GRADE
Group for the Analysis of Development

Thematic Evaluation for JBIC

"Improvement of Living Environment and livelihood in Poor Communities-in de Case of Peru"

Poverty Impact Assessment of PE-P19 and PE-P24

– Executive Summary –

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Executive Summary

Goals of the study

1. This study seeks to measure welfare impacts of JBIC financed Foncodes subprojects during 1996-2002. We use impact evaluation techniques recommended by the international literature on social funds impact evaluations. Also, the study seeks to identify bottlenecks that may have contributed to the relative failure of some of the evaluated subprojects in terms of their impacts on beneficiaries. The results from this study will be used to decide future activities of Foncodes and to provide critical inputs to the appropriate design of future programs and projects.

Features of the evaluation

2. The Fondo de Compensación y Desarrollo Social (Foncodes) or Fund was created in Peru in 1991 as a social fund with the objectives of generating employment, helping alleviate poverty, and improving access to social services by poor families. Between 1991 and 2000, it is estimated that the Fund spent about US$ 1,700 million funding micro-projects throughout the country. These projects involved the construction and renovation of school facilities, health care centers, water supply facilities, drainage and latrines, rural roads and electrification.

3. This evaluation was requested to GRADE under some parameters. It must be focused on projects and areas of intervention of PE-19 and PE-24 (eight departamentos). The study also shall evaluate water supply, electrification and roads and bridges subprojects (no sewerage/ latrines subprojects, for instance), with emphasis on impacts upon health condition of children and nursing mothers, poverty levels and households income (related to Millennium Development Goals). It was also requested than a set of communities located in the Selva region (SAPI communities) were included in the evaluation as these were part of a baseline study done before the interventions.

4. The method of intervention of Foncodes can be described looking at the so called “project cycle”, in which a community ends up receiving financial support from the Fund for a specific subproject. This cycle has changed along time, but we will focus on the period 1998-2003 in which JBIC intervention is evaluated. In this period Foncodes used the procedures agreed on the second loan from Interamerican Development Bank (IADB). The stages of the cycle are: (i) Targeting; (ii) Promotion; (iii) Identification; (iv) Design; (v) Approval; (vi) Implementation; (vii) Supervision; (viii) Operation; (ix) Ex-post evaluation

5. The intervened (or evaluated) areas of this study are located in eight departamentos of Peru, four in the Amazonian or Selva region (Amazonas, Loreto, Ucayali and Madre de Dios) and four mainly in the highlands or sierra region (Cajamarca, Ancash, Cusco and Puno).

6. The main units of analysis for measuring impacts in this study are: (i) households; (ii) interventions/projects/facilities; (iii) communities. Each unit is important for assessing the type of impacts and associated variables that we want to identify. But units of analysis are also important for defining crucial aspects of the evaluation method, for instance, the type of control group that it will use, or the level at which matching procedures need to be made to generate good estimations of impacts.

7. In this impact evaluation, we used three types of instruments for gathering information from the sampled communities and households: (i) Household survey applied to a sample within the community (including SAPI households); (ii) Community and subproject surveys to qualified informants, (iii) Height measuring of children and mother. This array of instruments was necessary to assess the impact of subproject activities on household welfare indicators. Community survey was key to identify bottlenecks which might have affected impacts via factors related to subprojects implementation or features of the facilities.

