EX-POST ECONOMIC IMPACT ASSESSMENT

Prepared by
Investment Centre Division
for
Emergency Operations and Rehabilitation Division

FINAL
SEPTEMBER 2012

FAO and EU Food Facility
www.fao.org/europeanunion

TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS

EIRR	Economic internal rate of return
EU	European Union
EUFF	European Union Food Facility
FAO	Food and Agriculture Organization of the United Nations
FFS	Farmer field school
FSSP	Food Security Support Programme
GIEWS	Global Information Early Warning System on Food and Agriculture
INERA	*Institut national de l'environnement et de la recherche agricole*, Burkina Faso
NPV	Net present value
PDO	Project development objective
ROI	Return on investment
SSIS	Small-scale irrigation systems

EXECUTIVE SUMMARY

In 2007-2008, agriculture commodity prices skyrocketed worldwide. The 2009 financial crisis extended the global recession. As of 2012, prices continue to remain higher than at pre-crisis levels and trends are marked by volatility. These shocks have had both short- and long-term adverse affects on the earning capacity and prospects of the poor, especially net food buyers. The combined effect of the high food prices and the global financial crisis of 2009 have driven an estimated 105 million people into hunger and malnutrition.

Although the effects have been pronounced in urban areas, of the 1.1 billion people living in poverty, an estimated 70 percent reside in rural areas and depend on the productivity of ecosystems for their livelihoods[1]. Many of these rural poor are smallholder farmers whose opportunities to benefit from higher food prices are constrained by a lack of access to inputs, such as improved and quality seeds, chemicals, fertilizers and adequate mechanization, as well as appropriate technical advice and access to markets.

The European Union (EU) allocated EUR 1 billion for a food price crisis response facility to deliver emergency assistance in a manner that would provide immediate relief for those adversely affected by high food prices and improve the capacities of vulnerable rural people to: (i) increase agricultural productivity; (ii) generate more income; and (iii) secure livelihoods against future food price shocks. The idea was to support effective transitions between humanitarian action and development processes, focusing on programmes that would have both a rapid and lasting impact on food security.

An EU Food Facility (EUFF) grant of EUR 238 million (USD 315 million), was channeled through the Food and Agriculture Organization of the United Nations (FAO) to fund field operations over a period of two years. The FAO-EUFF interventions aimed at boosting agricultural productivity and improving household food security and nutrition for smallholders in 28 countries across Africa, Asia and Latin America. FAO-EUFF projects were designed in line with government programmes to address the food price crisis.

The two-year timeframe of FAO-EUFF projects included four main types of interventions:

(i) distribution of seeds, fertilizers and other agricultural inputs;
(ii) seed multiplication and development of the seed industry;
(iii) mechanization and rural infrastructure improvements; and
(iv) capacity building and training activities.

FAO designed and implemented 31 EUFF projects in the following areas:

- expanding certified seed production;
- ensuring access to quality inputs supported by appropriate extension;
- strengthening existing farmer-based organizations;
- improving storage infrastructure;
- facilitating linkages to markets;
- establishing and strengthening community-managed irrigation schemes;
- increasing livestock production; and
- promoting conservation agriculture.

[1] European Union Food Facility Foundations for Future Action: An Internal Review of Selected Projects – FAO/EU

I. Examples of economic impact

Small-scale irrigation systems (SSIS) in the Philippines

With a total project cost estimated at USD 6 million over a period of two years, in addition to maintenance costs for irrigation estimated at 5 percent of the total project cost[2], the project benefits have been estimated at USD 16.1 million over a period of 15 years, which is the expected productive life of SSIS infrastructure and technology.

The results of the economic analysis show an economic internal rate of return (EIRR) of 15.1 percent and an investment net present value (NPV) of USD 7 million (at a 12 percent discount rate).

Seed systems in Burkina Faso

Total project cost has been estimated at USD 24.5 million over a period of two years, with the project benefits estimated at USD 30.9 million over a period of six years.

The results of the analysis show an EIRR of 18.8 percent and a NPV of USD 1.6 million (at a 12 percent discount rate).

The estimated increase in revenue per beneficiary for the agriculture kit distribution activity totals to USD 38 per year (estimation for year 2010). The additional income raised the beneficiaries above the national poverty line for that year.

Integrated programme in Cambodia

The total project cost has been estimated at USD 15.4 million over a period of two years, with the project benefits estimated at USD 45.9 million over a period of 15 years.

The results of the analysis show an EIRR of 16.1 percent and a NPV USD 2.4 million (at a 12 percent discount rate).

Survey results indicate that beneficiary families increased their food stocks on average by 90 percent, from 440 to 840 kg per household.

Small-scale irrigation in the Philippines

Total project cost = USD 6 million (over a period of two years)
Project benefits = estimated at USD 16.1 million (over a period of 15 years)
EIRR = 15.1 percent
NPV = USD 7 million (at a 12 percent discount rate)

Seed systems in Burkina Faso

Total project cost = USD 24.5 million (over a period of two years)
Project benefits = USD 30.9 million (over a period of six years)
EIRR = 18.8 percent
NPV = USD 1.6 million (at a 12 percent discount rate)

Integrated programme in Cambodia

Project cost = USD 15.4 million (over a period of two years)
Project benefits = USD 45.9 million (over a period of fifteen years)
EIRR = 16.1 percent
NPV = USD 2.4 million (at a 12 percent discount rate)

A comparison of yields with and without project inputs in the same growing season show an increase of 42 percent in the wet season (1 200 kg per ha without project inputs to 1 700 kg per ha with project inputs) and 94 percent in the dry season (1 200 kg per ha without project inputs to 2 330 kg per ha with project inputs).

II. Key messages on economic impact

- The countries benefiting from the FAO-EUFF interventions have started to build resilience to changes in prices by increasing agriculture production. This approach

[2] Standard rate for similar development projects financed by the World Bank.

required significant initial investments that aimed to save money over time3. The economic results, in particular those of three case studies, showed that projects (including investment in productive infrastructure) generate income streams that outlast input distribution activities alone. On the other hand, the input distribution interventions provided immediate results to poor farmers and their families affected by soaring food prices.

- The average investment cost per beneficiary was USD 112 over the two years of implementation of FAO-EUFF projects, with a total number of household beneficiaries to be 2 350 000. In most cases, the return per beneficiary exceeds the investment costs across the entire FAO-EUFF portfolio.
- The economic results of the FAO-EUFF interventions show good robustness to the sensitivity analysis, given the change in prices, delay in income generation and increased costs.
- Productivity increase has been strong in each project, ranging from 20 to 100 percent, as the FAO-EUFF interventions provided a full package of training and improved seeds. The carry-over of improved seed will assure increased production for at least three to four years after project implementation.
- Total additional agricultural production from the FAO-EUFF projects for main crops is: 207 952 tonnes of rice, 253 726 tonnes of maize and 486 689 tonnes of wheat. These figures are conservative, as they exclude the projects with no data and the expected increased production level owing to the improved seed carry-over period. The value of this production, using FAOSTAT international prices4 (year 2009), exceeds the investment made by the FAO-EUFF interventions.
- More than 80 000 ha of land is now under irrigation owing to the FAO-EUFF interventions. The production and economic benefits are expected to last at least 10 to 15 years after project completion.

III. Way forward

In **the medium- to long- term, the potential positive fiscal impact** of the FAO-EUFF interventions are estimated to be substantial, mainly due to: (i) increased output, income and employment, resulting in increased tax revenues; and (ii) multiplier effects due to increased economic activities in rural areas, resulting in increased demand for goods and services, which are expected to generate additional income and employment. Furthermore, substantial foreign exchange earnings and savings are expected, resulting from an increase in exports and/or a reduction in imports.

