BOARD
OF
DIRECTORS

ASIAN DEVELOPMENT BANK

IN.333-02
24 December 2002

PROJECT COMPLETION REPORT

The following Project Completion Report is attached for information:

Red River Delta Water Resources Sector Project
(Viet Nam) (Loan 1344-VIE[SF])

ASIAN DEVELOPMENT BANK

PCR: VIE 24269

PROJECT COMPLETION REPORT

ON THE

RED RIVER DELTA WATER RESOURCES SECTOR PROJECT
(Loan 1344-VIE[SF])

TO THE

SOCIALIST REPUBLIC OF VIET NAM

December 2002

CURRENCY EQUIVALENTS
(as of 31 October 2002)

Currency Unit – dong (D)

		At Appraisal (November 1994)	At Project Completion (December 2001)
D1,000	=	$0.09	$0.06
$1.00	=	D10,950	D15,106

ABBREVIATIONS

ADB	–	Asian Development Bank
BME	–	benefit monitoring and evaluation
CPO	–	central project office
EA	–	Executing Agency
GSO	–	General Statistical Office
DARD		Department of Agriculture and Rural Development
ICB	–	international competitive bidding
IS	–	international shopping
IDMC	–	irrigation and drainage management company
IWRP	–	Institute of Water Resources Planning
LCB	–	local competitive bidding
MARD	–	Ministry of Agriculture and Rural Development
SDR	–	special drawing rights
SPO	–	subproject office
SRRBSP	–	Second Red River Basin Sector Project
TA	–	technical assistance
VIWRR	–	Viet Nam Institute for Water Resources Research
WRU		Water Resources University

NOTES

(i) The fiscal year of the Government ends on 31 December.
(ii) In this report, "$" refers to US dollars.

CONTENTS

BASIC DATA

A. Loan Identification

1.	Country	Viet Nam
2.	Loan Number	1344
3.	Project Title	Red River Delta Water Resources Sector
4.	Borrower	Socialist Republic of Viet Nam
5.	Executing Agency	Ministry of Agriculture and Rural Development
6.	Amount of Loan	SDR40,417,000
7.	Project Completion Report Number	PCR: VIE 724

B. Loan Data

1.	Appraisal	
	– Date Started	27 November 1990
	– Date Completed	7 December 1990
2.	Appraisal Update	
	– Date Started	20 September 1993
	– Date Completed	2 October 1993
3.	Appraisal Update	
	– Date Started	1 December 1993
	– Date Completed	21 December 1993
4.	Loan Negotiations	
	– Date Started	7 November 1994
	– Date Completed	9 November 1994
5.	Date of Board Approval	13 December 1994
6.	Date of Loan Agreement	19 January 1995
7.	Date of Loan Effectiveness	
	– In Loan Agreement	19 April 1995
	– Actual	17 April 1995
	– Number of Extensions	–
8.	Closing Date	
	– In Loan Agreement	30 September 2000
	– Actual	23 October 2002
	– Number of Extensions	2
9.	Terms of Loan	
	– Service Charge	1.0% per annum
	– Maturity (number of years)	40
	– Grace Period (number of years)	10

10. Disbursements

a. Dates

Initial Disbursement	Final Disbursement	Time Interval (months)
21 September 1995	23 October 2002	85
Effective Date	**Original Closing Date**	**Time Interval (months)**
17 April 1995	30 September 2000	65

b. Amount ($ million)

Category or Subloan	Original Allocation	Last Revised Allocation	Amount Disbursed	Undisbursed Balance
01-Civil Works	36.00	36.23	35.45	0.66
02-Pumps and Mechanical Equipt.	19.15	10.66	10.49	0.32
03-Scientific Equipment/Vehicles	1.25	0.42	0.41	0.01
04-Consulting Services	0.70	1.92	1.92	0.06
05C-Survey, Investigations, and Design	1.00	2.19	2.12	0.05
06-Interest During Construction	1.90	1.46	1.19	0.29
Total	**60.00**	**52.88**	**51.58**	**1.39**

Note: Amount cancelled: $2.83 million.

