabbage, and 35,000 pounds/manzana of tomatoes, according to their updated table of monitoring indicators.

PILARH – Integrated Production and Communication Project

Herein, yields, cost, and price figures reported by the project were used. The most profitable product that PILARH promotes is tomato, a product already known in the area; in the scenario without a project, the average producer was already planting tomato in 0.44 hectares, a highly profitable vegetable. This means that the impact of the project depends mainly on the change in surface area for basic grains, allowing producers to cultivate the other crops promoted by the project.

As of July 2010, the project had surpassed its goals on number of beneficiary producers and cultivated area.

3.3 Results in Terms of ERR

The average economic profitability for irrigation projects created by the FDBPA of MCA-Honduras is 35.2%, based on its Economic Rate of Return (ERR). Such rate is 34.5% for PAG1, 36.1% for ADRA, and 34.9% for the PILARH project.

[6] Most producers of the project implemented by PAG received the technical assistance package from the EDA Program through an agreement signed between PAG and EDA. This allowed producers to obtain yields above the average of the producers based in the western zone (MCA-Honduras).

Figure 1. Estimated ERR for 10 years for irrigation projects

Reference or moderate scenario

Project	Base results
MCA average	35.2%
PAG1	34.5%
ADRA	36.1%
PILARH	34.9%

3.4 Sensitivity Analysis

Optimistic Scenario

The optimistic scenario is created by simulating a 20% increase in the key variables, production yields, product prices, and number of beneficiaries (Figure 2).

A 20% increase in yields, above those considered in the reference or moderate scenario would involve a 15.6% increase in general economic profitability for the irrigation projects supported by MCA-Honduras. The economic profitability of individual projects would rise 9.8% for PAG1, 14.6% for ADRA, and 33.6% for PILARH, showing a high sensitivity to this variable.

Similarly, a general 20% increase in products' prices would increase the average economic profitability by 9.8 percentage points; PAG1's profitability would increase 8 points, ADRA would increase its rate of economic return by 10.9 points and PILARH by 13 percentage points.

The last column on the right shows the effect of 20% increases in the number of beneficiaries. If this were to happen, the average Economic Rate of Return would reach 46%, with PAG1 rising to 45%, ADRA to 48%, and PILARH to 46%.

Figure 2. Optimistic scenario: Partial increases of 20%

ERR results for 10 years

Project	Base results	20% increase in yields	20% increase in prices	20% increase in the number of producers
MCA average	35.2%	50.8%	45%	46%
PAG1	34.5%	44.3%	42%	45%
ADRA	36.1%	50.7%	47%	48%
PILARH	34.9%	68.5%	48%	46%

Pessimistic Scenario

This scenario is constructed by simulating reductions of 20% in the variables of interest. That is, supposing that the production yields obtained during the first 10 years of the life of the project were actually 20% less than what was estimated in the base scenario, maintaining all other variables constant *(ceteris paribus).* Similarly, the impact on the ERR from a drop of 20% in the price of products *(ceteris paribus)* is simulated, and that only 80% of the number of beneficiaries predicted for all of the projects was attained.

The results are presented in Figure 3. A drop of 20% in yields, lower than those reported until now, would reduce the average economic profitability to 15.1% (20.1 percentage points lower in relation to the reference scenario). The economic profitability of the projects would be reduced by 11.8 percentage points in PAG1, 20.2 in ADRA, and would become negative in the case of PILARH. It is important to recognize that some projects are more sensitive than others to changes in this variable. PILARH in particular shows a high sensitivity.

Figure 3. Pessimistic scenario: Partial reductions of 20%

Results about the ERR at 10 years

Project	Base results	20% reduction in yields	20% drop in prices	20% fewer beneficiaries
MCA average	35.2%	15.1%	24.0%	23.0%
PAG1	34.5%	22.7%	26.1%	23.2%
ADRA	36.1%	15.9%	22.6%	23.3%
PILARH	34.9%	ERR < 0	21.0%	21.7%

A drop of 20% in the prices of all products would reduce the average ERR to 24% (11.2 percentage points lower than in the base scenario). The profitability of PAG1 would fall to 26.1%, ADRA to 22.6%, and PILARH to 21%.

Moreover, if the projects were to incorporate only 80% of the predicted producers, the average economic profitability would fall to 23%, leaving PAG and ADRA in similar levels as the average, and PILARH would shrink to an ERR of 21.7%.

Minimum profitability scenario

The minimum expected profitability in irrigation projects supported by MCA-Honduras is 15%. Figure 4 displays the variations that would have to occur in each variable of interest *(ceteris paribus)* for the rate of economic return to fall to the minimum level of 15%.

For the PAG1 project, this would require a 30% drop in the product yields, or a reduction of 41% in the prices of all products, or a reduction of 33% in the number of beneficiaries for the rate of economic return to fall to a minimum of 15%.

In the case of ADRA, the decreases would have to be 21% in yields, or 29% in prices, or 32% in the number of beneficiaries. For PILARH, these percentages would be 10% less yields, 28% lower prices, or a drop of 29% in the number of beneficiary producers.

Figure 4. Sensitivity to extreme changes

Maintaining a 15% ERR for 10 years

Project	Variation in yield	Variation in prices	Variation in beneficiaries
PAG1	-30%	-41%	-33%
ADRA	-21%	-29%	-32%
PILARH	-10%	-28%	-29%

Minimum profitability with simultaneous reduction

Lastly, we aim to determine what would be the uniform simultaneous reduction that would have to affect the 3 variables of interest (i.e., yields, prices, and producers served) in order for the rate of economic return to shrink to 15%.

This indicator becomes useful for monitoring economic impact purposes because upon observing that a project reaches said critical variation (for example, a reduction of 13% in PAG1) in one of the variables of interest, it will be necessary to verify that the variation in the other variables does not behave the same way, because that would bring the project's economic impact closer to its expected minimum critical level.