More robust analysis will be useful: overall the crops targeted by the FAO-EUFF projects had a good performance, but the high level of subsidy (seed and fertilizer) was not captured by the analysis. It would have been interesting for the analysis to test the sustainability of the models at a financial level with or without a reduced subsidy level over time.

The need for **interventions at a greater scale:** the FAO-EUFF interventions show a significant increase in productivity and physical agriculture outputs with no adverse affects on retail and producer prices, benefiting highly vulnerable populations. However, due to the nature, size and scale of FAO-EUFF projects, they cannot be expected to have a significant impact in preventing new food crises. Most of the supported countries are still currently net food importers and the growing domestic demand for targeted commodities remains unmet. Best practices and useful lessons learned could be drawn country by country and used for scaling up future interventions.

[3] Defining Disaster Resilience, DFID approach paper.
[4] Global Information Early Warning System on Food and Agriculture (GIEWS)-FAO data: http://www.fao.org/giews/english/ewi/cerealprice/2.htm.

1 PURPOSE OF THE REPORT

The objective of this desk study was to investigate the economic and financial outcome and impact of the interventions, based on an analysis of the compiled, available information on the impacts of the Food and Agriculture Organization of the United Nations (FAO) projects, funded by the European Union (EU).

The analysis adopted a two-fold approach. In Section 3, the analysis focuses on representative case studies (Philippines, Burkina Faso and Cambodia). These cases were selected on the availability of reliable monitoring and evaluation data. Combined, the projects in these countries totaled approximately USD 45 million, representing 15 percent of the overall FAO-EU Food Facility (EUFF) grant. In Section 4, a general economic impact analysis is offered, based on an aggregation of impacts of the FAO-EUFF interventions in other countries. Data in Section 4 are less reliable or exhaustive than in Section 3.

The two-year time frame of FAO-EUFF projects and the nature of some activities limit what can be accomplished in terms of assuring the measurement and analysis of impacts. The analysis mainly covers input supply and seed multiplication for which verifiable quantitative data are available. The analysis did not included short-term interventions on mechanization and capacity building, as it was not be possible to estimate reliable quantitative economic benefits.

2 METHODOLOGY

The analysis adopted the following methodology. For the three case studies in Section 3, both a financial and an economic analysis were conducted to estimate the overall benefit at the farmer level and to the whole economy. Generally, the benefits were estimated for the FAO-EUFF project implementation years and the estimated productive life of the intervention, once the project activities had ceased. As is customary in ex-ante economic analysis, the calculations were based on the assumption of a three- to four-year period of return for the improved seed distribution and 15- to 20-year period of return for the irrigation scheme rehabilitation. The project costs are assumed to be in line with the FAO-EUFF budget allocated for each country plus some contingencies for the irrigation maintenance. No attempt was made to evaluate the beneficiaries' contributions because this data was not available.

For the case studies, the indicators used were the economic internal rate of return (EIRR) and the net present value (NPV) of the investments made. The EIRR was used to assess the viability and robustness of the investments. Using the EIRR as the measure, the models' sensitivity to the changes in parameters could be assessed by varying the cost of investments, production costs and revenues. The EIRR is a measure of a project's worth; it compares the return on the investment with the best alternative use of the funds to explore the opportunity costs (e.g. if the money was deposited in an interest-earning bank account). The NPV can be described as the difference amount between the sums of discounted cash inflows and cash outflows. It compares the present value of money to the value of money in the future, taking inflation and returns into account.

No project cost-benefit analysis was performed at the time of the project's inception, as the FAO-EUFF interventions were designed as an emergency response to soaring food prices. Thus, it was not possible to conduct an analysis against a baseline-expected EIRR.

The aggregation of benefits for other projects was based on the additional agriculture output produced as a result of FAO-EUFF activities, and converted at the relevant international price (using FAOSTAT database) into values, to ensure comparable values for all countries.

The analysis is limited to a review of the available evidence, as no systematic data was collected to assess FAO-EUFF projects' overall economic and financial benefits during implementation. While the analyses of the overall impact of the FAO-EUFF interventions are not equivalent to a standard economic analysis, the review provides a snapshot of the types of impact of improved agricultural technology in project areas.

Capacity building activities supported by FAO-EUFF projects were key for success. As an example, to achieve a yield increase through improved seed varieties, the provision of seed alone was not sufficient to generate an increase in yields. The farmer field school (FFS) process was an essential contribution. However, it is extremely complex to attribute the economic impact of FFS, so no attempt was made. Instead the value was considered as embedded in the physical results obtained by the FAO-EUFF projects. It was assumed that further (difficult) elaborations to estimate the economic impact of capacity building does not add value to the scope of this analysis.

Wherever available, the analysis used real field data (e.g. quantities produced and price of production) from the FAO-EUFF projects. When not available, FAOSTAT data was used and adjusted, as needed.

3 COUNTRY PROJECT CASE STUDIES

3.1 Philippines case study

The project development objective (PDO) was to enhance food security of rainfed farming communities to buffer the effects of volatile food prices in the Philippines. The specific objective was to increase the productivity and production of rice (and other crops) by rainfed farmers through the promotion of small-scale irrigation systems (SSIS) and other production technologies.

The FAO-EUFF project focused on supporting a Government-led initiative, the Rice Self-Sufficiency Plan for 2009-2010, to boost rice productivity in both irrigated and rainfed areas throughout the country, with a view of becoming self-sufficient in rice production by 2013. The project used the FFS approach to provide technical support services, farmer-to-farmer knowledge transfer, demonstration and learning by doing.

The project focused on an integrated intervention package that included: (i) investment in SSIS, using a financing and subsidy package attractive to low-income beneficiaries; (ii) an effective FFS extension methodology to build farmer capacity; (iii) location-specific agricultural technology; and (iv) agricultural input distribution. Some of the project benefits could not be quantified in financial and economic terms, given the short duration of the project, as well as the intangible nature of some of these benefits. These included: (i) increased farmer capacity to share resources, and allocate and save water; (ii) institutional strengthening in the form of a web-based management information system, with 1 600 geo-referenced SSIS sites (including 400 additional sites not originally targeted in the project); and (iii) the knowledge obtained through training facilitators and farmers.

Overall, the project supported a total of over 3 800 farming households, 108 percent of the target. Participants were organized into 144 FFS distributed throughout 35 municipalities in five provinces. A total of 1 182 SSIS were built by the project, including the construction of water sources, such as shallow tube wells and small farm reservoirs. The average land holding was 1 ha per beneficiary. Therefore, a total of 3 900 additional ha were brought under irrigation as a result of the project.

This analysis was limited to a review of the available evidence. The financial analysis shows the potential of yield improvements as a result of the integrated intervention packages at the farmer level, more climate-smart agricultural practices, using water harvesting techniques, and irrigation. The economic analysis summarizes the overall impact of the improved technologies on production.

Beneficiaries. The project had two main categories of direct beneficiaries: (i) low-income rice producers and (ii) field extension staff. Indirect beneficiaries were the key agencies of the Department of Agriculture and provincial Governments.

3.1.1 Financial analysis

The financial analysis is based on typical crop budgets of the supported crops for wet and dry season irrigated farming (see **Annex 1** for a detailed crop budget). Targeted commodities were rice, maize and vegetable crops. Details on the types of vegetables produced were not available.

The project did not collect comprehensive quantitative data to enable conventional calculations of financial economic rates of return and to reasonably attribute overall changes to the project, as the project was not designed for this and its time frame was limited to two years. Nevertheless, the efficiency/impact could be evaluated on the basis of early indications of improved efficiency and use of SSIS. The qualitative/quantitative analysis was based on the project's final report and other data provided directly by the project team.

