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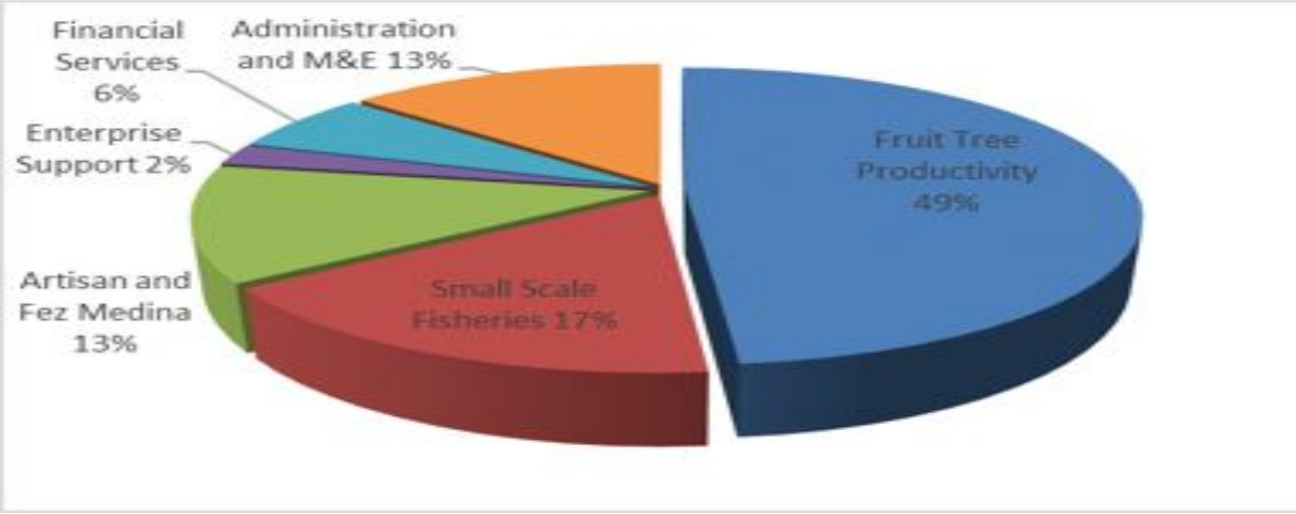
Abstract

The $129.7 million Rain-Fed Olive, Almond & Fig Tree Activity represented 39% of the Fruit Tree Productivity Project and 20% of the total compact. The Plantation Expansion in Rain-Fed Areas Sub-activity was one of two components of the activity, which sought to assist small-holder farmers by creating a greater dependence on perennial agricultural revenue generation, rather than annual cereal crop production. This sub-activity was evaluated using economic cost-benefit analysis (CBA) based on estimates of the expected yield, fixed and variable costs and gross margins in the "with" and "without" project situations. The ERR was estimated at 12.2%, suggesting favorable outcomes on beneficiaries as a result of the intervention. This ERR corresponds to an average intercropping rate of 78%. As a result, intercropping will remain a critical factor in the economic viability of this project, especially if fruit tree yields are lower and/or production costs are higher. A key limitation of the analysis was that the ERR was estimated based on the assumption that the contractually required 100% planting success rate would be achieved, whereas the actual success rate is estimated to be between 70% and 80%. While the available information is not sufficient to confirm the impacts of the project intervention, the analysis suggests that the expected impact of the sub-activity on the target group is likely to be positive on farmers' income, on food security, and on reducing poverty.

Measuring Results of the Plantation Expansion in Rain-Fed Areas Sub-Activity

Performance Evaluation under the Fruit Tree Productivity Project

In Context



The MCC compact with Morocco was a five-year investment (2008-2013) of $649.4 million in five projects: Fruit Tree Productivity (PAF, per its acronym in French), Small Scale Fisheries, Artisan and Fez Medina, Financial Services, and Enterprise Support.

The $323 million PAF Project represented 49% of the total compact and operated through five activities: (i) Rain-fed Olive, Almond, and Fig Tree Intensification and Expansion, (ii) Olive Tree Irrigation and Intensification in PMH zones, (iii) Date Tree Irrigation and Intensification in the Oasis, (iv) Fruit Tree Sector Services, (v) the creation of new modern crushing units supported by a dedicated fund (Catalyst Fund).

The Expansion of Fruit Plantations in Rain-Fed Areas Sub-activity sought to assist farmers by creating a greater dependence on perennial agricultural revenue generation, rather than annual cereal crop production as cereal yields are low and highly variable. The targeted group is composed of small-holder farmers who principally farm cereals. These farmers had to meet several criteria for assistance: the average farm size had to be around 3 hectares, the majority of which is fragmented and eroded due to their location (sloped areas), and conducted poor agricultural practices. This sub-activity affected 13 provinces

in the north and center of Morocco and reached 252 perimeters. According to the original project document, 100,000 hectares were to be planted with olive trees, 15,000 hectares of almond trees, and 5,000 hectares of fig trees. These objectives were revised downwards due to operational re-scoping in 2010 when it was clearly apparent that the costs of works were much higher than what was provided by the initial estimates made in the project design. It was decided to reduce the area to 80,000 hectares (62,000 hectares financed by MCC and the 18,000 remaining by the Government of Morocco).

