ECONOMIC AND FINANCIAL ANALYSIS

1. The additional financing for the project will upgrade productive rural infrastructure (PRI) in six central provinces: Binh Dinh, Binh Thuan, Ha Tinh, Ninh Thuan, Phu Yen and Thua Thien Hue. This phase of the project will focus on (i) improving about 100 kilometers (km) of canals and rural roads and about 20 irrigation schemes to irrigate about 29,000 hectares (ha); (ii) improving the capacity of provincial staff for technical designs, and farmers for agricultural production techniques; and (iii) improving project management skills for infrastructure. Implementation of the additional financing phase will directly support the government's National Target Program for New Rural Development and Agriculture Restructuring Strategy. Capacity strengthening activities under the first phase of the project focused on national and provincial staff engaged in the project as well as private sector consultants and contractors. Most of the staff will continue for implementation of the next phase. This second phase will enable more farming households and communities to respond more effectively to commercial opportunities through improved agricultural production and stronger market links as a result of improving the PRI.

A. Economic and Financial Analysis

2. This analysis considers the economic and financial viability of one subproject as an example of the viability of subprojects included in the additional financing phase and an indication of the overall viability of this phase of the project.

3. **Key assumptions.** The economic analysis uses second quarter 2014 constant prices, an exchange rate of D21,000 = $1 (the current rate), and a discount rate of 12%. The project life is 20 years. Without the project, the existing irrigated area is unchanged, and cropping patterns and practices are expected to continue. With the project, the whole command area will be irrigated throughout the life of the project with farmers adopting a more diversified cropping pattern and some improved practices. The analysis uses the world price numeraire. Economic prices exclude taxes. A standard conversion factor (SCF) of 0.93[1] is used to adjust financial prices, except for operation and maintenance (O&M) costs, for which a conversion factor of 0.87 is used. A shadow wage rate factor (SWRF) of 0.8 is applied to unskilled wage rates to reflect the relative abundance of unskilled labor.[2] Detailed estimates for the analysis are in the Subproject Investment Report.

B. Upgrading Saloun Reservoir and Irrigation System (Binh Thuan Province)

1. Costs and Benefits

4. The capital cost for the proposed works is D50,929 million ($2,425,180), the cost of supporting training and extension is D1,386 million, and the estimated annual O&M cost is D1,892 million ($89,963). In economic prices, the capital and training cost is D48,750 million ($2,321,440) and annual O&M is D1,772 million ($84,400).

5. Benefits in this subproject will accrue from an increase in the command area of the system from a current effective 70 ha (due to the poor condition of the existing canal system) to 421 ha, with rehabilitation of the existing canals and expansion of the distribution system.

[1] This was used during preparation of the original loan. For the recently prepared Productive Rural Infrastructure Sector Project in the Central Highlands, a SWRF of 1.1 (equivalent to an SCF of 0.91) was used. Using an SCF of either 0.93 or 0.91 will not produce significantly different results.

[2] This is the SWRF used in the analysis for the first loan. It may be too low for present circumstances and therefore variations in SWRF are tested in the sensitivity analysis (qv).

6. The area of irrigated rice will increase and water will be available to provide supplementary irrigation for maize during the summer–autumn season. The geology of most areas of Binh Thuan Province is not favorable; groundwater resources are very limited. Without rehabilitation of the reservoir and expansion of the irrigation canal network, opportunities to diversify to grow cash crops, such as dragon fruit, are not possible.

7. Crop diversification will be important. About 100 ha of the locally prominent dragon fruit are expected to be cultivated by households with land in the command area.[3] At full development of the cropping pattern, which will be reached after 9 years, assuming the area of dragon fruit is planted over 4 years, the subproject is expected to generate an additional 1,873 tons of rice, a decline in maize production of 767 tons, and new production of 4,000 tons of dragon fruit. Strong domestic and export markets for dragon fruit are established in Binh Thuan Province, which is the main production area for this fruit in Viet Nam. Ham Thuan Bac District, where the subproject commune is located, is one of the leading districts producing dragon fruit in the province. While the expected quantity represents only about 1% of Binh Thuan provincial production of dragon fruit in 2011, the subproject will enable the target ethnic minority beneficiary farmers to increase their income by reducing their dependency on rice by diversifying their agricultural production. The project will also reduce flood and drought risks.

2. Summary of Indicators and Sensitivity Analysis

8. The Upgrading Saloun Reservoir and Irrigation System Subproject is an economically viable subproject with an estimated economic internal rate of return (EIRR) of 15.3% and net present value of D20,538 million. This result includes only direct subproject costs and benefits accruing from expected agricultural production, and assumes that estimated costs and benefits are maintained over the life of the project. In financial prices, the internal rate of return is 13.9% and the net present value D11,920 million.

Table 1: Economic Results and Sensitivity

Item	Variable	EIRR (%)	NPV (D million)	Switching Values[a]
Base case		**15.5**	**21,822**	
Capital costs	+10%	14.8	17,956	+56%
	–10%	16.3	25,689	
O&M costs	+10%	15.2	20,015	+122%
	–10%	15.8	23,630	
All benefits	+10%	16.9	32,473	–20%
	–10%	13.9	11,171	
With project yields (field crops)	+10%	17.1	31,774	–22%
	–10%	13.9	11,870	
Dragon fruit yield	+10%	17.9	39,129	–13%
	–10%	12.8	4,515	
Dragon fruit total area	80 ha	14.0	10,729	60.8 ha
	120 ha	16.7	32,915	
Delay in benefits	1 year	13.8	10,904	
	2 years	12.2	1,157	
SWRF	0.9	15.1	19,442	

EIRR = economic internal rate of return, NPV = net present value, O&M = operation and maintenance, SWRF = shadow wage rate factor.

a Switching values are the increases or decreases in costs or benefits, and other factors required to result in an EIRR equal to the discount rate (i.e., an EIRR of 12%).