Overall, the crops targeted by the project had a good performance, with wet season rice production increasing by 33 percent. In the dry season, the production of rice and maize increased by 32 percent and 63 percent, respectively. This was accompanied by a substantial diversification of vegetable crops, with an increased production of 174 percent. These gains for project farmers were achieved against a background of an overall decline in rice production in the five project provinces, from 495 000 tonnes in the 2009 baseline to 474 000 tonnes in 2010, during the first project year. It is expected that the overall production might increase, as farmers achieve full use of SSIS. The subsidy level of the SSIS package (seed, fertilizer and infrastructure development) was not captured by the analysis. It would have been interesting for the project to test the sustainability of the models at the financial level with or without a reduced subsidy level.

The incremental benefits through the use of SSIS amounted to USD 2.2 million overall (as seen in **Table 1**). There was no increment of area cultivated by farmers; however, two full agriculture seasons are now possible owing to SSIS equipment.

Table 1: Net incremental benefits through the use of SSIS

Incremental benefits through use of SSIS					
Crop	**Ha**	**Additional Yield per Ha (T)**	**Unit price USD T**	**Net Value USD**	**Economic value**
Rice wet season	3,899	0.5	310	545,361	523,546
Rice dry season	2,339	0.5	310	327,217	314,128
Maize dry season	1,170	1.2	230	330,505	317,284
Total				**1,203,082**	**1,154,959**

Source: project's final report and http://www.da.gov.ph/ for prices.

Overall, the estimated increase in revenue per beneficiary for rice production amounted to USD 197.67 (PHP 8 427) per year (rice crop budget). Furthermore, the increase in production has convinced provincial Governments to commit their own resources to fund SSIS investments for an additional 3 000 farmers in an expansion of the existing programme within the current project provinces. The total commitment in mid-August 2011 amounted to USD 812 000, which speaks for the perceived outcomes generated by project interventions.

3.1.2 Economic analysis

The project benefits stream was based on assumptions and field data. Benefits have been calculated from sales of rice and maize, using prices provided by the project and other data. A summary of the main assumptions used in the analysis is shown in **Table 2**.

Table 2: Assumptions for economic analysis

Assumptions	
Total Beneficiary Households	3,899
Total Beneficiary Population	18,418
# of small-scale irrigation systems (SSIS)	1,182
Average farm area per household (ha)	1.0
% of area fully used under SSIS	100%
Cropping pattern wet season (ha)	1.0
Rice	1.0
Other crops (vegetables)	0.0
Cropping pattern dry season (ha)	1.0
Rice	0.6
White maize	0.3
Other crops (vegetables) (ha)	0.1
Average increase in rice yield wet season	32%
Average increase in rice yield dry season	32%
Average increase in corn yield	63%
Average increase in vegetable	174%
% IPP Conversion	120%

Source: project's final report and World Bank reports.

An import parity price discount was applied to rice at a rate of 120 percent of the farmer gate price, based on the figures provided by the latest irrigation rice project funded in the country by the World Bank[5].

The project's major long-term economic benefits stem from: increased income or increased household food security from both dry and wet season cropping, with the appropriate inputs and technologies resulting in a 32 percent increase in production for farmers growing rice,

[5] http://www.worldbank.org/projects/P088926/participatory-irrigation-development-project?lang=en.

63 percent increase for farmers growing maize (project documentation) and more than a double in production of farmers growing vegetables.

Based on the data available at this stage and the hypothesis illustrated above, an EIRR was computed for an assumed project life of 15 years. The total project cost has been estimated at USD 6 million over a period of two years, plus additional maintenance costs for irrigation estimated at 5 percent of the total project cost[6]. Project benefits have been estimated at USD 16.1 million over a period of 15 years, which is the expected productive life of SSIS infrastructure and technology (see **Annex 1** for detailed calculations).

The results of the analysis indicate an EIRR of 15.1 percent. The NVP amounts to USD 7 million at a 12 percent discount rate (see **Annex 1** for a complete dataset).

The economic results of the EUFF intervention is impressive, owing to the limited time span of capital investments, investment in human resource development and targeting of project investments in five districts of the Central Luzon Province. Most of the benefits have been derived from basic assumptions, and it is not possible to verify them with field data. However, with the limited data, the sensitivity analysis is robust, even when benefits are delayed by two years. The minimum EIRR possible with a 50 percent increase in costs is 11.2 percent (see **Table 3**).

Table 3: Sensitivity analysis

Sensitivity Analysis	Base case scenario	Cost increments			Benefits increments		Benefits decrease			Benefits delay	
		+10%	+20%	+50%	10%	+20%	-10%	-20%	- 30%	1 year	2 year
EIRR	15.1%	18.4%	16.2%	11.2%	23.8%	26.6%	18.2%	15.2%	12.2%	16.4%	13.2%
NPV (USD millions)	669	2,389	1,903	445	3,649	4,422	2,102	1,328	555	1,921	1,053

3.2 Burkina Faso case study

The PDO was to give access to base food crops in order to improve food security to people affected by the soar of food prices in 2008-2009. Specifically, the FAO-EUFF project aimed at improving staple food production through access to improved seeds by farmers. The project focused on supporting the seed value chain through farmer seed multipliers, farmer organizations and technical field staff capacity building. Great attention was given to improvements in infrastructure, e.g. laboratories for seed analysis, treatment and conservation. A range of benefits has been generated by the project, including improved seed availability in the country, increased agricultural production and productivity, improved water management and capacity strengthening of the involved farmers and institutions.

Enhancing the seed value chain, promoting capacity building of seed producers and field technicians, supporting the *Institut national de l'environnement et de la recherche agricole* (INERA) and developing group business provided a strong foundation for the investment. A growing cadre of specialists, including members of beneficiary communities with appropriate skills in the seed sector, has enabled the participating communities to use and benefit from project activities. All these benefits are valuable, as they are intangible assets that are crucial for medium- to long-term economic productivity of individuals and enterprises. They have helped to empower communities to build social capital, improve local governance and generally work more effectively to address farmers' priority needs.

[6] Standard rate for similar development projects financed by World Bank.

However, quantification of these benefits is elusive, and therefore, there was no attempt to add all these benefits to the overall economic rate of return. Instead, the analysis concentrates on the available data on infrastructure, seed multiplication and distribution of agriculture kits (seed and fertilizer). These interventions are the basis for the qualitative and quantitative analysis of the project.

The project supported the production of 18 741 tonnes of improved seed for rice, maize, sorghum, millet and cowpea. To achieve these results, INERA was supported to produce and distribute some 780 tonnes of foundation seeds. Four laboratories were established to analyse and certify the multiplied seeds. The project also rehabilitated 1 787 ha of irrigation schemes, mainly for rice production. Other infrastructure interventions included the processing and storage facilities for seeds. No long-term impact was foreseen because of the typology of irrigation systems developed, which will need major work in the next two to five years.

The financial analysis shows the potential of yield improvements due to increased seed and fertilizer adoption at the farm level and the potential of seed multiplication as a financial activity. The economic analysis shows the overall impact of the improved technologies on production and sensitivity to price change.

Beneficiaries. The project had four main categories of direct beneficiaries: (i) seed multipliers; (ii) agriculture kits recipients; (iii) trained farmers and field staff and (iv) productive and post-harvest infrastructure. The indirect beneficiaries were those farmers who are now able to access improved seed on the market as a result of the interventions. According to the project final report, 247 657 vulnerable households substantially improved their food security. The agriculture kits, totaling at 3 651 tonnes of certified seeds and 2 268 tonnes of fertilizer, were made available to 189 186 vulnerable households in 23 provinces.

3.2.1 Financial analysis

The financial analysis is based on typical crop budgets for seed multiplication targeted commodities.

Similar to other projects, the project did not collect comprehensive quantitative data to enable conventional calculations of financial rates of return and to reasonably attribute overall changes to the project. Nevertheless, efficiency/impact could be evaluated on the basis of early indications of improved efficiency and use of improved seed and seed multiplication as an economic activity. The qualitative/quantitative analysis was based on data provided by the project, including a recent report on seed multiplication[7].

