ECONOMIC AND FINANCIAL ANALYSIS OF KON TRANG KLA AND DAK TRIT SUBPROJECT, KON TUM PROVINCE

A. Introduction

1. The proposed subproject will upgrade irrigation system and rehabilitation of access road in Kon Trang Kla and Dak Trit, Kon Tum Province. The subproject will construct/upgrade irrigation canal system since many sections of the system have seriously deteriorated. Branch canals are in earth and prone to collapse and leakage. Some canal sections were damaged during Typhoon Ketsana in September 2009. The civil works will include: (i) Kon Trang Kla irrigation scheme lining (reinforced concrete) of earth primary canal; (ii) Da Pen Intake lining (reinforced concrete) of earth irrigation canal; (iii) Hamlet 1A intake lining of earth irrigation and drainage canals together with associated structures on each section. The rehabilitated system is expected to serve a full command area of 980 ha of land in the core and surrounding areas, primarily for paddy but also involving some other crops. The subproject will also rehabilitate one primary road and 11 branch roads with a total length of 14.8 km in and around the command area to link the production zones and the main road system.

B. Methodology

2. In this economic and financial analysis all benefits and costs of the irrigation and access road subproject are examined in order to assess its viability 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 associated to irrigation and access road are calculated for two alternative situations: “with” the subproject and “without” the subproject.

3. For the irrigation part, the same 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 subproject (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. It is also assumed that the rehabilitation of access road will contribute to the realization of the producer’s surplus reflected in the incremental value of production.

4. For the access road, in the “without” subproject scenario road travel will continue to be as difficult as it now is. The intent is to identify the incremental value of travel cost savings and of induced local production allowed by the subproject (over its expected useful life) and compare this value to the incremental cost of implementing the subproject and of operating and maintaining the rehabilitated infrastructure over time.

5. To develop a model for the analysis, certain 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 farm households 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 U.S. 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 subproject'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 Kon Trang Kla and Dak Trit Irrigation-Road Subproject – Kon Tum Province

Sub-project Area:		
Irrigated command area "with" subproject	ha	890.0
2013 irrigated area ("without" subproject)	ha	360.0
Incremental Subproject Output		
Expected Incremental Production (year 10 of subproject)		
Rice	t	4,990.4
Maize	t	(1,319.6)
Coffee	t	927.5
Potato	t	379.7
Watermelon	t	25.3
Fish	t	47.4
Expected Total Incremental Net Crop Economic Value (year 10)	billion VND	17.7
Expected Total Incremental Net VOC Saving Economic Value (year 10)	billion VND	13.1
Household		
Estimated Number of Benefited Households	Number	900.0
Expected Incremental Production per Household (year 10)		
Rice	kg	5,544.9
Maize	kg	(1,466.3)
Coffee	kg	1,030.6
Potato	kg	421.9
Watermelon	kg	28.1
Fish	kg	52.7
Expected Incrmental Net Crop Financial Value per Household (year 10)	million VND	21.9
The Poor		
Estimated Number of Poor Beneficiary Households	Number	318.0
Total Incremental Net Crop Financial Value of the Poor	billion VND	3.4
Share of the Poor in Incremental Net Crop Financial Value	%	18.9%
Incremental Net Crop Financial Value per Poor Household (year 10)	million VND	10.6
Subproject Financial Costs:		
Irrigation Component	billion VND	38.2
Access Road Component	billion VND	47.9
Total Subproject Costs	billion VND	86.1
Economic Returns:		
ENPV (base case)	billion VND	51.5
EIRR (base case)	%	20.2%
EIRR (sensitive cases)		
1. Capital Costs + 10%	%	18.4%
2. O&M Costs + 10%	%	19.8%
3. Benefits decrease - 10%	%	17.8%
4. Benefits decrease - 20%	%	15.2%
5. Benefits decrease - 30%	%	12.4%
6. Benefits delay - 2 years	%	13.6%
7. Subproject life is 5 years shorter	%	18.8%
8. Subproject life is 7 years shorter	%	17.3%

10. At the end of the text of this analysis are Annex Tables 1-19 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. **Table 5** presents the derivation of vehicle operating costs for various types of vehicles and **Table 6** shows the vehicle operating cost savings “with”

versus “without” the rehabilitation of the access road. Command area land use “with” and “without” the subproject over the life of the subproject appears in **Table 7** while **Table 8** shows crop patterns in both scenarios. Crop yields used in the analysis are displayed in **Table 9** and total crop production in **Table 10**. Incremental crop production due to the project is in **Table 11** and the total crop economic value “with” and “without” the project (and the resulting increment) is shown in **Table 12**. **Table 13** 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 14**. Incremental farm labor due to the Project is figured in **Table 15**. Net incremental crop benefits are in **Table 16**. Subproject cost in economic terms appears in **Table 17**. The economic internal rate of return (EIRR) is presented in **Table 18** and sensitivity analysis is in **Table 19**.

C. Subproject Benefits

11. Two major benefits have been identified for the subproject. For the combined road and irrigation, a potential producer surplus from anticipated increased crop production made possible by the improved road and irrigation system rehabilitation. For the road there is an anticipated reduction in vehicle operating costs (VOC) due to road improvements.

1. Rehabilitation of the Irrigation System

12. At the time of this analysis the Kon Trang Kla irrigation system is irrigating about 360 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 360 ha getting some sort of irrigation service is far smaller than the area serviced at the time the scheme was originally constructed (around 25 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 890 ha (after a dip during the two years of construction scheduled for 2015 and 2016).

13. 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 7, 8, and 9.

14. 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 4,990 tons per year. Incremental production in other crops include: coffee 927 tons, potatoes 379 tons, watermelon 25 tons per year, and fish (from fish ponds) by about 47 tons. Maize (which will be displaced by paddy and other crops) will decrease by 1,300 tons. The increase in production due to the subproject will be worth 31.7 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 13.9 billion VND within the command area - producing a net economic increase in crop income of 17.7 billion VND (see Annex Table 16).

2. Rehabilitation of the Access Road

15. Representative vehicle operating costs (VOC) have been estimated for several types of vehicles likely to use the proposed access road. These include motorcycles, cars, buses, four wheel drive trucks, agricultural tractors and bicycles. Operating costs include fuel, oil, lubricants, coolants, repairs and maintenance based on expected levels of utilization while annual overhead costs include insurance and depreciation. The difference between the "with" and "without" subproject scenarios relates to the significantly higher repairs and maintenance costs associated with the deteriorated road surfaces "without" the subproject compared to these costs "with" the subproject (see Table B).

Table B: VOC Incremental Savings

	Vehicle Operating Costs				
	Capital Cost	Assumed Annual Utilization	Without Project	With Project	Incremental Savings
	VND million	Kms	VND/km	VND/km	VND/km
Motor Cycle (100 ccs)	9.6	15,000	1,237	742	495
Tractor (1,000-1,500cc) - diesel	92.0	1,500	14,864	11,891	2,973
Car (1,000-2,300cc) - petrol	260.0	10,000	7,885	3,943	3,943
Bus (1500-2000cc) - diesel	160.0	15,000	4,668	2,801	1,867
Trucks (1,500-2,500cc) - four-wheel diesel	260.0	20,000	6,248	3,749	2,499
Trucks (2,000-3,500cc) - six-wheel diesel	400.0	25,000	6,035	4,224	1,810
Bicycles	0.8	750	273	218	55

16. The access road, in its present condition, gets very little through traffic (due to the difficult section) and a limited amount of local traffic or traffic out to main roads. Rough estimates have been made of this traffic as well as of the anticipated increase in traffic within the road service area in the "with" subproject scenario. A weighted average of vehicle operating cost savings of the various types of vehicles has been developed for both the "without" subproject traffic distribution and the "with" subproject traffic distribution (see Table C).

Table C: Weighted Average of VOC by Types of Vehicles

	Without Rehabilitation				Projected With Rehabilitation				Projected Diverted Traffic		
Traffic Types	Traffic	Percent	VOC	Weighted Average[a] VOC saving	Traffic Count	Percent	VOC	Weighted Average[a] VOC saving	Traffic	Percent	Weighted Average[b] VOC saving
	veh/day		VND	VND	veh/day		VND	VND	veh/day		VND
Motorized											
Motorcycle	50	15.5%	1,237	77	310	30.5%	742	151	560	82.4%	611
Tractors	20	6.2%	14,864	185	40	3.9%	11,891	117	0	0.0%	0
Motor Car	5	1.6%	7,885	61	20	2.0%	3,943	78	90	13.2%	522
Buses	0	0.0%	4,668	0	5	0.5%	2,801	9	0	0.0%	0
Truck - 4 wheel	17	5.3%	6,248	132	40	3.9%	3,749	98	30	4.4%	165
Truck - 6 wheel	0	0.0%	6,035	0	210	20.7%	4,224	375	0	0.0%	0
Non Motorized											
Bicycle	230	71.4%	273	39	390	38.4%	218	21	0	0.0%	0
Total	322	100.0%		494	1015	100.0%		849	680	100%	1,298

a/ The weighted average is the difference in VOC (Without minus With the project) times the percent of the traffic count for each vehicle type.
b/ For projected diverted traffic the weighted average VOC is based on With Rehabilitation VOC figures.

17. The level of utilization of the access road in Table C was based on locally collected data and data from past and ongoing rural access roads in the corresponding province and district. Since the geo-demographics are quite similar in all five Project provinces, this level of utilization is intended to serve as a guide for analysis of the remaining 26 proposed subprojects. However, economic re-evaluation should be done during the mid-term review (in 2016, a year after the subproject is completed) to validate actual rural road utilization.

18. After the completion of subproject construction the weighted average cost saving of "without" subproject traffic is applied in the analysis to the "without" subproject traffic estimate. Within a short time, however, it is expected that the "with" subproject traffic expectations will be reached, after which the "with" subproject weighted average of vehicle operation cost savings is applied to the "with" subproject traffic. Traffic benefits calculated on a km basis are applied to the full length of the road from year 4 of the subproject. Traffic is assumed to grow at a rate of 4%[1] a year after that time, reflected in a similar growth in value of the economic annual VOC savings. Taking year 10 of subproject life as an example, the economic VOC saving for local area traffic are expected to be 5.9 billion VND. Diverted traffic from the district road will save 17 km en route to the main road compared to its present longer route. This traffic (which also will be expected to grow at 4% a year) will save its full VOC per km on this 17 km. Using the year 10 example, diverted traffic economic annual VOC savings are expected to be 7.2 billion VND (Table D). The aggregate VOC savings are expected to be 13.1 billion VND for this snapshot year.