8. The main set of impact indicators used in this evaluation were (identified for each type of subproject):

a) Water supply subprojects

- Time spent in collecting water
- Population with sustainable access to improved water source
- Availability of water supply throughout the year
- Quality of water perceived by users
- Rate of incidence of diarrhea in children under age 6
- Rate of skin diseases in children under age 6
- Prevalence of under height children 2-10 years old
- Infant mortality rate

b) Electrification subprojects

- Number of small and micro enterprises in the community
- Number of days of wage employment of household members
- Number of working electrical appliances in household
- Students' time spent studying at home
- Self-employment income (farming and non-farming)
- Wage income (farming and non-farming)
- Household income
- Hours of study at home by children
- Value of house

c) Transport subprojects

- Number of small and micro enterprises in the community
- Household transport expenditures per capita

- Number of days of wage employment of household members
- Self-employment income (farming and non-farming)
- Wage income (farming and non-farming)
- Household income
- Enrollment rate in schools
- Regularity in student attendance to school
- Value of assets

Sample design

9. The objective of sample design was to select an appropriate representative sample of subprojects of PE-P19 and PE-P24 to be evaluated in the context of this study, and also to build a reliable control group for measuring impacts using with/without estimators in a non-experimental setting. Sample sizes were defined according to pre-existent information on the variance of some key variables like income (electricity or roads) or differential incidence of diarrhea among children in rural communities *vis a vis* those without water access. The sample sizes were defined to be able to get reliable estimates on impacts on these two types of variables. According to the budget for this study, we carried out a household survey with a maximum goal of 2,240 households applied in 224 communities, with an average of 10 households per community.

10. A probit model of Foncodes intervention in each line and for each departamento was estimated as a function of pre-intervention variables like pre-Census 1999 data or Poverty Map of 1996. For each line and departamento we were able to identify non-intervened communities which were potential controls for all the intervened ones. A systematic sample (in the pscore value) was taken for each line in each departamento, and this defined the corresponding control community (the closer in the pscore value, without replacement). This exercise was done for all communities and for the three evaluated lines in each departamento, and pscores were stored for potential use in the replacement of control communities which may not be reached or which had some problem (as indeed occurred as we will see ahead).

Methodological approach

11. The so-called “evaluation problem” is generally a problem of establishing causality. A public program generates an impact or change on people´s lives and we want to know if they improved their welfare due to that intervention. For establishing this potential causality between the intervention and people´s welfare we need to know what would have happened to these people without the intervention (a counterfactual), and after that, compare them on the welfare variable. Obviously, we cannot observe the same people in these two states. Observing people before and after intervention generally does not solve the problem either, because other socio-economic factors—besides the intervention itself—may have affected the

impact variable as well.

12. The solution to this problem in the evaluation literature was to build a counterfactual group (which mimics the behavior of the treated group without intervention) from those who were not intervened. For this to be a reasonable approach, the group that we can use as counterfactual must be similar to the treated one in some fundamental way, i.e., these people must be equally likely to have participated in the program than the actual participants, but did not participate due to exogenous factors (i.e. not related to characteristics that affect impacts).

13. In this specific study we adopt a model for impact evaluation of a program like Foncodes that seeks to capture the specific setting in which this intervention occurs and to be useful for the type of data that we have for the evaluation. This model has to consider that: (i) Foncodes intervention occurs at the community level, i.e., communities (not individuals) are selected for intervention, and participation decisions are based upon some community (or more aggregate like district or province) variables; (ii) some impacts (or outcomes) expected from the intervention occur directly at the community level and others at household level; (iii) we do not have baseline (pre-intervention) data for treated and untreated communities, so we need to take a sample of non-participating or untreated communities from a set of communities which were similar to treated ones in observable pre-intervention variables.

14. The sampling method used in this study was useful in many aspects. First, it assured a high degree of comparability between treated and non-treated communities since the sampling stage. Second, taking a sample from the whole distribution of the p-score values generated in the sampling procedure (for each intervention and departmento) helped us to get reliable estimates of impacts, avoiding potential biases within the common support. An finally, this procedure was very useful for replacing control communities which had undesirable features, as having the evaluated intervention done by other public or private institution. In this case we were able to use control communities from other interventions but that have similar p-scores to the evaluated one when running the corresponding probit participation models. This was important because after the field work was done, we found that some control communities in the water and electricity lines have already get the corresponding service and had to be discarded for the analysis. These, however, were replaced by other control communities (from other lines) in the same departamento using the stored pscore values for other controls and estimated in the sampling process. This procedure avoided loosing a significant part of the sample of controls in water projects and was consistent with the adopted methodology. We used the same original pscores when estimating impacts.