In this case, the critical threshold for attaining yield and participating producers goals would be 87% for PAG1, 90% for ADRA, and 94% for PILARH (based on the data in Figure 5). In this scenario of combined changes, to attain these goals would compromise the economic impact of the irrigation projects if they become affected by an external shock, represented by a drop in prices for the products brought to the market in the percentages indicated in Figure 5. It must be clarified that only two variables (yields and number of producers) could be under MCA-Honduras' and the project implementers' control, and that the probability that such variations in the three variables may occur simultaneously is quite low.

Figure 5. Sensitivity to uniform combined changes

Maintaining a 15% ERR for 10 years

Project	General variation
MCA average	-10%
PAG1	-13%
ADRA	-10%
PILARH	-6%

4. EAP-ZAMORANO VALUE-ADDED PROJECT

4.1 General Comments

This project has the goal of improving the competitive and productive status of 60 micro, small, and medium-sized businesses (MIPYMES) that process primarily plant- and fruit-based foodstuffs, expanding their technological development, their standardization of production processes and their innovation of processing chains. This project works with processing MIPYMES in four geographically, agro-economically, and socio-economically representative areas of the country: West, South, North-Central, and East, through/in coordination with projects and social organizations associated to Zamorano that already tackle key links within the agroindustrial value chain. The project also directly helped 20 MIPYMES coffee and cacao producers to develop identity standards using the chemical mapping method.

The project considered targeting 60 MIPYMES, evenly distributed in 20 micro-, 20 small-, and 20 medium-sized businesses. For initial estimation of the expected ERR purposes, the typology of businesses was modeled by considering as typical producers a business with value added on beans as a representative of the micro-businesses; another one that converted crops into snacks (Malanga) as representative of small businesses and a bee honey producer/bottler in the medium-sized business category.

For the purposes of recalculating the ERR, this typology was maintained in relation to their ability to represent businesses based on size, level of investment and volume of sales, and the type of technical assistance service that was required .

4.2 Results According to Type of Business

The businesses finally targeted belong to a myriad of production categories, including grains and seeds, wines and beverages, canned and bottled products, dairy products, sweets, snacks, honey, and others (see Figure 6). The average income of these businesses before the Value-Added Project (PVA) ranged from US$ 16,508 in the category of pastries and baked goods, to US$ 207,418 in businesses dedicated to fruit and vegetable post-harvesting. Overall, the project reached an average increase of US$ 8,113 in businesses' income, which represents an 11.3% increase over the average of US$ 72,024 that businesses registered before PVA. This general increase is slightly higher than the goal of 10% envisioned in the project design.

The categories that benefited the most, in relative terms, were: meat products, which increased their income by 43.1%, followed by fruit and vegetable post-harvesting (25.2%), wine and beverages (23.1%),

honey and derivative products (22.9%), and pastry and baked goods (20.8). On the contrary, canners and bottlers' general average fell about 1% during the project period.

Figure 6. Average income increase, according to business category

CATEGORY	Number of businesses	Average Income in US$ before PVA	Average Income Increase in US$ after PVA	Average Income Increase as a %
Meat products	2	24,518.4.	10,557.4.	43.1%
Sweets	6	45,890.2.	1,260.5.	2.7%
Canned and bottled items	7	64,740.4	-554.5	-0.9%
Fried items and snacks	6	42,236.9	5,106.0	12.1%
Grains and seeds	10.	87,973.1	6,444.3	7.3%
Dairy and dairy-based products	7	137,123.1	2,461.5	1.8%
Honey and honey-based products	3	115,668.8	26,533.8	22.9%
Post-harvest of fruits and vegetables	4	207,418.5	52,371.1	25.2%
Pastries and baked goods	7	16,508.8	3,429.7	20.8%
Wines and beverages	8	19,830.1	4,572.8	23.1%
Total	**60**	**72,024.3**	**8,113.0**	**11.3%**

The analysis of results by business size indicates that the effective distribution of the 60 businesses corresponds to 9 micro-, 18 small-, and 33 medium-sized businesses (Figure 7). The largest impacts in relative terms are observed in the micro-businesses, which registered income increases of 77.6% [7], followed by small businesses with 21.4% increases and medium ones with 9.7% increases. [8]

Figure 7. Average increase in income, according to the size of assisted businesses

TYPE	Number of businesses	Results in Volume of Sales		
		US$ before PVA	US$ after PVA	Income Increase (%)
Micro	9	3,609	6,409	77.6%
Small	18	21,008	25,506	21.4%
Medium	33	118,510	130,044	9.7%
General total	**60**	**72,024**	**80,137**	**11.3%**

[7] It must be considered that these relative variations are influenced by the scale of the absolute magnitudes. That is that, in terms of absolute values, a 9.7% increase in medium-sized businesses represents several more times the absolute increase of the micro-businesses.

[8] It should pointed out that a greater dynamism of involved micro-businesses' income does not necessarily involve that there is greater profitability within the micro-business group. On the contrary, a high profitability within the specific micro-businesses group would require a high number of assisted businesses in order to reach economies of scale and reach a point of equilibrium that would allow for distributing the implementation costs of the project in this sector.

4.3 Results in Terms of ERR

The economic rate of return of this project comes to an estimation of 27% for 10 years, and rises to 30% if a horizon of 15 years is considered. This general rate is strongly influenced by the larger number of medium-sized businesses involved in the project.[9]

Figure 8. EAP – Value-Added Project

Estimated ERR at 10 and 15 years	
Project	**Reference results**
IRR in 10 years	27%
IRR in 15 years	30%

4.4 Sensitivity Analysis

The sensitivity of the project was measured through the simulation of changes in the ERR as a result of variations in project sensitive variables , such as production volumes and prices.[10] An optimistic scenario was modeled with increases of 10% in the variables of interest, and a pessimistic scenario assuming that the same variables decreased by 10%. In both cases, comparative statistical analysis is conducted.

