ECONOMIC AND FINANCIAL ANALYSIS OF EA KAO SUBPROJECT, DAK LAK PROVINCE

A. Introduction

1. The representative irrigation subproject for PRIDP involves the rehabilitation of the canal network of the Ea Kao irrigation system located in the outskirt of Buon Ma Thuot city. The subproject will help restore irrigation water supply via N1 Main Canal to Buon Brme, in Hoa Phu Commune and N2 Main Canal to across National Highway 14, to irrigate coffee plantation areas in Khanh Xuan Ward and provide supplementary water supply to Khanh Xuan irrigation scheme to irrigate paddy fields in downstream Hoa Xuan Commune during the late dry season when the water level of Khanh Xuan reservoir is extremely low.

2. The subproject will upgrade (i) 8,837m of N1 Main Canal, which together with the already lined section of 483 m will result in a total canal length of 9,320 m, thus extending the currently functioning length of 8,111 m with 1,209 m, and (ii) 9,549 m of N2 Main Canal, which together with the already lined section of 531 m will result in a total canal length of 10,080 m, thus extending the currently functioning length of 6,842 m with 3,238 m, crossing National Highway 14 (along Le Duan Road) to reach the agriculture land of Khanh Xuan Ward, a large part of which is agriculture-dominant. The subproject will also rehabilitate and complete the required structures on the canals.

3. The canal rehabilitation planned for this subproject will irrigate 2,100 ha of land in the core and surrounding areas, primarily for paddy but also involving some other crops. There may be additional benefits regarding fish farming, trees (fruit and perennial) and the recharging of wells used for domestic water supply. Rehabilitation will involve about 18 km of main canal and about 110 structures (turnouts, aqueducts, control structures, etc.) will need to be rebuilt or improved.

B. Methodology

4. In this economic and financial analysis all benefits and costs are examined in order to assess the viability of the subproject as well as to comment on its expected impact on various sectors of the local society, particularly the poor. For this analysis the costs and benefits within the irrigation command area are calculated for two alternative situations: “with” the project and “without” the project. The same irrigation command area will be examined in both scenarios - namely the full intended area that will be irrigated once the canals have been rehabilitated. In the “without” project scenario part of this command area is not, in fact, irrigated. Nevertheless, the analysis must take account of what may be grown on this land “without” the irrigation that the canal rehabilitation will allow. The intent is to identify the incremental value of production allowed by the project (over its expected useful life) and compare this value to the incremental cost of implementing the project and of operating and maintaining the rehabilitated infrastructure over time.

5. To develop a model for the analysis, a number of assumptions are made regarding future practice (both “with” and “without” the subproject) and about the valuation of inputs and outputs. These include:

Subproject life is counted as 20 years. That is, assuming adequate maintenance, the irrigation system should be able to maintain its expected benefits for 20 years before another major renovation may be required.

"Without" the subproject present cultivation patterns and technology are expected to continue for the life of the project.

"With" the subproject, the full command area is expected to continue to be irrigated throughout the life of the project, allowing farmers to adopt appropriate cropping patterns and technology.

Some agricultural outputs may be consumed within the household, but are valued as if sold.

Some agricultural inputs such as farm labor are provided by the farm household but are valued at the market rate as if hired.

Values are expressed in constant 2013 prices so as to exclude inflation.

The Vietnamese Dong is the unit of account. The exchange rate used is Dong 21,000 per US dollar.

6. Financial prices used in this analysis were identified through field visits conducted by the PPTA team and validated by ADB/SEER economist before this analysis was undertaken. These prices have been cross-checked with prices identified in other projects and in some secondary sources.

7. In order to assess the Project's contributions (and costs) to the economy of Viet Nam it is necessary to convert financial values into their economic equivalents. Economic valuations exclude transfers from one part of society to another (i.e. taxes and subsidies) and attempt to facilitate the comparison of project benefits and real opportunity costs to the economy by translating all prices into a common, undistorted footing. Basic assumptions (in addition to those above) used in the economic analysis include:

The analysis uses the domestic price numeraire and for traded goods a shadow exchange rate factor (SERF) of 1.1 is applied.

For rural labor, a shadow wage rate factor (SWRF) of 0.8 is applied.

Transfer payments such as taxes and subsidies are excluded in the calculation of economic values.

To calculate the economic net present value (ENVP) of the subproject a discount rate of 12% is used as representing the opportunity cost of the capital invested.

8. In the analysis, estimated results of Year 10 of the Subproject (i.e., year 2024) were used as a snapshot of the annual subproject profile in the with- and without-subproject and increments. The subproject was assumed to be completed by December 2014 and 2015 would be Year 1 of the Subproject. The reason for Year 10 (2024) to be used as a representative is that it is from when the subproject benefits are most stable until the end of its life cycle Year 20 (or year 2034).

9. Table A summarizes key indicators of this economic and financial analysis.

Table A: Summary Figures for the Ea Kao Irrigation Subproject – Dak Lak Province

Sub-project Area:		
Irrigated command area "with" subproject	ha	2,100.0
2013 irrigated area ("without" subproject)	ha	940.0
Incremental Subproject Output		
Subproject		
Expected incremental production (year 10 of subproject)		
Rice	t	9,881.3
Maize	t	(2,998.0)
Coffee	t	2,175.5
Potato	t	(306.1)
Watermelon	t	(1,181.2)
Fish	t	107.1
Expected Total Incremental Net Crop Economic Value (year 10)	billion VND	30.2
Household		
Estimated Number of Benefited Households	Number	1,597.0
Expected incremental production per household (year 10)		
Rice	kg	6,187.4
Maize	kg	(1,877.3)
Coffee	kg	1,362.3
Potato	kg	(191.6)
Watermelon	kg	(739.6)
Fish	kg	67.0
Expected Incrmental Net Crop Financial Value per Household (year 10)	million VND	21.0
The Poor		
Estimated Number of Poor Beneficiary Households	Number	638.8
Total Incremental Net Crop Financial Value of the Poor	billion VND	6.4
Share of the Poor in Incremental Net Crop Financial Value	%	21.1%
Incremental Net Crop Financial Value per Poor Household (year 10)	million VND	10.0
Costs:		
Subproject Financial Cost	billion VND	93.1
Economic Returns:		
ENPV (base case)	billion VND	43.6
EIRR (base case)	%	18.9%
EIRR (sensitive cases)		
1. Capital Costs + 10%	%	17.6%
2. O&M Costs + 10%	%	18.6%
3. Benefits decrease - 10%	%	17.2%
4. Benefits decrease - 20%	%	15.2%
5. Benefits decrease - 30%	%	13.0%
6. Benefits delay - 2 years	%	13.9%
7. Subproject life is 5 years shorter	%	17.5%
8. Subproject life is 7 years shorter	%	16.2%

10. At the end of the text of this analysis are Annex Tables 1-17 showing the flow of calculations. **Table 1** shows the derivation of certain important internationally traded outputs such as rice, maize, and coffee while **Table 2** does the same for internationally traded inputs such as fertilizers. **Table 3** lists farm-gate prices of inputs and outputs in financial terms and **Table 4** shows economic farm-gate prices. Command area land use “with” and “without” the subroject over the life of the subproject appears in **Table 5** while **Table 6** shows crop patterns in both scenarios. Crop yields used in the analysis are displayed in **Table 7** and total crop

production in **Table 8**. Incremental crop production due to the project is in **Table 9** and the total crop economic value "with" and "without" the project (and the resulting increment) is shown in **Table 10**. **Table 11** displays the crop inputs assumed to be used for crops grown within the command area and total (and incremental) economic crop production costs are calculated in **Table 12**. Incremental farm labor due to the Project is figured in **Table 13**. Net incremental crop benefits are in **Table 14**. Subproject cost in economic terms appears in **Table 15**. The economic internal rate of return (EIRR) is presented in **Table 16** and sensitivity analysis is in **Table 17**.

C. Subproject Benefits

11. At the time of this analysis the Ea Kao irrigation system is irrigating about 940 ha. Some of this area receives fully adequate water while in other parts of the scheme irrigation water is less reliable. Similarly, some areas get irrigation water in both the autumn and spring seasons while other areas receive water only in one season. The 940 ha getting some sort of irrigation service is far smaller than the area serviced at the time the scheme was originally constructed (20 years ago). With a lack of significant maintenance the system has deteriorated to its present state and coverage. In the "Without" the subproject scenario, it is assumed that the area irrigated will continue to decrease at a pace of 3% a year. In the "with" the subproject scenario, the irrigated area is expected to grow to 2,100 ha (after a dip during the two years of construction scheduled for 2015 and 2016).

12. Changes in command area land use, crop practices/patterns, cropping intensities, and crop yields were based on the locally collected data during the feasibility study in the Subproject area. SERD/SEER economist validated these details with technical staff of the provincial Department of Agriculture and Rural Development before the analysis was conducted. All detailed assumptions are in Annex Tables 5, 6, and 7.

13. These two irrigation scenarios have, over time, different implications for the crops to be grown. "Without" the subproject, there will be an increase in the land area without being irrigated. During the rainy season un-irrigated paddy and maize can be grown on this land while in the dry season some land will be fallow. "With" the subproject, the entire command area is to receive irrigation water in both seasons. There will also be water for some ha of winter crops. The result of the increase in irrigated land (and the improvement in its reliability) is that the crops grown on the land will yield more production -- in both physical terms and in value "with" the subproject compared to "without" the subproject. This will not only be true for the land that would have been un-irrigated in the "without" situation. Farmers who already were getting water ("without" the Project) will get more securely and reliably delivered water "with" the subproject. This is expected to encourage them to apply more and better productive inputs and (in combination with a better water supply) attain better yields.

14. The net value of incremental crop production has been calculated for each year throughout the life of the subproject. During the two years of construction it is assumed that irrigated area will temporarily contract and, as a result, the value of crop production may drop somewhat. After construction is completed, though, the value of incremental crop production will increase to reflect irrigated production on the entire command area of 2,100 ha. After an initial surge this incremental value will continue to gradually grow throughout the life of the project (assuming adequate maintenance of the system) due to the expected "without" subproject contraction of the irrigated area during this time period (due to continuing deterioration of the canals).

15. A snapshot of year 10 in the life of the subproject would indicate that incremental paddy production within the command area can be expected to be more than 9,800 tons per year. Maize, potatoes, and watermelon (which will be displaced by paddy) will decrease by close to 3,000 tons, 1,200 tons, and 306 tons respectively. Coffee production should increase by about 2,200 tons per annum, and fish (from fish ponds) by about 107 tons. This increase in production due to the subproject will be worth 56.9 billion VND (in constant 2013 prices). In effect, production costs will also increase as higher value crops are grown and more productive inputs are used. Incremental (economic) production costs can be expected to increase by almost 26.7 billion VND within the command area - producing a net economic increase in crop income of 30.2 billion VND (see Annex Table 14).

D. Subproject Cost

16. The estimated cost of the irrigation system is 93.1 billion VND in financial prices and 73.5 billion VND in economic prices. Annual O&M expenditures are assumed to amount to 3% of construction costs while the more major periodic maintenance (every eighth year) will be about 30% (see Annex Tables 15 and 16).

E. Economic Analysis

1. Economic Returns

17. To calculate the economic returns of the subproject the net incremental value of crop production (the quantifiable benefit of the project) is determined for each year of project life and arranged as a stream of cash flow. Costs are similarly arrayed with construction costs falling in the first two years followed by annual maintenance costs in each subsequent year and a somewhat more major periodic maintenance expenditure every eighth year after construction. To calculate the cash flow of net project economic benefits the cost cash flow is subtracted from the benefit cash flow.

18. The Ea Kao subproject is expected to be economically viable in that the economic internal rate of return (EIRR) has been calculated to be 18.9% and the net present value (ENPV) of the investment (at a discount rate of 12%) is 43.6 billion VND. Cost and revenue streams are presented in Annex Tables 14 and 16.

2. Sensitivity Analysis

19. The reported economic returns of the subproject are based on the assumption that costs and benefits over the life of the subproject will be “as calculated”. The future, of course, may not perfectly follow that assumption. It is useful to examine particular risks and check what difference they may make to the economic returns of the subproject. Some of these risks include the following:

Investment Cost: While care has been taken to accurately estimate the cost of the subproject investment, it is of course possible that actual costs may be higher than the calculated amount.

A 10% increase in investment cost will cause the EIRR to fall to 17.6%. The sensitivity factor[1] is 1.4 and the switching value[2] is at a 70.1% increase in investment cost.

O&M Cost: A 10% increase in O&M cost will cause the EIRR to fall to 18.6%. The sensitivity factor is 0.5 and the switching value is at a 200.5% increase in O&M cost.