15. Standard matching techniques were used for assessing program impacts under a

non-experimental setting[1]. We used two complementary approaches for the matching procedures: at community and household levels. At community level, we estimated average impacts at community level using the same sampling pscore values (based on Pre-census 1999 and Poverty Map observed variables) to match communities and get impact estimates for each intervention. This corresponds to community level impact estimations. The second use of matching was at the household level. In this case, we used the original sampling pscore values to limit the households which can be matched in a radius of 0.1 value of the pscore (this is a probability value between 0 and 1). The matching now was made on five household level variables: family size, household head age, education, gender and mother´s tongue. Thus, inside each intervention and for each departamento, we ran household matching impact estimations only comparing households in treated communities to households in "near" non-treated communities, controlling for these household covariates. Results were obtained both for specific departamentos and interventions, and also for aggregate impacts, estimating also their corresponding variances and standard errors.

16. One important methodological point for our analysis was that every household in a treated community was considered as a "treated" household even if not directly benefited. This is consistent with two issues related to Foncodes interventions: (i) the community is the intervention unit for Foncodes; (ii) there are potential externality type effects in each intervention at community level which are difficult to assess with the available instruments. In other words, in this study we are evaluating the impacts of Foncodes intervention, not of the implemented services. We are also evaluating impacts in a context in which there may exist households in a treated community that did not received direct benefits but that can receive indirect benefits (for instance, children living in a non-connected house to piped water built from Foncodes project who may get benefits from going to a local school which is connected to piped water due to Foncodes).

Estimated Impacts

17. *Water subprojects*. - At community level, the main positive results found are over daily time required to collect water (2.7 in treated group versus 9.2 minutes for control group), expenditure in hygiene products increased (2.09 soles more in treated group) and perception of water quality was higher (65% vs. 55%). At this level of analysis, we did not find significant impacts for crucial indicators like incidence of diarrhea in children 0-6 years old, or in childrens´ nutrition status.

18. At household level, on the other hand, we did find positive impacts on two very

[1] Mostly we used one-to-one and kernel type techniques when measuring impacts.

important indicators: incidence of diarrhea (it dropped from 55% to 39%) and of skin diseases (from 19% to 11%) among children 0-6 years old. Impacts on time saving and favorable perceptions on water quality were in line with what we found at the community level analysis. No significant impacts were found on infant mortality and child malnutrition at the household level either.

19. Part of the explanation of these differences on impacts on diarrhea and skin diseases at household level vis a vis community level analysis may be related to the introduction of additional household level covariates (family size, head education or gender) in the matching procedure, as this may reduce variances and generate more precise estimates. Bigger samples also may have played a role in this more precise result.

20. Access to piped water at home and number of hygiene practices are two key impact variables which have potential positive effects on health status of family members. Besides Foncodes intervention, it is important to know what variables may influence the probability of households connecting to the water network, and the adoption of a certain number of hygiene practices. For this reason we estimated regression models for water connection and number of hygiene practices using the overall sample of households. We considered as explanatory variables in the connection regression, income per capita, community and water project features, and some household characteristics.

21. The probability of households connecting the water network is positively related to per capita income, as expected, and also to some attributes of the water project, like it being working well and benefiting all people in the community (according to informants´ opinions). Also, the gender of household head seems to affect water connection (pointing out a gender bias in this key variable) . Also, households located in selva have more difficulties to get water connection.

22. In the case of hygiene practices, per capita income does not appear as important for adopting these, by the contrary, it seems that less poores households tend to have less hygiene practices (-9%). However, connection to the water network does have a clear and relatively big impact on the adoption of hygiene practices (marginal impact of 25%), and so, this seems to be akey variable for people adopting this type of practices. Also, head´s education appears as important in adopting hygiene practices and head age, with older heads having less hygiene practices at home. Also, households in selva hava a higher number of hygiene practices at home, probably because water quality is much lower than in the sierra region.