Figure 9 presents the expected impact in the ERR for 10 years in the optimistic scenario, suggesting that if a generalized increase of 10% was registered in the production volumes of the businesses participating in the PVA, volumes above the values estimated by the project, the ERR would increase to 28.2% (a linear increase of around 0.75 points in the ERR for every 10% increase in production).

Similarly, an increase of 10% in products prices would drive the ERR to 44.3%, compared to 27.4% in the base scenario, which reflects a high sensitivity of the project to variations in the prices of the products. Finally, if both variations were produced simultaneously, the ERR would be 44.9%.

Figure 9. Optimistic scenario: Partial increases of 10%

ERR results in 10 years

Project	Reference results	10% increase in production	10% increase in prices	10% increase in production and prices
ERR in 10 years	27.4%	28.2%	44.3%	44.9%

[9] This allowed the project to offset the absolute negative balances derived from a small number of micro-businesses below their point of financial equilibrium.

[10] In this case, the goal number of beneficiary businesses is fixed, 60, and the project met the goal before being concluded.

Should the behavior of the variables of interest be adverse, a drop of 10% in the expected production for the next 10 years would be reflected on an ERR of 26.6%. Further, if this 10% reduction occurred in the products prices , the economic profitability of the project would fall to 7.5%. (Figure 10)

Figure 10. Pessimistic scenario: Partial reductions of 10%

ERR results in 10 years

Project	Base results	10% decrease in production	10% drop in prices	10% reduction in production and prices
ERR in 10 years	27.4%	26.6%	7.5%	6.3%

In order for the economic profitability of the PVA to fall to a minimum level of 15% on a 10-year horizon, the production levels should be 32% smaller than those registered in 2010. That is, not only should they register no growth, but rather shrink compared to the values reached in the first year of the project framework's operations.

In addition, the high sensitivity to prices is reflected in that a general reduction of 6.5% in the prices of the products would be enough to elevate economic profitability to 15 percent.

Figure 11. Sensitivity to extreme changes

Maintaining a 15% ERR for 10 years

Project	Variation in production	Variation in prices
ERR in 10 years	-32%	-6.5%

5. RESEARCH PROJECTS

5.1 EAP-Zamorano Biological Control

The project has progressed training 345 producers and installing 27 validation plots. Preliminary results of trials indicate that the efficiency in pest control through applying natural enemies (biological control) is very similar to that of implementing agro-chemicals (chemical control). On the other hand, the biological control costs are slightly higher than those of chemical control; however, this would be compensated by increases in the effective production yields that go from 10% up to 50%.[11] Anyway, these results cannot be conclusive and more trials in different environments will be needed. The final impact will be seen when a significant number of producers adopt the biological control offered by the project as their main method to control pests.

Profitability Analysis

The expected economic rate of return of this project comes is 55.2% for 10 years, and rises to 60% in a term of 15 years.

Figure 12. EAP-Zamorano Biological Control Reference Scenario

Results on ERR in 10 years

Project	Reference results
ERR in 10 years	55.2%
ERR in 15 years	60.0%

Sensitivity Analysis

In an optimistic scenario, an increase of 20% in yields, in addition to those originally predicted, would raise the ERR to 58% (an increase of 2.8 percentage points). Similarly, increases of 20% in the prices of their products or in the number of targeted producers would rise the ERR to 59.7%.

[11] It is expected that in the medium and long term, the reduction of chemical methods applications may allow the increase of other natural enemies that remain in the environment, and whose populations have reduced by the presence of such chemicals. This will complete the positive effect of natural enemies freed by EAP-Zamorano and increase effectiveness in the control of other important pests.

Figure 13. Optimistic scenario: Partial increases of 20%

Results on ERR in 10 years

Project	Reference results	20% increase in yields	20% increase in prices	20% increase in the number of producers
ERR in 10 years	55.2%	58.0%	59.7%	59.7%

Regarding the opposite scenario, a reduction of 20% in yields, prices, or number of expected beneficiaries would reduce the ERR to 52.2%, 50%, and 50% respectively (Figure 14), reflecting the project's very small sensitivity to these variables. Namely, the project seems robust in terms of the expected economic impacts.

Figure 14. Pessimistic scenario: Partial reductions of 20%

Results on ERR in 10 years

Project	Base results	20% decrease in yields	20% drop in prices	20% decrease in the number of producers
ERR in 10 years	55.2%	52.2%	50.0%	50.0%

To reach a minimum profitability of 15%, this Biological Control project would have to face a drop of almost 90% in the prices of protected projects, or to assist only 10% of the proposed producers, which seems pretty unlikely.

Figure 15. Sensitivity to extreme changes

Maintaining a 15% ERR for 10 years

Project	Variation in yields	Variation in prices	Variation in the number of producers
ERR in 10 years	-146.3%	-87.9%	-87.9%

5.2 IHCAFE – In Vitro Production of Coffea Arabica Clones by Somatic Embryogenesis

The project's progress includes the production of 125,000 seedlings and the establishment of 60 commercial plots at a national level, to validate the FI hybrids (Central American, Millennium, and Cassiopaea) that will be planted by 60 small, medium, and large producers distributed through the coffee-producing regions of Olancho, El Paraíso, Copan – West, Santa Bárbara, Comayagua, Cortes – Yoro and Tegucigalpa (Center-South).

The project goals are to incorporate 270 new producers per year between the fifth and ninth year, plus a final incorporation of 340 additional producers in the 10th year of implementation, reaching a cumulative total of 1,945 producers, in a surface area of 1,775 manzanas planted with coffee from the laboratory

Profitability Analysis

The Economic Rate of Return of this project is 24% in 10 years, and rises to 33% on a 15-year horizon, as of the starting date of the FDBPA/MCA framework.

Figure 16. Base Scenario

Results on ERR in 10 years

Project	Base results
ERR in 10 years	24%
ERR in 15 years	33%

Sensitivity Analysis

In an optimistic scenario of a 20% increase in prices and number of producers, the ERR for this project would increase 2.7 and 1.6 percentage points, respectively, reflecting little sensitivity to changes in such variables.