Production performance for the seed multiplication interventions was significant for all the crops considered. The production of non-certified seeds (rejected by the laboratories) ranged from 21 to 38 percent, according to the report. Details on production levels are shown in **Table 4**.

[7] *Etude des comptes d'exploitation des producteurs semenciers au Burkina Faso; FAO Août 2011*.

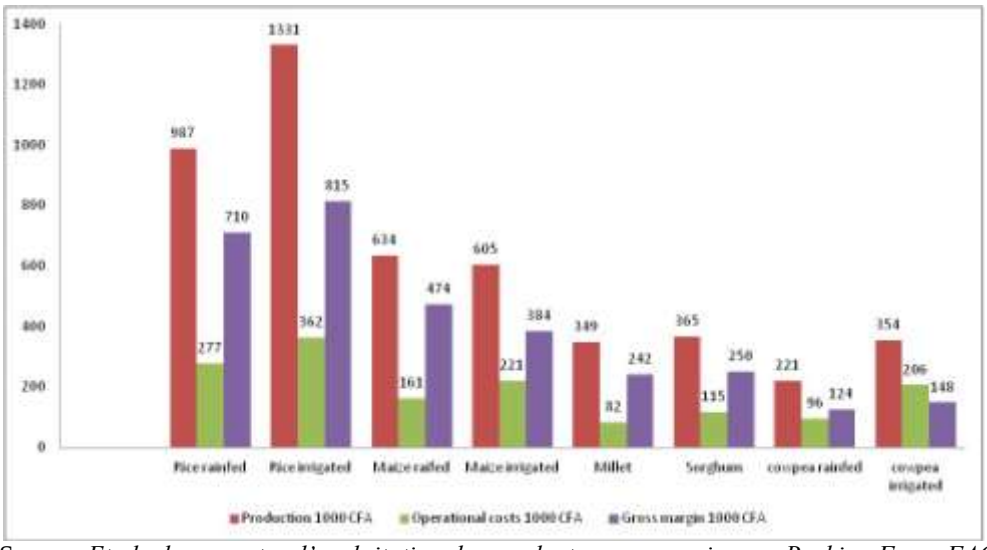
Table 4: Seed production and yields

Crop	Production	ha	Yield t/ha
Rice	10,623	3,056	3.5
Maize	5,112	3,412	1.5
Sorghum	1,486	1,486	1.0
Millet	595	345	1.7
Cowpea	2,350	1,175	2.0

Source: author compilation from project final report.

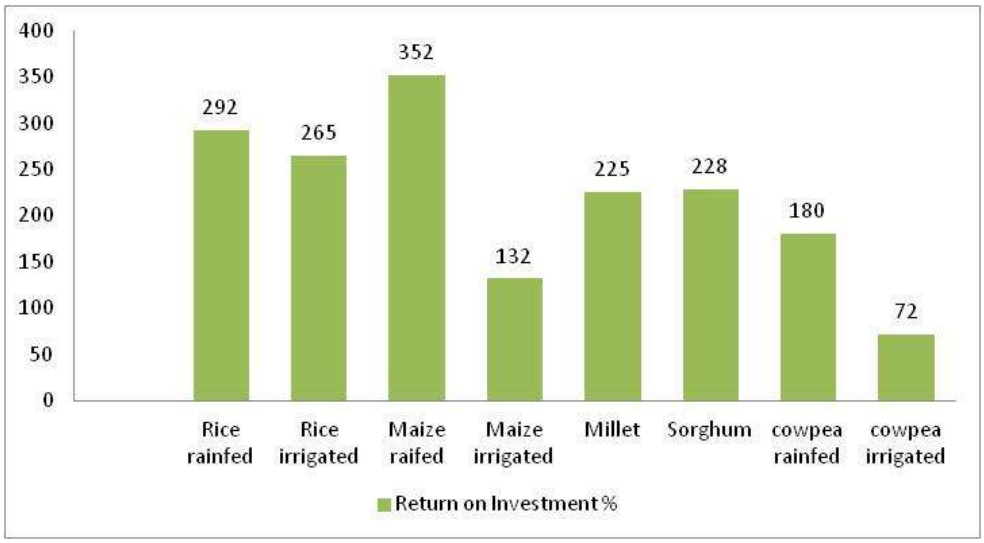
Rice recorded the highest performance in terms of gross margin, but it had a modest return on investment (ROI) per ha. Good performance was also calculated for maize and sorghum. The financial performances are summarized in **Figure 1**, showing that maize and rice were the most profitable crops for seed multiplication.

Figure 1: Financial performance of seed multiplication activities per ha



Source: *Etude des comptes d'exploitation des producteurs semenciers au Burkina Faso; FAO Août 2011.*

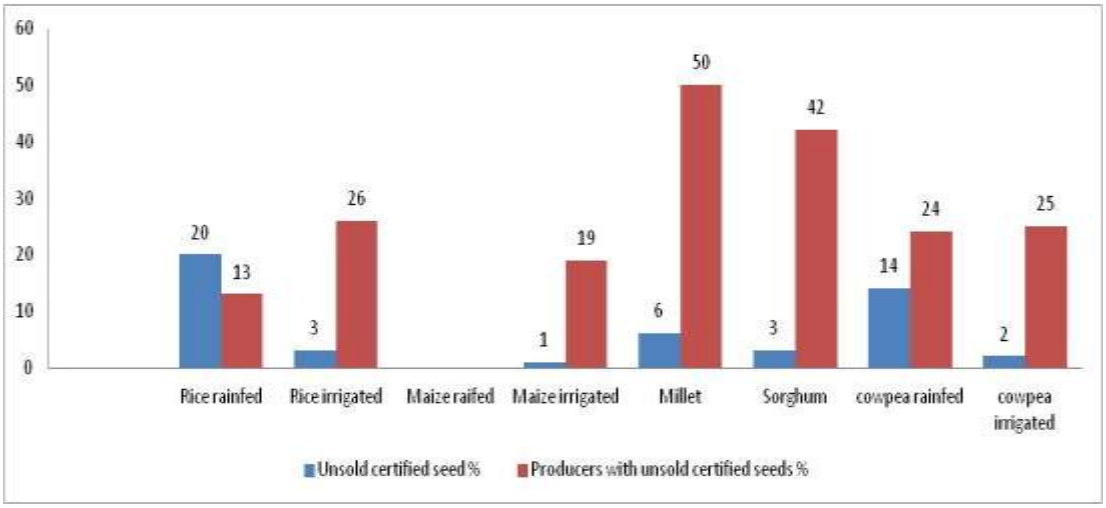
Figure 2: ROI for seed multiplication activities per ha



Source: *Etude des comptes d'exploitation des producteurs semenciers au Burkina Faso; FAO - Août 2011.*

Commercialization was another indicator of the performance and robustness of the investment, as seed multiplication was carried out mainly for the market. **Figure 3** shows the rate of unsold certified seed produced by farmers for the major crops. These rates raise concern over the quality of the certified seeds, the market and demand by farmers.

Figure 3: Rate of unsold improved seed produced and rate of producers with unsold certified seed



Source: *Etude des comptes d'exploitation des producteurs semenciers au Burkina Faso; FAO Août 2011*.

Satisfactory commercialization performance is an interesting indicator, as it implies a high market demand and the appreciation by farmers for the targeted crops. The levels of de-classified seed raise the issue of capacity building and/or quality of base seed provided to multipliers.

Overall the crops targeted by the projects had a good performance, but the high level of subsidy (seed and fertilizer) was not captured by the analysis. It would have been interesting for the project to test the sustainability of the models at a financial level with or without a reduced subsidy level over time[8].