Revenue/Benefits: If prices of crop produces are reduced by 30%, the EIRR will decrease to 13.0%. The sensitivity factor in this case is 2.9 and the switching value is at a price level that is 34.2% of its predicted level used in the base case scenario.

Delay of Revenue/Benefit Realization: ADB project implementation in the sector indicates an average delay of project implementation by 2 years. If it is the case with this subproject, the EIRR will decrease to 13.9%. The sensitivity factor in this case is 2.9 and the ENPV is 71.2% lower than its level estimated in the base case scenario.

Life of Subproject: Subproject sustainability is always a concern. Many rural infrastructure projects suffer from poor quality of construction and/or inadequate maintenance. At times, natural disasters destroy projects. It has been assumed that, with adequate O&M, the Ea Kao irrigation subproject will last for at least twenty years. If the subproject life actually turns out to be 15 years (75% of the assumed 20-year life) the EIRR will fall to 17.6% - and if project life is 13 years the EIRR will be 16.2%. The sensitivity indicators are 2.3 and 2.4 respectively and a switching value of 9 years in both cases.

20. Overall, the Ea Kao subproject is expected to have economic returns which are quite attractive and fairly robust. None of the risk factors appear to place the subproject's economic viability in immediate jeopardy. Effective maintenance of the canal infrastructure, however, is a basic assumption for this opinion (see section H for further discussion).

F. Household Financial Returns

21. Since the economic analysis was developed from the financial prices, presentation of the subproject's FIRR in addition to the EIRR would have limited meaning. In this context, it is more meaningful to discuss how the Subproject will impact the household financial returns. It should be noted that all figures presented hereunder have been converted back to local financial prices.

22. There are 1,597 households farming land within the 2,100 ha of the Ea Kao irrigation scheme's "with" subproject command area. The average farm size within the command area is 1.31 ha. This land is often located in two or more widely separated parcels. If the "average" farm can be assumed to have representative proportions of irrigated and non-irrigated command area land "without" the Subproject, this household land will be able to produce 21.0 million VND ($1,000) in incremental net crop income in the "with" subproject scenario in the year 10 snapshot. (Returns will continue to grow per year over the remaining life of the Subproject.) Assuming a household size of 4.5 people, this means that per person incremental net crop income will increase by 4.68 million VND ($222) (see Annex Table 14).

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[1] Sensitivity is the absolute value of the percent change in the EIRR divided by the percent change in the risk factor (such as cost). A sensitivity level that is greater than 1.0 indicates that a percent change in the risk factor will cause a change in the EIRR of more than 1% of its base case value --- indicating a relatively high degree of volatility. A relatively low degree of volatility would be indicated by a sensitivity factor level that is less than 1.0.

[2] The switching value is the percent change in the risk variable that will make the EIRR fall to the level of the opportunity cost of capital (which is 12%).

23. The incremental net crop income noted above assumes all labor inputs are a cost (valued at the going rate for farm labor in the area). “With” the subproject, however, different cropping patterns and increased crop inputs will be applied compared to the “without” subproject situation. These differences will call for an increased amount of farm labor. For the part of the incremental labor that is drawn from the farm household itself, these (wages) comprise part of incremental household income (in addition to incremental net crop revenue) - although the additional time commitment to on-farm work may partly have an opportunity cost of work and income off the farm. For the “average” household, the incremental labor requirements in year 10 come to 111 days a year or 8.3 million VND ($395) (see Annex Table 13). The part of this figure that is not hired labor and is not off-set by lost employment opportunities off the farm represents an increase in household income. The portion of the figure that goes toward hired labor can be seen as income for other households (which may or may not have land within the command area).

24. In addition to the quantified benefits associated with crop production which have been included in this analysis there are additional, less easily quantified benefits associated with this subproject. For example, main and primary canals generally are associated with access paths along their lengths. These paths also serve as ways for people to get to their fields - and for some households may provide easier access to area schools and clinics, etc.

G. Analysis of Poverty Impacts

25. Validated information indicates that 639 households are considered “poor”. While the actual location of the farms of the poor households is not known, it is likely that a high proportion of these farms are in the non-irrigated (“without” the subproject) portion of the 940 ha of the command area. This non-irrigated area produces much less value in the way of crops per ha than does the irrigated area. A way of calculating the amount of incremental crop benefit going to poor households is to assume that all of them farm in the non-irrigated (“without”) lower section of the system. A further assumption is that poor households have an average farm size that is 50% of that of the over-all average farm size in the area. The 639 poor farm households, then, have farms of an average 0.28 ha. In aggregate these poor farm households can be expected to have incremental net crop income from the Subproject of 6.36 billion VND (in the year 10 snapshot) or 21% of the over-all incremental net crop income from the subproject. This translates into 9.96 million VND ($474) per poor household (see Annex Table 14).

26. For the same poor households the incremental labor inputs (in year 10) from the subproject come to 86 days per year - which, at the wage for on-farm labor, would be valued at 6.47 million VND ($308). Some of this, again, might be in the form of hired labor while some of the increased household labor contributions may have an opportunity cost in regards to other paid jobs. A good deal of this figure, however, is likely to be a net contribution to poor household income.

27. A note could be made regarding labor inputs in the construction activities of the subproject. Local poor households having some significant level of under-employment may well share in this temporary work. It is not clear from the preliminary cost estimates as to how many days of manual labor will be involved in construction or how much of that labor will come from the local area (rather than being brought in by the contractors). However, it is likely that a significant number of labor days will go to local households, many of them drawn from the poor.

28. Detailed calculations supporting the above analysis are in Annex Tables 1-17 at the end of the analysis.

H. Fiscal Affordability and Sustainability

29. Based on the above analysis, sustainability of all subprojects proposed by all five project provinces (including the Subproject under examination in this document) is dependent on effective maintenance of the system. Since irrigation fee is currently waived by the Government and water user group can only take care of on-farm facilities, the responsibility of operating and maintaining the whole system rests with the provincial irrigation and drainage companies (IDMCs) in each province.

30. To ensure adequate O&M of the all proposed subprojects for the period of 2018-2034, each of the five Provincial People's Committees (PPCs) will need to set aside an annual budget of at least VND8.8 billion (in 2013 constant price) for O&M of the newly constructed/rehabilitated systems (irrigation and access road).

31. The analysis presented in Table B indicates that (i) based on the past five year's figures, all PPCs actually will be able to allocate significant amounts of budget for infrastructure investment and O&M; (ii) the levels required of VND8.8 billion is only in the range of 2.0%-3.4% of these projected allocations. Therefore, the required O&M budget level is assessed as highly affordable to all PPCs. Reviews of ongoing past and ongoing projects suggested that if the O&M budget required of PPCs is below 5% of these annual allocations, PPCs will be able to finance it.

32. This analysis suggests that the Project Loan Agreement must include (i) a covenant to bind all five PPCs to allocate a budget of VND8.8 billion (in 2013 constant price) for O&M of the newly constructed/rehabilitated systems (irrigation and access road; and (ii) a covenant to ensure the provincial IDMCs receive adequate allocations for the O&M work under their responsibility. The level of VND8.8 billion is intended to serve as the estimate for referencing by the PPCs in their endorsement to the Provincial People's Councils prior to the submission to the Central Government.

Table B: Provincial Contributions Required and Affordability (for all five Project Provincial People's Committees)

Unit: VND million

PPC	Provincial Contribution Required and Affordability					
	2013 (Project Start)	2014	2015	2016	2017	2018 - onwards
0. Budget Required for Each Province						
Counterpart contribution Required during Project implementation	1,949	1,949	1,949	1,949	1,949	0
Budget Required for Annual Operation and Maintenance	0	2,940	2,940	2,940	4,410	8,820
Total Annual Budget Required for Each Province (VND million)	**1,949**	**4,889**	**4,889**	**4,889**	**6,359**	**8,820**
Total Annual Budget Required for Each Province (USD thousand)	**93**	**233**	**233**	**233**	**303**	**420**
1. Dak Nong Province Affordability Profile						
Annual Allocation for Infrastructure Investment and O&M In-province *	432,024	373,632	370,100	371,966	359,349	430,356
Total Budget Required as % of the In-province Annual Allocation	0.5%	1.3%	1.3%	1.3%	1.8%	2.0%
2. Kon Tum Affordability Profile						
Annual Allocation for Infrastructure Investment and O&M In-province *	140,900	190,860	250,000	260,000	260,000	260,000
Total Budget Required as % of the In-province Annual Allocation	1.4%	2.6%	2.0%	1.9%	2.4%	3.4%
3. Dak Lak Affordability Profile						
Annual Allocation for Infrastructure Investment and O&M In-province *	472,445	404,632	410,000	415,000	425,000	435,000
Total Budget Required as % of the In-province Annual Allocation	0.4%	1.2%	1.2%	1.2%	1.5%	2.0%
4. Gia Lai Affordability Profile						
Annual Allocation for Infrastructure Investment and O&M In-province *	319,944	335,941	352,738	370,375	388,894	408,339
Total Budget Required as % of the In-province Annual Allocation	0.6%	1.5%	1.4%	1.3%	1.6%	2.2%
5. Lam Dong Affordability Profile						
Annual Allocation for Infrastructure Investment and O&M In-province *	303,898	275,640	291,420	306,000	321,300	337,000
Total Budget Required as % of the In-province Annual Allocation	0.6%	1.8%	1.7%	1.6%	2.0%	2.6%

* Annual allocation required for infrastructure investment and O&M in each province was estimated based on actual allocations for this item over the 2009-2012 period.

Source: Asian Development Bank estimates.

ANNEX TABLES 1-17

Table 1a: Economic Price Estimates for Internationally Traded Outputs (Rice)

Viet Nam: Productive Rural Infrastructure Development Project in the Central Highlands

(2013 Constant Viet Nam Dong)		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	…	2034
Rice: (Export parity in 2013 currencies)[a/]																
Thailand (current $)[a/]	$/t	563	540	520	500	498	496	494	492	490	490	490	490	490		480
Thailand (constant 2005 $)[a/]		467	440	414	391	382	374	366	358	350	350	350	350	350		314
MUV (2005=1.00)[b/]	2005	1.21	1.23	1.21	1.27	1.30	1.32	1.34	1.37	1.40	1.40	1.40	1.40	1.37		1.53
MUV (2013=1.00)[b/]	2013	0.98	1.00	0.98	1.04	1.06	1.08	1.10	1.12	1.14	1.14	1.14	1.14	1.12		1.25
Rice FOB Bangkok (constant 2013 $)	$/t	573	540	528	482	471	461	451	441	430	430	430	430	438		385
Freight & insurance	$/t	0	0	0	0	0	0	0	0	0	0	0	0	0		0
CIF price at Sai Gon port	$/t	573	540	528	482	471	461	451	441	430	430	430	430	438		385
Landed price at port	$/t	573	540	528	482	471	461	451	441	430	430	430	430	438		385
Quality-Adjusted Price	$/t	516	486	476	434	424	415	406	397	387	387	387	387	395		347
Adjusted border price	$/t	573	540	528	482	471	461	451	441	430	430	430	430	438		385
Border price in local currency	'000 VND/t	12,036	11,340	11,097	10,118	9,885	9,678	9,471	9,264	9,020	9,020	9,020	9,020	9,208		8,093
Port handling and storage charges	'000 VND/t	145	145	145	145	145	145	145	145	145	145	145	145	145		145
Storage, handling and transport to/from local market	'000 VND/t	70	70	70	70	70	70	70	70	70	70	70	70	70		70
Average marketing margin	'000 VND/t	510	510	510	510	510	510	510	510	510	510	510	510	510		510
Price at local market / ex- rice mill	'000 VND/t	11,311	10,615	10,372	9,393	9,160	8,953	8,746	8,539	8,295	8,295	8,295	8,295	8,483		7,368
Processing cost	'000 VND/t	110	110	110	110	110	110	110	110	110	110	110	110	110		110
Price at mill gate (in paddy form)	'000 VND/t	7,617	7,143	6,978	6,312	6,154	6,013	5,873	5,732	5,566	5,566	5,566	5,566	5,694		4,935
Storage, handling and transport from farm	'000 VND/t	60	60	60	60	60	60	60	60	60	60	60	60	60		60
Export parity farm gate price (paddy)	'000 VND/t	7,557	7,083	6,918	6,252	6,094	5,953	5,813	5,672	5,506	5,506	5,506	5,506	5,634		4,875
Export parity farm gate price (paddy)	'000 VND/kg	7.56	7.08	6.92	6.25	6.09	5.95	5.81	5.67	5.51	5.51	5.51	5.51	5.63		4.88

a/ WB Commodity Price Projections prepared January 15, 2013 for 2013-2020, and 2025 with other years interpolated.
(Thailand, 5% broken, white rice, milled, f.o.b. Bangkok)

b/ Manufacturing Unit Value Index

c/ Adjustment for Quality 10%

d/ Exchange rate of Vietnamese Dong (VND) per $ during in January 2013: 21,000

e/ SCF 0.9 SERF 1.1

f/ Conversion factor of paddy to rice 68%

Table 1b: Economic Price Estimates for Internationally Traded Outputs (Maize)