This sub-activity, as with the others composing the PAF, has been the subject of several cost-benefit analyses during the life of the project. The original cost-benefit analysis for the PAF was completed in 2007, and subsequently in 2010 the restructuring process led to a revision of the rate of return for all components involved, including the plantation expansion sub-activity. Finally, on the eve of the closing of the PAF, the economic analysis was repeated for all of the activities in the PAF.

This paper summarizes the results of the cost-benefit analysis and performance evaluation of the Expansion of Olive Plantations in Rain-Fed Areas Sub-activity. The evaluation estimated the impacts on beneficiaries' revenues which were generated by the olive tree expansion intervention. Because the targeted plantations were not yet in production, this evaluation was conducted using empirical estimates and evolving assumptions. On the basis of the assumptions, observations, interviews with key-informants, and field investigations, an estimation of the expected returns and margins per hectare of olive trees planted was made. Furthermore, the economic analysis models of the Expansion of Olive Tree Plantation Sub-activity have been updated on the basis of results from the baseline survey and an estimation of the expected impacts.

Program Logic

The Fruit Tree Productivity Project (PAF) aimed to reduce the volatility of agricultural production and increase the volume and value of tree crops to promote economic growth in the agricultural sector and reduce poverty in the country.

According to the PAF program logic, the Expansion of Olive, Almond, and Fig Plantations in Rain-Fed Areas Sub-activity should produce significant outputs in terms of diversification of the production and increased productivity of fruit trees with high added value. The anticipated effects of these outputs, in conjunction with outputs from other activities, should help reduce the volatility of agricultural production and increase the volume and value of tree crops in the targeted zones. In the medium and long term, the expected overall impact should enable economic growth and poverty reduction in these zones.

The overall program logic for the Expansion and Intensification of Olive, Almond, and Fig Plantations in Rain-Fed Areas Activity is described in the following figure:

Inputs	Outputs	Intermediate outcomes	Impact

MCC funded studies and works for the expansion of olive and almond plantations in rain-fed areas	The area planted and maintained given back to beneficiaries in the rain-fed areas	• The volatility of agricultural production is reduced • The volume and value of tree crops in the targeted areas are increased	Farmers' revenues are improved

The assumptions underlying this activity are:

- Farmers are aware of the threats of soil erosion that affect their land and are willing to change from a production system based on annual crops to a system based on tree crops.
- Farmers confront significant limitations which prevents them from realizing enhanced productivity;
- Farmers will adopt the techniques recommended by the project including techniques for cultivating fruit trees, and of water and soil conservation. They will ensure the maintenance of the plantations during and after the completion of the project.
- The olive crop provides better and more stable returns than those generated by annual field crops; notably cereals, legumes, and fodder crops.

Measuring Results

MCC uses multiple sources to measure results. Monitoring data is used during compact implementation. Independent evaluations are generally completed post-compact. Monitoring data is typically generated by the program implementers, and specifically covers the program participants who received treatment through the compact. MCC conducts performance evaluations to assess whether the program was adequately designed to meet the needs of the program beneficiaries and how the program was implemented. This performance evaluation used the following criteria to assess the performance of program activities: coherence, efficiency, effectiveness, applicability, and durability.

Monitoring Results

The following table summarizes the performance of specific output and outcome indicators for the evaluated sub-activity.

Indicators	Level	Actual	Target	Percent Complete

• Area planted with olive and almond trees (ha)	Output	60,703	60,372	101%
• Area transferred to beneficiaries (ha)	Output	34,592	60,372	57%
• Area treated with Soil and Conversation Works (ha)	Output	37,719	41,901	76%

The average completion rate is 78%. Targets were met for one out of three output indicators.

Evaluation Questions

Knowing that the target plantations are not yet in production, the evaluation questions attempt to compare the baseline survey data with the estimates of project outputs and outcomes. More specifically, the evaluations looked to answer the following questions:

- What are the expected impacts of the expansion of rain-fed olive trees on the beneficiaries' revenues?
- What are the effects on the expected returns to, costs of, and net margin obtained from a hectare of olive trees?
- What plausible and realistic assumptions were adopted to arrive at these estimations?
- What is the economic rate of return of the olive plantation activity by activity?

The approach of this evaluation of the economic and financial impact of the project focused on three aspects of crucial importance: (i) the role and importance of cereal crops as a means of livelihood for the small farmers in the project area ; (ii) the motivation of small farmers to abandon traditional farming practices (PAT, per its acronym in French) used in fruit trees crops in favor of improved agricultural practices (PAA, per its acronym in French) ; (iii) the willingness of farmers to fully or partially internalize the costs associated with the protection of natural resources.

Evaluation Results

The impact of the olive expansion activity is potentially positive on farmers' income, on food security, and on reducing poverty:

- The ERR was estimated at 12.2% suggesting favorable outcomes on beneficiaries as a result of the intervention. While the ERR depends on a number of variables associated with fruit production,

namely yields of fruit tree, oil content, prices and agricultural practices used by participating farmers, it also depends on the whether intercropping of cereal crops will be practiced during the life of the project and on their yields and prices. Intercropping will remain a critical factor in the economic viability of this project, especially if fruit tree yields are lower and/or production costs are higher. This ERR corresponds to an average intercropping rate of 78%.