Figure 17. Optimistic scenario: Partial increases of 20%

Results on ERR in 10 years

Project	Reference results	20% increase in the number of producers	20% increase in prices
ERR in 10 years	24%	25.6%	26.7%

In the opposite scenario, faced with the situation of only serving 80% of the expected producers, the ERR would fall to 21.5%, and facing a drop of similar magnitudes in products prices, the ERR would also fall to 19.9%.

Figure 18. Pessimistic scenario: Partial reductions of 20%

Results on ERR in 10 years

Project	Reference results	20% decrease in the number of producers	20% drop in prices
ERR in 10 years	23.6%	21.5%	19.9%

In the extreme side, the number of producers served would be only 40% of the predicted amount , or prices would be at a 74%-level of what was expected, and even so the IHCAFE Project would reach a minimum profitability of 15%, keeping everything else constant.

Figure 19. Sensitivity to extreme changes

Maintaining a 15% ERR in 10 years

Project	Variation in producers	Variation in prices
ERR in 10 years	-61.6%	-26.8%

5.3 FUNDER – Production of Potato Seeds in Honduras.

This project reports training 105 people, split between technicians and producers, on production of pre-basic, basic, registered and certified seed. The project's goals indicate, first, a total of 56 producers producing certified seed using the genetic material developed in the FUNDER laboratory, and 506 producers of potatoes for consumption, who will use the certified seed produced and offered by the aforementioned 56 producers. All of this is expected to occur by the fourth implementation year.

Profitability Analysis

Based on the assumptions and goals of the initial scenario, this project has expected yields of 74.4% in 10 years and 74.9% in 15 years.[12]

Figure 20. Base Scenario

Effects on ERR in 10 and 15 years

Project	Base results
ERR in 10 years	74.4%
ERR in 15 years	74.9%

Sensitivity Analysis

This project to produce potato seed is highly sensitive to variations in the expected yields in production and less sensitive to changes in prices or planted surface area.

[12] Given the high profitability rate, the cash flow value obtained after year 10, even though positive in nominal terms, approach to zero when calculating their present value using such rate.

An optimistic scenario reflects that, given an increase of 20% in the expected yields, profitability increases from 74.4% to 113.2%. Similarly, but with less intensity, similar increases of 20% in prices and planted surface area rise the ERR to 86% and 82.9%, respectively.

Figure 21. Optimistic scenario: Partial increases of 20%

Results on ERR in 10 years

Project	Reference results	20% increase in yields	20% increase in prices	20% increase in planted Area
ERR in 10 years	74.4%	113.2%	86.0%	82.9%

If the scenario is pessimistic and should there be a reduction of 20% in the expected yields, this project would register negative profitability. Drops of 20% in prices or in planted area would reduce the ERR to 60.9% and 65% respectively. That is, the project would not be seriously threatened given possible changes in these variables.

Figure 22. Pessimistic scenario: Partial reductions of 20%

Effects on ERR in 10 years

Project	Reference results	20% decrease in yields	20% drop in prices	20% decrease in planted area
ERR in 10 years	74.4%	ERR < 0	60.9%	65.0%

If the yields came to be 15.1% lower than expected, *ceteris paribus*, the project could still maintain the minimum profitability through an ERR of 15%. Falls in yields of 15.2% or deeper would lead to a profitability of less than 15%.

The minimum profitability would always be guaranteed if the prices fell 62.5% or less, or if the planted surface area were 14% or larger, assuming that everything else remains constant.

Figure 23. Sensitivity to extreme changes

Maintaining a 15% ERR in 10 years

Project	Variation in yields	Variation in prices	Variation in planted area
ERR in 10 years	-15.1%	-62.5%	-86.0%

5.4 OIRSA – Aguán River Valley Free of MOSCAMED [Mediterranean Fruit Fly]

The project reports partial progress on employed techniques, installation of traps and control points, and identification of 40 producers to start cultivating strategic crops. Cost Reduction Indicators are not yet included, nor are values for the export baseline. Since its original design, this project considered incorporating producers through the fourth year of implementation.

Profitability Analysis

The high implementation costs, along with the fact that the benefits for producers will only start to flow until the fourth year of implementation, make the expected ERR for this project to be 21% in 10 years and rise to 27.3% if measured for a 15-year term.

Figure 24. Base Scenario

Effects on ERR in 10 and 15 years

Project	Base results
ERR in 10 years	21.0%
ERR in 15 years	27.3%

Sensitivity Analysis

The project is highly sensitive to changes in the products prices and the number of producers, but not to variations in the expected crop yields.

An increase of 20% in prices of the supported products drives the ERR to increase more than twice its rate (from 21% to 44.5%); meanwhile, if the number of producers increased 20%, the ERR would increase to 28.7%.

Figure 25. Optimistic scenario: Partial increases of 20%

Effects on ERR in 10 years

Project	Reference results	20% increase in yields	20% increase in prices	20% increase in the number of producers
ERR in 10 years	21.0%	21.0%	44.5%	28.7%

On the other hand, a reduction of 20% in prices would lead to an economic-wise loss for this project. The reduction of 20% in the number of producers would lower the ERR to 11.2%, which remains being positive, but smaller than the minimum expected rate of 15%.

Figure 26. Pessimistic scenario: Partial reductions of 20%

Effects on ERR in 10 years

Project	Reference results	20% decrease in yields	20% drop in prices	20% decrease in the number of producers
ERR in 10 years	21.0%	21.0%	ERR < 0	11.2%

The low sensitivity of this project shows that even if prices dropped by 3.5% and the number of assisted producers by 13%, this project would still be on the minimum threshold of an ERR of 15%. Reductions greater than these percentages would cause profitability rates fewer than 15% or even losses.