Viet Nam: Productive Rural Infrastructure Development Project in the Central Highlands

(2013 Constant Viet Nam Dong)		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	…	2034
Maize: (Import parity in 2013 currencies)[a/]																
Maize: Gulf Port (in current $)[a/]	$/t	298	290	270	250	248	246	244	242	240	240	240	240	240		230
Maize: Gulf Port (constant 2005 $)[a/]	$/t	247	236	215	195	190	185	181	176	172	172	172	172	172		150
MUV (2000=1.00)[b/]	2000	1.21	1.23	1.26	1.28	1.31	1.33	1.35	1.38	1.40	1.40	1.40	1.40	1.40		1.53
MUV (2013=1.00)[b/]	2013	0.98	1.00	1.02	1.04	1.06	1.08	1.10	1.12	1.14	1.14	1.14	1.14	1.14		1.25
Maize: Gulf Port (in constant 2013 $)	$/t	304	290	264	240	233	227	222	216	211	211	211	211	211		184
Frieght and Insurance to Sai Gon	$/t	50	50	50	50	50	50	50	50	50	50	50	50	50		50
CIF price at Sai Gon port	$/t	354	340	314	290	283	277	272	266	261	261	261	261	261		234
Landed price at port	$/t	354	340	314	290	283	277	272	266	261	261	261	261	261		234
Quality-Adjusted Price	$/t	283	306	283	261	255	250	245	240	235	235	235	235	235		211
Adjusted border price	$/t	314	340	314	290	283	277	272	266	261	261	261	261	261		234
Border price in local currency	'000 VND/t	6,599	7,140	6,598	6,082	5,953	5,824	5,721	5,592	5,488	5,488	5,488	5,488	5,488		4,921
Port handling and storage charges	'000 VND/t	145	145	145	145	145	145	145	145	145	145	145	145	145		145
Storage, handling and transport to/from local market	'000 VND/t	70	70	70	70	70	70	70	70	70	70	70	70	70		70
Average marketing margin	'000 VND/t	100	100	100	100	100	100	100	100	100	100	100	100	100		100
Price at local market	'000 VND/t	6,914	7,455	6,913	6,397	6,268	6,139	6,036	5,907	5,803	5,803	5,803	5,803	5,803		5,236
Processing cost	'000 VND/t	30	30	30	30	30	30	30	30	30	30	30	30	30		30
Price at mill gate (raw material)	'000 VND/t	4,166	4,491	4,166	3,856	3,779	3,701	3,639	3,562	3,500	3,500	3,500	3,500	3,500		3,159
Storage, handling and transport from farm	'000 VND/t	110	110	110	110	110	110	110	110	110	110	110	110	110		110
Farmgate price per tonne	'000 VND/t	4,056	4,381	4,056	3,746	3,669	3,591	3,529	3,452	3,390	3,390	3,390	3,390	3,390		3,049
Farmgate price per kg	'000 VND/kg	4.06	4.38	4.06	3.75	3.67	3.59	3.53	3.45	3.39	3.39	3.39	3.39	3.39		3.05

a/ WB Commodity Price Projections prepared January 15, 2013 for 2013-2020, and 2025 with other years interpolated.
(U.S. hard red winter, Gulf port)

b/ Manufacturing Unit Value Index

c/ Exchange rate of Vietnamese Dong (VND) per $ during in January 2013: 21,000

Table 1c: Economic Price Estimates for Internationally Traded Outputs (Coffee, Arabica)

Viet Nam: Productive Rural Infrastructure Development Project in the Central Highlands

(2013 Constant Viet Nam Dong)		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	…	2034
Coffee, Arabica (in 2013 currencies)[a/]																
Coffee, Arabica: Gulf Port (in current $)[a/]	$/t	411	380	370	360	359	358	357	356	355	355	355	355	355		350
Coffee, Arabica: Gulf Port (constant 2005 $)[a/]		341	309	295	281	276	270	265	259	254	254	254	254	254		229
MUV (2005=1.00)[b/]	2005	1.21	1.23	1.22	1.28	1.30	1.32	1.34	1.37	1.40	1.40	1.40	1.40	1.38		1.53
MUV (2013=1.00)[b/]	2013	0.98	1.00	0.99	1.04	1.06	1.08	1.09	1.12	1.14	1.14	1.14	1.14	1.12		1.25
Rice FOB Bangkok (constant 2013 $)	$/t	419	379	372	346	340	332	326	319	312	312	312	312	316		281
Quality Adjustment[c/]	$/t	377	341	335	311	306	299	294	287	281	281	281	281	285		253
Freight, insurance, etc.	$/t	35	35	35	35	35	35	35	35	35	35	35	35	35		35
CIF Saigon	$/t	412	376	370	346	341	334	329	322	316	316	316	316	320		288
CIF Saigon in VND [d/]	'000 VND/t	8,645	7,902	7,768	7,271	7,155	7,015	6,899	6,760	6,627	6,627	6,627	6,627	6,711		6,047
Freight & handling Saigon to project area[e/]	'000 VND/t	399	399	399	399	399	399	399	399	399	399	399	399	399		399
Conversion to dry coffee beans[f/]	'000 VND/t	6,184	5,628	5,527	5,154	5,067	4,962	4,875	4,770	4,671	4,671	4,671	4,671	4,734		4,236
Processing charges[e/]	'000 VND/t	100	100	100	100	100	100	100	100	100	100	100	100	100		100
Handling and transport farm to processor[e/]	'000 VND/t	50	50	50	50	50	50	50	50	50	50	50	50	50		50
Economic Farmgate Price per tonne	'000 VND/t	6,034	5,478	5,377	5,004	4,917	4,812	4,725	4,620	4,521	4,521	4,521	4,521	4,584		4,086
Economic Farmgate Price per kg	'000 VND/kg	6.03	5.48	5.38	5.00	4.92	4.81	4.73	4.62	4.52	4.52	4.52	4.52	4.58		4.09

a/ WB Commodity Price Projections prepared January 15, 2013 for 2013-2020, and 2025 with other years interpolated.

b/ Manufacturing Unit Value Index

c/ Adjustment for Quality 10%

d/ Exchange rate of Vietnamese Dong (VND) per $ during in January 2013: 21,000

e/ SCF 0.9 SERF 1.1

f/ Conversion factor to dry beans 75%

Table 2a: Economic Price Estimates for Internationally Traded Inputs (Urea)

Viet Nam: Productive Rural Infrastructure Development Project in the Central Highlands

(2013 Constant Viet Nam Dong)		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	…	2034
(Urea: (in 2013 currencies)[a/]																
Urea: Black Sea (in current $)[a/]	$/t	405	390	370	350	345	339	334	329	324	324	324	324	324		300
Urea: Black Sea (in constant 2005 $)[a/]	$/t	336	317	295	274	265	256	248	240	232	232	232	232	232		196
MUV (2005=1.00)[b/]	2005	1.21	1.23	1.25	1.28	1.30	1.32	1.35	1.37	1.40	1.40	1.40	1.40	1.40		1.53
MUV (2013=1.00)[b/]	2013	0.98	1.00	1.02	1.04	1.06	1.08	1.09	1.11	1.14	1.14	1.14	1.14	1.14		1.24
Urea: Black Sea (in constant 2013 $)	$/t	413	390	363	337	326	315	305	295	285	285	285	285	285		241
Freight and Insurance to Haiphong	$/t	50	50	50	50	50	50	50	50	50	50	50	50	50		50
CIF Haiphong	$/t	463	440	413	387	376	365	355	345	335	335	335	335	335		291
CIF Haiphong in VND[c/]	'000 VND/t	9,731	9,240	8,672	8,129	7,897	7,664	7,457	7,251	7,044	7,044	7,044	7,044	7,044		6,114
Handling and transport to district center[d]	'000 VND/t	399	399	399	399	399	399	399	399	399	399	399	399	399		399
Price at District Center	'000 VND/t	10,130	9,639	9,071	8,528	8,296	8,063	7,856	7,650	7,443	7,443	7,443	7,443	7,443		6,513
Transport and Handling to Farm[d/]	'000 VND/t	100	100	100	100	100	100	100	100	100	100	100	100	100		100
Farmgate price per tonne	'000 VND/t	10,030	9,539	8,971	8,428	8,196	7,963	7,757	7,550	7,343	7,343	7,343	7,343	7,343		6,413
Farmgate price per kg	'000 VND/kg	10.03	9.54	8.97	8.43	8.20	7.96	7.76	7.55	7.34	7.34	7.34	7.34	7.34		6.41

a/ WB Commodity Price Projections prepared January 15, 2013 for 2013-2020, and 2025 with other years interpolated.
(Bulk, f.o.b. Black Sea ports)

b/ Manufacturing Unit Value Index

c/ Exchange rate of Vietnamese Dong (VND) per $ during in January 2013:

d/ SCF 0.9 SERF 1.1

Table 2b: Economic Price Estimates for Internationally Traded Inputs (TSP)

Viet Nam: Productive Rural Infrastructure Development Project in the Central Highlands

(2013 Constant Viet Nam Dong)		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	…	2034
(TSP: (in 2013 currencies)[a/]																
TSP: Tunisia (in current $)[a/]	$/t	462	430	425	420	415	409	404	399	394	394	394	394	394		370
TSP: Tunisia (in constant 2000 $)[a/]	$/t	383	350	339	328	318	309	300	291	282	282	282	282	282		242
MUV (2005=1.00)[b/]	2005	1.21	1.23	1.25	1.28	1.31	1.32	1.35	1.37	1.40	1.40	1.40	1.40	1.40		1.53
MUV (2013=1.00)[b/]	2013	0.98	1.00	1.02	1.04	1.06	1.08	1.10	1.12	1.14	1.14	1.14	1.14	1.14		1.24
TSP: Tunisia (in constant 2013 $)	$/t	471	430	416	403	391	380	369	358	346	346	346	346	346		297
Freight and Insurance to Haiphong	$/t	50	50	50	50	50	50	50	50	50	50	50	50	50		50
CIF Haiphong	$/t	521	480	466	453	441	430	419	408	396	396	396	396	396		347
CIF Haiphong in VND[c/]	'000 VND/t	10,931	10,080	9,796	9,512	9,254	9,022	8,790	8,558	8,326	8,326	8,326	8,326	8,326		7,294
Handling and transport to district center[d]	'000 VND/t	399	399	399	399	399	399	399	399	399	399	399	399	399		399
Price at District Center	'000 VND/t	11,330	10,479	10,195	9,911	9,653	9,421	9,189	8,957	8,725	8,725	8,725	8,725	8,725		7,693
Transport and Handling to Farm[d/]	'000 VND/t	100	100	100	100	100	100	100	100	100	100	100	100	100		100
Farmgate price per tonne	'000 VND/t	11,231	10,379	10,095	9,812	9,554	9,321	9,089	8,857	8,625	8,625	8,625	8,625	8,625		7,593
Farmgate price per kg	'000 VND/kg	11.23	10.38	10.10	9.81	9.55	9.32	9.09	8.86	8.62	8.62	8.62	8.62	8.62		7.59

a/ WB Commodity Price Projections prepared January 15, 2013 for 2013-2020, and 2025 with other years interpolated.
(Bulk, granular, f.o.b. Tunisian ports)

b/ Manufacturing Unit Value Index

c/ Exchange rate of Vietnamese Dong (VND) per $ during in January 2013: VND 21,000

d/ SCF 0.9 SERF 1.1

Table 2c Economic Price Estimates for Internationally Traded Inputs (DAP)

Viet Nam: Productive Rural Infrastructure Development Project in the Central Highlands