The impact on beneficiaries has been calculated only for agriculture kit recipients. For example, the improvement in yield for rice owing to seed and fertilizer exceeded 100 percent, raising the yield for rice from 1 200 to 2 600 tonnes per ha. This has had a dramatic impact on the most vulnerable households who received the agriculture kits distributed by the intervention. A summary of the yield levels achieved through the distribution of agriculture kits against the baseline is outlined in **Table 5**[9].

[8] The simulation was not possible in this analysis, as no detailed crop budgets were available.
[9] Similar yield increase has been used for other economic and financial analysis for project design in the subregion.

Table 5: Yield levels achieved for agriculture kit recipients

Crop	Seed distributed (T)	Ha	Production (T)	Yield t/ha	Baseline Yield	Additional yield
Rice	1,154	11,110	29,107	2.6	1.2	1.4
Maize	1,447	46,574	83,538	1.8	0.9	0.9
Sorghum	679	33,683	28,417	0.8	0.6	0.2
Millet	137	14,511	9,205	0.6	0.5	0.1
Cowpea	234	6,368	4,207	0.7	0.6	0.1

Source: author compilation from project documents.

Overall, the estimated increase in revenue per beneficiary for the kit distribution activity was USD 38 per year (project document estimation for year 2010). The additional income raised the beneficiaries above the national poverty line for that year. However, it has not been possible to estimate the sustainability of the intervention, nor to simulate with reduced subsidy for improved seed and fertilizer, as key data was not available. It is possible to expect that a proportion of beneficiaries (30 to 50 percent), if they can afford the investment, will continue to use improved seeds and/or fertilizers, as they have observed their impact in terms of yield/income. The overall improved seed chain was also strengthened by project interventions.

3.2.2 Economic analysis

The project benefits stream was based on assumptions and field data. The benefits were calculated from the: (i) sales of improved certified seeds other than those purchased directly by the project, using the price given by the project and other data; (ii) impact of the agriculture kit (improved seeds and fertilizers) on staple food production; and (iii) additional production from the improved seeds sold directly by the farmers. The effects of the produced seeds have been projected for three years, assuming that after that period the seeds have to be replaced. It is assumed that the farmers using improved seeds are the same ones benefiting from irrigation rehabilitation (1 789 ha). To avoid double counting, no specific benefits from irrigation were calculated; however, these benefits were included in the yield increase.

An import parity price discount was applied at a rate of 70 percent of the farmer gate price to rice and maize because these crops are normally imported [10]. The production costs included in the analysis are 20 percent when all inputs were provided by the project (e.g. seed multiplication and agriculture kits) and 20 percent when all production costs were supported by farmers[11]. The hypothesis for the economic analysis is outlined in **Table 6**.

Table 6: **Hypothesis for economic analysis**

Hypothesis	%
% of certified seed production sold directly by farmers(excluding the % bought by the project)	60%
% additional production cost (labor, tools…) for seed multiplication activity	20%
% additional production costs (inputs, labor, tools..) for agriculture production applying improve seed	20%
% IPP conversion	70%

[10] Based on recent research by FAO and World Food Programme, among others: www.ochaonline.un.org/OchaLinkClick.aspx?link=ocha&docId=1094514.

[11] Similar cost increase has been used for other economic and financial analysis for project design in the subregion.

The impact of improved seeds alone has been isolated to calculate its benefit on production and valuated at farmer gate price. **Table 7** summarizes the expected increase in production as a result of improved seed adoption (excluding fertilizer application).

Table 7: Yield increase due to improved seed

Increase in yield due to seeds	
Rice	20%
Maize	30%
Sorghum	20%
Millet	30%
Cowpea	30%

Positive externalities associated with private sector involvement in seed multiplication and capacity building are expected. However, no attempt could be made to quantify these benefits. The project's major long-term economic benefits stem from: strengthened capacity in improved seed production and certification for targeted crops; seed value chain enhancement; and private sector/farmer organizations' involvement in seed multiplication and distribution.

Based on the data available and the hypothesis illustrated above, an EIRR was computed for an assumed project life of six years (i.e. the two years of implementation and four additional years for production benefits generated by the carry-over of improved seeds by farmers).

It has been estimated that an additional 35 500 tonnes of grain was produced with the improved seed produced and sold directly by farmers, assuming that no fertilizer was used (see **Table 4** for the background hypothesis). The estimated economic value is USD 9.9 million. Close to 68 000 tonnes of grains have been produced through the agriculture kits (fertilizers and improved seeds), with an estimated economic value of USD 12.4 million. The value of seeds sold directly by the farmers has been estimated at USD 5.3 million, using prices given by the project.

The total project cost has been estimated at USD 24.5 million over a period of two years. No additional costs were included in the analysis after the project closure. The project benefits have been estimated at USD 30.9 million over a period of six years. No attempt was made to cover the analysis over a longer period of time, as it was too early to evaluate the sustainability of the project, specifically related to research, dissemination and multiplication of seed in the economy. Furthermore, no attempt was made to test for sustainability of the intervention if the subsidies/packages in terms of seeds, inputs and markets were to be removed.

The results of the analysis indicate an EIRR of 18.8 percent. The NPV of the investment amounts to USD 1.6 million at a 12 percent discount rate. See **Annex 1** for more details.

The economic results of the EUFF intervention are impressive. This is due to the size and target of the project activities (seeds multiplication and distribution, as well as fertilizer distribution). However, the project was not designed to monitor the financial and economic impact most benefits derive from assumptions (i.e. they are not verified with field data). This is true for the improved seed that were used in farmers' production fields. For example, if we assume that only 50 percent (rather that 60 percent) of the certified seed are sold and used for production, the EIRR drops to 9.2 percent.

3.3 Cambodia case study

The PDO of the Food Security Support Programme (FSSP) was to improve the food security and nutrition awareness of vulnerable rural populations, in particular those affected by volatile food prices in ten provinces of Cambodia. Improvements were to be achieved through increases in productivity, strengthened management practices, enhanced access to agricultural inputs and services, diversification and improved fishing feeding practices. The EUFF funded USD 15 million in FAO project activities in support of the national FSSP.

The project focused on various interventions that included: (i) distribution of agricultural inputs (rice seeds, vegetable seeds, fertilizers for rice and vegetables and hand tools); (ii) post-harvest equipment distribution (tarpaulins and rice seed storage bins); (iii) distribution of aquaculture equipment (fingerlings, lime and fertilizers); (iv) rehabilitation of 11 hatcheries and establishment of five new hatcheries; (vi) training and development of 82 community fish refuges and management committees; (vii) nutrition promotion and awareness and distribution of fuel-efficient stoves; (viii) rehabilitation or establishment of irrigation schemes (irrigation channels and wells) and water harvesting structures for small-scale irrigation; and (ix) training of trainers, field demonstrations and farmer training to support all interventions.

Some of the benefits generated by the project cannot be quantified in financial and economic terms given the short duration of the project and the lack of data (for example, regarding the fingerlings), as well as the intangible nature of some of the benefits, such as increased farmer knowledge in agricultural techniques and nutrition.

Overall, the project assisted approximately 53 000 vulnerable farm families in ten provinces. Post-harvest losses decreased by 25 percent. Survey results show that beneficiary families increased their food stocks on average by 90 percent, from 440 to 840 kg per household. The level of rice self-sufficiency for over nine months, which was achieved by beneficiary households, increased from 32 to 48 percent. These results substantially exceeded the project target of 36 percent.

The average area under vegetable cultivation per household for approximately 1 300 benefiting households more than doubled from 700 to 1750 m^2, and the diversity of vegetables more than doubled, increasing from 2.5 to 5.7 varieties. However, the frequency of consumption of vegetables increased only marginally from 5.8 days to 6 days per week, as the vegetables were mostly grown for the market.