Table D: Economic Annual VOC Savings with the Access Road Rehabilitation

	Year	Road Km	Projected Road Area Traffic	Economic VOC Savings/km	Economic Annual VOC Savings	Diverted Traffic km Saved	Projected Diverted Traffic	Economic VOC Savings/km	Economic Annual VOC Savings	Economic Total Annual VOC Savings
			4%	VND /km	mill VND/yr	km	veh/day	VND /km	mill VND/yr	mill VND/yr
1	2015	9.9	802	0	0	0	0	0	0	0
2	2016	14.8	869	494	2,317	17	680	1,298	5,478	7,795
3	2017	14.8	869	671	3,152	17	680	1,298	5,478	8,630
4	2018	14.8	1,015	849	4,656	17	707	1,298	5,697	10,353
5	2019	14.8	1,056	849	4,842	17	735	1,298	5,925	10,767
6	2020	14.8	1,098	849	5,036	17	765	1,298	6,162	11,198
7	2021	14.8	1,142	849	5,237	17	796	1,298	6,408	11,646
8	2022	14.8	1,187	849	5,447	17	827	1,298	6,665	12,111
9	2023	14.8	1,235	849	5,665	17	860	1,298	6,931	12,596
10	2024	14.8	1,284	849	5,891	17	895	1,298	7,209	13,100
11	2025	14.8	1,336	849	6,127	17	931	1,298	7,497	13,624
12	2026	14.8	1,389	849	6,372	17	968	1,298	7,797	14,169
13	2027	14.8	1,445	849	6,627	17	1,007	1,298	8,109	14,735
14	2028	14.8	1,502	849	6,892	17	1,047	1,298	8,433	15,325
15	2029	14.8	1,563	849	7,167	17	1,089	1,298	8,770	15,938
16	2030	14.8	1,625	849	7,454	17	1,132	1,298	9,121	16,575
17	2031	14.8	1,690	849	7,752	17	1,178	1,298	9,486	17,238
18	2032	14.8	1,758	849	8,062	17	1,225	1,298	9,865	17,928
19	2033	14.8	1,828	849	8,385	17	1,274	1,298	10,260	18,645
20	2034	14.8	1,901	849	8,720	17	1,325	1,298	10,670	19,391

D. Subproject Cost

19. The estimated cost of rehabilitating the access road and irrigation system is 86.1 billion VND in financial prices and 68.9 billion VND in economic prices. The access road will cost 47.9 billion VND (financial) and the irrigation system 38.2 billion (both in financial 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 17 and 18).

E. Economic Analysis

1. Economic Returns

20. To calculate the economic returns of the subproject, the net incremental value benefits (both VOC savings as well as producer surplus in terms of crop production) is determined for each year of project life and arranged as a stream of cash flow. Costs are similarly arrayed -

[1] The traffic growth rate is the average rate for rural transport in the Central Highland Region as indicated in various past and ongoing rural transport initiatives.

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.

21. The Kon Trang Kla and Dak Trit Irrigation-Road Irrigation subproject is expected to be economically viable in that the economic internal rate of return (EIRR) has been calculated to be 20.2% and the net present value (ENPV) of the investment (at a discount rate of 12%) is 51.5 billion VND. Cost and revenue streams are presented in Annex Tables 16 and 18.

2. Sensitivity Analysis

22. The reported economic returns of the subproject are based on the assumption that costs and benefits over the life of the project 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 project. Some of these risks include the following:

- **Investment Cost**: A 10% increase in investment cost will cause the EIRR to fall to 18.4%. The sensitivity factor[2] is 1.6 and the switching value[3] is at a 61.3% increase in investment cost.
- **O&M Cost**: A 10% increase in O&M cost will cause the EIRR to fall to 19.8%. The sensitivity factor is 0.6 and the switching value is at a 175.2% increase in O&M cost.
- **Revenue/Benefits**: If prices of crop produces and VOC benefits are reduced by 30%, the EIRR will decrease to 12.4%. The sensitivity factor is 3.2 and the switching value is at a price level that is 31.2% of its predicted level used in the base case scenario.
- **Delay of Revenue/Benefit Realization**: If subproject implementation delays by 2 years, the EIRR will decrease to 13.6%. The sensitivity factor in this case is 3.2 and the ENPV is 76.9% lower than its level estimated in the base case scenario.
- **Life of Subproject**: It has been assumed that, with adequate O&M, the 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 18.8% - and if project life is 13 years the EIRR will be 17.3%. The sensitivity indicators are 2.4 and 2.6 respectively and a switching value of nearly 10 years in both cases.

23. Overall, the 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 and road infrastructure, however, is a basic assumption to support this assessment (see section H for further discussion).

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[2] 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.

[3] 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%).

F. Household Financial Returns

24. 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.

25. There are 900 households farming land within the 890 ha of the irrigation scheme's "with" subproject command area. The average farm size within the command area is 0.99 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 21.9 million VND ($1,042) 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 4.86 million VND ($231) (see Annex Table 16).

26. 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 99 days a year or 7.4 million VND ($353) (see Annex Table 15). 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).

27. In addition to the quantified benefits associated with crop production, there are VOC savings that have been quantified but it would be arbitrary to estimate per-household benefit due to the lack of realistic road unitization by local households, particularly the 900 households under the analysis. In this context, a more detailed analysis is needed after the completion of the access road rehabilitation. However, it is certain that the majority of the 900 households will benefit from the improved road one way or another since the access road is in the examined production areas.

G. Analysis of Poverty Impacts

28. Validated information indicates that 318 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 360 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 318 poor farm households, then, have farms of an average 0.49 ha. In aggregate these poor farm households can be

expected to have incremental net crop income from the subproject of 3.36 billion VND (in the year 10 snapshot) or 19% of the over-all incremental net crop income from the subproject. This translates into 10.56 million VND ($502) per poor household (see Annex Table 16).

29. For the same poor households the incremental labor inputs (in year 10) from the subproject come to 68 days per year - which, at the wage for on-farm labor, would be valued at 5.13 million VND ($244). 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.

30. A note could be made regarding labor inputs in the construction activities of the subproject (irrigation and access road). 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.

31. As with average households in this subproject area, it is difficult to put a figure on how much of the subproject benefits poor households will receive from VOC savings due to the improved access road.

32. Detailed calculations supporting the above analysis are in Annex Tables 1-19 at the end of the analysis.

H. Fiscal Affordability and Sustainability

33. 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.

34. 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).

35. The analysis presented in Table E 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.

36. 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 E: 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 1-19

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 5a: Vehicle Operating Cost Derivation: Kon Trang Kla and Dak Trit Irrigation-Road Subproject
Viet Nam: Productive Rural Infrastructure Development Project in the Central Highlands

(2013 Constant Viet Nam Dong)

Motor Cycle (100 ccs)	Rate	Unit	Financial Price VND '000s	Financial Price $	C/F	Economic Price VND '000s	Economic Price $	Financial cost per km 12,000 km/yr	Financial cost per km 15,000 km/yr	Financial cost per km 20,000 km/yr	Economic cost per km 12,000 km/yr	Economic cost per km 15,000 km/yr	Economic cost per km 20,000 km/yr
Investment cost	1	cycle	9,600	505.3	0.88	8,448	444.6						
Economic life	7	year											
Depreciation	14%	year	1,371	72.2	0.88	1,207	63.5						
Operating cost		km/yr											
Fuel consumption (gasoline)	3.5	l	18.0	0.9	0.88	15.84	0.8	398	497	663	350	438	584
Lubricant	1	lt/400 km	33	1.7	0.88	29.04	1.5	52	65	87	46	57	76
Repairs and maintenance	5%	year	480	25.3	0.95	456.00	24.0	25.3	31.6	42.1	24.0	24.0	24.0
Insurance	1	year	65	3.4	0.95	61.75	3.3	3.4	3.4	3.4	3.3	3.3	3.3
Operating cost		$/km						0.04	0.04	0.04	0.04	0.03	0.03
		VND/km						757.9	756.8	755.8	670.1	661.5	652.9
Depreciation cost		$/km						0.006	0.005	0.004	0.005	0.004	0.003
		VND/km						114.3	91.4	68.6	100.6	80.5	60.3
Vehicle Operating Cost (VOC)		$/km						0.046	0.045	0.043	0.041	0.039	0.038
		VND/km						872.2	848.3	824.3	770.7	742.0	713.2

Bus (1500-2000cc) - diesel	Rate	Unit	Financial Price VND '000s	Financial Price $	C/F	Economic Price VND '000s	Economic Price $	Financial 10,000 km/yr	Financial 15,000 km/yr	Financial 20,000 km/yr	Economic 10,000 km/yr	Economic 15,000 km/yr	Economic 20,000 km/yr
Investment cost	1	bus	160,000	8,421	0.88	140,800	7,410.5						
Economic life	10	year											
Depreciation	10%	year	16,000	842	0.88	14,080	741.1						
Operating cost		km/yr											
Fuel consumption (diesel)	14	lt/100 km	13.0	0.7	0.88	11.4	0.6	958	1437	1916	843	1264	1686
Lubricant and coolant	4.5	lt/4,000 km	149	7.8	0.88	130.7	6.9	20	29	39	17	26	34
Repairs and maintenance	2%	year	3,200	168.4	0.95	3,040.0	160.0	168.4	252.6	336.8	160	160	160
Insurance	1	year	400	21.1	0.95	380.0	20.0	21.1	21.1	21.1	20.0	20.0	20.0
Operating cost		$/km						0.12	0.12	0.12	0.10	0.10	0.10
		VND/km						2,217.1	2,203.8	2,197.1	1,976.3	1,862.3	1,805.3
Depreciation cost		$/km						0.084	0.056	0.042	0.074	0.049	0.037
		VND/km						1,600.0	1,066.7	800.0	1,408.0	938.7	704.0
Vehicle Operating Cost (VOC)		$/km						0.201	0.172	0.158	0.178	0.147	0.132
		VND/km						3,817.1	3,270.5	2,997.1	3,384.3	2,800.9	2,509.3