(2013 Constant Viet Nam Dong)		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	…	2034
(DAP: (in 2013 currencies)[a/]																
DAP: U.S. gulf (in current $)[a/]	$/t	540	500	490	480	478	476	474	472	470	470	470	470	470		460
DAP: U.S. gulf (in constant 2005 $)[a/]	$/t	447	407	390	375	367	359	351	344	336	336	336	336	336		301
MUV (2005=1.00)[b/]	2005	1.21	1.23	1.26	1.28	1.30	1.33	1.35	1.37	1.40	1.40	1.40	1.40	1.40		1.53
MUV (2013=1.00)[b/]	2013	0.98	1.00	1.02	1.04	1.06	1.08	1.10	1.12	1.14	1.14	1.14	1.14	1.14		1.24
DAP: U.S. gulf (in constant 2013 $)	$/t	549	500	479	461	451	441	431	423	413	413	413	413	413		370
Freight and Insurance to Haiphong	$/t	50	50	50	50	50	50	50	50	50	50	50	50	50		50
CIF Haiphong	$/t	599	550	529	511	501	491	481	473	463	463	463	463	463		420
CIF Haiphong in VND[c/]	'000 VND/t	12,582	11,550	11,111	10,724	10,518	10,312	10,105	9,925	9,718	9,718	9,718	9,718	9,718		8,815
Handling and transport to district center[d]	'000 VND/t	399	399	399	399	399	399	399	399	399	399	399	399	399		399
Price at District Center	'000 VND/t	12,981	11,949	11,510	11,123	10,917	10,711	10,504	10,324	10,117	10,117	10,117	10,117	10,117		9,214
Transport and Handling to Farm[d/]	'000 VND/t	100	100	100	100	100	100	100	100	100	100	100	100	100		100
Farmgate price per tonne	'000 VND/t	12,881	11,849	11,411	11,024	10,817	10,611	10,405	10,224	10,018	10,018	10,018	10,018	10,018		9,115
Farmgate price per kg	'000 VND/kg	12.88	11.85	11.41	11.02	10.82	10.61	10.40	10.22	10.02	10.02	10.02	10.02	10.02		9.11

a/ WB Commodity Price Projections prepared January 15, 2013 for 2013-2020, and 2025 with other years interpolated.
(Bulk, standard size, f.o.b. U.S. gulf ports)

b/ Manufacturing Unit Value Index

c/ Exchange rate of Vietnamese Dong (VND) per $ during in January 2013: VND 21,000

d/ SCF 0.9 SERF 1.1

Table 3: Summary of Financial Prices

Viet Nam: Productive Rural Infrastructure Development Project in the Central Highlands

(2013 Constant Viet Nam Dong)		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	…	2034
Financial[a/]																
Outputs																
Paddy (Spring)	'000 VND/kg	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2		6.2
Paddy (Autumn)	'000 VND/kg	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8		6.8
Sraw[b/]	'000 VND/kg	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7		0.7
Maize	'000 VND/kg	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5		5.5
Coffee	'000 VND/kg	7.2	6.6	6.5	6.0	5.9	5.8	5.7	5.5	5.4	5.4	5.4	5.4	5.5		4.9
Potatoes	'000 VND/kg	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7		2.7
Watermelon	'000 VND/kg	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7		2.7
Fish	'000 VND/kg	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5		13.5
Inputs																
Rice seed (local)	'000 VND/kg	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0		18.0
Rice seed (improved)	'000 VND/kg	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0		45.0
Maize seed	'000 VND/kg	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5		58.5
Coffee seedling for 1 ha	'000 VND/ha	3,500.0	3,500.0	3,500.0	3,500.0	3,500.0	3,500.0	3,500.0	3,500.0	3,500.0	3,500.0	3,500.0	3,500.0	3,500.0		3,500.0
Potato seed	'000 VND/kg	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7		2.7
Watermelon seed	'000 VND/kg	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0		72.0
Fish Fingerlings	'000 VND/kg	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6		0.6
Urea	'000 VND/kg	11.0	10.5	9.9	9.3	9.0	8.8	8.5	8.3	8.1	8.1	8.1	8.1	8.1		7.1
Super Phosphate	'000 VND/kg	11.8	10.9	10.6	10.3	10.0	9.8	9.5	9.3	9.1	9.1	9.1	9.1	9.1		8.0
DAP	'000 VND/kg	13.1	12.1	11.6	11.2	11.0	10.8	10.6	10.4	10.2	10.2	10.2	10.2	10.2		9.3
NPK	'000 VND/kg	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0
N	'000 VND/kg	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4		5.4
P	'000 VND/kg	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5		2.5
K	'000 VND/kg	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2		7.2
Manure	'000 VND/t	171.0	171.0	171.0	171.0	171.0	171.0	171.0	171.0	171.0	171.0	171.0	171.0	171.0		171.0
Pesticide	'000 VND/ha	1,260.0	1,260.0	1,260.0	1,260.0	1,260.0	1,260.0	1,260.0	1,260.0	1,260.0	1,260.0	1,260.0	1,260.0	1,260.0		1,260.0
Tractor hire	'000 VND/ha	1,755.0	1,755.0	1,755.0	1,755.0	1,755.0	1,755.0	1,755.0	1,755.0	1,755.0	1,755.0	1,755.0	1,755.0	1,755.0		1,755.0
Labor (Irrigation, road and embankments)	'000 VND/day	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0		75.0
Labor (Water Supply)	'000 VND/day	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0		65.0

a/ Financial crop and input prices were mostly derived from the district DARD and District Extension offices --- supplemented by interviews with local farmers.

b/ Rice straw as a percent of rice output. 10%

Table 4: Summary of Economic Prices

Viet Nam: Productive Rural Infrastructure Development Project in the Central Highlands

(2013 Constant Viet Nam Dong)		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	…	2034
Economic[a/]																
Outputs																
Paddy (Spring)	'000 VND/kg	6.8	6.4	6.2	5.6	5.5	5.4	5.2	5.1	5.0	5.0	5.0	5.0	5.1		4.4
Paddy (Autumn)	'000 VND/kg	7.6	7.1	6.9	6.3	6.1	6.0	5.8	5.7	5.5	5.5	5.5	5.5	5.6		4.9
Sraw[b/]	'000 VND/kg	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7		0.7
Maize	'000 VND/kg	4.1	4.4	4.1	3.7	3.7	3.6	3.5	3.5	3.4	3.4	3.4	3.4	3.4		3.0
Coffee	'000 VND/kg	6.0	5.5	5.4	5.0	4.9	4.8	4.7	4.6	4.5	4.5	4.5	4.5	4.6		4.4
Potatoes	'000 VND/kg	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7		2.7
Watermelon	'000 VND/kg	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7		2.7
Fish	'000 VND/kg	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5		13.5
Inputs																
Rice seed (local)	'000 VND/kg	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0		18.0
Rice seed (improved)	'000 VND/kg	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0		45.0
Maize seed	'000 VND/kg	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5		58.5
Coffee seedling	'000 VND/ha	3,500.0	3,500.0	3,500.0	3,500.0	3,500.0	3,500.0	3,500.0	3,500.0	3,500.0	3,500.0	3,500.0	3,500.0	3,500.0		3,500.0
Potato seed	'000 VND/kg	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7		2.7
Watermelon seed	'000 VND/kg	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0		72.0
Fish Fingerlings	'000 VND/kg	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6		0.6
Urea	'000 VND/kg	10.0	9.5	9.0	8.4	8.2	8.0	7.8	7.5	7.3	7.3	7.3	7.3	7.3		6.4
Super Phosphate	'000 VND/kg	11.2	10.4	10.1	9.8	9.6	9.3	9.1	8.9	8.6	8.6	8.6	8.6	8.6		7.6
DAP	'000 VND/kg	12.9	11.8	11.4	11.0	10.8	10.6	10.4	10.2	10.0	10.0	10.0	10.0	10.0		9.1
NPK	'000 VND/kg	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0
N	'000 VND/kg	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4		5.4
P	'000 VND/kg	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5		2.5
K	'000 VND/kg	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2		7.2
Manure	'000 VND/t	171.0	171.0	171.0	171.0	171.0	171.0	171.0	171.0	171.0	171.0	171.0	171.0	171.0		171.0
Pesticide	'000 VND/ha	1,260.0	1,260.0	1,260.0	1,260.0	1,260.0	1,260.0	1,260.0	1,260.0	1,260.0	1,260.0	1,260.0	1,260.0	1,260.0		1,260.0
Tractor hire	'000 VND/ha	1,755.0	1,755.0	1,755.0	1,755.0	1,755.0	1,755.0	1,755.0	1,755.0	1,755.0	1,755.0	1,755.0	1,755.0	1,755.0		1,755.0
Labor	'000 VND/day	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0		60.0

a/ Economic prices for major items are as derived in Tables 1 and 2 above.

b/ The Shadow Wage Rate adjustment is assumed to be: 0.8

Table 5 : Command Area Land Use With and Without the Project: Ea Kao Irrigation Scheme

Viet Nam: Productive Rural Infrastructure Development Project in the Central Highlands

		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	…	2034
sub-project year				1	2	3	4	5	6	7	8	9	10		20
Without Project[a/]															
Spring Season															
Well irrigated	ha	700	679	659	639	620	601	583	566	549	532	516	501		369
Irregularly irrigated	ha	240	233	226	219	212	206	200	194	188	182	177	172		127
Unirrigated	ha	1,160	1,188	1,216	1,242	1,268	1,293	1,317	1,340	1,363	1,385	1,407	1,428		1,604
Total Spring cropped area	ha	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100		2,100
Autumn Season															
Well irrigated	ha	700	679	659	639	620	601	583	566	549	532	516	501		369
Irregularly irrigated	ha	240	233	226	219	212	206	200	194	188	182	177	172		127
Unirrigated	ha	1,160	1,188	1,216	1,242	1,268	1,293	1,317	1,340	1,363	1,385	1,407	1,428		1,604
Total Autumn cropped area	ha	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100		2,100
Winter Season															
More reliably irrigated	ha	500	485	470	456	443	429	416	404	392	380	369	358		264
Less reliably irrigated	ha	100	97	94	91	89	86	83	81	78	76	74	72		53
Unirrigated	ha	1,500	1,518	1,535	1,552	1,569	1,585	1,600	1,615	1,630	1,644	1,658	1,671		1,784
Total Winter cropped area	ha	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100		2,100
Fish ponds	ha	14	14	13	13	12	12	12	11	11	11	10	10		7
With Project[b/c/d/]															
Spring Season															
Well irrigated	ha	700	679	577	491	980	1,470	1,470	1,470	1,470	1,470	1,470	1,470		1,470
Irregularly irrigated	ha	240	233	198	168	399	630	630	630	630	630	630	630		630
Unirrigated	ha	1,160	1,188	1,325	1,441	721	0	0	0	0	0	0	0		0
Total Spring cropped area	ha	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100		2,100
Autumn Season															
Well irrigated	ha	700	679	577	491	980	1,470	1,470	1,470	1,470	1,470	1,470	1,470		1,470
Irregularly irrigated	ha	240	233	198	168	399	630	630	630	630	630	630	630		630
Unirrigated	ha	1,160	1,188	1,325	1,441	721	0	0	0	0	0	0	0		0
Total Spring area	ha	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100		2,100
Winter Season															
Well irrigated	ha	500	485	412	350	280	210	210	210	210	210	210	210		210
Irregularly irrigated	ha	100	97	82	70	140	210	210	210	210	210	210	210		210
Unirrigated	ha	1,500	1,518	1,605	1,680	1,680	1,680	1,680	1,680	1,680	1,680	1,680	1,680		1,680
Total Winter cropped area	ha	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100		2,100
Fish Ponds	ha	14	14	12	10	21	32	32	32	32	32	32	32		32

a/ Without Project irrigated area deteriorates at a rate of:	3.0%
b/ With Project Command Area is assumed to be ha:	2,100
c/ Construction is in 2013 and 2014 --- causing, during construction, a loss of irrigated coverage of:	15%
d/ System is assumed to be operational in 2015 with irrigation coverage maximized by 2016. Partial benefits in 2015.	
e/ In most systems tail areas get poorer water supplies than upstream areas. Assumed percent less reliably irrigated:	30%
f/ Winter season With-Project reliable irrigation percent:	10%
Winter season With-Project unreliable irrigation percent:	10%

Table 6: Crop Pattern With and Without Project: Ea Kao Irrigation Scheme

Viet Nam: Productive Rural Infrastructure Development Project in the Central Highlands