Nine thousand families received improved cooking stoves and improvements in food handling and hygiene reached 45 and 74 percent of beneficiaries, respectively.

Some 47.5 km of irrigation channels where rehabilitated, resulting in 8 500 ha under irrigation. A total of 36 ponds and dams were rehabilitated and built, and 47.5 km of road rehabilitated. As a result of the irrigation schemes, ponds and wells provided or rehabilitated by the project allowed some 12 000 additional households to benefit from improved access to irrigation water and improved water supplies for basic human needs and livestock.

Beneficiaries. The project had two main categories of direct beneficiaries: (i) low-income rice producers and (ii) field extension staff.

As with other projects, the analysis is limited to a review of the available evidence, as no data was collected to assess the project's overall economic and financial benefits. The financial analysis shows the potential of rice yield improvements owing to improved inputs and

enhanced agricultural extension. The economic analysis summarizes the overall impact of the improved technologies on production.

3.3.1 Financial analysis

The financial analysis is based on the overall production of rice in the wet and dry seasons (irrigated). The project did not collect comprehensive quantitative data to enable conventional calculations of financial economic rates of return and to reasonably attribute overall changes to the project. Still, the efficiency/impact could be evaluated on the basis of early indications of improved yields. The qualitative/quantitative analysis was based on data provided by the project.

Overall, the crops targeted by the project performed well. A comparison of yields with and without project inputs in the same growing season show an increase of 42 percent in the wet season (1 200 kg per ha without project inputs to 1 700 kg per ha with project inputs) and 94 percent in the dry season (1 200 kg per ha without project inputs to 2 330 kg per ha with project inputs). It was assumed that the dry season rice was already under irrigation.

The incremental benefits amount to USD 3.9 million. This can be seen in **Table 8**.

Table 8: Net incremental benefits

Incremental benefits				
	MT	**Unit price USD T**	**Net Value USD**	**Economic value**
Rice	18,200	215	3,916,640	3,916,640
			3,916,640	**3,916,640**

Given the lack of more substantive information for the financial analysis, it was not possible to segregate increases in income per farming household by type of activity, such as rice and vegetable production and fish farming.

3.3.2 Economic analysis

The project benefit stream is based on assumptions and field data. Benefits were calculated assuming that 20 percent of the overall rice production was sold to the market and using available price given by the project and other data. **Table 9** summaries the main assumptions used within the analysis.

Table 9: Assumptions for economic analysis

Assumptions		
	Without project	With Project
Total Beneficiary Households	53,000	53,000
Agriculture		
Beneficiary households wth irrigation	9,000	11,500
Hectares under irrigation (ha)		8,500
Adoption rate for improved ag. Practices		29.80%
Rice production (MT)	58,000	76,200
% IPP Conversion		100%

An import parity price discount was applied to rice, at a rate of 100 percent of the farmer gate price, as no specific data was available at the time of the analysis. The project's major long-term economic benefits stem from: increased income or increased food security from both dry and wet season cropping with the appropriate inputs and technologies, resulting in the level of rice self-sufficiency being greater than nine months (with an increase from 32 to 48 percent for beneficiary households). Given the promising reduction in post-harvest losses (25 percent) by the farming households who received improved storage and handling equipment and techniques, it is possible to argue that if these inputs had been distributed to all project beneficiaries, the overall benefits would have increased.

The project supported a number of pilot innovations that showed promising results. Given an encouraging rate of adoption at 30 percent for the direct beneficiaries in agricultural improved practices, it is reasonable to assume that some of the residual benefits will accrue through farmer knowledge transfer, as the project invested in capacity building for Government personnel and benefiting households.

Based on the data available at this stage and the hypothesis illustrated above, EIRR was computed for an assumed project life of fifteen years. The total project cost has been estimated at USD 15.4 million over a period of two years, plus additional maintenance costs for irrigation estimated at 5 percent of the total project cost[12]. Project benefits have been estimated at USD 45.9 million over a period of fifteen years.

The results of the analysis give an EIRR of 16.1 percent. The NPV amounts to USD 2.4 million at a 12 percent discount rate. The economic results of the EUFF intervention are impressive, given that the EIRR is based on only 20 percent of production being sold to the market. With the limited data, the sensitivity analysis is robust, even when benefits are delayed by two years. The minimum EIRR possible (with a 50 percent increase in costs) is 11.9 percent (see **Table 10** and **Annex 1** for complete data analysis).

Table 10: Sensitivity analysis

Sensitivity Analysis	Base case scenario	Cost increments			Benefits increments		Benefits decrease			Benefits delay	
		+10%	+20%	+50%	10%	+20%	-10%	-20%	- 30%	1 year	2 year
EIRR	**16.1%**	**19.3%**	**17.0%**	**11.9%**	**24.9%**	**27.7%**	**19.0%**	**16.0%**	**12.9%**	**17.1%**	**13.8%**
NPV (USD millions)	2,453	7,264	5,927	1,918	10,797	12,993	6,404	4,207	2,011	5,890	3,426

It is assumed that the farmers who benefited from these initiatives will be prepared to continue purchasing inputs to replicate the results achieved by the project intervention. It would be worthwhile to follow the long-term progress of the project with appropriate monitoring systems.

4 AGGREGATION OF BENEFITS FROM THE OTHER COUNTRY PROJECTS

This section summarizes the benefits that arise from the other FAO-EUFF projects interventions, focusing on crop production. The aim is to give a snapshot of physical output, total number of beneficiaries and value of the additional production[13]. The analysis is based

[12] Standard rate for similar development projects financed by World Bank.

[13] The value of additional production for the major traded crop was calculated using international prices (FAOSTAT 2009/2010).

on 26 projects, totaling an investment of approximately USD 263 million. This represents some 85 percent of the FAO-EUFF interventions. It was possible to calculate an overall EIRR or undertake a cost benefit analysis, as the data are not homogeneous or consistent. Out of the 26 projects, 19 have sufficient quantitative data to estimate the additional benefits of the FAO-EUFF intervention. Seven projects did not have sufficient data on final agriculture output. These were not included in the aggregation.

The FAO-EUFF benefits primarily resulted from: (a) adoption of new technology packages (improved seeds and fertilizers) for increased production and productivity; (b) reduced post-harvest losses; (c) enhanced produce processing and/or packaging; (d) improved access to services, markets and information; (e) reduced transaction costs; (f) improved product quality and producer (farm-gate) prices; and (g) improved economies of scale.

Furthermore, increased output, income and employment in the project areas will result in increased demand for goods and services. This is expected to generate additional income and employment effects and increase government tax revenues. As the FAO-EUFF interventions supported production of major food crops, the increased output from the targeted areas will increase national production, and thereby contribute to growth in overall gross domestic product and national food security. In addition, possible reductions in imports would result in foreign exchange savings, especially in the case of rice and maize. Furthermore, it is expected that consumers will benefit from reduced consumer prices and improved availability of better quality locally produced food commodities, an important contribution of the EUFF in response to high food prices.

Major institutional benefits expected from the FAO-EUFF projects are: (a) producer and marketing groups are effectively functioning and linked to markets; (b) local communities are managing physical infrastructure investments in a sustainable way; (c) public and private sector operators are providing quality services that are demanded by smallholder producers and rural entrepreneurs; and (d) a strengthened public institution responsible for supervising and managing the new or rehabilitated irrigation schemes.

The social benefits expected from the FAO-EUFF projects are a result of its focus on rural poverty reduction. The projects provided additional sources of income for poor rural households, and served to diversify rural incomes and prevent distress outmigration, thereby contributing to reduced vulnerability. The seed multiplication intervention supported seed multiplication associations and linked them to the market. The irrigation technology introduced by the project and the associated technical competencies (e.g. for water management and crop husbandry) will help further reduce weather-related vulnerability of the targeted population.