Figure 27. Sensitivity to extreme changes

Maintaining a 15% ERR in 10 years

Project	Variation in yields	Variation in prices	Variation in the number of producers
ERR in 10 years		-3.5%	-13.0%

6. CONCLUSIONS

This report constitutes a partial analysis of the economic profitability of projects financed by the FDBPA. It is based on those projects that have completed their financing and infrastructure construction phases supported by MCA-Honduras. This initial period of implementation lasts, on average, between 12 to 18 months. The impact of these projects can be fully observed after various years of implementation. However, it bears mentioning that the delays of project implementation will result in a smaller ERR than that expected in the initial estimates, so that the net benefits will be registered later than predicted.

The partial results reflect a high economic profitability, expressed in an average ERR of 35.2% for irrigation projects and 27.4% for the Value-Added Project (PVA).[13] An estimate of the global economic profitability rate for FDBPA projects is generated weighing the partial re-estimated rates by the amounts supported by MCA-Honduras for such projects. The results are presented in Figure 28, and result in a weighted global ERR of 38%, which currently represents almost three times the capital opportunity cost and more than twice the minimum profitability accepted by FDBPA.

Figure 28. FDBPA Global Rate of Economic Return

From the irrigation and value-added projects, and considering the amount of contribution form MCA-Honduras

Project	MCA Amount	ERR	Product
PAG1	748,750	34.5%	258,319
ADRA	761,856	36.1%	275,030
PILARH	400,000	34.9%	139,600
EAP-ZAMORANO VA	452,434	27.4%	123,967
EAP-ZAMORANO BIOLOGY CENTER	700,000	55.2%	386,400
CLONES LAB IHCAFE	424,308	23.6%	100,137
POTATO LAB - FUNDER	525,000	74.4%	390,600
OIRSA-SENASA - MOSCAMED	891,011	21.0%	187,112
Totals	**4,903,359**		**1,861,165**
Weighted ERR		**38%**	

The sensitivity analyses reflect fairly solid profitability rates, outlaying the high sensitivity to variations in prices of PVA products. This high sensitivity, however, is also correlated to the products associated with

[13] Another element that contributes to greater profitability for the FDBPA Program is that neither financial costs nor repayment of investment capital constitute charges, because it is a MCA-H donation.

the medium-sized businesses, which in the project design were represented by honey and honey-derivative producers.

Another project with high sensitivity to prices and number of beneficiaries is the OIRSA-SENASA project. In fact, due to its nature, it is to be expected that its positive effects would be manifested more at a macro-economic level in the medium and long term, and not so much in the economic income of producers in the area.

It is recommended that project implementers report and update the project's impact indicators in order to evaluate the project in the future, and thus obtain an ERR estimate on wider data associated to a larger number of projects during several years of implementation.

APPENDIX 1. LIST OF PROJECTS

Implementing Institution	Project Name	Area or Type of Project
Adventist Agency for Development and Assistance Resources (ADRA)	Community Irrigation Systems for Horticultural Production in the Province of Santa Barbara	IRRIGATION
Brotherhood of Honduras (HdH)	Strengthening the joint economy of small horticultural producers in the province of Ocotepeque	IRRIGATION
Brotherhood of Honduras (HdH)	Food Self-Sufficiency Project - Solidary Economy in the Sensenti Valley.	IRRIGATION
Global Village Project (PAG)	Marketing and competitiveness among the horticultural producers of the Celaque, Belén Gualcho, and Ocotepeque plateau	IRRIGATION
Global Village Project (PAG)	Integrated Production System (IPS; in Spanish, SIP), Ojos de Agua, Comayagua	IRRIGATION
CHF International	Development of productive systems with crops adaptable to the conditions of Valle province	IRRIGATION
Save the Children Honduras (SCH)	Production in Lenca Indigenous Communities - PROHLENCA	IRRIGATION
PILARH -	Integrated Production and Information Project	IRRIGATION
Mixed Cooperative United for Limited Progress COOMUPL PROGRESSIO	Productive diversification in the coffee-producing zone of La Sierra de La Paz, through the financing of low-irrigation areas for crop production	IRRIGATION
FAO	“Renewable energy for crop production with systems for applying fertilizer through irrigation by an ultra-low-pressure drip” – HORTICULTURA HIDROENERGETICA	IRRIGATION
EAP-Zamorano	Increasing productivity and sustainable incomes for micro, small, and medium Honduran agro-processors (PVA)	MICROBUSINESS VALUE ADDED
Honduras Coffee Institute (IHCAFE)	In vitro production of F1 hybrid clones of Coffea arabica by somatic embroyogenesis to increase the genetic base of coffee in Honduras	RESEARCH AND TECHNOLOGY
EAP-Zamorano	Increasing the productivity and income of small- and medium-scale Honduran farmers through the use of biological control in horticultural production (Biological Control)	RESEARCH AND TECHNOLOGY
Foundation for Rural Business Development (FUNDER)	Production of Potato Seed in Honduras	RESEARCH AND TECHNOLOGY
OIRSA-SAG	Recognition of the Mediterranean-Fruit-Fly-Free Area in the Aguan River Valley	RESEARCH AND TECHNOLOGY

APPENDIX 2. RESPONSE TO COMMENTS FROM MCC

NOVEMBER 2010

General Comments:

Model Structure. *NORC gave the general guidance and basic templates on how to construct counterfactual scenarios. Each grantee, with help and supervision from technicians from MCA-H FDBPA, developed the specific model for their project. NORC reviewed the final model and calculated the ERR.*

In all projects involving crops, the basic data was the investment plan by crop developed by FINTRAC. MCA-H established a "general model" with all the crops, and then adjusted it to reflect the specific crops for each project. In many cases, the grantees presented their own calculations of IRR, but then, MCA-H re-calculated the IRR, in part to make sure the calculations were correct, but also to avoid the tedious procedure of going through each formula within the worksheet.