Source: Asian Development Bank estimates.

[3] The district authorities will fully support the diversification into dragon fruit, as noted in Document 2185/UBND-KT of 4 October 2013 addressed to the Binh Thuan Provincial Project Management Unit from the Ham Thuan Bac District People's Committee.

9. The variations tested mostly have relatively small impact on the EIRR and net present value and none of the variations tested result in an EIRR below the discount rate of 12%. The results are most sensitive to delays in achieving benefits, which are linked to dragon fruit, and to dragon fruit yields and cropping area. The switching values suggest that at least 15% of the command area should be planted in dragon fruit for an economically successful outcome of the project. Given the support of local authorities, this objective is likely to be achieved.[4]

10. The cost of establishing dragon fruit is relatively high and could present an obstacle for many households in this poor area. In addition to the high initial investment, the crop produced only reaches its full production after several years. However, households in the project area have been receiving assistance under Prime Ministerial Decision 54/2012/QD-TTg relating to production credit; Decision 551/QD-TTg relating to support for the development of production and remote and difficult areas;[5,6] and the national programs 135, 134, and 168. These government programs include provision of inputs such as seed of improved varieties and other inputs, as well as support to improve skills and knowledge for crop diversification. The additional financing project will provide technical training to equip beneficiary farmers with necessary skills and knowledge and market linkage support.[7]

3. Financial Impact on Households

11. The subproject has the potential to have a significant impact on households with land in the command area of the reservoir. At present, the average cropping pattern, i.e., the without-project cropping pattern used in the analysis, generates net income of about D9.1 million ($433) per ha per year. With the project, the average with-project cropping pattern, with 24% of land planted in dragon fruit, will generate incremental net income of about D67 million ($3,189) per ha per year, in addition to the present D9.1 million. If a household were to grow only dragon fruit after project implementation, the net income for 1 ha would be D256 million per year ($12,190).

12. These numbers refer to a 1 ha farm. But even with 0.5 ha or less, the subproject can have a large impact on household incomes relative to present on-farm income. Even growing just field crops under the improved irrigation regime will produce significant increases in household income. Winter rice followed by a mix of summer rice and summer maize will generate incremental farm income of about D6 million per ha per year ($287).

4. Poverty Impacts

13. The Dong Giang commune district, where the subproject is located, has a population of 2,464 in 633 households. Only 6% of the population is from the majority Kinh population, the remainder belong to various ethnic minority groups. Over 95% of households are classified as

[4] Crop diversification in the subproject area will benefit from provincial support for crop diversification and improvement in crop quality, as described in Binh Thuan PPC Decision No. 03/2010/QD-UBND of 12 January 2010 "On some policies to support the development of production, processing, consumption of safe vegetables and fruits in Binh Thuan province by 2015."

[5] Decision 54/2012/QD-TTg of 4 December 2012, "promulgating the Policy on loans for development of production with respect to especially difficult ethnic minority households for the period from 2012 to 2015."

[6] Decision 551/QD-TTg of 4 April 2013 "On approving the Program 135 on supporting the infrastructure investment and production development for specially difficult communes, border communes, safety zone communes and specially difficult villages."

[7] Under the ongoing Quality and Safety Enhancement of Agriculture Products and Biogas Development Project (QSAEP), technical and marketing support has been provided to farmers in the same district. Field visits to those farmers supported by QSAEP and marketing support will be provided to the farmers in the Saloun subproject area.

poor. A total of 386 households have land in the command area of the Saloun reservoir, with an average landholding of just over 1 ha per household. These households, if they maintain the average cropping pattern, can expect incremental farm income of about D67 million ($3,189) per ha per year at full crop development, which would represent a very significant increase over current incomes. Other households in the commune can expect to benefit from the indirect effects of (i) increased economic activity in the area arising from the greater agricultural production and (ii) reduced risk of floods and drought. The subproject will have a significant positive impact on reducing poverty in the subproject area.

C. Fiscal Affordability and Sustainability

14. A review of the financial position of the six participating provinces shows significant growth in financial activity and the availability of funds for both capital and current expenditures. Among the six participating provinces, provincial government per capita expenditures were D1.30 million in Ninh Thuan and D1.77 million in Thua Thien Hue in 2008, and increased to D2.72 million in Binh Dinh and D4.35 million in Ha Tinh in 2012. Provincial expenditures more than doubled in all six provinces, compared with overall inflation during the period of about 50%, indicating a sizeable real increase in provincial expenditures. Most provinces, however, remain dependent on transfers from the central government for budget resources. The estimated O&M costs will be in the range of 0.4%–2% per year per province. The project review mission conducted in December 2013 confirms the allocation of adequate counterpart funds for O&M for the completed subprojects in all six provinces and it was confirmed that the adequate 2014 O&M budget for completed subprojects was transferred to the irrigation companies. Therefore, it is affordable.