Car (1,000-2,300cc) - petrol	Rate	Unit	Financial Price VND '000s	Financial Price $	C/F	Economic Price VND '000s	Economic Price $	Financial 8,000 km/yr	Financial 10,000 km/yr	Financial 12,000 km/yr	Economic 8,000 km/yr	Economic 10,000 km/yr	Economic 12,000 km/yr
Investment cost	1	sedan	260,000	13,684	0.88	228,800	12,042.1						
Economic life	12	year											
Depreciation	8%	year	21,667	1,140	0.88	19,067	1,003.5						
Operating cost		km/yr											
Fuel consumption (petrol)	10	lt/100 km	18.0	0.9	0.88	15.8	0.8	758	947	1137	667	834	1000
Lubricant and coolant	4.5	lt/3,000 km	149	7.8	0.88	130.7	6.9	21	26	31	18	23	28
Repairs and maintenance	1.5%	year	3,900	205.3	0.95	3,705.0	195.0	205.3	256.6	307.9	195	195	195
Insurance	1	year	400	21.1	0.95	380.0	20.0	21.1	21.1	21.1	20.0	20.0	20.0
Operating cost		$/km						0.13	0.13	0.12	0.11	0.11	0.10
		VND/km						2,387.0	2,377.0	2,370.3	2,138.2	2,036.1	1,968.0
Depreciation cost		$/km						0.143	0.114	0.095	0.125	0.100	0.084
		VND/km						2,708.3	2,166.7	1,805.6	2,383.3	1,906.7	1,588.9
Vehicle Operating Cost (VOC)		$/km						0.268	0.239	0.220	0.238	0.208	0.187
		VND/km						5,095.3	4,543.7	4,175.9	4,521.5	3,942.7	3,556.9

Tractor (1,000-1,500cc) - diesel	Rate	Unit	Financial Price VND '000s	Financial Price $	C/F	Economic Price VND '000s	Economic Price $	Financial 1,200 km/yr	Financial 1,500 km/yr	Financial 2,000 km/yr	Economic 1,200 km/yr	Economic 1,500 km/yr	Economic 2,000 km/yr
Investment cost	1	tractor	92,000	4,842	0.88	80,960	4,261.1						
Economic life	8	year											
Depreciation	13%	year	11,500	605	0.88	10,120	532.6						
Operating cost		km/yr											
Fuel consumption ***(diesel)***	17	lt/100 km	13.0	0.7	0.88	11.4	0.6	140	174	233	123	154	205
Lubricant and coolant	4.5	lt/4,000 km	149	7.8	0.88	130.7	6.9	2	3	4	2	3	3
Repairs and maintenance	5.0%	year	4,600	242.1	0.95	4,370.0	230.0	242.1	302.6	403.5	230	230	230
Insurance	1	year	400	21.1	0.95	380.0	20.0	21.1	21.1	21.1	20.0	20.0	20.0
Operating cost		$/km						0.34	0.33	0.33	0.31	0.27	0.23
		VND/km						6,413.8	6,347.1	6,280.5	5,935.8	5,144.1	4,352.5
Depreciation cost		$/km						0.504	0.404	0.303	0.444	0.355	0.266
		VND/km						9,583.3	7,666.7	5,750.0	8,433.3	6,746.7	5,060.0
Vehicle Operating Cost (VOC)		$/km						0.842	0.738	0.633	0.756	0.626	0.495
		VND/km						15,997.1	14,013.8	12,030.5	14,369.1	11,890.8	9,412.5

Table 5b: Vehicle Operating Cost Derivation: Kon Trang Kla and Dak Trit Irrigation-Road Subproject (continued)
Viet Nam: Productive Rural Infrastructure Development Project in the Central Highlands

(2013 Constant Viet Nam Dong)

Trucks (1,500-2,500cc) - four-wheel diesel

	Rate	Unit	Financial Price VND '000s	Financial Price $	C/F	Economic Price VND '000s	Economic Price $	Financial 15,000 km/yr	Financial 20,000 km/yr	Financial 25,000 km/yr	Economic 15,000 km/yr	Economic 20,000 km/yr	Economic 25,000 km/yr
Investment cost	1	truck	260,000	13,684	0.88	228,800	12,042.1						
Economic life	10	year											
Depreciation	10%	year	26,000	1,368	0.88	22,880	1,204.2						
Operating cost		km/yr											
Fuel consumption ***(diesel)***	20	lt/100 km	13.0	0.7	0.88	11.4	0.6	2,053	2,737	3,421	1,806	2,408	3,011
Lubricant and coolant	4.5	lt/4,000 km	149	7.8	0.88	130.7	6.9	29	39	49	26	34	43
Repairs and maintenance	2.0%	year	5,200	273.7	0.95	4,940.0	260.0	273.7	364.9	456.1	260	260	260
Insurance	1	year	785	41.3	0.95	745.8	39.3	41.3	41.3	41.3	39.3	39.3	39.3
Operating cost		$/km						0.16	0.16	0.16	0.14	0.14	0.13
		VND/km						3,036.1	3,023.0	3,015.2	2,699.7	2,605.0	2,548.1
Depreciation cost		$/km						0.091	0.068	0.055	0.080	0.060	0.048
		VND/km						1,733.3	1,300.0	1,040.0	1,525.3	1,144.0	915.2
Vehicle Operating Cost (VOC)		$/km						0.251	0.228	0.213	0.222	0.197	0.182
		VND/km						4,769.5	4,323.0	4,055.2	4,225.1	3,749.0	3,463.3

Trucks (2,000-3,500cc) - six-wheel diesel

	Rate	Unit	Financial Price VND '000s	Financial Price $	C/F	Economic Price VND '000s	Economic Price $	Financial 20,000 km/yr	Financial 25,000 km/yr	Financial 30,000 km/yr	Economic 20,000 km/yr	Economic 25,000 km/yr	Economic 30,000 km/yr
Investment cost	1	truck	400,000	21,053	0.88	352,000	18,526.3						
Economic life	10	year											
Depreciation	10%	year	40,000	2,105	0.88	35,200	1,852.6						
Operating cost		km/yr											
Fuel consumption ***(diesel)***	20	lt/100 km	13.0	0.7	0.88	11.4	0.6	2,737	3,421	4,105	2,408	3,011	3,613
Lubricant and coolant	4.5	lt/4,000 km	149	7.8	0.88	130.7	6.9	39	49	59	34	43	52
Repairs and maintenance	3.0%	year	12,000	631.6	0.95	11,400.0	600.0	631.6	789.5	947.4	600	600	600
Insurance	1	year	1,045	55.0	0.95	992.8	52.3	55.0	55.0	55.0	52.3	52.3	52.3
Operating cost		$/km						0.17	0.17	0.17	0.15	0.15	0.14
		VND/km						3,289.4	3,278.9	3,272.0	2,940.3	2,816.4	2,733.8
Depreciation cost		$/km						0.105	0.084	0.070	0.093	0.074	0.062
		VND/km						2,000.0	1,600.0	1,333.3	1,760.0	1,408.0	1,173.3
Vehicle Operating Cost (VOC)		$/km						0.278	0.257	0.242	0.247	0.222	0.206
		VND/km						5,289.4	4,878.9	4,605.3	4,700.3	4,224.4	3,907.1

Bicycles

	Rate	Unit	Financial Price VND '000s	Financial Price $	C/F	Economic Price VND '000s	Economic Price $	Financial 600 km/yr	Financial 750 km/yr	Financial 1,000 km/yr	Economic 600 km/yr	Economic 750 km/yr	Economic 1,000 km/yr
Investment cost	1	cycle	800	42	0.88	704	37.1						
Economic life	5	year											
Depreciation	20%	year	160	8	0.88	141	7.4						
Operating cost		km/yr											
Fuel consumption ***(diesel)***	0	lt/100 km	13.0	0.7	0.88	11.4	0.6	0	0	0	0	0	0
Lubricant and coolant	0	lt/4,000 km	0	0.0	0.88	0.0	0.0	0	0	0	0	0	0
Repairs and maintenance	3.0%	year	24	1.3	0.95	22.8	1.2	1.3	1.6	2.1	1	1	1
Insurance	0	year	0	0.0	0.95	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0
Operating cost		$/km						0.00	0.00	0.00	0.00	0.00	0.00
		VND/km						40.0	40.0	40.0	38.0	30.4	22.8
Depreciation cost		$/km						0.014	0.011	0.008	0.012	0.010	0.007
		VND/km						266.7	213.3	160.0	234.7	187.7	140.8
Vehicle Operating Cost (VOC)		$/km						0.016	0.013	0.011	0.014	0.011	0.009
		VND/km						306.7	253.3	200.0	272.7	218.1	163.6

Summary

	Capital Cost	Assumed Annual Utilization	Vehicle Operating Costs: Without Project	Vehicle Operating Costs: With Project	Vehicle Operating Costs: Incremental Savings
	VND million	Kms	VND/km	VND/km	VND/km
Motor Cycle (100 ccs)	9.6	15,000	1,237	742	495
Tractor (1,000-1,500cc) - diesel	92.0	1,500	14,864	11,891	2,973
Car (1,000-2,300cc) - petrol	260.0	10,000	7,885	3,943	3,943
Bus (1500-2000cc) - diesel	160.0	15,000	4,668	2,801	1,867
Trucks (1,500-2,500cc) - four-wheel diesel	260.0	20,000	6,248	3,749	2,499
Trucks (2,000-3,500cc) - six-wheel diesel	400.0	25,000	6,035	4,224	1,810
Bicycles	0.8	750	273	218	55

Table 6: Vehicle Operating Cost Savings With the Road Rehabilitation: Kon Trang Kla and Dak Trit Irrigation-Road Subproject
Viet Nam: Productive Rural Infrastructure Development Project in the Central Highlands

(2013 Constant Viet Nam Dong)

A: Weighted Per Vehicle VOC Derivation With and Without the Road Rahabilitation

	Without Rehabilitation				Projected With Rehabilitation				Projected Diverted Traffic		
Traffic Types	**Traffic**	**Percent**	**VOC**	**Weighted Average[/a] VOC saving**	**Traffic Count**	**Percent**	**VOC**	**Weighted Average[/a] VOC saving**	**Traffic**	**Percent**	**Weighted Average[b/] VOC saving**
	veh/day		VND	VND	veh/day		VND	VND	veh/day		VND
Motorized											
Motorcycle	50	15.5%	1,237	77	310	30.5%	742	151	560	82.4%	611
Tractors	20	6.2%	14,864	185	40	3.9%	11,891	117	0	0.0%	0
Motor Car	5	1.6%	7,885	61	20	2.0%	3,943	78	90	13.2%	522
Buses	0	0.0%	4,668	0	5	0.5%	2,801	9	0	0.0%	0
Truck - 4 wheel	17	5.3%	6,248	132	40	3.9%	3,749	98	30	4.4%	165
Truck - 6 wheel	0	0.0%	6,035	0	210	20.7%	4,224	375	0	0.0%	0
Non Motorized											
Bicycle	230	71.4%	273	39	390	38.4%	218	21	0	0.0%	0
Total	322	100.0%		494	1015	100.0%		849	680	100%	1,298

a/ The weighted average is the difference in VOC (Without minus With the project) times the percent of the traffic count for each vehicle type.
b/ For projected diverted traffic the weighted average VOC is based on With Rehabilitation VOC figures.