We agree with MCC's point about the messiness and poor organization of the worksheets. We experienced similar frustrations when estimating the ERRs and developing the model in order to do the sensitivity analysis. However, these were the worksheets presented to NORC and we worked with what we received.

Based on MCC's comments on regarding the differences – in number of producers and amount of land - between the WOP and the WP scenarios, NORC made adjustments to the worksheets for the irrigation and the FUNDER projects.

With regard to the research projects, much of the information needed to validate or calibrate the model is still pending. As such, the current effort must be taken as an "intermediate" evaluation; the expectation is that more data will be forthcoming when the projects are further along in their implementation. We propose that MCA-H request from each grantee a development plan that specifies how they will proceed to comply with the targets.

Value Added ERR (Zamorano)

Documents reviewed:

Zamorano_Agroprocesadores_2010.xlsx
Final Report – ERR Calculations for Public Goods Grants Projects Sep29-2010.docx, Sections 1, 2, and 4

Comments:

1. *Model Structure*
   a. The data seem to be taken from three particular producers. How representative are these three producers of other producers in their sector? How representative are Beans, Malanga, and Honey of the micro, small, and medium enterprises within the program? Could the cases weight or otherwise incorporate the other enterprises within their size category?

      When EAP-Zamorano first presented the project they chose those three sectors as representative of micro, medium, and small enterprises. Over the course of the project, many other sectors

entered the project. However, the classification was based on sales, not on sector. So, it might be the case of two enterprises in the same sector, classified differently based on their size.

b. Is the *With Project* (WP) investments category of "equipment and tools" meant to be equivalent in scope to the *Without Project* (WOP) costs category of "investment in equipment and irrigation"? Be explicit if so.
No, the WOP project situation refers to minor working tools, different to those implied in WP.

c. Are there additional maintenance costs associated with the equipment/tools/irrigation purchased as an investment for both the With and Without Project producers?
Not in this project. All relevant costs are included in the model as inputs.

d. Why do we assume none of the WOP enterprises would license? Don't they?
This is a valid assumption. Small firms prefer to stay informal in Honduras.

e. Are WP (With Project) producers' investment of own funds in equipment/tools/irrigation in fact zero?
The model assumes that all the equipment needed to fulfill the targets will be purchased with the FDBPA resources.

f. The same production function is used for all three sizes of enterprise. Why?
This depends on the specific sector and firm size. However, the approach of adding value to the products is very similar among them.

2. *Documentation*
   a. Need documentation for the initial period parameters.
      i) Income sections between WP and WOP do not look comparable in category.
      ii) Document why cost compositions differ between With and Without Project.
      iii) In particular, why does the sales price differ for commodities for the With and Without scenarios? Document the source for these prices.
      Beginning from year one, the improvements made to the product accounts for the price and income differentials (i.e. better looking, better quality, more reliable, more elaborated products).

   b. In general, there needs to be much more documentation and sourcing for the assumptions made throughout.

   c. It is difficult to follow the ERR model through without additional documentation. Several sections even within the same worksheet will have the same title and headings and similar layout, but different numbers, making it tedious to ascertain how the model is constructed. Remove any superfluous parts and label pieces which remain.
      The logic of the model structure is to establish WOP and WP scenario for a typical (or average) producer, and then to multiply the results by the number of beneficiaries to be incorporated. The grantee did some IRR estimations, whose base data is used to estimate the ERR. However, it is true that some sections may be wrongly labeled; or otherwise the used parameters changed in the model. The labels refer to the initial parameter estimated by the proponent.

   d. Need to document the parameters used in the year-on-year growth in the production function.
      In general, those were the economic intermediate indicators that NORC requested from grantees to validate with the baseline data first, and then to include, periodically, in the M&E reports. However, the deliverables plans for the projects only require these indicators to be handed in at the end of the project.

e. Document the assumptions on the opportunity costs for manual labor and illustrate where opportunity costs of capital enter into the model.
These are the shadow prices for labor in the economy and are based on INE data on employment in the HH survey. We will provide a worksheet showing the methodology. On the other hand, there are no financial costs or capital repayment in the model. The opportunity cost of capital is taken as a discount rate to estimate the present value of the flow of net benefits.

3. *Calculations*
   a. The Report states that the micro enterprises had the highest revenue increases at 77.6%, followed by 21.4% for the small and 9.7% for the medium enterprises. Yet the ERR and IRR results for the enterprises show a very different pattern: the representative medium enterprise has ERR/IRR results of 38%/25% followed by micro at 10%/2% with small being the lowest at 4%/0%. This results in the micro and small enterprise efforts having a negative net present value at 12% discount rate.
      i) Help us understand the discrepancy between the revenue pattern and the ERR/IRR pattern
      ii) Can you give any insight into why the economic and internal rates of return are so low for micro and small enterprises?
      This is a matter of equilibrium point. In order to recover the investment made in micro and small enterprises and give positive IRR, a larger amount of this type of firms would be needed. This is a result of the small absolute positive values for this type of firms.

4. *Sustainability*
   a. Why should we or should we not expect the productivity path outlined for this activity to be sustained over the next 15 years (presumably until 2022)?
   As in the FINTRAC's producers' case, these firms are supposed to have "graduated" from the EAP_Zamorano's program, and the assumption is that product improvements will remain.

Irrigation ERR
Documents reviewed:
APGGF – Final Evaluation-RESUMEN_ERR_RIEGO_2010.xlsx
APGGF—Final Evaluation—Irrigation notes.docx

Comments:

1. *Costs:*

   a. The ADRA and PAG1 subprojects increased in scope (in terms of both irrigation beneficiaries and hectares irrigated), but the model does not reflect an increase in costs. Has there been any verification or validation of this?
   No. We have corrected the worksheets to make the number of hectares and beneficiaries comparable in the WOP and the WP scenarios. This is why the ERR has changed for the irrigation projects.

   b. Are the costs of operating and maintaining the irrigation incorporated into the model (perhaps under mechanization costs)?
   Yes. There is a line for irrigation maintenance costs.