23. *Electricity subprojects*. - At community level, there are four main average impacts of electricity projects on the treatment group. The number of small businesses increased in 4.8 (1.9 for untreated to 6.7 for treated), the average number of electric appliances by household increased in 0.96, the average total income of families increase 3,585 soles (more than 50%) in the treated communities, and the selling value of houses increased in 100% for treated communities. We do not find

significant effects on the hours of study at home, or on rental and selling values of houses.

24. At household level, we found impacts which are similar to the ones at the community level. The presence of an electricity project increased in 20% the probability for a household to have a family business (this variable is different from the one at the community level, which was based on informants´ assessments about the number of businesses in the community. Here the variables identifies if each household runs a family non-agricultural business). The average number of electric appliances per household increased in 0.98. Surprisingly, in this case we do not find an impact in incomes at the household level, something we did find in the community level estimates. It seems that controlling for household specific covariates in this case tended to eliminate the differences in income that were detected when only matching average income of communities.

25. At household level also there was a significant increase in weekly hours devoted to study at home by children in school and also on the selling value of the houses, in line with the effects at community level and other studies on impact of electrification subprojects. On the other hand, the rental value of houses showed a negative impact, reflecting perhaps the weak development of this market in rural areas of Peru.

26. *Transport subprojects*. – At community level we did not find any statistical significant impacts of transport subprojects for any of the key selected variables. The only significant impact that we found at this level was in the price of land devoted to pasture.

27. However, at the household level, we did find some relevant impacts. Income from wage jobs, for instance, increased with transportation projects in 650 soles (about US$ 200 per year). This is an increase of about 100% in this source of income for rural families in treated communities. Also, we found a positive impact on the rate of attendance to school by children. The average days of non-attendance during last three months was lower in 1 day for children in treated communities versus non-treated (although this does not appear to be much in this context). Finally, we found again a negative effect on the rental value of houses that does not have a clear explanation. No other variables showed any significant impacts on the treated group of households.

28. Again, the main explanation for catching impacts at the household level that did not appear at the community level must be related to the use of household covariates which increased the precision of the estimations. After controlling for these household variables (family size, head education and gender, etc), impacts could be measured in a more precise way using the matching method.

Identifying bottlenecks

29. For the identification of bottlenecks affecting the performance of projects we built an index of "project success" using the impact measures found in each of the three lines evaluated and only for treated communities. We use the index with High/Low values as indicator of relative success for each treated community in each type of intervention.

30. We analyze some attributes of the context in which the project was developed and also about some attributes of the project itself. In this case, we explore the bilateral relationship between the success index and each factor, and also try to estimate a multiple regression (although the number of observations is always a limitation for this type of analysis).

31. In the case of water subprojects we use three impact variables for constructing our success index: (i) time saved collecting water; (ii) favorable opinion about water quality; (iii) reduction in diarrhea among children 0-6 years old.

32. Comparing low and high performing projects, we do not see much difference in community size in the aggregate. Average budget per project (thousand of soles) was higher for more successful water projects. This was clear for Cajamarca, Madre de Dios and Puno. In the case of Loreto, however, the situation was reversed: more successful projects had lower budgets. The overall picture indicates that higher budgets (with the same level of efficiency assumed) may favor better impacts on the beneficiaries in water projects. However, this relationship could be departamento-specific, as the case of Loreto in which less budgets generated better projects. In general, this calls for a more specific evaluation of the optimal size of water projects in different contexts.

33. As expected, water subprojects which are currently functioning have been more effective. Also those projects which were promoted with local initiative were more successful and the charging of tariff is positively related to more effectiveness. These and the factors mentioned before are used in a multiple regression framework (probit model) to assess the overall importance of these variables in the relative performance of water projects.