B: Economic Annual VOC Savings with the Road Rehabilitation

	Year	Road Km	Projected Road AreaTraffic	Economic VOC Savings/km	Economic Annual VOC Savings	Diverted Traffic km Saved	Projected Diverted Traffic	Economic VOC Savings/km	Economic Annual VOC Savings	Economic Total Annual VOC Savings
			4%	VND /km	mill VND/yr	km	veh/day	VND /km	mill VND/yr	mill VND/yr
1	2015	9.9	802	0	0	0	0	0	0	0
2	2016	14.8	869	494	2,317	17	680	1,298	5,478	7,795
3	2017	14.8	869	671	3,152	17	680	1,298	5,478	8,630
4	2018	14.8	1,015	849	4,656	17	707	1,298	5,697	10,353
5	2019	14.8	1,056	849	4,842	17	735	1,298	5,925	10,767
6	2020	14.8	1,098	849	5,036	17	765	1,298	6,162	11,198
7	2021	14.8	1,142	849	5,237	17	796	1,298	6,408	11,646
8	2022	14.8	1,187	849	5,447	17	827	1,298	6,665	12,111
9	2023	14.8	1,235	849	5,665	17	860	1,298	6,931	12,596
10	2024	14.8	1,284	849	5,891	17	895	1,298	7,209	13,100
11	2025	14.8	1,336	849	6,127	17	931	1,298	7,497	13,624
12	2026	14.8	1,389	849	6,372	17	968	1,298	7,797	14,169
13	2027	14.8	1,445	849	6,627	17	1,007	1,298	8,109	14,735
14	2028	14.8	1,502	849	6,892	17	1,047	1,298	8,433	15,325
15	2029	14.8	1,563	849	7,167	17	1,089	1,298	8,770	15,938
16	2030	14.8	1,625	849	7,454	17	1,132	1,298	9,121	16,575
17	2031	14.8	1,690	849	7,752	17	1,178	1,298	9,486	17,238
18	2032	14.8	1,758	849	8,062	17	1,225	1,298	9,865	17,928
19	2033	14.8	1,828	849	8,385	17	1,274	1,298	10,260	18,645
20	2034	14.8	1,901	849	8,720	17	1,325	1,298	10,670	19,391

Table 7 : Command Area Land Use With and Without the Project: Kon Trang Kla and Dak Trit Irrigation-Road Subproject

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	100	97	94	91	89	86	83	81	78	76	74	72		53
Irregularly irrigated	ha	260	252	245	237	230	223	217	210	204	198	192	186		137
Unirrigated	ha	530	541	551	561	571	581	590	599	608	616	625	632		700
Total Spring cropped area	ha	890	890	890	890	890	890	890	890	890	890	890	890		890
Autumn Season															
Well irrigated	ha	120	116	113	110	106	103	100	97	94	91	88	86		63
Irregularly irrigated	ha	260	252	245	237	230	223	217	210	204	198	192	186		137
Unirrigated	ha	510	521	532	543	554	564	573	583	592	601	610	618		690
Total Autumn cropped area	ha	890	890	890	890	890	890	890	890	890	890	890	890		890
Winter Season															
More reliably irrigated	ha	120	116	113	110	106	103	100	97	94	91	88	86		63
Less reliably irrigated	ha	50	49	47	46	44	43	42	40	39	38	37	36		26
Unirrigated	ha	720	725	730	735	740	744	748	753	757	761	765	768		800
Total Winter cropped area	ha	890	890	890	890	890	890	890	890	890	890	890	890		890
Fish ponds	ha	5	5	5	5	5	5	4	4	4	4	4	4		3
With Project[b/c/d/]															
Spring Season															
Well irrigated	ha	100	97	82	70	391	712	712	712	712	712	712	712		712
Irregularly irrigated	ha	260	252	214	182	180	178	178	178	178	178	178	178		178
Unirrigated	ha	530	541	593	638	319	0	0	0	0	0	0	0		0
Total Spring cropped area	ha	890	890	890	890	890	890	890	890	890	890	890	890		890
Autumn Season															
Well irrigated	ha	120	116	99	84	398	712	712	712	712	712	712	712		712
Irregularly irrigated	ha	260	252	214	182	180	178	178	178	178	178	178	178		178
Unirrigated	ha	510	521	577	624	312	0	0	0	0	0	0	0		0
Total Spring area	ha	890	890	890	890	890	890	890	890	890	890	890	890		890
Winter Season															
Well irrigated	ha	120	116	99	84	87	89	89	89	89	89	89	89		89
Irregularly irrigated	ha	50	49	41	35	62	89	89	89	89	89	89	89		89
Unirrigated	ha	720	725	750	771	741	712	712	712	712	712	712	712		712
Total Winter cropped area	ha	890	890	890	890	890	890	890	890	890	890	890	890		890
Fish Ponds	ha	5	5	4	4	9	13	13	13	13	13	13	13		13

a/ Without Project irrigated area deteriorates at a rate of:	3.0%
b/ With Project Command Area is assumed to be ha:	890
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:	20%
f/ Winter season With-Project reliable irrigation percent:	10%
Winter season With-Project unreliable irrigation percent:	10%

Table 8: Crop Pattern With and Without Project: Kon Trang Kla and Dak Trit Irrigation-Road Subproject

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	90	87	85	82	80	77	75	73	71	68	66	64		47
Paddy: Irregularly Irrigated	ha	234	227	220	214	207	201	195	189	183	178	173	167		123
Coffee: Irrigated	ha	36	35	34	33	32	31	30	29	28	27	27	26		19
Maize: Unirrigated[a/]	ha	265	270	276	281	286	290	295	300	304	308	312	316		350
Fallow	ha	265	270	276	281	286	290	295	300	304	308	312	316		350
Total Spring area	ha	890	890	890	890	890	890	890	890	890	890	890	890		890
Autumn Season															
Paddy: Well Irrigated	ha	120	116	113	110	106	103	100	97	94	91	88	86		63
Paddy: Irregularly Irrigated	ha	260	252	245	237	230	223	217	210	204	198	192	186		137
Paddy: Unirrigated	ha	408	417	426	435	443	451	459	466	474	481	488	495		552
Maize: Unirrigated[a/]	ha	102	104	106	109	111	113	115	117	118	120	122	124		138
Total Autumn area	ha	890	890	890	890	890	890	890	890	890	890	890	890		890
Winter Season															
Potatoes	ha	160	155	151	146	142	137	133	129	125	122	118	114		84
Watermelon	ha	24	23	23	22	21	21	20	19	19	18	18	17		13
Total Winter area	ha	184	178	173	168	163	158	153	149	144	140	136	132		97
Fish Ponds[b/]	ha	5	5	5	5	5	5	4	4	4	4	4	4		3
With Project[c/]															
Spring Season															
Paddy: Well Irrigated	ha	90	87	74	63	352	641	641	641	641	641	641	641		641
Paddy: Irregularly Irrigated	ha	234	227	193	164	162	160	160	160	160	160	160	160		160
Coffee: Irrigated	ha	36	35	30	25	57	89	89	89	89	89	89	89		89
Maize: Unirrigated[a/]	ha	265	270	297	319	159	0	0	0	0	0	0	0		0
Fallow	ha	265	270	297	319	159	0	0	0	0	0	0	0		0
Total Spring area	ha	890	890	890	890	890	890	890	890	890	890	890	890		890
Autumn Season															
Paddy: Well Irrigated	ha	120	116	99	84	398	712	712	712	712	712	712	712		712
Paddy: Irregularly Irrigated	ha	260	252	214	182	180	178	178	178	178	178	178	178		178
Paddy: Unirrigated	ha	424	433	475	510	255	0	0	0	0	0	0	0		0
Maize: Unirrigated[a/]	ha	106	108	119	128	64	0	0	0	0	0	0	0		0
Total Autumn area	ha	910	909	906	904	897	890	890	890	890	890	890	890		890
Winter Season															
Potatoes	ha	160	155	132	112	136	160	160	160	160	160	160	160		160
Watermelon	ha	10	10	8	7	12	18	18	18	18	18	18	18		18
Total Winter area	ha	170	165	140	119	149	178	178	178	178	178	178	178		178
Fish Ponds[b/]	ha	5	5	4	4	9	13	13	13	13	13	13	13		13

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 9: Crop Yields per ha With and Without Project: Kon Trang Kla and Dak Trit Irrigation-Road Subproject

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 10: Crop Production With and Without the Project: Kon Trang Kla and Dak Trit Irrigation-Road Subproject