		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	…	2034
sub-project year				1	2	3	4	5	6	7	8	9	10		20
Without Project															
Spring Season															
Paddy: Well Irrigated	ha	630	611	593	575	558	541	525	509	494	479	465	451		332
Paddy: Irregularly Irrigated	ha	216	210	203	197	191	185	180	175	169	164	159	155		114
Coffee: Irrigated	ha	94	91	88	86	83	81	78	76	74	71	69	67		50
Maize: Unirrigated[a/]	ha	580	594	608	621	634	646	659	670	682	693	703	714		802
Fallow	ha	580	594	608	621	634	646	659	670	682	693	703	714		802
Total Spring area	ha	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100		2,100
Autumn Season															
Paddy: Well Irrigated	ha	700	679	659	639	620	601	583	566	549	532	516	501		369
Paddy: Irregularly Irrigated	ha	240	233	226	219	212	206	200	194	188	182	177	172		127
Paddy: Unirrigated	ha	928	951	972	994	1,014	1,034	1,054	1,072	1,091	1,108	1,125	1,142		1,283
Maize: Unirrigated[a/]	ha	232	238	243	248	254	259	263	268	273	277	281	286		321
Total Autumn area	ha	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100		2,100
Winter Season															
Potatoes	ha	580	563	546	529	513	498	483	469	455	441	428	415		306
Watermelon	ha	100	97	94	91	89	86	83	81	78	76	74	72		53
Total Winter area	ha	680	660	640	621	602	584	566	549	533	517	501	486		359
Fish Ponds[b/]	ha	14	14	13	13	12	12	12	11	11	11	10	10		7
With Project[c/]															
Spring Season															
Paddy: Well Irrigated	ha	630	611	519	442	882	1,323	1,323	1,323	1,323	1,323	1,323	1,323		1,323
Paddy: Irregularly Irrigated	ha	216	210	178	151	359	567	567	567	567	567	567	567		567
Coffee: Irrigated	ha	94	91	78	66	138	210	210	210	210	210	210	210		210
Maize: Unirrigated[a/]	ha	580	594	662	721	360	0	0	0	0	0	0	0		0
Fallow	ha	580	594	662	721	360	0	0	0	0	0	0	0		0
Total Spring area	ha	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100		2,100
Autumn Season															
Paddy: Well Irrigated	ha	700	679	577	491	980	1,470	1,470	1,470	1,470	1,470	1,470	1,470		1,470
Paddy: Irregularly Irrigated	ha	240	233	198	168	399	630	630	630	630	630	630	630		630
Paddy: Unirrigated	ha	928	951	1,060	1,153	576	0	0	0	0	0	0	0		0
Maize: Unirrigated[a/]	ha	232	238	265	288	144	0	0	0	0	0	0	0		0
Total Autumn area	ha	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100		2,100
Winter Season															
Potatoes	ha	580	563	478	406	392	378	378	378	378	378	378	378		378
Watermelon	ha	20	19	16	14	28	42	42	42	42	42	42	42		42
Total Winter area	ha	600	582	495	420	420	420	420	420	420	420	420	420		420
Fish Ponds[b/]	ha	14	14	12	10	21	32	32	32	32	32	32	32		32

a/ While maize is not the only non-irrigated crop that people grow, it is used here as a proxy for all non-irrigated crops grown.

b/ Most households with access to water have fish ponds --- primarily for home consumption. As the effectively irrigated area increases (with the project), the number of households able to have fishponds will also increase.

c/ During the two years of construction it is assumed that there will be some decrease in the area irrigated. Following construction it is assumed that full irrigation coverage will be attained over a two year period.

Table 7: Crop Yields per ha With and Without Project: Ea Kao Irrigation Scheme

Viet Nam: Productive Rural Infrastructure Development Project in the Central Highlands

		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	…	2034
sub-project year				1	2	3	4	5	6	7	8	9	10		20
Without Project[a/]															
Spring Season															
Paddy: Well Irrigated	t/ha	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4		5.4
Paddy: Irregularly Irrigated	t/ha	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5		2.5
Coffee: Irrigated	t/ha	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0
Maize: Unirrigated	t/ha	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0
Autumn Season															
Paddy: Well Irrigated	t/ha	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5
Paddy: Irregularly Irrigated	t/ha	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0
Paddy: Unirrigated	t/ha	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8		1.8
Maize: Unirrigated	t/ha	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0
Winter Season															
Potatoes	t/ha	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3		8.3
Watermelon	t/ha	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0		40.0
Fish	t/ha	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0
With Project															
Spring Season															
Paddy: Well Irrigated	t/ha	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4		5.4
Paddy: Irregularly Irrigated	t/ha	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5		2.5
Coffee: Irrigated	t/ha	2.0	2.0	2.0	2.0	4.3	6.5	8.8	11.0	11.0	11.0	11.0	11.0		11.0
Maize: Unirrigated	t/ha	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0
Autumn Season															
Paddy: Well Irrigated	t/ha	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5
Paddy: Irregularly Irrigated	t/ha	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0
Paddy: Unirrigated	t/ha	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8		1.8
Maize: Unirrigated	t/ha	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0
Winter Season															
Potatoes	t/ha	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3		8.3
Watermelon	t/ha	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0		40.0
Fish	t/ha	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0

a/ Yields were mostly derived from the district DARD and District Extension offices --- supplemented by interviews with local farmers.

Table 8: Crop Production With and Without the Project: Ea Kao Irrigation Scheme

Viet Nam: Productive Rural Infrastructure Development Project in the Central Highlands

		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	…	2034
sub-project year				1	2	3	4	5	6	7	8	9	10		20
Without Project[a/]															
Spring Season															
Paddy: Well Irrigated	t	3,402	3,300	3,201	3,105	3,012	2,921	2,834	2,749	2,666	2,586	2,509	2,433		1,794
Paddy: Irregularly Irrigated	t	540	524	508	493	478	464	450	436	423	411	398	386		285
Coffee: Irrigated	t	188	182	177	172	166	161	157	152	147	143	139	134		99
Maize: Unirrigated	t	1,740	1,782	1,823	1,863	1,902	1,939	1,976	2,011	2,045	2,078	2,110	2,141		2,406
Autumn Season															
Paddy: Well Irrigated	t	3,150	3,056	2,964	2,875	2,789	2,705	2,624	2,545	2,469	2,395	2,323	2,253		1,662
Paddy: Irregularly Irrigated	t	960	931	903	876	850	824	800	776	752	730	708	687		506
Paddy: Unirrigated	t	1,670	1,711	1,750	1,789	1,826	1,862	1,896	1,930	1,963	1,995	2,026	2,056		2,310
Maize: Unirrigated	t	696	713	729	745	761	776	790	804	818	831	844	857		963
Winter Season															
Potatoes	t	4,814	4,670	4,529	4,394	4,262	4,134	4,010	3,890	3,773	3,660	3,550	3,443		2,539
Watermelon	t	4,000	3,880	3,764	3,651	3,541	3,435	3,332	3,232	3,135	3,041	2,950	2,861		2,110
Fish	t	71	68	66	64	62	61	59	57	55	54	52	50		37
With Project															
Spring Season															
Paddy: Well Irrigated	t	3,402	3,300	2,805	2,384	4,764	7,144	7,144	7,144	7,144	7,144	7,144	7,144		7,144
Paddy: Irregularly Irrigated	t	540	524	445	378	898	1,418	1,418	1,418	1,418	1,418	1,418	1,418		1,418
Coffee: Irrigated	t	188	182	155	132	586	1,365	1,838	2,310	2,310	2,310	2,310	2,310		2,310
Maize: Unirrigated	t	1,740	1,782	1,987	2,162	1,081	0	0	0	0	0	0	0		0
Autumn Season															
Paddy: Well Irrigated	t	3,150	3,056	2,597	2,208	4,411	6,615	6,615	6,615	6,615	6,615	6,615	6,615		6,615
Paddy: Irregularly Irrigated	t	960	931	792	673	1,596	2,520	2,520	2,520	2,520	2,520	2,520	2,520		2,520
Paddy: Unirrigated	t	1,670	1,711	1,908	2,075	1,038	0	0	0	0	0	0	0		0
Maize: Unirrigated	t	696	713	795	865	432	0	0	0	0	0	0	0		0
Winter Season															
Potatoes	t	4,814	4,670	3,969	3,374	3,256	3,137	3,137	3,137	3,137	3,137	3,137	3,137		3,137
Watermelon	t	800	776	660	561	1,120	1,680	1,680	1,680	1,680	1,680	1,680	1,680		1,680
Fish	t	71	68	58	49	103	158	158	158	158	158	158	158		158

Table 9: Incremental Crop Production: Ea Kao Irrigation Scheme

Viet Nam: Productive Rural Infrastructure Development Project in the Central Highlands

		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	…	2034
sub-project year				1	2	3	4	5	6	7	8	9	10		20
Over-all Incremental Crop Production															
Rice															
Spring Paddy: Well Irrigated	t	0	0	(396)	(721)	1,752	4,223	4,310	4,395	4,478	4,558	4,635	4,711		5,350
Spring Paddy: Irregularly Irrigated	t	0	0	(63)	(114)	420	954	968	981	994	1,007	1,019	1,031		1,133
Autumn Paddy: Well Irrigated	t	0	0	(367)	(667)	1,623	3,910	3,991	4,070	4,146	4,220	4,292	4,362		4,953
Autumn Paddy: Irregularly Irrigated	t	0	0	(112)	(203)	747	1,696	1,720	1,744	1,768	1,790	1,812	1,833		2,014
Autumn Paddy: Unirrigated	t	0	0	158	287	(788)	(1,862)	(1,896)	(1,930)	(1,963)	(1,995)	(2,026)	(2,056)		(2,310)
Total Paddy	t	0	0	(780)	(1,419)	3,754	8,921	9,093	9,261	9,423	9,580	9,733	9,881		11,139
Maize															
Spring Maize: Unirrigated	t	0	0	164	299	(821)	(1,939)	(1,976)	(2,011)	(2,045)	(2,078)	(2,110)	(2,141)		(2,406)
Autumn Maize: Unirrigated	t	0	0	66	119	(328)	(776)	(790)	(804)	(818)	(831)	(844)	(857)		(963)
Total Maize	t	0	0	230	418	(1,149)	(2,715)	(2,766)	(2,815)	(2,863)	(2,909)	(2,954)	(2,998)		(3,369)
Coffee	t	0	0	(22)	(40)	420	1,204	1,681	2,158	2,163	2,167	2,171	2,176		2,211
Potato	t	0	0	(560)	(1,020)	(1,006)	(997)	(873)	(752)	(636)	(522)	(413)	(306)		598
Watermellon	t	(3,200)	(3,104)	(3,104)	(3,090)	(2,421)	(1,755)	(1,652)	(1,552)	(1,455)	(1,361)	(1,270)	(1,181)		(430)
Fish	t	0	0	(8)	(15)	41	97	99	101	102	104	106	107		120
Incremental Crop Production per Household															
Number of Households[a/]	1,597														
Rice	kg/hh	0.0	0.0	(488.2)	(888.6)	2,350.3	5,585.8	5,693.9	5,798.7	5,900.4	5,999.0	6,094.6	6,187.4		6,975.2
Maize	kg/hh	0.0	0.0	143.9	261.9	(719.6)	(1,700.0)	(1,731.8)	(1,762.7)	(1,792.7)	(1,821.7)	(1,849.9)	(1,877.3)		(2,109.4)
Coffee	kg/hh	0.0	0.0	(13.7)	(24.9)	262.9	753.6	1,052.5	1,351.3	1,354.2	1,357.0	1,359.7	1,362.3		1,384.4
Potato	kg/hh	0.0	0.0	(350.9)	(638.6)	(630.1)	(624.0)	(546.4)	(471.0)	(398.0)	(327.1)	(258.3)	(191.6)		374.5
Watermelon	kg/hh	(2,003.8)	(1,943.6)	(1,943.6)	(1,934.9)	(1,515.9)	(1,098.9)	(1,034.4)	(971.8)	(911.1)	(852.2)	(795.1)	(739.6)		(269.2)
Fish	kg/hh	0.0	0.0	(5.1)	(9.4)	25.7	60.7	61.9	63.0	64.0	65.1	66.1	67.0		75.3

a/ Figures in this table are hh averages only. For a given location within the command area (CA) households will benefit in proportion to the amount of land in the CA that they have. In addition, hhs with irrigation water Without the Project will have less of an increment than hhs (Without the Project) that have no irrigation water. Also, not all households grow the same proportionate mix of crops.