   Are any costs of additional water used in irrigation (or benefits from water savings if water usage is lower) incorporated?
   Most of the projects take into consideration the payment of a canon for the use of water.

2. *Crop yields*

   a. The PAG1 and ADRA ERRs are based on stated yields with and without the project, but require additional documentation on where these yields come from.
   These data were reported in the last M&E worksheet by the grantees. In the case of ADRA, they did a small survey of 20 producers/beneficiaries.

   b. For PILARH, the document states that there was no information on the products promoted by the project nor any actual yields captured in monitoring data. This is a major weakness, and it would be difficult to consider this an *ex post* ERR without this information.
   This was corrected using PILARH data received via mail on March 2010.

3. *Crop composition*
   a. In general, crop composition parameters need much more details/documentation about how these estimates were obtained or from where they were derived.
   We used FINTRAC investment plans by crop.

   b. With and without project scenarios (WP and WOP, respectively) do not have the same allocation of land across crops in year 1. For PAG1, higher allocation of land to broccoli, carrots, and lettuce in year 1 under WP (though lower overall land usage and slower growth in allocation to these crops). For ADRA, different allocation across beans and corn.
   This was also corrected in the last set of estimations. Sometimes the projects report these figures.

   c. The total land used is higher in the WP than WOP scenarios, even in year 1, for ADRA and PILARH. Is this because the additional land was previously laying fallow? In any case, we

need to reflect the opportunity cost of that land, so the WOP should have the same total amount of land, with the additional land allocated to maize and beans.
This was already corrected in the worksheets.

d. The parameters determining the shift to higher valued crops require more documentation. For example, the shift to broccoli, carrots and lettuce in PAG1 is 13% WP and 21% WOP—where does this parameter come from? For ADRA, the growth rate of allocation to broccoli, cabbage and tomato of 35% in year 3 (and constant thereafter)—from where is this parameter estimate derived?
In many cases these parameters depend on the project implementer and are also limited by the fixed amount of land allowed to each beneficiary.

4. *Sustainability*
   a. What institutional arrangements are in place to believe that the same productivity will be sustained for 15 years (presumably until 2022)?
   Producers are organized around the irrigation utilization and maintenance groups (Juntas de Riego), and are well trained by the grantee. Besides, there is the "canon" that irrigation users pay. Moreover, many grantees are NGOs that are established in the local area and work there in different kind of projects during several years. These are all factors that can contribute to sustained productivity.

5. *Calculations*
   a. It appears that the composite ERR averaging the returns across the 3 subprojects is higher than all of the individual subproject ERRs. This is not mathematically possible, so most likely indicates an error in the formulas.
   The difference came from the "average typical MCA-H producer" that we constructed, by averaging all the crops involved in these 3 projects, hoping to capture the situation of the other producers working with the now unaccounted-for projects. Then we used this average land and crop distribution to estimate income and costs based on yields and prices of the different types of crops. This resulted in a profit overestimation due to the more diversified average producer, toward more profitable crops. This was already corrected in the previous version of the report, and the average ERR was re-estimated based on average income and costs for the 3 projects under consideration.

FUNDER ERR (Semilla de Papa)

Currently, all potato seeds are imported from the Netherlands and other countries. Therefore, the WOP scenario involves a producer of potato for consumption that saves 5% of his crops to use as seeds. Obviously, these are not good-quality seeds and the producer obtains very low yields from it. Harvested potatoes are divided into first-class potatoes (between 75% and 80% of crops), that receive higher payments, and second-class potatoes whose lower quality garners a lower market price.

The production process of potato is divided into several stages: First, the laboratory will produce a basic seed (genetic material). Second, this basic seed is transplanted to produce a new tuber, a registered seed. This registered seed will be distributed among 56 producers by FUNDER laboratory for them to crop and harvest certified seeds, which are the ones that are sown to produce potatoes for human consumption. In summary, the first comparison to be established is between 56 producers of traditional-consumption potatoes versus 56 producers of certified-seed potatoes.

There is a second element in this project: the utilization of the certified seeds by 506 producers to obtain potatoes for consumption. Here, the WOP scenario involves a typical potato-seeds producer, compared to the producer who will employ certified seeds (WP Scenario).

Finally, these two components are combined and the project's total impact is estimated. In fact, we could stay in the first stage, which is strictly the lab stage; however, in order to guarantee the laboratory's success, the proponent was asked to incorporate plans for using the resulting seeds.

1. *Costs*
   a. Can you define each of the key cost items, and explain why they are different between the with and without project scenarios?

   b. Where did the cost information from the FDBPA worksheet come from? Can you explain further how that was incorporated into the cost calculations on the IRR worksheet?

2. *Model Structure/ Assumptions*

   a. It's difficult to see the overall structure without documentation (more on documentation in the next section), including the definition and reasoning for the various sections in the TIR/ERR worksheet. Also, how are each of the sections defined? This is not in the written report, either. In addition, it's then difficult to know how to assess the various ERRs contained in that worksheet in terms of the different scenarios – what does each one signify? How did you get to the single ERR that is mentioned in the written report?

   b. There are specific comments in the spreadsheet file about things that are not clear.

   c. Some of the inputs for number of producers and hectares do not match the numbers noted in the written report- why is this? How did you arrive at the numbers of beneficiaries and hectares that were used?

   d. Not entirely clear how items from the Hoja1 and FDBPA worksheets were incorporated into the calculations in the TIR/ERR worksheet.

   e. There seem to be some differences in the assumptions for without project and with project, where it's not clear why they are different. For example:

      i) Why are the costs for chemical application assumed to go down for the with-project, and up for without? In the without scenario, more chemicals are assumed to be needed? Another reason?

      ii) Why do you assume only the with-project producers would adopt a biological control/ natural pest control method? Is this why their costs would go down? Based on info from biological control, that method seems to have significant costs as well. Is it not possible that farmers in the without project scenario might also adopt a natural method?
      Only trained producers usually use biological pest control.

      iii) In the with project scenario, you say that you estimate that half of the EDA farmers would adopt this technology. First, is this total EDA farmers trained (about 7000), or EDA farmers who passed the $2000 threshold (about 6000)? Second, where are these numbers reflected in the numbers of producers benefitting? Is this spread out across the various sections? Not clear how to total across the various sections, per similar question on this breakdown above. Also,

what about the farmers who were trained as part of the grant itself? What about the 1220 farmers identified in the written report as having potential for take-up?
At the beginning of the FDBPA implementation, proponents associated these projects with the EDA component as being mandatory. Later on, this ceased to be condition; however, many projects kept saying this in their proposals.