34. Both the budget of the project and the variable on the type of initiative for building the project appear as the most important factors affecting water project performance in the treated communities. Projects located in Selva tend to have a lower performance although not statistically significant in the regression. This result is important and suggest paying particular attention to the evaluation of project size (budget) in different contexts. It could happen that there are some economies of scale in the building of water facilities which in certain contexts require more investment to achieve better results. The issue of finding optimal size of water projects in different contexts becomes an important further step in the evaluation of this intervention.

35. The result about the importance of local initiative (versus external initiative) for the

projects is consistent and will appear in the other interventions as well. This calls attention over the way in which Foncodes intervenes in these communities. For water projects, it seems that it is better that communities are the ones with the initiative for projects. This will reflect probably a higher demand for the service and also a higher involvement of the community in the operational phase, providing more resources and care to the maintenance of the facilities. It seems that external initiative for adopting water projects is not a good substitute for local initiative which must be promoted but not superseded by the intervention.

36. For electricity subprojects we used the following impact variables for the performance index: (i) average number of businesses in the community; (ii) average non-agricultural income; (iii) number of weeks in non-agricultural jobs; (iv) selling value of the house.

37. In this case, the size of the community appears positively affecting the performance of the projects, which may be associated to certain minimum scale for getting a more efficient service in this type of investment. In terms of budget, however, the picture is mixed. For projects in Cusco, better projects are associated with lower budgets, which calls attention on the possibility of over-expenditure. In Loreto, by the contrary, higher performance is associated to bigger budgets, which in this case may be also explained by larger community size. In this case, also, it must be taken in consideration that there are communities in which the project is not currently working.

38. For the 5 projects located in the Low performance category in Loreto, only 3 are currently working, whereas all projects are working currently in Cusco. In general, the electricity projects in Loreto seem to fare less well than the ones in Cusco. Another variable which seems to have some influence in performance is age of the project. Older projects seem to do better, especially in the case of Loreto. To the question if all people in the community benefited from the project, the responses were that only in 42% of all treated communities this was the case. Also, the high performance projects featured a higher proportion of responses saying that all population benefited. This raises the issue of limited access to this service by the entire community. As the process of connecting to the electric network depends on income, initial differences among people at the community are reflected in this factor of limited coverage for the electric projects. Finally, in this case external initiative does not appear to affect much the performance of the projects.

39. We also estimated a probit model for the relative performance of electricity subprojects. The only variables which affect performance significantly are the size of the community and the opinion (from the informant) that all in the community benefited or not. This may be associated to the same variables (income, other services, minimum scale), to which the electricity projects are sensitive. It seems that these projects are more effective above certain minimum size of the communities. In this case, particular attention must be paid to the distributional impacts of electricity projects which seem to favor only certain portions with higher

income at the rural population living in the treated communities.

40. For the transport projects we used the following impact variables in our performance index: (i) mean non-agricultural income; (ii) wage income; (iii) assistance of children to classes at school. There is no clear pattern for the size of community. In the case of altitude (which may be associated to more difficulties for transport in Selva), we see that in departamentos with selva and sierra (Cusco, Cajamarca), the higher performance communities in transportation tend to be in the sierra region. In general, impacts of the transport projects in selva appear as more limited due to the higher restrictions in transport infrastructure that these communities face, and which cannot be solved by the relatively small projects financed by Foncodes (mostly bridges, sidewalks, sometimes non-motorized roads).

41. The cost (budget) of projects did not appear to be strongly related to performance. About 90% of the transportation projects are currently working (with no detectable difference in performance) and 88% are perceived as benefiting all in the community. By its nature, the benefits of transport projects are more like a public good which benefits can be appropriate for most people living in the community.

42. The importance of local initiative for the success of the transport projects reappears (like for the water projects). Also, the most effective projects are those in which there is higher perception of good maintenance (generally by the community). However, it must be stressed that in only 35% of the treated communities there was favorable opinion about maintenance from the informants. It also seems that the way in which the initiative was taken for the project affected the maintenance of it after construction.