Table 10: Economic Total Crop Production Value With and Without the Project: Ea Kao Irrigation Scheme

Viet Nam: Productive Rural Infrastructure Development Project in the Central Highlands

(2013 Constant Viet Nam Dong)		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	…	2034
sub-project year				1	2	3	4	5	6	7	8	9	10		20
Without Project Total Production Value															
Rice															
Spring Paddy: Well Irrigated	billion VND	25.71	23.37	22.14	19.41	18.35	17.39	16.47	15.59	14.68	14.24	13.81	13.40		8.75
Spring Paddy: Irregularly Irrigated	billion VND	4.08	3.71	3.51	3.08	2.91	2.76	2.61	2.47	2.33	2.26	2.19	2.13		1.39
Autumn Paddy: Well Irrigated	billion VND	23.80	21.64	20.50	17.97	16.99	16.10	15.25	14.44	13.59	13.19	12.79	12.41		8.10
Autumn Paddy: Irregularly Irrigated	billion VND	7.25	6.60	6.25	5.48	5.18	4.91	4.65	4.40	4.14	4.02	3.90	3.78		2.47
Autumn Paddy: Unirrigated	billion VND	12.62	12.12	12.11	11.18	11.13	11.08	11.02	10.95	10.81	10.98	11.15	11.32		11.26
Total Paddy	billion VND	73.47	67.44	64.52	57.13	54.57	52.25	50.01	47.85	45.56	44.69	43.85	43.03		31.97
Rice straw	billion VND	7.35	6.74	6.45	5.71	5.46	5.22	5.00	4.78	4.56	4.47	4.38	4.30		3.20
Maize															
Spring Maize: Unirrigated	billion VND	7.06	7.81	7.40	6.98	6.98	6.96	6.97	6.94	6.93	7.04	7.15	7.26		7.34
Autumn Maize: Unirrigated	billion VND	2.82	3.12	2.96	2.79	2.79	2.79	2.79	2.78	2.77	2.82	2.86	2.90		2.94
Total Maize	billion VND	9.88	10.93	10.35	9.77	9.77	9.75	9.76	9.72	9.71	9.86	10.02	10.16		10.27
Coffee	billion VND	1.13	1.00	0.95	0.86	0.82	0.78	0.74	0.70	0.67	0.65	0.63	0.61		0.44
Potato	billion VND	13.00	12.61	12.23	11.86	11.51	11.16	10.83	10.50	10.19	9.88	9.58	9.30		6.86
Watermelon	billion VND	10.80	10.48	10.16	9.86	9.56	9.27	9.00	8.73	8.46	8.21	7.96	7.73		5.70
Fish	billion VND	0.95	0.92	0.90	0.87	0.84	0.82	0.79	0.77	0.75	0.72	0.70	0.68		0.50
Total Without Project Value	billion VND	116.58	110.13	105.56	96.06	92.52	89.25	86.13	83.05	79.88	78.48	77.13	75.81		58.93
With Project Total Production Value[a/]															
Rice															
Spring Paddy: Well Irrigated	billion VND	25.71	23.37	19.40	14.91	29.03	42.53	41.53	40.52	39.34	39.34	39.34	39.34		34.83
Spring Paddy: Irregularly Irrigated	billion VND	4.08	3.71	3.08	2.37	5.47	8.44	8.24	8.04	7.80	7.80	7.80	7.80		6.91
Autumn Paddy: Well Irrigated	billion VND	23.80	21.64	17.97	13.80	26.88	39.38	38.45	37.52	36.42	36.42	36.42	36.42		32.25
Autumn Paddy: Irregularly Irrigated	billion VND	7.25	6.60	5.48	4.21	9.73	15.00	14.65	14.29	13.88	13.88	13.88	13.88		12.29
Autumn Paddy: Unirrigated	billion VND	12.62	12.12	13.20	12.98	6.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Total Paddy	billion VND	73.47	67.44	59.13	48.26	77.44	105.35	102.86	100.37	97.44	97.44	97.44	97.44		86.27
Rice straw	billion VND	7.35	6.74	5.91	4.83	7.74	10.54	10.29	10.04	9.74	9.74	9.74	9.74		8.63
Maize															
Spring Maize: Unirrigated	billion VND	7.06	7.81	8.06	8.10	3.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Autumn Maize: Unirrigated	billion VND	2.82	3.12	3.22	3.24	1.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Total Maize	billion VND	9.88	10.93	11.29	11.34	5.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Coffee	billion VND	1.13	1.00	0.83	0.66	2.88	6.57	8.68	10.67	10.44	10.44	10.44	10.44		10.19
Potato	billion VND	13.00	12.61	10.72	9.11	8.79	8.47	8.47	8.47	8.47	8.47	8.47	8.47		8.47
Watermelon	billion VND	2.16	2.10	1.78	1.51	3.02	4.54	4.54	4.54	4.54	4.54	4.54	4.54		4.54
Fish	billion VND	0.95	0.92	0.78	0.67	1.40	2.13	2.13	2.13	2.13	2.13	2.13	2.13		2.13
Total With Project Value	billion VND	107.94	101.75	90.44	76.37	106.83	137.59	136.97	136.22	132.76	132.76	132.76	132.76		120.23
Incremental Economic Crop Production Value															
Rice	billion VND	0.00	0.00	(5.93)	(9.76)	25.16	58.42	58.14	57.78	57.07	58.03	58.95	59.85		59.74
Maize	billion VND	0.00	0.00	0.93	1.57	(4.22)	(9.75)	(9.76)	(9.72)	(9.71)	(9.86)	(10.02)	(10.16)		(10.27)
Coffee	billion VND	0.00	0.00	(0.12)	(0.20)	2.06	5.79	7.94	9.97	9.78	9.80	9.82	9.83		9.76
Potato	billion VND	0.00	0.00	(1.51)	(2.75)	(2.72)	(2.69)	(2.36)	(2.03)	(1.72)	(1.41)	(1.11)	(0.83)		1.61
Watermelon	billion VND	(8.64)	(8.38)	(8.38)	(8.34)	(6.54)	(4.74)	(4.46)	(4.19)	(3.93)	(3.67)	(3.43)	(3.19)		(1.16)
Fish	billion VND	0.00	0.00	(0.11)	(0.20)	0.55	1.31	1.33	1.36	1.38	1.40	1.42	1.45		1.62
Total	billion VND	(8.64)	(8.38)	(15.12)	(19.69)	14.31	48.34	50.84	53.17	52.88	54.28	55.63	56.95		61.30
U.S. $ Equivalent	million $	(0.41)	(0.40)	(0.72)	(0.94)	0.68	2.30	2.42	2.53	2.52	2.58	2.65	2.71		2.92

a/ As the area irrigated during construction will be less than normal, there will be a decrease in irrigated crop production during that period.

Table 11: Physical Inputs for Major Crops Without & With the Project: Ea Kao Irrigation Scheme

Viet Nam: Productive Rural Infrastructure Development Project in the Central Highlands

(2013 Constant Viet Nam Dong) Notes: Amounts in VND in this table are in financial terms. In crop models, they are converted into economic terms.

Without Project

		Spring Paddy well irrigated	Spring Paddy not well irrigated	Autumn Paddy well irrigated	Autumn Paddy not well irrigated	Rainfed Paddy	Spring Maize	Autumn Maize	Coffee	Potato	Water-melon	Fish
Inputs												
	amount/ha											
Seed	kg	28	28	28	28	35	28	28		1,100	10	
	'000 VND								3,500			
Fert	'000 VND											
Urea	kg	250	200	250	200	50	220	220	650	332	220	
K	kg	70	70	70	70	60			500			
Super P	kg	300	150	300	150		230	230	700	300	200	
Herbicide/Pesticides	'000 VND	600	450	600	450	400	300	300	1,000	280		
Tractor hire	'000 VND	1,940	1,940	1,940	1,940	1,940	1,200	1,200	1,940	1,940	1,940	
Labor	person-days	120	120	120	120	90	80	80	300	152	140	40
Fingerlings	number											20,000
Processing costs	'000 VND	700	700	700	700	350			1,000			

With Project

		Spring Paddy well irrigated	Spring Paddy not well irrigated	Autumn Paddy well irrigated	Autumn Paddy not well irrigated	Rainfed Paddy	Spring Maize	Autumn Maize	Coffee	Potato	Water-melon	Fish
Inputs												
	amount/ha											
Seed	kg	28	28	28	28	35	28	28		1,100	10	
	'000 VND								3,500			
Fert	'000 VND											
Urea	kg	300	200	300	200	50	220	220	650	332	220	
K	kg	80	70	80	70	60			500			
Super P	kg	320	150	320	150		230	230	700	300	200	
Herbicide/Pesticides	'000 VND	600	450	600	450	400	300	300	1,000	280		
Tractor hire	'000 VND	1,940	1,940	1,940	1,940	1,940	1,200	1,200	1,940	1,940	1,940	
Labor	person-days	120	120	120	120	90	80	80	300	152	140	40
Fingerlings	number											20,000
Processing costs	'000 VND	700	700	700	700	350			1,000			

Table 12: Total Crop Economic Costs With and Without the Project: Ea Kao Irrigation Scheme
Viet Nam: Productive Rural Infrastructure Development Project in the Central Highlands

(2013 Constant Viet Nam Dong)		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	…	2034
sub-project year				1	2	3	4	5	6	7	8	9	10		20
Without Project Total Crop Production Cost															
Rice															
Spring Paddy: Well Irrigated	billion VND	10.75	10.29	9.85	9.48	9.12	8.78	8.45	8.14	7.89	7.66	7.43	7.20		5.13
Spring Paddy: Irregularly Irrigated	billion VND	3.22	3.09	2.96	2.86	2.76	2.66	2.57	2.48	2.40	2.33	2.26	2.19		1.58
Autumn Paddy: Well Irrigated	billion VND	11.94	11.43	10.94	10.53	10.13	9.76	9.39	9.04	8.77	8.51	8.25	8.01		5.70
Autumn Paddy: Irregularly Irrigated	billion VND	3.57	3.43	3.29	3.18	3.06	2.96	2.85	2.75	2.67	2.59	2.51	2.44		1.75
Autumn Paddy: Unirrigated	billion VND	8.54	8.72	8.89	9.08	9.25	9.43	9.59	9.75	9.92	10.08	10.23	10.38		11.61
Total Paddy	billion VND	38.03	36.96	35.95	35.12	34.33	33.58	32.86	32.16	31.65	31.16	30.69	30.22		25.78
Maize															
Spring Maize: Unirrigated	billion VND	7.12	7.18	7.23	7.32	7.41	7.49	7.56	7.63	7.76	7.89	8.01	8.13		8.78
Autumn Maize: Unirrigated	billion VND	2.85	2.87	2.89	2.93	2.96	3.00	3.03	3.05	3.10	3.16	3.20	3.25		3.51
Total Maize	billion VND	9.97	10.05	10.12	10.25	10.37	10.48	10.59	10.69	10.87	11.04	11.21	11.38		12.29
Coffee	billion VND	3.40	3.26	3.13	3.03	2.92	2.83	2.73	2.64	2.56	2.48	2.41	2.34		1.69
Potato	billion VND	11.93	11.41	10.93	10.52	10.13	9.75	9.39	9.05	8.78	8.51	8.26	8.01		5.72
Watermelon	billion VND	1.50	1.44	1.38	1.33	1.28	1.24	1.19	1.15	1.11	1.08	1.05	1.02		0.74
Fish	billion VND	0.20	0.20	0.19	0.19	0.18	0.17	0.17	0.16	0.16	0.15	0.15	0.15		0.11
Total Without Project Value	billion VND	65.03	63.33	61.71	60.43	59.21	58.05	56.93	55.84	55.13	54.44	53.76	53.11		46.32
With Project Total Crop Production Cost[a/]															
Rice															
Spring Paddy: Well Irrigated	billion VND	10.75	10.29	8.63	7.28	15.01	22.32	22.14	21.96	21.96	21.96	21.96	21.96		21.16
Spring Paddy: Irregularly Irrigated	billion VND	3.22	3.09	2.60	2.20	5.25	8.24	8.20	8.16	8.16	8.16	8.16	8.16		7.96
Autumn Paddy: Well Irrigated	billion VND	11.94	11.43	9.59	8.08	17.17	25.55	25.35	25.15	25.15	25.15	25.15	25.15		24.25
Autumn Paddy: Irregularly Irrigated	billion VND	3.57	3.43	2.89	2.44	5.76	9.04	8.99	8.94	8.94	8.94	8.94	8.94		8.73
Autumn Paddy: Unirrigated	billion VND	8.54	8.72	9.70	10.53	5.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Total Paddy	billion VND	38.03	36.96	33.40	30.53	48.44	65.15	64.68	64.21	64.21	64.21	64.21	64.21		62.10
Maize															
Spring Maize: Unirrigated	billion VND	7.12	7.18	7.88	8.49	4.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Autumn Maize: Unirrigated	billion VND	2.85	2.87	3.15	3.40	1.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Total Maize	billion VND	9.97	10.05	11.04	11.89	5.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Coffee	billion VND	3.40	3.26	2.75	2.32	4.85	7.35	7.32	7.29	7.29	7.29	7.29	7.29		7.17
Potato	billion VND	11.93	11.41	9.58	8.08	7.74	7.40	7.35	7.30	7.30	7.30	7.30	7.30		7.06
Watermelon	billion VND	0.30	0.29	0.24	0.21	0.41	0.61	0.60	0.60	0.60	0.60	0.60	0.60		0.58
Fish	billion VND	0.20	0.20	0.17	0.14	0.30	0.45	0.45	0.45	0.45	0.45	0.45	0.45		0.45
Total With Project Value	billion VND	63.83	62.17	57.17	53.17	67.62	80.97	80.41	79.85	79.85	79.85	79.85	79.85		77.36
Incremental Economic Crop Production Costs															
Rice	billion VND	0.00	0.00	(2.55)	(4.59)	14.11	31.57	31.82	32.05	32.56	33.05	33.52	33.99		36.32
Maize	billion VND	0.00	0.00	0.91	1.64	(4.48)	(10.48)	(10.59)	(10.69)	(10.87)	(11.04)	(11.21)	(11.38)		(12.29)
Coffee	billion VND	0.00	0.00	(0.39)	(0.70)	1.92	4.52	4.59	4.66	4.74	4.81	4.89	4.96		5.47
Potato	billion VND	0.00	0.00	(1.35)	(2.44)	(2.39)	(2.35)	(2.04)	(1.75)	(1.48)	(1.22)	(0.96)	(0.71)		1.35
Watermelon	billion VND	(1.20)	(1.15)	(1.14)	(1.13)	(0.88)	(0.63)	(0.59)	(0.55)	(0.52)	(0.48)	(0.45)	(0.42)		(0.16)
Fish	billion VND	0.00	0.00	(0.02)	(0.04)	0.12	0.28	0.28	0.29	0.29	0.30	0.30	0.31		0.35
Total	billion VND	**(1.20)**	**(1.15)**	**(4.54)**	**(7.26)**	**8.41**	**22.91**	**23.48**	**24.01**	**24.72**	**25.42**	**26.09**	**26.74**		**31.04**
U.S. dollar equivalent	million $	(0.06)	(0.05)	(0.22)	(0.35)	0.40	1.09	1.12	1.14	1.18	1.21	1.24	1.27		1.48

a/ As the area irrigated during construction will be less than normal, there will be a decrease in irrigated crop production during that period.