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	486	471	457	444	430	417	405	393	381	369	358	348		256
Paddy: Irregularly Irrigated	t	585	567	550	534	518	502	487	473	458	445	431	418		309
Coffee: Irrigated	t	72	70	68	66	64	62	60	58	56	55	53	52		38
Maize: Unirrigated	t	795	811	827	842	857	871	885	899	912	924	937	949		1,050
Autumn Season															
Paddy: Well Irrigated	t	540	524	508	493	478	464	450	436	423	411	398	386		285
Paddy: Irregularly Irrigated	t	1,040	1,009	979	949	921	893	866	840	815	791	767	744		549
Paddy: Unirrigated	t	734	751	767	782	797	812	826	839	853	866	878	890		993
Maize: Unirrigated	t	306	313	319	326	332	338	344	350	355	361	366	371		414
Winter Season															
Potatoes	t	1,328	1,288	1,250	1,212	1,176	1,140	1,106	1,073	1,041	1,010	979	950		700
Watermelon	t	960	931	903	876	850	824	800	776	752	730	708	687		506
Fish	t	27	26	25	25	24	23	22	22	21	21	20	19		14
With Project															
Spring Season															
Paddy: Well Irrigated	t	486	471	401	341	1,900	3,460	3,460	3,460	3,460	3,460	3,460	3,460		3,460
Paddy: Irregularly Irrigated	t	585	567	482	410	405	401	401	401	401	401	401	401		401
Coffee: Irrigated	t	72	70	59	50	243	579	779	979	979	979	979	979		979
Maize: Unirrigated	t	795	811	890	957	478	0	0	0	0	0	0	0		0
Autumn Season															
Paddy: Well Irrigated	t	540	524	445	378	1,791	3,204	3,204	3,204	3,204	3,204	3,204	3,204		3,204
Paddy: Irregularly Irrigated	t	1,040	1,009	857	729	720	712	712	712	712	712	712	712		712
Paddy: Unirrigated	t	763	779	854	918	459	0	0	0	0	0	0	0		0
Maize: Unirrigated	t	318	324	356	383	191	0	0	0	0	0	0	0		0
Winter Season															
Potatoes	t	1,328	1,288	1,095	931	1,130	1,330	1,330	1,330	1,330	1,330	1,330	1,330		1,330
Watermelon	t	400	388	330	280	496	712	712	712	712	712	712	712		712
Fish	t	27	26	22	19	43	67	67	67	67	67	67	67		67

Table 11: Incremental Crop Production: Kon Trang Kla and Dak Trit Irrigation-Road Subproject

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	(57)	(103)	1,470	3,043	3,055	3,068	3,079	3,091	3,102	3,113		3,204
Spring Paddy: Irregularly Irrigated	t	0	0	(68)	(124)	(113)	(102)	(87)	(72)	(58)	(44)	(31)	(18)		92
Autumn Paddy: Well Irrigated	t	0	0	(63)	(114)	1,313	2,740	2,754	2,768	2,781	2,793	2,806	2,818		2,919
Autumn Paddy: Irregularly Irrigated	t	0	0	(121)	(220)	(200)	(181)	(154)	(128)	(103)	(79)	(55)	(32)		163
Autumn Paddy: Unirrigated	t	29	28	87	136	(338)	(812)	(826)	(839)	(853)	(866)	(878)	(890)		(993)
Total Paddy	t	29	28	(221)	(426)	2,132	4,689	4,743	4,795	4,846	4,896	4,944	4,990		5,386
Maize															
Spring Maize: Unirrigated	t	0	0	63	114	(379)	(871)	(885)	(899)	(912)	(924)	(937)	(949)		(1,050)
Autumn Maize: Unirrigated	t	12	12	36	57	(141)	(338)	(344)	(350)	(355)	(361)	(366)	(371)		(414)
Total Maize	t	12	12	99	171	(520)	(1,209)	(1,229)	(1,248)	(1,267)	(1,285)	(1,303)	(1,320)		(1,464)
Coffee	t	0	0	(8)	(15)	179	517	719	921	923	924	926	927		941
Potato	t	0	0	(155)	(281)	(45)	189	223	257	289	320	350	380		629
Watermellon	t	(560)	(543)	(573)	(596)	(354)	(112)	(88)	(64)	(40)	(18)	4	25		206
Fish	t	0	0	(3)	(6)	19	44	44	45	46	46	47	47		53
Incremental Crop Production per Household															
Number of Households[a/]	900														
Rice	kg/hh	32.0	31.0	(245.7)	(472.8)	2,369.4	5,209.6	5,269.8	5,328.2	5,384.9	5,439.8	5,493.1	5,544.9		5,983.9
Maize	kg/hh	13.3	12.9	110.3	190.1	(577.2)	(1,343.9)	(1,365.9)	(1,387.2)	(1,407.9)	(1,427.9)	(1,447.4)	(1,466.3)		(1,626.5)
Coffee	kg/hh	0.0	0.0	(9.3)	(16.9)	198.9	574.1	798.6	1,023.1	1,025.1	1,027.0	1,028.8	1,030.6		1,045.6
Potato	kg/hh	0.0	0.0	(171.8)	(312.6)	(50.5)	210.3	248.3	285.2	320.9	355.6	389.3	421.9		699.1
Watermelon	kg/hh	(622.2)	(603.6)	(637.2)	(662.0)	(393.0)	(124.9)	(97.4)	(70.7)	(44.9)	(19.8)	4.5	28.1		228.5
Fish	kg/hh	0.0	0.0	(3.5)	(6.4)	21.0	48.4	49.2	49.9	50.7	51.4	52.0	52.7		58.3

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 12: Economic Total Crop Production Value With and Without the Project: Kon Trang Kla and Dak Trit Irrigation-Road Subproject
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	3.67	3.34	3.16	2.77	2.62	2.48	2.35	2.23	2.10	2.03	1.97	1.91		1.25
Spring Paddy: Irregularly Irrigated	billion VND	4.42	4.02	3.81	3.34	3.16	2.99	2.83	2.68	2.52	2.45	2.38	2.30		1.50
Autumn Paddy: Well 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: Irregularly Irrigated	billion VND	7.86	7.15	6.77	5.93	5.61	5.32	5.04	4.77	4.49	4.35	4.22	4.10		2.67
Autumn Paddy: Unirrigated	billion VND	5.55	5.32	5.30	4.89	4.86	4.83	4.80	4.76	4.70	4.77	4.83	4.90		4.84
Total Paddy	billion VND	25.58	23.53	22.56	20.02	19.16	18.38	17.64	16.91	16.14	15.86	15.60	15.34		11.66
Rice straw	billion VND	2.56	2.35	2.26	2.00	1.92	1.84	1.76	1.69	1.61	1.59	1.56	1.53		1.17
Maize															
Spring Maize: Unirrigated	billion VND	3.22	3.55	3.35	3.15	3.14	3.13	3.12	3.10	3.09	3.13	3.18	3.22		3.20
Autumn Maize: Unirrigated	billion VND	1.24	1.37	1.30	1.22	1.22	1.21	1.21	1.21	1.20	1.22	1.24	1.26		1.26
Total Maize	billion VND	4.47	4.92	4.65	4.38	4.36	4.34	4.34	4.31	4.30	4.36	4.42	4.47		4.46
Coffee	billion VND	0.43	0.38	0.36	0.33	0.31	0.30	0.28	0.27	0.26	0.25	0.24	0.23		0.17
Potato	billion VND	3.59	3.48	3.37	3.27	3.17	3.08	2.99	2.90	2.81	2.73	2.64	2.56		1.89
Watermelon	billion VND	2.59	2.51	2.44	2.37	2.29	2.23	2.16	2.09	2.03	1.97	1.91	1.85		1.37
Fish	billion VND	0.36	0.35	0.34	0.33	0.32	0.31	0.30	0.29	0.29	0.28	0.27	0.26		0.19
Total Without Project Value	billion VND	39.58	37.54	35.99	32.69	31.54	30.48	29.47	28.47	27.43	27.03	26.64	26.26		20.91
With Project Total Production Value[a/]															
Rice															
Spring Paddy: Well Irrigated	billion VND	3.67	3.34	2.77	2.13	11.58	20.60	20.11	19.63	19.05	19.05	19.05	19.05		16.87
Spring Paddy: Irregularly Irrigated	billion VND	4.42	4.02	3.34	2.56	2.47	2.38	2.33	2.27	2.21	2.21	2.21	2.21		1.95
Autumn Paddy: Well Irrigated	billion VND	4.08	3.71	3.08	2.37	10.92	19.07	18.62	18.17	17.64	17.64	17.64	17.64		15.62
Autumn Paddy: Irregularly Irrigated	billion VND	7.86	7.15	5.93	4.56	4.39	4.24	4.14	4.04	3.92	3.92	3.92	3.92		3.47
Autumn Paddy: Unirrigated	billion VND	5.77	5.52	5.91	5.74	2.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Total Paddy	billion VND	25.80	23.73	21.03	17.36	32.15	46.30	45.20	44.11	42.82	42.82	42.82	42.82		37.91
Rice straw	billion VND	2.58	2.37	2.10	1.74	3.22	4.63	4.52	4.41	4.28	4.28	4.28	4.28		3.79
Maize															
Spring Maize: Unirrigated	billion VND	3.22	3.55	3.61	3.58	1.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Autumn Maize: Unirrigated	billion VND	1.29	1.42	1.44	1.43	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Total Maize	billion VND	4.51	4.98	5.05	5.02	2.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Coffee	billion VND	0.43	0.38	0.32	0.25	1.19	2.78	3.68	4.52	4.43	4.43	4.43	4.43		4.32
Potato	billion VND	3.59	3.48	2.96	2.51	3.05	3.59	3.59	3.59	3.59	3.59	3.59	3.59		3.59
Watermelon	billion VND	1.08	1.05	0.89	0.76	1.34	1.92	1.92	1.92	1.92	1.92	1.92	1.92		1.92
Fish	billion VND	0.36	0.35	0.30	0.26	0.58	0.90	0.90	0.90	0.90	0.90	0.90	0.90		0.90
Total With Project Value	billion VND	38.36	36.34	32.65	27.89	43.99	60.12	59.82	59.46	57.94	57.94	57.94	57.94		52.44
Incremental Economic Crop Production Value															
Rice	billion VND	0.24	0.22	(1.68)	(2.93)	14.29	30.70	30.32	29.92	29.35	29.65	29.94	30.23		28.88
Maize	billion VND	0.05	0.05	0.40	0.64	(1.91)	(4.34)	(4.34)	(4.31)	(4.30)	(4.36)	(4.42)	(4.47)		(4.46)
Coffee	billion VND	0.00	0.00	(0.05)	(0.08)	0.88	2.49	3.40	4.25	4.17	4.18	4.19	4.19		4.15
Potato	billion VND	0.00	0.00	(0.42)	(0.76)	(0.12)	0.51	0.60	0.69	0.78	0.86	0.95	1.03		1.70
Watermelon	billion VND	(1.51)	(1.47)	(1.55)	(1.61)	(0.96)	(0.30)	(0.24)	(0.17)	(0.11)	(0.05)	0.01	0.07		0.56
Fish	billion VND	0.00	0.00	(0.04)	(0.08)	0.26	0.59	0.60	0.61	0.62	0.62	0.63	0.64		0.71
Total	billion VND	(1.22)	(1.20)	(3.33)	(4.81)	12.45	29.64	30.35	30.99	30.51	30.91	31.30	31.68		31.53
U.S. $ Equivalent	million $	(0.06)	(0.06)	(0.16)	(0.23)	0.59	1.41	1.45	1.48	1.45	1.47	1.49	1.51		1.50