Environmental benefits are expected from FAO-EUFF project support to sustainable land and water management in irrigation schemes, including: (a) mitigated effects of droughts; (b) improved sediment retention and flood control; (c) improved access to and control of water; and (d) carbon sequestration.

The FAO-EUFF intervention often supported livestock and fisheries sectors, but the available data was insufficient for quantitative analysis to estimate additional production or its value.

Particular attention was given to rural infrastructure. For the purpose of the analysis only, the irrigation schemes (new and rehabilitation) were taken into account. The calculation of benefits from roads, especially rural roads, requires a data set that was not available.

Overall, more than 80 000 ha of land is now under irrigation (see **Table 11** for country details) as a result of the FAO-EUFF project interventions. In most cases, the land is now productive for two seasons in a calendar year, mostly under rice, vegetable and in some instances maize. In particular, the production and economic benefits from this intervention will last for an extended period after project completion (at least 10-15 years). That is much more than the benefits from the improved seed interventions.

The total number of FAO-EUFF projects household beneficiaries is approximately 2 350 000. This number has to be considered with caution owing to varying measuring criteria in different projects (e.g. it is not always clear if the beneficiary numbers are expressed in terms of individuals or households). In this analysis, the household has been considered as an individual beneficiary (although the overall household benefits from the intervention. Thus, the overall number of direct beneficiaries should be much greater). The average investment cost per beneficiary has been estimated at USD 112 for the two years of implementation of FAO-EUFF projects.

Productivity increases have been strong in each FAO-EUFF project, ranging from 20 to 100 percent, as the interventions provided a full package of training and improved seeds. The sustainability of these interventions beyond the seed carry-over period has not been estimated. The carry-over of improved seed will assure increased production for at least three to four years after project implementation. Thus, the real benefits to the countries' economies are much greater that the estimations in the analysis.

The data on production was gathered from the FAO-EUFF projects final reports. Unfortunately, seven projects out of 29 had no sufficient data to quantify benefits; thus, these projects were not included in the final analysis (see **Table 11** for more details). However, in one case (Togo) the value of the production was calculated (though not the quantity), and it was included in the final value.

The crops benefiting from FAO-EUFF project interventions are mainly: rice, maize, wheat, sorghum, cowpea and vegetables. The total additional agricultural production in tonnes for the main crops is as follows: rice 207 952; maize 253 726; and wheat 486 689. These figures are conservative, as they exclude the projects with no data and the expected increased production level due to the improved seed carry-over period (see **Table 11**). The value of this production using FAOSTAT international prices[14] (year 2009) exceeds the investment made through the FAO-EUFF interventions.

[14] GIEWS-FAO data: http://www.fao.org/giews/english/ewi/cerealprice/2.htm.

Table 11: Main project activities and physical output per country

Country	Main intervention	Beneficiaries	Project costs (USD)		Total add production for project years (T)		
				Irrigation (ha)	Rice	Maize	Wheat
Afghanistan	Seed production	5,820	18,401,155				189,944
Bangladesh	Seed production,livestock,fisheries	85,059	9,310,559	960	3,200	350	
Burundi	Agric. production	7,557	7,449,343	3,500	8,850		
CAR	Seed multiplication, agric. production	121,500	13,425,746		1,100	1,100	25209(vegetables)
DRC	Seed multiplication and distribution	180,000	13,396,421		2,321	7,970	
Eritrea	Seed multiplication, livestock	108,410	4,629,953	107			53
Guatemala	Agric. production	22,116	6,189,405	38	49,527		
Guinea Bissau	Agric. production	120,000	4,027,990	1,000	22,784		
Haiti	Agric. production, fisheries	109,641	13,353,693	60	Data unavailable		
Honduras	Agric. production, livestock	27,750	7,772,832	48	Data unavailable		
Jamaica	Seed multiplication, agric. production,livestock	17,825	7,995,850	270	Data unavailable		
Kenya	Livestock, fodder production	111,500	5,434,647		Data unavailable		
Lesotho	Agric. production	41,385	5,441,100			31,323	
Liberia	Agric. production, seed multiplication	26,100	6,062,050	700	13,500		
Mozambique	Seed multiplication, agric production	42,077	10,086,011		40,250	80,455	
Nepal	Agric. production,livestock	106,760	11,113,680		7,027	19,154	6,603
Nicaragua	Agric. production	9,429	4,075,423		Data Unavailable		
Niger	Agric. production	167,935	4,093,166	77	21500(millet); 20000(cowpea)		
Niger 2	Seed multiplication, agric. production	14,917	3,733,320	108	Data Unavailable		
Pakistan	Agric. production	242,100	34,286,132	8,950	16,756	27,043	290,089
Sierra Leone	Agric production,livestock	16,200	14,245,934		Data unavailable		
Somalia	Agric. production	176,133	13,746,492	64,655		85,200	6900(Sorghum);70500(sesame)
Sri Lanka	Agric. production, livestock, fishery	127,000	7,065,176	2,990	51,487	1,131	
Togo	Agric. production, seed multiplication	170,000	3,443,292		Data unavailable		
Zambia	Agric. production	119,280	10,296,231		Data unavailable		
Zimbabwe	Agric. production	184,900	24,296,651		Data unavailable		
Total		**2,361,394**	**263,372,252**	**83,462**	**216,802**	**253,726**	**486,689**
Average investment cost per beneficiary		**112**					

5 CONCLUSIONS

The EUFF was launched to address the effects of soaring food prices in the most affected countries. The aim was to support the transition period from emergency aid to longer-term development, focusing on programmes that would have both a quick and lasting impact on food security. The country case studies and the overall benefit aggregation of FAO-EUFF interventions show a significant increase in productivity and physical agriculture outputs, benefiting highly vulnerable populations.

The investment cost per beneficiaries of FAO-EUFF projects has been estimated at USD 112 over two years, while the return per beneficiary exceeds (in most cases) the investment costs.

The three country case studies show significant EIRRs and positive NPVs, which provide a sound economic and financial justification for the FAO-EUFF interventions. The economic results show good robustness to the sensitivity analysis, considering the change in prices, delay in income generation and increased costs. This is particularly true in the case of the Philippines and Cambodia, but less in the case of Burkina Faso, where sensitivity to changes in the price of seeds appears to be significant.

The increase in farmers' income was substantial in most case studies. For the Philippines, it is close to USD 200 per farmer per year. The increase in production has convinced the provincial Governments to commit its own resources to fund investments in SSIS as an expansion of the existing programme to an additional 3 000 farmers.

The case study analysis shows that benefits from irrigation SSIS interventions last beyond the project life with a positive impact, lasting about 15 to 20 years when proper maintenance is ensured. The overall 83 000 ha of irrigated land rehabilitated under the FAO-EUFF projects will generate a significant impact on food security, water management and environment in the intervention areas. Conversely, agriculture kit distributions could have only a short-term impact (one season or year) on farmers' production and income. In the case of Burkina Faso, the stream of additional production and income significantly increased in the first two to three years, but then will drop dramatically – unless farmers buy improved seeds again. As a consequence, in cases where beneficiary farmers do not re-invest their additional income in improved inputs for the subsequent cropping season, the impact will be lost after a few seasons. Thus, future agriculture production would be back to pre-intervention levels, and with it, farmers' ability to cope with price volatility.

The countries benefiting from the FAO-EUFF interventions have started to build resilience to changes in prices by increasing agriculture production. This approach required significant initial investments, but could save money over time[15]. The economic results, in particular those of the case studies, show that projects (including investment in productive infrastructure) generate income streams that outlast input distribution activities alone. On the other hand, the input distribution interventions provided immediate results (and hence relief) to poor farmers and their families affected by soaring food prices.

[15] Defining Disaster Resilience, the Government of Great Britain Department for International Development approach paper.