Table 13: Incremental Crop Labor: Ea Kao Irrigation Scheme

Viet Nam: Productive Rural Infrastructure Development Project in the Central Highlands

(2013 Constant Viet Nam Dong)		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	…	2034
sub-project year				1	2	3	4	5	6	7	8	9	10		20
Without Project Crop Labor Days															
Spring Paddy: Well Irrigated	person days	75,600	73,332	71,132	68,998	66,928	64,920	62,973	61,084	59,251	57,473	55,749	54,077		39,878
Spring Paddy: Irregularly Irrigated	person days	25,920	25,142	24,388	23,656	22,947	22,258	21,591	20,943	20,315	19,705	19,114	18,541		13,672
Autumn Paddy: Well Irrigated	person days	84,000	81,480	79,036	76,665	74,365	72,134	69,970	67,871	65,834	63,859	61,944	60,085		44,308
Autumn Paddy: Irregularly Irrigated	person days	28,800	27,936	27,098	26,285	25,496	24,732	23,990	23,270	22,572	21,895	21,238	20,601		15,191
Autumn Paddy: Unirrigated	person days	83,520	85,550	87,520	89,430	91,283	93,081	94,824	96,516	98,156	99,748	101,291	102,788		115,500
Spring Maize Unirrigated	person days	46,400	47,528	48,622	49,683	50,713	51,712	52,680	53,620	54,531	55,415	56,273	57,105		64,167
Autumn Maize Unirrigated	person days	18,560	19,011	19,449	19,873	20,285	20,685	21,072	21,448	21,812	22,166	22,509	22,842		25,667
Coffee	person days	28,200	27,354	26,533	25,737	24,965	24,216	23,490	22,785	22,102	21,439	20,795	20,171		14,875
Potato	person days	88,160	85,515	82,950	80,461	78,047	75,706	73,435	71,232	69,095	67,022	65,011	63,061		46,503
Watermelon	person days	14,000	13,580	13,173	12,777	12,394	12,022	11,662	11,312	10,972	10,643	10,324	10,014		7,385
Fish	person days	564	547	531	515	499	484	470	456	442	429	416	403		297
Total Without Project Labor	person days	493,724	486,976	480,431	474,082	467,924	461,950	456,155	450,535	445,083	439,794	434,664	429,688		387,443
With Project Crop Labor Days															
Spring Paddy: Well Irrigated	person days	75,600	73,332	62,332	52,982	105,871	158,760	158,760	158,760	158,760	158,760	158,760	158,760		158,760
Spring Paddy: Irregularly Irrigated	person days	25,920	25,142	21,371	18,165	43,103	68,040	68,040	68,040	68,040	68,040	68,040	68,040		68,040
Autumn Paddy: Well Irrigated	person days	84,000	81,480	69,258	58,869	117,635	176,400	176,400	176,400	176,400	176,400	176,400	176,400		176,400
Autumn Paddy: Irregularly Irrigated	person days	28,800	27,936	23,746	20,184	47,892	75,600	75,600	75,600	75,600	75,600	75,600	75,600		75,600
Autumn Paddy: Unirrigated	person days	83,520	85,550	95,398	103,768	51,884	0	0	0	0	0	0	0		0
Spring Maize Unirrigated	person days	46,400	47,528	52,999	57,649	28,824	0	0	0	0	0	0	0		0
Autumn Maize Unirrigated	person days	18,560	19,011	21,200	23,060	11,530	0	0	0	0	0	0	0		0
Coffee	person days	28,200	27,354	23,251	19,763	41,382	63,000	63,000	63,000	63,000	63,000	63,000	63,000		63,000
Potato	person days	88,160	85,515	72,688	61,785	59,620	57,456	57,456	57,456	57,456	57,456	57,456	57,456		57,456
Watermelon	person days	2,800	2,716	2,309	1,962	3,921	5,880	5,880	5,880	5,880	5,880	5,880	5,880		5,880
Fish	person days	564	547	465	395	828	1,260	1,260	1,260	1,260	1,260	1,260	1,260		1,260
Total With Project Labor	person days	482,524	476,112	445,015	418,583	512,490	606,396	606,396	606,396	606,396	606,396	606,396	606,396		606,396
Incremental Crop Labor Days															
Spring Paddy: Well Irrigated	person days	0	0	(8,800)	(16,016)	38,943	93,840	95,787	97,676	99,509	101,287	103,011	104,683		118,882
Spring Paddy: Irregularly Irrigated	person days	0	0	(3,017)	(5,491)	20,156	45,782	46,449	47,097	47,725	48,335	48,926	49,499		54,368
Autumn Paddy: Well Irrigated	person days	0	0	(9,778)	(17,795)	43,270	104,266	106,430	108,529	110,566	112,541	114,456	116,315		132,092
Autumn Paddy: Irregularly Irrigated	person days	0	0	(3,352)	(6,101)	22,395	50,868	51,610	52,330	53,028	53,705	54,362	54,999		60,409
Autumn Paddy: Unirrigated	person days	0	0	7,878	14,338	(39,399)	(93,081)	(94,824)	(96,516)	(98,156)	(99,748)	(101,291)	(102,788)		(115,500)
Spring Maize Unirrigated	person days	0	0	4,377	7,965	(21,889)	(51,712)	(52,680)	(53,620)	(54,531)	(55,415)	(56,273)	(57,105)		(64,167)
Autumn Maize Unirrigated	person days	0	0	1,751	3,186	(8,755)	(20,685)	(21,072)	(21,448)	(21,812)	(22,166)	(22,509)	(22,842)		(25,667)
Coffee	person days	0	0	(3,282)	(5,974)	16,416	38,784	39,510	40,215	40,898	41,561	42,205	42,829		48,125
Potato	person days	0	0	(10,262)	(18,677)	(18,427)	(18,250)	(15,979)	(13,776)	(11,639)	(9,566)	(7,555)	(5,605)		10,953
Watermelon	person days	(11,200)	(10,864)	(10,864)	(10,815)	(8,473)	(6,142)	(5,782)	(5,432)	(5,092)	(4,763)	(4,444)	(4,134)		(1,505)
Fish	person days	0	0	(66)	(119)	328	776	790	804	818	831	844	857		963
Total Incremental Crop Labor	person days	(11,200)	(10,864)	(35,416)	(55,499)	44,566	144,446	150,241	155,861	161,313	166,602	171,732	176,708		218,953
Incremental days/hh[a/]	person days	(7)	(7)	(22)	(35)	28	90	94	98	101	104	108	111		137
Incremental value of labor inputs/hh	million VND	(0.5)	(0.5)	(1.7)	(2.6)	2.1	6.8	7.1	7.3	7.6	7.8	8.1	8.3		10.3
Incremental Labor Income[b/]	billion VND	(0.84)	(0.81)	(2.66)	(4.16)	3.34	10.83	11.27	11.69	12.10	12.50	12.88	13.25		16.42

a/ Some of the incremental days will be from family labor (to the extent that it is underemployed Without the Project) and the remainder will be in the form of hired labor.

b/ Labor income is at the average financial wage. Some of this will go to hired labor. The rest will go as a "wage" to family labor inputs --- increasing household income to the extent that that family labor would have been underutilized without the Project.

Table 14: Net Incremental Economic Crop Benefits: Ea Kao Irrigation Scheme

Viet Nam: Productive Rural Infrastructure Development Project in the Central Highlands

(2013 Constant Viet Nam Dong)		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	…	2034
sub-project year				1	2	3	4	5	6	7	8	9	10		20
Without Proj. Net Econ Crop Benefit	billion VND	51.55	46.80	43.86	35.63	33.31	31.20	29.20	27.21	24.75	24.05	23.36	22.70		12.61
With Project Net Econ Crop Benefit	billion VND	44.11	39.57	33.27	23.20	39.20	56.62	56.55	56.36	52.91	52.91	52.91	52.91		42.86
Incremental Value of Production	billion VND	(8.64)	(8.38)	(15.12)	(19.69)	14.31	48.34	50.84	53.17	52.88	54.28	55.63	56.95		61.30
Incremental Crop Cost	billion VND	(1.20)	(1.15)	(4.54)	(7.26)	8.41	22.91	23.48	24.01	24.72	25.42	26.09	26.74		31.04
Net Incremental Crop Benefit	billion VND	**(7.44)**	**(7.23)**	**(10.59)**	**(12.43)**	**5.90**	**25.43**	**27.36**	**29.16**	**28.16**	**28.86**	**29.54**	**30.21**		**30.26**
Incremental Average Crop Benefit per Household[a/]															
Number of households involved in examined crops (field estimates	1,597														
Economic benefits/hh	million VND	(4.66)	(4.53)	(6.63)	(7.78)	3.69	15.92	17.13	18.26	17.63	18.07	18.50	18.92		18.95
Financial benefits/hh	million VND	(5.18)	(5.03)	(7.37)	(8.65)	4.10	17.69	19.04	20.29	19.59	20.08	20.56	21.02		21.05
U.S. $ equivalent/hh	$	(246.50)	(239.50)	(350.77)	(411.88)	195.36	842.36	906.45	966.00	932.83	956.19	978.85	1,000.83		1,002.43
Incremental Average Crop Benefits per Person[a/]															
Ave. number of persons/hh	4.5														
Economic benefits/person	million VND	(1.04)	(1.01)	(1.47)	(1.73)	0.82	3.54	3.81	4.06	3.92	4.02	4.11	4.20		4.21
Financial benefits/person	million VND	(1.15)	(1.12)	(1.64)	(1.92)	0.91	3.93	4.23	4.51	4.35	4.46	4.57	4.67		4.68
U.S.$ equivalent/person	$	(54.78)	(53.22)	(77.95)	(91.53)	43.41	187.19	201.43	214.67	207.30	212.49	217.52	222.41		222.76
Incremental Ave. Financial Crop Benefits for Poor Households --- assumed to be located in "without" subproject unirrigated area															
Ave. farm size per household (ha)	1.31														
Unirrigated ha 'without' net cr. ben.	billion VND	5.40	5.63	4.79	2.87	2.51	2.15	1.83	1.45	0.93	0.95	0.96	0.98		(1.11)
Same ha 'with' net crop benefit	billion VND	5.40	5.63	4.79	2.87	3.62	15.60	16.79	17.90	17.28	17.71	18.13	18.54		18.57
Same ha incremental cr. Ben	billion VND	0.00	0.00	0.00	0.00	1.11	13.45	14.96	16.45	16.35	16.77	17.17	17.56		19.68
This figure per ha	million VND	0.00	0.00	0.00	0.00	0.96	11.59	12.90	14.18	14.09	14.45	14.80	15.14		16.97
This figure per average household	million VND	0.00	0.00	0.00	0.00	1.26	15.25	16.96	18.65	18.53	19.01	19.47	19.91		22.31
% poor households among those involved in examined crops	40%														
No. of poor households among those involved in examined crops	638.8														
Assumed poor hh farm size (ha)	0.66														
Incremental bennefit per poor household	million VND	0.00	0.00	0.00	0.00	0.63	7.62	8.48	9.32	9.27	9.50	9.73	9.96		11.16
Total incremental benefit of the poor	billion VND	0.00	0.00	0.00	0.00	0.40	4.87	5.42	5.96	5.92	6.07	6.22	6.36		7.13
Share of poor of total incremental benefits	%			0%	0%	7%	19%	20%	20%	21%	21%	21%	21%		24%
Incremental farm labor "income" of poor on own land															
Unirrig. ha "without" labor inputs	person-days	148,480	152,090	155,591	158,987	162,282	165,477	168,577	171,584	174,500	177,329	180,073	182,735		205,334
Same ha "with" labor inputs	person-days	148,480	152,090	155,591	158,987	283,089.5	334,962	334,962	334,962	334,962	334,962	334,962	334,962		334,962
Same ha incremental labor inputs	person-days	0.00	0	0	0	120,808	169,484	166,385	163,378	160,462	157,633	154,888	152,227		129,628
This figure per ha	person-days	0.00	0.00	0.00	0.00	104.14	146.11	143.44	140.84	138.33	135.89	133.52	131.23		111.75
This figure per poor hh	person-days	0.00	0.00	0.00	0.00	68.47	96.06	94.31	92.60	90.95	89.35	87.79	86.28		73.47
Equivalent financial wage/poor hh	million VND	0.00	0.00	0.00	0.00	5.14	7.20	7.07	6.95	6.82	6.70	6.58	6.47		5.51

a/ Note that household land that gets poor or no irrigation water without the Project will generate benefits larger than these average figures while household land already receiving reliable irrigation water without the Project will generate a smaller increment in income.