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: Physical Inputs for Major Crops Without & With the Project: Kon Trang Kla and Dak Trit Irrigation-Road Subproject

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 14: Total Crop Economic Costs With and Without the Project: Kon Trang Kla and Dak Trit Irrigation-Road Subproject
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	1.54	1.47	1.41	1.35	1.30	1.25	1.21	1.16	1.13	1.09	1.06	1.03		0.73
Spring Paddy: Irregularly Irrigated	billion VND	3.49	3.35	3.21	3.10	2.99	2.88	2.78	2.68	2.60	2.52	2.45	2.38		1.71
Autumn Paddy: Well Irrigated	billion VND	2.05	1.96	1.88	1.80	1.74	1.67	1.61	1.55	1.50	1.46	1.41	1.37		0.98
Autumn Paddy: Irregularly Irrigated	billion VND	3.87	3.72	3.57	3.44	3.32	3.20	3.09	2.98	2.89	2.81	2.72	2.64		1.90
Autumn Paddy: Unirrigated	billion VND	3.75	3.83	3.90	3.97	4.04	4.11	4.18	4.24	4.31	4.37	4.44	4.50		4.99
Total Paddy	billion VND	14.70	14.32	13.96	13.67	13.39	13.12	12.87	12.62	12.43	12.26	12.08	11.91		10.31
Maize															
Spring Maize: Unirrigated	billion VND	3.25	3.27	3.28	3.31	3.34	3.36	3.39	3.41	3.46	3.51	3.56	3.60		3.83
Autumn Maize: Unirrigated	billion VND	1.25	1.26	1.27	1.28	1.29	1.31	1.32	1.33	1.35	1.37	1.39	1.41		1.51
Total Maize	billion VND	4.50	4.53	4.55	4.59	4.63	4.67	4.71	4.74	4.81	4.88	4.94	5.01		5.34
Coffee	billion VND	1.30	1.25	1.20	1.16	1.12	1.08	1.05	1.01	0.98	0.95	0.92	0.89		0.65
Potato	billion VND	3.29	3.15	3.01	2.90	2.79	2.69	2.59	2.50	2.42	2.35	2.28	2.21		1.58
Watermelon	billion VND	0.36	0.35	0.33	0.32	0.31	0.30	0.29	0.28	0.27	0.26	0.25	0.24		0.18
Fish	billion VND	0.08	0.08	0.07	0.07	0.07	0.07	0.06	0.06	0.06	0.06	0.06	0.06		0.04
Total Without Project Value	billion VND	24.23	23.67	23.13	22.71	22.31	21.93	21.56	21.20	20.97	20.75	20.54	20.33		18.10
With Project Total Crop Production Cost[a/]															
Rice															
Spring Paddy: Well Irrigated	billion VND	1.54	1.47	1.23	1.04	5.99	10.81	10.72	10.64	10.64	10.64	10.64	10.64		10.25
Spring Paddy: Irregularly Irrigated	billion VND	3.49	3.35	2.81	2.38	2.37	2.33	2.32	2.30	2.30	2.30	2.30	2.30		2.25
Autumn Paddy: Well Irrigated	billion VND	2.05	1.96	1.64	1.39	6.97	12.38	12.28	12.18	12.18	12.18	12.18	12.18		11.75
Autumn Paddy: Irregularly Irrigated	billion VND	3.87	3.72	3.13	2.64	2.60	2.55	2.54	2.53	2.53	2.53	2.53	2.53		2.47
Autumn Paddy: Unirrigated	billion VND	3.90	3.97	4.34	4.66	2.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Total Paddy	billion VND	14.84	14.46	13.16	12.11	20.25	28.07	27.86	27.65	27.65	27.65	27.65	27.65		26.71
Maize															
Spring Maize: Unirrigated	billion VND	3.25	3.27	3.53	3.76	1.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Autumn Maize: Unirrigated	billion VND	1.30	1.31	1.41	1.50	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Total Maize	billion VND	4.55	4.57	4.94	5.26	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Coffee	billion VND	1.30	1.25	1.05	0.89	2.01	3.12	3.10	3.09	3.09	3.09	3.09	3.09		3.04
Potato	billion VND	3.29	3.15	2.64	2.23	2.69	3.14	3.12	3.09	3.09	3.09	3.09	3.09		2.99
Watermelon	billion VND	0.15	0.14	0.12	0.10	0.18	0.26	0.26	0.25	0.25	0.25	0.25	0.25		0.25
Fish	billion VND	0.08	0.08	0.06	0.05	0.12	0.19	0.19	0.19	0.19	0.19	0.19	0.19		0.19
Total With Project Value	billion VND	24.22	23.65	21.98	20.64	27.86	34.77	34.53	34.28	34.28	34.28	34.28	34.28		33.18
Incremental Economic Crop Production Costs															
Rice	billion VND	0.15	0.14	(0.80)	(1.56)	6.87	14.95	14.99	15.03	15.22	15.39	15.57	15.74		16.40
Maize	billion VND	0.05	0.05	0.39	0.67	(2.02)	(4.67)	(4.71)	(4.74)	(4.81)	(4.88)	(4.94)	(5.01)		(5.34)
Coffee	billion VND	0.00	0.00	(0.15)	(0.27)	0.89	2.03	2.06	2.08	2.11	2.14	2.17	2.20		2.39
Potato	billion VND	0.00	0.00	(0.37)	(0.67)	(0.11)	0.45	0.52	0.60	0.67	0.74	0.82	0.88		1.42
Watermelon	billion VND	(0.21)	(0.20)	(0.21)	(0.22)	(0.13)	(0.04)	(0.03)	(0.02)	(0.01)	(0.01)	0.00	0.01		0.07
Fish	billion VND	0.00	0.00	(0.01)	(0.02)	0.05	0.13	0.13	0.13	0.13	0.13	0.13	0.14		0.15
Total	billion VND	**(0.01)**	**(0.01)**	**(1.15)**	**(2.06)**	**5.55**	**12.84**	**12.97**	**13.08**	**13.31**	**13.53**	**13.74**	**13.95**		**15.08**
U.S. dollar equivalent	million $	(0.00)	(0.00)	(0.05)	(0.10)	0.26	0.61	0.62	0.62	0.63	0.64	0.65	0.66		0.72

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 15: Incremental Crop Labor: Kon Trang Kla and Dak Trit Irrigation-Road Subproject

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	10,800	10,476	10,162	9,857	9,561	9,274	8,996	8,726	8,464	8,210	7,964	7,725		5,697
Spring Paddy: Irregularly Irrigated	person days	28,080	27,238	26,420	25,628	24,859	24,113	23,390	22,688	22,008	21,347	20,707	20,086		14,812
Autumn Paddy: Well Irrigated	person days	14,400	13,968	13,549	13,142	12,748	12,366	11,995	11,635	11,286	10,947	10,619	10,300		7,596
Autumn Paddy: Irregularly Irrigated	person days	31,200	30,264	29,356	28,475	27,621	26,793	25,989	25,209	24,453	23,719	23,008	22,317		16,457
Autumn Paddy: Unirrigated	person days	36,720	37,541	38,337	39,109	39,858	40,585	41,290	41,974	42,637	43,280	43,904	44,509		49,648
Spring Maize Unirrigated	person days	21,200	21,632	22,051	22,458	22,852	23,234	23,605	23,965	24,314	24,653	24,981	25,300		28,004
Autumn Maize Unirrigated	person days	8,160	8,342	8,519	8,691	8,857	9,019	9,176	9,327	9,475	9,618	9,756	9,891		11,033
Coffee	person days	10,800	10,476	10,162	9,857	9,561	9,274	8,996	8,726	8,464	8,210	7,964	7,725		5,697
Potato	person days	24,320	23,590	22,883	22,196	21,530	20,884	20,258	19,650	19,061	18,489	17,934	17,396		12,828
Watermelon	person days	3,360	3,259	3,161	3,067	2,975	2,885	2,799	2,715	2,633	2,554	2,478	2,403		1,772
Fish	person days	216	210	203	197	191	185	180	175	169	164	159	155		114
Total Without Project Labor	person days	189,256	186,996	184,804	182,677	180,614	178,614	176,673	174,790	172,964	171,193	169,475	167,808		153,658
With Project Crop Labor Days															
Spring Paddy: Well Irrigated	person days	10,800	10,476	8,905	7,569	42,232	76,896	76,896	76,896	76,896	76,896	76,896	76,896		76,896
Spring Paddy: Irregularly Irrigated	person days	28,080	27,238	23,152	19,679	19,452	19,224	19,224	19,224	19,224	19,224	19,224	19,224		19,224
Autumn Paddy: Well Irrigated	person days	14,400	13,968	11,873	10,092	47,766	85,440	85,440	85,440	85,440	85,440	85,440	85,440		85,440
Autumn Paddy: Irregularly Irrigated	person days	31,200	30,264	25,724	21,866	21,613	21,360	21,360	21,360	21,360	21,360	21,360	21,360		21,360
Autumn Paddy: Unirrigated	person days	38,160	38,938	42,709	45,915	22,957	0	0	0	0	0	0	0		0
Spring Maize Unirrigated	person days	21,200	21,632	23,727	25,508	12,754	0	0	0	0	0	0	0		0
Autumn Maize Unirrigated	person days	8,480	8,653	9,491	10,203	5,102	0	0	0	0	0	0	0		0
Coffee	person days	10,800	10,476	8,905	7,569	17,134	26,700	26,700	26,700	26,700	26,700	26,700	26,700		26,700
Potato	person days	24,320	23,590	20,052	17,044	20,697	24,350	24,350	24,350	24,350	24,350	24,350	24,350		24,350
Watermelon	person days	1,400	1,358	1,154	981	1,737	2,492	2,492	2,492	2,492	2,492	2,492	2,492		2,492
Fish	person days	216	210	178	151	343	534	534	534	534	534	534	534		534
Total With Project Labor	person days	189,056	186,802	175,870	166,577	211,787	256,996	256,996	256,996	256,996	256,996	256,996	256,996		256,996
Incremental Crop Labor Days															
Spring Paddy: Well Irrigated	person days	0	0	(1,257)	(2,288)	32,671	67,622	67,900	68,170	68,432	68,686	68,932	69,171		71,199
Spring Paddy: Irregularly Irrigated	person days	0	0	(3,269)	(5,949)	(5,407)	(4,889)	(4,166)	(3,464)	(2,784)	(2,123)	(1,483)	(862)		4,412
Autumn Paddy: Well Irrigated	person days	0	0	(1,676)	(3,051)	35,018	73,074	73,445	73,805	74,154	74,493	74,821	75,140		77,844
Autumn Paddy: Irregularly Irrigated	person days	0	0	(3,632)	(6,610)	(6,008)	(5,433)	(4,629)	(3,849)	(3,093)	(2,359)	(1,648)	(957)		4,903
Autumn Paddy: Unirrigated	person days	1,440	1,397	4,372	6,805	(16,901)	(40,585)	(41,290)	(41,974)	(42,637)	(43,280)	(43,904)	(44,509)		(49,648)
Spring Maize Unirrigated	person days	0	0	1,676	3,051	(10,098)	(23,234)	(23,605)	(23,965)	(24,314)	(24,653)	(24,981)	(25,300)		(28,004)
Autumn Maize Unirrigated	person days	320	310	972	1,512	(3,756)	(9,019)	(9,176)	(9,327)	(9,475)	(9,618)	(9,756)	(9,891)		(11,033)
Coffee	person days	0	0	(1,257)	(2,288)	7,573	17,426	17,704	17,974	18,236	18,490	18,736	18,975		21,003
Potato	person days	0	0	(2,831)	(5,152)	(833)	3,466	4,093	4,700	5,290	5,862	6,416	6,954		11,522
Watermelon	person days	(1,960)	(1,901)	(2,007)	(2,085)	(1,238)	(393)	(307)	(223)	(141)	(62)	14	89		720
Fish	person days	0	0	(25)	(46)	151	349	354	359	365	370	375	379		420
Total Incremental Crop Labor	person days	(200)	(194)	(8,934)	(16,100)	31,172	78,383	80,324	82,206	84,032	85,804	87,522	89,188		103,338
Incremental days/hh[a/]	person days	(0)	(0)	(10)	(18)	35	87	89	91	93	95	97	99		115
Incremental value of labor inputs/hh	million VND	(0.0)	(0.0)	(0.7)	(1.3)	2.6	6.5	6.7	6.9	7.0	7.2	7.3	7.4		8.6
Incremental Labor Income[b/]	billion VND	(0.01)	(0.01)	(0.67)	(1.21)	2.34	5.88	6.02	6.17	6.30	6.44	6.56	6.69		7.75
													353.92243		