However, due to the nature, size and scale of the projects, they cannot be expected to have a significant impact in preventing new food crises in the countries. Nevertheless, useful lessons learned could be drawn country by country and used to scale up best practices.

Despite the achievements in production increases, most of the FAO-EUFF supported countries are still currently net food importers. The growing domestic demand for targeted commodities remains unmet. Major adverse effects on retail and producer prices, as a result of the expected supply increase, were not reported.

In the medium to long term, the potential positive fiscal impact of the FAO-EUFF intervention would be substantial, mainly due to: (i) increased output, income and employment, resulting in increased tax revenues; and (ii) multiplier effects, due to increased economic activities in rural areas, resulting in increased demand for goods and services, which are expected to generate additional income and employment effects. Furthermore, substantial foreign exchange earnings and savings can be expected, resulting from an increase in exports and/or a reduction in imports.

ANNEXES

Annex 1. Economic and financial analysis background tables

Philippines case study

	PY1	PY2	PY3	PY4	PY5	PY6	PY7	PY8	PY9	PY10	PY11	PY12	PY13	PY14	PY15
Economic Benefits from land under production with SSIS		1,154,959	1,154,959	1,154,959	1,154,959	1,154,959	1,154,959	1,154,959	1,154,959	1,154,959	1,154,959	1,154,959	1,154,959	1,154,959	1,154,959
Total estimated economic benefits	0	1,154,959	1,154,959	1,154,959	1,154,959	1,154,959	1,154,959	1,154,959	1,154,959	1,154,959	1,154,959	1,154,959	1,154,959	1,154,959	1,154,959
Economic cost of the project	2,800,000	2,800,000	280,000	280,000	280,000	280,000	280,000	280,000	280,000	280,000	280,000	280,000	280,000	280,000	280,000
Benefits-Costs	- 2,800,000	-1,645,041	874,959	874,959	874,959	874,959	874,959	874,959	874,959	874,959	874,959	874,959	874,959	874,959	874,959
EIRR	15.08%														

Rice crop Budget						
Description	**Unit**	**Rainfed Rice Quantity**	**Irrigated Rice Quantity**	**Unit Costs**	**Rainfed Costs**	**Irrigated Costs**
A. Production Parameters						
1. Labor						
Land Preparation						
First Plowing	person-animal day	3	3	150	450	450
Second Plowing	person-animal day	3	4	150	450	600
First Harrowing	person-animal day	2	3	150	300	450
Second Harrowing	person-animal day	2	2	150	300	300
Fertilizer Application	person-day	2	4	150	300	600
Planting	person-day	6	6	150	900	900
Insecticide/Pesticide Application	person-day	1	2	150	150	300
Harvesting & Threshing (8% of the produce)	kgs.	113	150	10	1,128	1,500
Hauling	kgs.	1,410	1,875	1	1,410	1,875
Irrigation Fee	pesos/cropping	0	1	2,000	0	2,000
Sub-total					***5,388***	***8,976***
2. Material Inputs						
Seeds	kgs.	80	100	10	800	2,000
Fertlizers						
Complete (14 - 14 - 14)	50 kgs.	2	2	1,262	2,524	2,524
Urea (45 - 0 – 0)	50 kgs.	1	1	1,280	1,280	1,280
Pesticide	Liter	1	1	1,200	1,200	1,200
Sub-total					***5,804***	***7,004***
Total Production Costs					***11,192***	***15,980***
Gross Income						
Gross Value	kgs.	1,410	1,875	28	40,044	53,259
Net Income per hectare					**28,852**	**37,279**

Burkina Faso case study

	PY1	PY2	PY3	PY4	PY5	PY6
Economic benefits from Improved seed private sector	474,764	1,424,291	2,848,582			
Economic benefits from increase agriculture production due to improved seed	879,851	2,639,552	5,279,103	3,167,462	2,111,641	1,055,821
Economic benefits from kit distribution	1,106,036	3,318,107	6,636,214			
Total estimated economic benefits	2,460,650	7,381,949	14,763,899	3,167,462	2,111,641	1,055,821
Economic cost of the project	12,000,000	12,500,000	0	0	0	0
Benefits-Costs	- 9,539,350	- 5,118,051	14,763,899	3,167,462	2,111,641	1,055,821
EIRR	18.84%					
NPV	$1,657,389					

Benefits from seed multiplication private selling

Crop	Total seed production (T)	Seed bought by the project		Seed sold directly by the multiplicators		
		Kit	Remaing production	Certified production sold	unit price USD	Net Value
Rice	10,623	1154	9,469	5,681	825	3,749,724
Maize	5,112	1447	3,665	2,199	300	527,760
Sorghum	1,486	679	807	484	330	127,829
Millet	345	137	208	125	375	37,440
Cowpea	1,175.0	234	941	565	675	304,884
Total	**18,741**	**3,651**	**15,090**	**9,054**		**4,747,637**

Benefits from land under production with improved seed sold directly by private sector

Crop	Ha	Yield per Ha (T)	Additional Seed contributio	Total additional production	Unit price USD T	Net Value USD	Economic value
Rice	71,018	1.2	0.24	17,044	550	7,499,448	5,249,614
Maize	48,867	0.9	0.27	13,194	200	2,111,040	1,477,728
Sorghum	32,280	0.6	0.12	3,874	220	681,754	477,228
Millet	12,480	0.5	0.15	1,872	250	374,400	374,400
Cowpea	18,820	0.6	0.18	3,388	450	1,219,536	1,219,536
Total				**39,371**		**11,886,178**	**8,798,505**

Benfits from kits distribution

Crop	Production	Additional production	Price	Value	Economic Value
Rice	29107	15,775	550	6,941,000	4,858,700
Maize	83538	41,621	200	6,659,424	4,661,597
Sorghum	28417	8,207	220	1,444,467	1,011,127
Millet	9205	1,950	250	389,900	389,900
Cowpea	4207	386	450	139,032	139,032
Total		**67,939**		**15,573,823**	**11,060,356**

Cambodia case study

	PY1	PY2	PY3	PY4	PY5	PY6	PY7	PY8	PY9	PY10	PY11	PY12	PY13	PY14	PY15
Economic Benefits from land under production		3,279,648	3,279,648	3,279,648	3,279,648	3,279,648	3,279,648	3,279,648	3,279,648	3,279,648	3,279,648	3,279,648	3,279,648	3,279,648	3,279,648
Total estimated economic benefits	0	3,279,648	3,279,648	3,279,648	3,279,648	3,279,648	3,279,648	3,279,648	3,279,648	3,279,648	3,279,648	3,279,648	3,279,648	3,279,648	3,279,648
Economic cost of the project	7,700,000	7,700,000	770,000	770,000	770,000	770,000	770,000	770,000	770,000	770,000	770,000	770,000	770,000	770,000	770,000
Benefits-Costs	- 7,700,000	-4,420,352	2,509,648	2,509,648	2,509,648	2,509,648	2,509,648	2,509,648	2,509,648	2,509,648	2,509,648	2,509,648	2,509,648	2,509,648	2,509,648
EIRR	16.08%														
Note: Economic benefits from land under production assumes 20% of all production sold															

Economic Benefits from land under production				
	MT	**Unit price USD T**	**Net Value USD**	**Economic value**
Rice	76,200	215	16,398,240	16,398,240
			16,398,240	**16,398,240**

Economic Benefits from land under production rainfed with project				
	MT	**Unit price USD T**	**Net Value USD**	**Economic value**
Rice	58,000	215	12,481,600	12,481,600
			12,481,600	**12,481,600**

Incremental benefits				
	MT	**Unit price USD T**	**Net Value USD**	**Economic value**
Rice	18,200	215	3,916,640	3,916,640
			3,916,640	**3,916,640**