11. Local Costs (Financed)
- Amount ($) 34.22
- Percent of Local Costs 61%
- Percent of Total Cost 46%

C. Project Data

1. Project Cost ($ million)

Cost	Appraisal Estimate	Actual
Foreign Exchange Cost	22.00	17.36
Local Currency Cost	53.00	56.38
Total	75.00	73.74

2. Financing Plan ($ million)

Cost	Appraisal Estimate	Actual
Implementation Costs		
Borrower-Financed	15.00	22.16
ADB-Financed	58.10	50.39
Other External Financing	0	0
Total	**73.10**	**72.55**
IDC Costs		
Borrower-Financed	0	0
ADB-Financed	1.90	1.19
Other External Financing	0	0
Total	**75.00**	**73.74**

ADB = Asian Development Bank, IDC = interest during construction.

3. Cost Breakdown by Project Component ($ million)

Component	Appraisal Estimate	Actual
Civil Works and Materials	43.60	46.78
Pumps and Mechanical/Electrical Equipment	23.50	11.11
Scientific Equipment and Vehicles	1.30	0.41
Survey, Investigation, and Design	2.00	4.37
Consulting Services	0.70	1.92 [a]
Land Compensation	0.50	3.84
Taxes and Duties	1.50	0.93
Administration	0	3.19
Interest During Construction	1.90	1.19
Total	**75.00**	**73.74**

[a] Includes consultants for project implementation, benefit monitoring and evaluation and Project Completion Review, and preparation of subprojects for Second Red River Basin Project

4. Project Schedule

Item	Appraisal Estimate	Actual
Date of Contract with Consultants		
Commencement of Services	May 1995	November 1996
Completion of Services	November 1996	November 1997
Upgrading and Improvement of Water Resources Infrastructure		
(i) Core Subprojects		
Trieu Duong		
- Commencement of Construction	October 1993	December 1993
- Completion of Construction	January 1996	December 1995
Phan Dong		
- Commencement of Construction	October 1993	January 1995
- Completion of Construction	January 1996	December 1997
Thanh Diem		
- Commencement of Construction	October 1994	February 1996
- Completion of Construction	October 1996	April 2001
Lan I/II		
- Commencement of Construction	October 1993	October 1993
- Completion of Construction	July 1996	December 1996
(ii) Additional Subprojects		
Nam Ninh (first additional subproject)		
- Commencement of Construction	July 1995	April 1996
- Completion of Construction	June 1997	December 1998
Nhue River (final additional subproject)		
- Commencement of Construction	January 1998	October 1998
- Completion of Construction	September 2000	February 2002