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 16: Net Incremental Economic Crop Benefits: Kon Trang Kla and Dak Trit Irrigation-Road Subproject
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	15.35	13.87	12.86	9.99	9.23	8.55	7.91	7.26	6.45	6.28	6.10	5.94		2.81
With Project Net Econ Crop Benefit	billion VND	14.14	12.69	10.67	7.24	16.13	25.35	25.29	25.18	23.66	23.66	23.66	23.66		19.26
Incremental Value of Production	billion VND	(1.22)	(1.20)	(3.33)	(4.81)	12.45	29.64	30.35	30.99	30.51	30.91	31.30	31.68		31.53
Incremental Crop Cost	billion VND	(0.01)	(0.01)	(1.15)	(2.06)	5.55	12.84	12.97	13.08	13.31	13.53	13.74	13.95		15.08
Net Incremental Crop Benefit	billion VND	**(1.21)**	**(1.19)**	**(2.19)**	**(2.74)**	**6.90**	**16.80**	**17.38**	**17.91**	**17.21**	**17.39**	**17.56**	**17.73**		**16.45**
Incremental Average Crop Benefit per Household[a/]															
Number of households involved in examined crops (field estimates	900														
Economic benefits/hh	million VND	(1.35)	(1.32)	(2.43)	(3.05)	7.66	18.67	19.31	19.90	19.12	19.32	19.51	19.70		18.28
Financial benefits/hh	million VND	(1.50)	(1.46)	(2.70)	(3.39)	8.52	20.74	21.46	22.12	21.24	21.46	21.68	21.88		20.31
U.S. $ equivalent/hh	$	(71.22)	(69.72)	(128.51)	(161.29)	405.55	987.60	1,021.79	1,053.10	1,011.65	1,022.10	1,032.23	1,042.06		966.94
Incremental Average Crop Benefits per Person[a/]															
Ave. number of persons/hh	4.5														
Economic benefits/person	million VND	(0.30)	(0.29)	(0.54)	(0.68)	1.70	4.15	4.29	4.42	4.25	4.29	4.34	4.38		4.06
Financial benefits/person	million VND	(0.33)	(0.33)	(0.60)	(0.75)	1.89	4.61	4.77	4.91	4.72	4.77	4.82	4.86		4.51
U.S.$ equivalent/person	$	(15.83)	(15.49)	(28.56)	(35.84)	90.12	219.47	227.07	234.02	224.81	227.13	229.39	231.57		214.88
Incremental Ave. Financial Crop Benefits for Poor Households --- assumed to be located in "without" subproject unirrigated area															
Ave. farm size per household (ha)	0.99														
Unirrigated ha 'without' net cr. ben.	billion VND	2.37	2.48	2.10	1.25	1.09	0.93	0.79	0.62	0.40	0.40	0.41	0.41		(0.49)
Same ha 'with' net crop benefit	billion VND	2.37	2.48	2.10	1.25	4.56	11.12	11.50	11.85	11.39	11.50	11.62	11.73		10.88
Same ha incremental cr. Ben	billion VND	0.00	0.00	0.00	0.00	3.48	10.18	10.71	11.23	10.99	11.10	11.21	11.31		11.37
This figure per ha	million VND	0.00	0.00	0.00	0.00	6.56	19.21	20.21	21.19	20.74	20.95	21.15	21.35		21.46
This figure per average household	million VND	0.00	0.00	0.00	0.00	6.49	19.00	19.99	20.96	20.51	20.71	20.92	21.11		21.22
% poor households among those involved in examined crops	35%														
No. of poor households among those involved in examined crops	318														
Assumed poor hh farm size (ha)	0.49												5.03		
Incremental bennefit per poor household	million VND	0.00	0.00	0.00	0.00	3.24	9.50	9.99	10.48	10.25	10.36	10.46	10.56		10.61
Total incremental benefit of the poor	billion VND	0.00	0.00	0.00	0.00	1.03	3.02	3.18	3.33	3.26	3.29	3.33	3.36		3.37
Share of poor of total incremental benefits	%			0%	0%	15%	18%	18%	19%	19%	19%	19%	19%		21%
Incremental farm labor "income" of poor on own land															
Unirrig. ha "without" labor inputs	person-days	66,080	67,515	68,907	70,258	71,568	72,838	74,071	75,266	76,426	77,551	78,642	79,700		88,685
Same ha "with" labor inputs	person-days	66,080	67,515	68,907	70,258	126,120.2	153,043	153,043	153,043	153,043	153,043	153,043	153,043		153,043
Same ha incremental labor inputs	person-days	0.00	0	0	0	54,553	80,205	78,972	77,777	76,617	75,492	74,401	73,343		64,357
This figure per ha	person-days	0.00	0.00	0.00	0.00	102.93	151.33	149.00	146.75	144.56	142.44	140.38	138.38		121.43
This figure per poor hh	person-days	0.00	0.00	0.00	0.00	50.89	74.82	73.67	72.56	71.48	70.43	69.41	68.42		60.04
Equivalent financial wage/poor hh	million VND	0.00	0.00	0.00	0.00	3.82	5.61	5.53	5.44	5.36	5.28	5.21	5.13		4.50

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 17: Economic Project Costs: Kon Trang Kla and Dak Trit Irrigation-Road Subproject
Viet Nam: Productive Rural Infrastructure Development Project in the Central Highlands

(2013 Constant Viet Nam Dong)

Subproject Investment Cost Estimates

Financial Costs (Irrigation)		US$	million VND
Material Costs		1,100,000	23,100
Labor Costs		280,000	5,880
Land Acquisition and Resettlement (LAR) Costs		0	0
Sub-Total		1,380,000	28,980
Contingencies	10%	138,000	2,898
Detailed Design and Construction Supervision	9%	136,620	2,869
Value-added Taxes	10%	165,462	3,475
Sub-total Financial Cost (Irrigation)		1,820,082	38,222

Economic Costs (Irrigation)	US$	million VND
Material Costs	990,000	20,790
Labor Costs	224,000	4,704
Land Acquisition and Resettlement (LAR) Costs	0	0
Sub-Total	1,214,000	25,494
Contingencies	121,400	2,549
Detailed Design and Construction Supervision	120,186	2,524
Value-added Taxes	0	0
Sub-total Economic Costs (Irrigation)	1,455,586	30,567

Financial Costs (Access Road)		US$	million VND
Material Costs		1,400,000	29,400
Labor Costs		330,000	6,930
Land Acquisition and Resettlement (LAR) Costs		0	0
Sub-Total		1,730,000	36,330
Contingencies	10%	173,000	3,633
Detailed Design and Construction Supervision	9%	171,270	3,597
Value-added Taxes	10%	207,427	4,356
Sub-total Financial Cost (Access Road)		2,281,697	47,916
Grand Total Subproject Financial Costs		**4,101,779**	**86,137**

Economic Costs (Access Road)	US$	million VND
Material Costs	1,260,000	26,460
Labor Costs	264,000	5,544
Land Acquisition and Resettlement (LAR) Costs	0	0
Sub-Total	1,524,000	32,004
Contingencies	152,400	3,200
Detailed Design and Construction Supervision	150,876	3,168
Value-added Taxes	0	0
Sub-total Economic Costs (Access Road)	1,827,276	38,373
Grand Total Subproject Economic Costs	**3,282,862**	**68,940**

Table 18: Economic Rate of Return: Kon Trang Kla and Dak Trit Irrigation-Road Subproject