43. We tried to estimate a probit model for the performance of transport projects but none of the variables had a significant coefficient, and only the “external initiative” comes close of having a negative impact on performance. Thus, we could not find a significant factor affecting the performance of transport projects, although there is some evidence about the importance of local initiative for good projects, and also that most transport projects have severe problems for maintenance.

Some recommendations

44. This impact evaluation has proved useful for measuring specific impacts in each line of intervention and for each departamento. Overall average impacts were emphasized in the analysis but also we presented more disaggregate results (at departamento levels, or for specific sub-groups of the treated sample).

45. The general picture of impacts is that water subprojects have been effective in reducing the incidence of diarrhea and skin diseases among 0-6 years old children, and also have been good at saving people´s time spent in collecting water *vis a vis* the pre-intervention situation. Electricity subprojects, on the other hand, seem to be effective increasing the number of small businesses in rural localities and the value of houses. Finally, transport subprojects were more effective increasing wage income and children school attendance rates.

46. These were results at the average level. Many impacts, however, are very different along departamentos, regions, or sub-groups. In particular, water and transport subprojects seem to be less effective in the selva region, whereas electricity subprojects less effective in sierra. This calls attention to the great heterogeneity of conditions that characterizes rural Peru and which was a challenge for a centralized social Fund like Foncodes during the period under evaluation. However, this situation also suggests that a more decentralized approach may be a good idea for getting better impacts in the future, if this is well designed and implemented.

47. In terms of bottlenecks, we found that local participation (initiative) seem to play a central role in the success of projects, and this may be a call for more control of project cycle to be given to local communities. In this sense, the current trend for decentralization of Foncodes can be a good idea if correctly designed and implemented.

48. In this process one point should be taken with particular care. Since a big part of Foncodes successes in producing effects on people´s lives was related to its capacity to intervene in many and different places at the same time, knowledge and technologies learned in this process must no be lost in the decentralization process. By the contrary, these are very important assets that must be used as the main contribution of a new Foncodes to the decentralization process in Peru.

49. In terms of specifics of projects, we find that both water and transport projects face potentially serious problems of sustainability. In most cases, we did not find people paying tariffs and organizing themselves very well for maintenance. There could be a trade off between the initial budget and maintenance as well, as bigger subprojects may require less maintenance (at least at the first stages) than more cheaper subprojects. It is important to consider the fact that maintenance activities may be in some cases too demanding for the communities, and real capacity for this should be carefully assessed. In some cases, a little more investment in the project may reduce demands on maintenance in the future, assuring a higher impact. The same applies to transport projects.

50. Electricity subprojects, on the other hand, do not face maintenance problems but pose equity challenges as in most of these only a fraction of the population starts to get benefits since inception. It seems that the cost of connection and tariffs are still important barriers for this to happen in higher proportion. This is a case in which a potential subsidy for rural communities must be assessed. This may no require more fiscal resources if a cross subsidy is designed to help rural poorer people to get access to this important service. It is likely that the lack of impact on incomes at household level that we found has to do with the fact that only a fraction of surveyed families in treated communities were really getting the service.

The article on the Ex-post Evaluation Report on ODA Loan Projects (http://www.jbic.go.jp/english/oec/post/2006/index.php) was based on the draft final report of this study. Evaluation findings in this executive summary and the final report differ from those in the article due to further refinement of the method of impact measurement. Most of the differences come from the refinement of the matching method. For the draft report, we re-applied matching procedures to the collected data, but this was not an efficient use of the information used for selecting the communities in the sampling process. Because of this we used the original pscore values of the sampled communities (treated and control) and based our matching estimations on those values. Important differences appeared in estimating some specific impacts, especially in transport projects for which we found some impacts at the household level that were not found using the previous methodology.