3. *Documentation*

More documentation on the structure of the model, where key numbers and assumptions and prices come from, and overall logic of the model, including the various sections, would be helpful.

4. *Sustainability*

a. Are there assumptions about further distribution of the seed variety, as well as further development, that need to be incorporated into the model, or documented as to how they have been already?
b. Are there assumptions about broader dissemination and take-up beyond EDA farmers and the farmers that have been trained?
c. Are there assumptions about the value and/or productivity of the seed that change over time? *No, but this is just to keep the model simple.*

Biological Control ERR

1. *Costs*

a. Can you define each of the key cost items, and where the cost data in the FDBPA worksheet came from?
Not sure here whether the crop investment plans came from FINTRAC or whether they were developed by EAP-Zamorano. The cost of developing the biological pests came from Zamorano.

2. *Model Structure/Assumptions*

a. Why were tomato, onion, and sweet potato chosen for crops 1, 2, and 3? Were they a focus in testing this product? Are they representative in a certain way?
The criterion here is the profitability of these crops. Also, there is an inner knowledge from Zamorano about the pests that they cannot control with the other biological pests they already have developed.

b. For the with project scenario, when you note the assumption of replacement with chemicals with a natural method, do you mean a complete replacement, partial, something else? Could you specify further? *It is diminishing over time, but it never comes to a total (100%) replacement*.

c. When you say that approximately half of the EDA farmers will be assumed to adopt it, do you mean of the total that were trained (about 7000), or the total that passed the income threshold (about 6000)? Also, the 4200 in the actual beneficiary line in the ERR worksheet is higher than half of either of those – are there additional farmers you are including? Farmers who participated in the testing? Also, are there possibly other farmers who might adopt it, based on possible further dissemination scenarios? Do you really think that EDA farmers would adopt in that proportion, given the large role that chemical products for pest control plays in the EDA training curriculum?
This ceased to be a condition for the project anymore. Producers can be outside EDA's farmers.

d. Can you explain why the costs for chemical products go up for the without-project scenario, and down for the with-project scenario? Because of the amount they will buy? What about the costs associated with the natural product? From the monitoring data available, it seems like they can be pretty substantial as well?
EAP Zamorano says that it is due to the diminishing effectiveness of the chemical over time. On the other hand, the results of the validation experiment are still very preliminary and we prefer not to make any change based on results so far.

e. Given what you say in the written report about what is known to date of the effectiveness and the costs of chemical pest control versus natural, an ERR of 55 or 60% seems very high – can you explain further how this has been accounted for in the model/ calculations?
See answer above.

f. Based on what we know to date about effectiveness, plus reasonable assumptions from the grant research, we can expect that crops yields and incomes will go up as a result of using this product? Not entirely clear how this issue is incorporated.
Not enough data to say anything.

Documentation

a. The area for crops 1-3 in the ERR worksheet is in hectares? Yes

b. More documentation on the structure of the model, how the various pieces are defined, and the sources of information for they key assumptions, inputs, and calculations, would be helpful.

3. *Sustainability*

a. Are there assumptions about further dissemination over time that should be included?
We understand the grantee was asked to present a dissemination plan.

b. Are there assumptions about the further development of the products, or change in effectiveness of the products over time, that should be included?
These type of assumptions, wherever is applicable, were incorporated into the model by the grantee.

IHCAFE ERR

1. *Costs*

a. Can you define the key cost items?

2. *Model Structure/ Assumptions*

a. Not sure what this assumption means – could you explain: "Se considera un nivel tecnologico de manejo de cultivo bajo, medio y alto a ser aplicado por pequeños, medianos y grandes productores respectivamente."
This is a more complex model because the proponent broke down in detail the technological standard to use according to the size of the coffee producer – small, medium or large. Costs, yields and related information are specified separately by producer type and size.

b. For the with project, it looks like you are assuming that the entire area of cultivation will be dedicated to the new hybrid plants – is that correct?
Yes. The model compares a traditional brand versus the new produced hybrid.

c. You mention 60 people identified as potential producers in the written report, but in the spreadsheet it looks like up to 340 potential producers over time – how did you arrive at the 340?
These are the intermediate targets proposed by the grantee. We added a comment about this in the report.

d. How did you arrive at the 320 estimated hectares in the spreadsheet?

e. For the 320 producers and 320 hectares in the without project portion – how did you arrive at these numbers?
Areas were proposed by the grantee based on the amount of producer by type (i.e. Small producers plant 0.5 Mz, median producer 1 Mz, big producers are above 1 Mz, or so).

3. Documentation

a. Could you provide more information on the overall structure and documentation of the model?

b. Could you provide more documentation on the elements in the "datos por nivel tecnologico" and con proyecto and sin proyecto worksheets? These seem to feed key information into the ERR calculation, but it's not entirely clear what is contained within them, or how the different groups and levels in each are defined.
The model differentiates the take-up of each producer over time. It also considers that it will take 3 years for each plant, once sown, to start their productive cycle. Similarly, at the beginning, yields are smaller and will increase as the plant matures.

4. Sustainability

a. What about long-term assumptions to disseminate the use of hybrids further? Is there anything on this that should be incorporated further?
Our understanding is that the grantee was asked to introduce a dissemination plan.