Unit: VND billion in 2013 Constant Prices

Year	Subproject Year	Economic Costs of Irrigation Component			Economic Costs of Access Road Component			Total Economic Costs	Economic Benefits		Total Economic Benefits	Net Economic Cash Flow
		Construction Cost	O&M Cost	Periodic Major Maintenance	Construction Cost	O&M Cost	Periodic Major Maintenance		Crop Benefits	VOC Savings Benefits		
2013												
2014												
2015	1	15.28			34.47			49.75	(2.19)	-	(2.19)	(51.94)
2016	2	15.28			34.47			49.75	(2.74)	7.80	5.05	(44.70)
2017	3		0.92			2.07		2.99	6.90	8.63	15.53	12.54
2018	4		0.92			2.07		2.99	16.80	10.35	27.15	24.17
2019	5		0.92			2.07		2.99	17.38	10.77	28.15	25.16
2020	6		0.92			2.07		2.99	17.91	11.20	29.11	26.13
2021	7		0.92			2.07		2.99	17.21	11.65	28.85	25.87
2022	8		0.92			2.07		2.99	17.39	12.11	29.50	26.51
2023	9		0.92			2.07		2.99	17.56	12.60	30.15	27.17
2024	10		-	9.17		-	20.68	29.85	17.73	13.10	30.83	0.97
2025	11		0.92			2.07		2.99	19.24	13.62	32.87	29.88
2026	12		0.92			2.07		2.99	15.17	14.17	29.34	26.36
2027	13		0.92			2.07		2.99	15.31	14.74	30.04	27.06
2028	14		0.92			2.07		2.99	15.44	15.32	30.76	27.78
2029	15		0.92			2.07		2.99	15.56	15.94	31.50	28.52
2030	16		0.92			2.07		2.99	15.69	16.58	32.26	29.28
2031	17		0.92			2.07		2.99	15.80	17.24	33.04	30.06
2032	18		-	9.17		-	20.68	29.85	15.92	17.93	33.85	3.99
2033	19		0.92			2.07		2.99	16.03	18.64	34.67	31.69
2034	20		0.9			2.1		2.99	16.4	19.4	35.84	32.85
							NPV	**113.5**			**165.0**	**51.5**
											EIRR	**20.2%**

Table 19: Sensitivity Analysis: Kon Trang Kla and Dak Trit Irrigation-Road Subproject

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	(2.19)	5.05	15.53	27.15	28.15	29.11	28.85	29.50	30.15	30.83	32.87	29.34		34.67	35.84
Sub-project Economic Benefits from Production	(2.19)	(2.74)	6.90	16.80	17.38	17.91	17.21	17.39	17.56	17.73	19.24	15.17		16.03	16.45
Sub-project Economic Benefits from VOC	-	7.80	8.63	10.35	10.77	11.20	11.65	12.11	12.60	13.10	13.62	14.17		18.64	19.39
B A S E C A S E A N A L Y S I S															
Total costs	49.75	49.75	2.99	2.99	2.99	2.99	2.99	2.99	2.99	29.85	2.99	2.99		2.99	2.99
Capital costs (billion VND)	49.75	49.75	-	-	-	-	-	-	-	-	-	-		-	-
Maintenance Costs - Routine(billion VND)	-	-	2.99	2.99	2.99	2.99	2.99	2.99	2.99	-	2.99	2.99		2.99	2.99
Maintenance Costs - Periodic (billion VND)	-	-	-	-	-	-	-	-	-	29.85	-	-		-	-
Maintemance Costs (billion VND)	-	-	2.99	2.99	2.99	2.99	2.99	2.99	2.99	29.85	2.99	2.99		2.99	2.99
Benefits (billion VND)	(2.19)	5.05	15.53	27.15	28.15	29.11	28.85	29.50	30.15	30.83	32.87	29.34		34.67	35.84
Net cash flow (billion VND)	(51.94)	(44.70)	12.54	24.17	25.16	26.13	25.87	26.51	27.17	0.97	29.88	26.36		31.69	32.85
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	54.73	54.73	2.99	2.99	2.99	2.99	2.99	2.99	2.99	29.85	2.99	2.99		2.99	2.99
Capital costs	54.73	54.73	-	-	-	-	-	-	-	-	-	-		-	-
Maintenance Costs	-	-	2.99	2.99	2.99	2.99	2.99	2.99	2.99	29.85	2.99	2.99		2.99	2.99
Benefits	(2.19)	5.05	15.53	27.15	28.15	29.11	28.85	29.50	30.15	30.83	32.87	29.34		34.67	35.84
Net cash flow	(56.92)	(49.68)	12.54	24.17	25.16	26.13	25.87	26.51	27.17	0.97	29.88	26.36		31.69	32.85
Case 2 - Maintenance costs increase by 10%															
Total costs	49.75	49.75	3.28	3.28	3.28	3.28	3.28	3.28	3.28	32.84	3.28	3.28		3.28	3.28
Capital costs	49.75	49.75	-	-	-	-	-	-	-	-	-	-		-	-
Maintenance Costs	-	-	3.28	3.28	3.28	3.28	3.28	3.28	3.28	32.84	3.28	3.28		3.28	3.28
Benefits	(2.19)	5.05	15.53	27.15	28.15	29.11	28.85	29.50	30.15	30.83	32.87	29.34		34.67	35.84
Net cash flow	(51.94)	(44.70)	12.24	23.87	24.86	25.83	25.57	26.21	26.87	(2.01)	29.58	26.06		31.39	32.55
Case 3 - Benefits decrease by 10%															
Total costs	49.75	49.75	2.99	2.99	2.99	2.99	2.99	2.99	2.99	29.85	2.99	2.99		2.99	2.99
Capital costs	49.75	49.75	-	-	-	-	-	-	-	-	-	-		-	-
Maintenance Costs	-	-	2.99	2.99	2.99	2.99	2.99	2.99	2.99	29.85	2.99	2.99		2.99	2.99
Benefits	(1.97)	4.55	13.98	24.44	25.33	26.20	25.97	26.55	27.14	27.74	29.58	26.41		31.21	32.25
Net cash flow	(51.72)	(45.21)	10.99	21.45	22.35	23.21	22.98	23.56	24.15	(2.11)	26.60	23.42		28.22	29.27
Case 4 - Benefits decrease by 20%															
Total costs	49.75	49.75	2.99	2.99	2.99	2.99	2.99	2.99	2.99	29.85	2.99	2.99		2.99	2.99
Capital costs	49.75	49.75	-	-	-	-	-	-	-	-	-	-		-	-
Maintenance Costs	-	-	2.99	2.99	2.99	2.99	2.99	2.99	2.99	29.85	2.99	2.99		2.99	2.99
Benefits	(1.75)	4.04	12.42	21.72	22.52	23.29	23.08	23.60	24.12	24.66	26.29	23.47		27.74	28.67
Net cash flow	(51.50)	(45.71)	9.44	18.74	19.53	20.30	20.10	20.61	21.14	(5.19)	23.31	20.49		24.75	25.69
Case 5 - Benefits decrease by 30%															
Total costs	49.75	49.75	2.99	2.99	2.99	2.99	2.99	2.99	2.99	29.85	2.99	2.99		2.99	2.99
Capital costs	49.75	49.75	-	-	-	-	-	-	-	-	-	-		-	-
Maintenance Costs	-	-	2.99	2.99	2.99	2.99	2.99	2.99	2.99	29.85	2.99	2.99		2.99	2.99
Benefits	(1.53)	3.54	10.87	19.01	19.70	20.38	20.20	20.65	21.11	21.58	23.01	20.54		24.27	25.09
Net cash flow	(51.28)	(46.22)	7.88	16.02	16.72	17.39	17.21	17.66	18.12	(8.27)	20.02	17.56		21.29	22.10
Case 6 - Benefits delay 2 years															
Total costs	49.75	49.75	2.99	2.99	2.99	2.99	2.99	2.99	2.99	29.85	2.99	2.99		2.99	2.99
Capital costs	49.75	49.75	-	-	-	-	-	-	-	-	-	-		-	-
Maintenance Costs	-	-	2.99	2.99	2.99	2.99	2.99	2.99	2.99	29.85	2.99	2.99		2.99	2.99
Benefits	-	-	(2.19)	5.05	15.53	27.15	28.15	29.11	28.85	29.50	30.15	30.83		33.04	33.85
Net cash flow	(49.75)	(49.75)	(5.17)	2.07	12.54	24.17	25.16	26.13	25.87	(0.35)	27.17	27.84		30.06	30.86
Case 7 - Subproject life is 5 years shorter															
Total costs	49.75	49.75	2.99	2.99	2.99	2.99	2.99	2.99	2.99	29.85	2.99	2.99		-	-
Capital costs	49.75	49.75	-	-	-	-	-	-	-	-	-	-		-	-
Maintenance Costs	-	-	2.99	2.99	2.99	2.99	2.99	2.99	2.99	29.85	2.99	2.99		-	-
Benefits	(2.19)	5.05	15.53	27.15	28.15	29.11	28.85	29.50	30.15	30.83	32.87	29.34		-	-
Net cash flow	(51.94)	(44.70)	12.54	24.17	25.16	26.13	25.87	26.51	27.17	0.97	29.88	26.36		-	-
Case 8 - Subproject life is 7 years shorter															
Total costs	49.75	49.75	2.99	2.99	2.99	2.99	2.99	2.99	2.99	29.85	2.99	2.99		-	-
Capital costs	49.75	49.75	-	-	-	-	-	-	-	-	-	-		-	-
Maintenance Costs	-	-	2.99	2.99	2.99	2.99	2.99	2.99	2.99	29.85	2.99	2.99		-	-
Benefits	(2.19)	5.05	15.53	27.15	28.15	29.11	28.85	29.50	30.15	30.83	32.87	29.34		-	-
Net cash flow	(51.94)	(44.70)	12.54	24.17	25.16	26.13	25.87	26.51	27.17	0.97	29.88	26.36		-	-

SUMMARY FOR SENSITIVITY ANALYSIS

	ENPV (Bil. VND)	BCR	EIRR	SI (ENPV)	SV(ENPV)
Base case	**51.5**	**1.45**	**20.2%**		
1. Capital Costs + 10%	43.1	1.35	18.4%	1.6	61.3%
2. O&M costs + 10%	48.6	1.42	19.8%	0.6	175.2%
3. Benefits decrease - 10%	35.0	1.31	17.8%	3.2	31.2%
4. Benefits decrease - 20%	18.5	1.16	15.2%	3.2	31.2%
5. Benefits decrease - 30%	2.0	1.02	12.4%	3.2	31.2%
6. Benefits delay - 2 years	11.9	1.10	13.6%	3.2	ENPV = 76.9% lower
7. Subproject life is 5 years shorter	34.8	1.32	18.8%	2.4	ENPV = 32.5% lower
8. Subproject life is 7 years shorter	23.9	1.22	17.3%	2.6	ENPV = 53.7% lower