Table 15: Economic Project Costs: Ea Kao Irrigation Scheme
Viet Nam: Productive Rural Infrastructure Development Project in the Central Highlands

(2013 Constant Viet Nam Dong)

Subproject Investment Cost Estimates

Financial Costs

		US$	million VND
Material Costs		2,300,000	48,300
Labor Costs		1,000,000	21,000
Land Acquisition and Resettlement (LAR) Costs		0	0
Sub-Total		3,300,000	69,300
Contingencies	10%	330,000	6,930
Detailed Design and Construction Supervision	11%	399,300	8,385
Value-added Taxes	10%	402,930	8,462
Total Financial Construction Cost		4,432,230	93,077

Economic Costs[a/]

	US$	million VND
Material Costs	2,070,000	43,470
Labor Costs	800,000	16,800
Land Acquisition and Resettlement (LAR) Costs	0	0
Sub-Total	2,870,000	60,270
Contingencies	287,000	6,027
Detailed Design and Construction Supervision	347,270	7,293
Value-added Taxes	0	0
Total Economic Construction Cost	3,504,270	73,590

Table 16: Economic Rate of Return: Ea Kao Irrigation Scheme

Unit: VND billion in 2013 Constant Prices

Year	Subproject Year	Economic Costs				Economic Benefits	Net Economic Cash Flow
		Construction Cost	O&M Cost	Periodic Major Maintenance	Total Cost		
2013							
2014							
2015	1	36.79			36.79	(10.59)	(47.38)
2016	2	36.79			36.79	(12.43)	(49.23)
2017	3		2.21		2.21	5.90	3.69
2018	4		2.21		2.21	25.43	23.22
2019	5		2.21		2.21	27.36	25.15
2020	6		2.21		2.21	29.16	26.95
2021	7		2.21		2.21	28.16	25.95
2022	8		2.21		2.21	28.86	26.65
2023	9		2.21		2.21	29.54	27.34
2024	10		-	22.08	22.08	30.21	8.13
2025	11		2.21		2.21	33.45	31.25
2026	12		2.21		2.21	25.61	23.40
2027	13		2.21		2.21	26.15	23.94
2028	14		2.21		2.21	26.68	24.47
2029	15		2.21		2.21	27.19	24.98
2030	16		2.21		2.21	27.68	25.48
2031	17		2.21		2.21	28.17	25.96
2032	18		-	22.08	22.08	28.63	6.56
2033	19		2.21		2.21	29.09	26.88
2034	20		2.21		2.21	30.26	28.05
				ENPV	**83.9**	**127.5**	**43.6**
						EIRR	**18.9%**

Table 17: Sensitivity Analysis: Ea Kao Irrigation Scheme

Viet Nam: Productive Rural Infrastructure Development Project in the Central Highlands

Sub-project Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	…	2033	2034
	1	2	3	4	5	6	7	8	9	10	11	12	…	19	20
B E N E F I T S	(10.59)	(12.43)	5.90	25.43	27.36	29.16	28.16	28.86	29.54	30.21	33.45	25.61		29.09	30.26
Incremental benefits from production (billion VND)	(10.59)	(12.43)	5.90	25.43	27.36	29.16	28.16	28.86	29.54	30.21	33.45	25.61		29.09	30.26
B A S E C A S E A N A L Y S I S															
Total costs	36.79	36.79	2.21	2.21	2.21	2.21	2.21	2.21	2.21	22.08	2.21	2.21		2.21	2.21
Capital costs (billion VND)	36.79	36.79	-	-	-	-	-	-	-	-	-	-		-	-
Maintenance Costs - Routine(billion VND)	-	-	2.21	2.21	2.21	2.21	2.21	2.21	2.21	-	2.21	2.21		2.21	2.21
Maintenance Costs - Periodic (billion VND)	-	-	-	-	-	-	-	-	-	22.08	-	-		-	-
Maintemance Costs (billion VND)	-	-	2.21	2.21	2.21	2.21	2.21	2.21	2.21	22.08	2.21	2.21		2.21	2.21
Benefits (billion VND)	(10.59)	(12.43)	5.90	25.43	27.36	29.16	28.16	28.86	29.54	30.21	33.45	25.61		29.09	30.26
Net cash flow (billion VND)	(47.38)	(49.23)	3.69	23.22	25.15	26.95	25.95	26.65	27.34	8.13	31.25	23.40		26.88	28.05
S E N S I T I V I T Y A N A L Y S I S															
Case 1 - Capital costs increase by 10%															
Total costs	40.47	40.47	2.21	2.21	2.21	2.21	2.21	2.21	2.21	22.08	2.21	2.21		2.21	2.21
Capital costs	40.47	40.47	-	-	-	-	-	-	-	-	-	-		-	-
Maintenance Costs	-	-	2.21	2.21	2.21	2.21	2.21	2.21	2.21	22.08	2.21	2.21		2.21	2.21
Benefits	(10.59)	(12.43)	5.90	25.43	27.36	29.16	28.16	28.86	29.54	30.21	33.45	25.61		29.09	30.26
Net cash flow	(51.06)	(52.91)	3.69	23.22	25.15	26.95	25.95	26.65	27.34	8.13	31.25	23.40		26.88	28.05
Case 2 - Maintenance costs increase by 10%															
Total costs	36.79	36.79	2.43	2.43	2.43	2.43	2.43	2.43	2.43	24.28	2.43	2.43		2.43	2.43
Capital costs	36.79	36.79	-	-	-	-	-	-	-	-	-	-		-	-
Maintenance Costs	-	-	2.43	2.43	2.43	2.43	2.43	2.43	2.43	24.28	2.43	2.43		2.43	2.43
Benefits	(10.59)	(12.43)	5.90	25.43	27.36	29.16	28.16	28.86	29.54	30.21	33.45	25.61		29.09	30.26
Net cash flow	(47.38)	(49.23)	3.47	23.00	24.93	26.73	25.73	26.43	27.12	5.92	31.02	23.18		26.66	27.83
Case 3 - Benefits decrease by 10%															
Total costs	36.79	36.79	2.21	2.21	2.21	2.21	2.21	2.21	2.21	22.08	2.21	2.21		2.21	2.21
Capital costs	36.79	36.79	-	-	-	-	-	-	-	-	-	-		-	-
Maintenance Costs	-	-	2.21	2.21	2.21	2.21	2.21	2.21	2.21	22.08	2.21	2.21		2.21	2.21
Benefits	(9.53)	(11.19)	5.31	22.88	24.62	26.24	25.34	25.97	26.59	27.19	30.11	23.04		26.18	27.23
Net cash flow	(46.32)	(47.98)	3.10	20.68	22.42	24.03	23.13	23.77	24.38	5.11	27.90	20.84		23.97	25.02
Case 4 - Benefits decrease by 20%															
Total costs	36.79	36.79	2.21	2.21	2.21	2.21	2.21	2.21	2.21	22.08	2.21	2.21		2.21	2.21
Capital costs	36.79	36.79	-	-	-	-	-	-	-	-	-	-		-	-
Maintenance Costs	-	-	2.21	2.21	2.21	2.21	2.21	2.21	2.21	22.08	2.21	2.21		2.21	2.21
Benefits	(8.47)	(9.95)	4.72	20.34	21.89	23.33	22.52	23.09	23.64	24.17	26.76	20.48		23.27	24.21
Net cash flow	(45.26)	(46.74)	2.51	18.13	19.68	21.12	20.32	20.88	21.43	2.09	24.55	18.28		21.06	22.00
Case 5 - Benefits decrease by 30%															
Total costs	36.79	36.79	2.21	2.21	2.21	2.21	2.21	2.21	2.21	22.08	2.21	2.21		2.21	2.21
Capital costs	36.79	36.79	-	-	-	-	-	-	-	-	-	-		-	-
Maintenance Costs	-	-	2.21	2.21	2.21	2.21	2.21	2.21	2.21	22.08	2.21	2.21		2.21	2.21
Benefits	(7.41)	(8.70)	4.13	17.80	19.15	20.41	19.71	20.20	20.68	21.15	23.42	17.92		20.36	21.18
Net cash flow	(44.21)	(45.50)	1.92	15.59	16.94	18.20	17.50	18.00	18.47	(0.93)	21.21	15.72		18.15	18.97
Case 6 - Benefits delay 2 years															
Total costs	36.79	36.79	2.21	2.21	2.21	2.21	2.21	2.21	2.21	22.08	2.21	2.21		2.21	2.21
Capital costs	36.79	36.79	-	-	-	-	-	-	-	-	-	-		-	-
Maintenance Costs	-	-	2.21	2.21	2.21	2.21	2.21	2.21	2.21	22.08	2.21	2.21		2.21	2.21
Benefits	-	-	(10.59)	(12.43)	5.90	25.43	27.36	29.16	28.16	28.86	29.54	30.21		28.17	28.63
Net cash flow	(36.79)	(36.79)	(12.80)	(14.64)	3.69	23.22	25.15	26.95	25.95	6.78	27.34	28.00		25.96	26.42
Case 7 - Subproject life is 5 years shorter															
Total costs	36.79	36.79	2.21	2.21	2.21	2.21	2.21	2.21	2.21	22.08	2.21	2.21		-	-
Capital costs	36.79	36.79	-	-	-	-	-	-	-	-	-	-		-	-
Maintenance Costs	-	-	2.21	2.21	2.21	2.21	2.21	2.21	2.21	22.08	2.21	2.21		-	-
Benefits	(10.59)	(12.43)	5.90	25.43	27.36	29.16	28.16	28.86	29.54	30.21	33.45	25.61		-	-
Net cash flow	(47.38)	(49.23)	3.69	23.22	25.15	26.95	25.95	26.65	27.34	8.13	31.25	23.40		-	-
Case 8 - Subproject life is 7 years shorter															
Total costs	36.79	36.79	2.21	2.21	2.21	2.21	2.21	2.21	2.21	22.08	2.21	2.21		-	-
Capital costs	36.79	36.79	-	-	-	-	-	-	-	-	-	-		-	-
Maintenance Costs	-	-	2.21	2.21	2.21	2.21	2.21	2.21	2.21	22.08	2.21	2.21		-	-
Benefits	(10.59)	(12.43)	5.90	25.43	27.36	29.16	28.16	28.86	29.54	30.21	33.45	25.61		-	-
Net cash flow	(47.38)	(49.23)	3.69	23.22	25.15	26.95	25.95	26.65	27.34	8.13	31.25	23.40		-	-

SUMMARY FOR SENSITIVITY ANALYSIS

	ENPV (Bil. VND)	BCR	EIRR	SI (ENPV)	SV(ENPV)
Base case	**43.6**	**1.52**	**18.9%**		
1. Capital Costs + 10%	37.4	1.41	17.6%	1.4	70.1%
2. O&M costs + 10%	41.4	1.48	18.6%	0.5	200.5%
3. Benefits decrease - 10%	30.8	1.37	17.2%	2.9	34.2%
4. Benefits decrease - 20%	18.1	1.22	15.2%	2.9	34.2%
5. Benefits decrease - 30%	5.3	1.06	13.0%	2.9	34.2%
6. Benefits delay - 2 years	12.5	1.15	13.9%	2.9	ENPV = 71.2% lower
7. Subproject life is 5 years shorter	28.8	1.36	17.5%	2.3	ENPV = 34.0% lower
8. Subproject life is 7 years shorter	19.2	1.24	16.2%	2.4	ENPV = 55.9% lower

9 years