- The ERR was estimated based on the assumption that the contractually required 100% planting success rate is achieved. The consultant states that this assumption is not realistic. The success rate is estimated to be between 70% and 80%. The simulation of the success rate of planting at 80% and 70% generates an ERR of 11% and 10% respectively.

- At full development and thanks to newly established fruit trees along with intercropping, the food security of the participating households is likely to be enhanced.

- While the available information is not sufficient to confirm that the project interventions have reached the real poor in the project area, one thing is certain is that 80% of the farmers in the selected villages obtained 83% of the areas planted. The average area planted by each beneficiary is about 1.56Ha. The Provinces that have been targeted by the project have high poverty levels.

- During its implementation over 2009-2013, the planting activity generated the equivalent of 5.6 million man-days of employment opportunities. Tree planting activities under the Project are labor intensive and hence expected to generate additional seasonal, but permanent, employment opportunities directly associated with the value chain of fruit trees such as pruning, treatment and harvesting, transportation services and transformation, in addition to casual labor. It is estimated that at full development, an average of 4,700 to 5,000 permanent seasonal employment opportunities would be created annually.

Evaluator	Mohammed AMEZIANE HASSANI (Individual Consultant to MCA-Morocco)
Methodology	Economic cost-benefit analysis (CBA) based on the estimate of the expected yield, fixed and variable costs and gross margins in the “with” and “without” project situations.
Evaluation period	June-July 2013
Main results [1]	Estimated Rate of Return (ERR): 12.2 %

Final Impact	As a result of the program intervention, the evaluator estimates that: • The expected impact of the expansion activity on the target group is likely to be positive both in terms of income, food security and poverty. • The income from newly planted trees will start to accumulate very slowly until it stabilizes at a fairly high level from year 10 onward. Thanks to intercropping, the income deficit during the first 5 years or so is compensated for by income from intercropping of field crops. From year 5 to year 10 income derived from olive plantations is likely to turn positive and the overall situation of beneficiaries will start to show a significant improvement. From year 10 through to year 20, it is expected that the farmers will start to feel the real benefit of the project in terms of significant increase in real income. At that point, the role of intercropping will still be important but significantly reduced as a percentage of the overall income of the households. • 4,700 to 5,000 permanent seasonal employment opportunities would be created annually. • Average area planted for each beneficiary was around 1.56 hectares

Lessons Learned

This study demonstrated that when olive trees are cultivated in combination with intercropping, the economic rate of return would be higher. Based on the results from this evaluation, the following lessons were learned:

- Without intercropping, the activity impact on household farmers would be negative during the first five years since it takes a few years before olive trees enter into production and about 10 years to reach full productivity. Intercropping, which is considered as one of the main sources of soil erosion, has been included in the estimation of the project ERR. Most of all, it is a critical variable in this project because it compensates for the income forgone after plantation.

- There is no doubt that without intercropping, food security of participating farmers would have

been seriously threatened. Practically all participants in the Focus Group discussions considered cereal cultivation before and after the project very important. This practice is a result of farmers' dependence on cereal, legumes and fodder crops, primarily for food security and a source of critically needed liquidity for urgent expenditures.

- Most of the soil and water conservation works that have been constructed in nearly 45% of the area planted have not been welcomed by farmers and are likely to disappear over time, and most importantly, result in intercropping both in the situation WP and WOT, and lack of periodic maintenance.

- Illegal grazing is an issue. It has been consistently identified in Focus Groups as an important problem. This problem, which is responsible for considerable damages to young olive trees (based on farmers statements and direct observation), should be studied by giving proper attention to all stakeholders, including landless households who depend on livestock for their livelihoods. Possible solutions may include, among others: compensation in cash or in kind, the recognition of the passage rights for livestock, the creation of paths for livestock, the recruitment of beneficiary-funded guards and/or protection of trees in vulnerable planted areas.

- The evaluator notes that a key explanation of farmers' non-adherence to and respect of the Soil and Water Conservation Works by farmers was due primarily to the fact that farmers were neither adequately informed/trained on the utility, operation and maintenance, costs and benefits, of these works particularly on yields and environment. Consequently as farmers continued to practice intercropping after plantation of fruit trees, they were not careful in the use of agricultural machinery, which resulted in partial or complete destruction of these works. While the cost of these works was fully accounted for in the calculation of the ERR, their benefits were not considered, thus the same ERR could have been achieved with significant reduction of the investment cost. MCC and the Government of Morocco may wish to take stock of this important lesson, and take corrective measures in the implementation of ongoing Maroc Vert Program, as well as in similar future projects by both MCC and the Government of Morocco.

Endnotes

1. A key limitation of this estimate is that the rate of return was calculated on the assumption that the planting survival rate would be at 100%, one of the pre-project targets for tree survival. Field missions conducted at 14 perimeters in 7 provinces showed a non-negligible mortality rate, meaning that this estimate may overstate the economic rate of return.