5. Project Performance Report Ratings

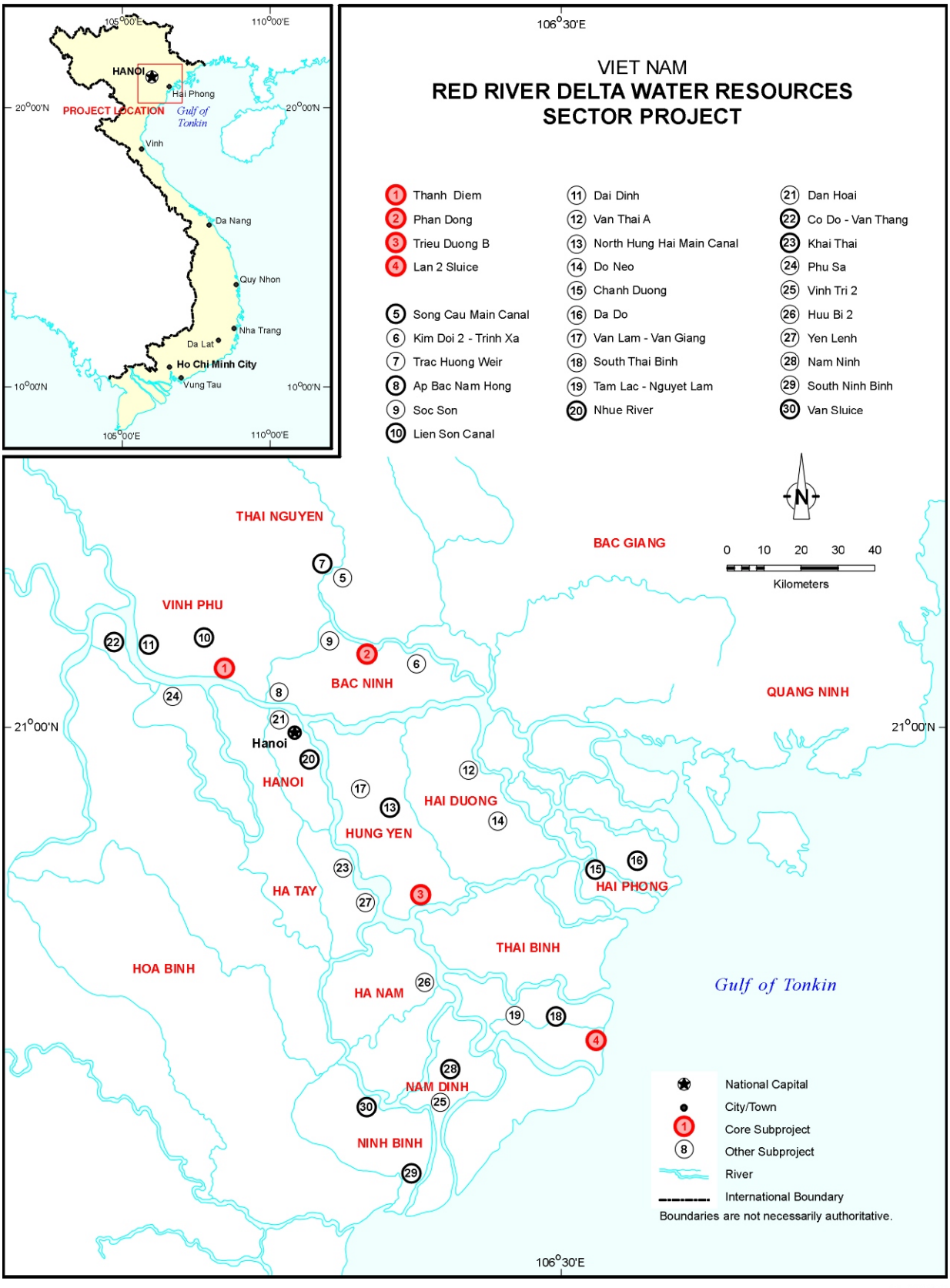
Implementation Period	Ratings	
	Development Objectives	Implementation Progress
From 1 Jan 1995 to 31 Dec 1995	Satisfactory	Satisfactory
From 1 Jan 1996 to 31 Dec 1996	Satisfactory	Satisfactory
From 1 Jan 1997 to 31 Dec 1997	Satisfactory	Satisfactory
From 1 Jan 1998 to 31 Dec 1998	Satisfactory	Satisfactory
From 1 Jan 1999 to 31 Dec 1999	Satisfactory	Satisfactory
From 1 Jan 2000 to 31 Dec 2000	Satisfactory	Satisfactory
From 1 Jan 2001 to 31 Dec 2001	Satisfactory	Satisfactory
From 1 Jan 2002 to 30 Jun 2002	Satisfactory	Satisfactory

D. Data on Asian Development Bank Missions

Name of Mission	Date	No. of Persons	No. of Person-Days	Specialization of Members[a]
Fact-Finding	27 July–11 Aug 1990	3	48	a, c, d
Appraisal	27 Nov–7 Dec 1990	5	55	a, b, c, d, h
Appraisal Update	20 Sep–2 Oct 1993	3	32	c, d, e
Appraisal Update	1–21 Dec 1993	4	84	c, d, d(sc),f
Inception	3–11 May 1995	2	18	d, j
Review	4–15 Mar 1996	2	17	d, j
Special Loan Administration	22–28 Oct 1996	1	7	d
Midterm Review	17–27 Nov 1997	3	18	d, g, j
Special Loan Administration	24–26 Nov 1997	2	6	d, j
Special Loan Administration	23–25 Apr 1998	1	3	d
Review	25 Sep–15 Oct 1999	1	21	d(sc)
Review	4–19 Oct 1999	3	37	d, e, j
Review	17–26 Oct 2000	2	12	d, j
Review	26–29 Nov 2001	2	6	d, j
Project Completion Review[b]	17 Jun–12 Jul 2002	5	112	c(sc), d, g, i(sc), j

[a] a – agronomist, b – counsel, c – economist, d – engineer, e – environment specialist, f – financial analyst, g – implementation officer, h – programs officer, i – social development specialist, j – support staff, sc – staff consultant.

[b] The project completion report was prepared by Pieter M. Smidt, Principal Project Implementation Officer.


VIET NAM
RED RIVER DELTA WATER RESOURCES SECTOR PROJECT
106°30'E
105°00'E
110°00'E
20°00'N
10°00'N
HANOI
Hai Phong
PROJECT LOCATION
Gulf of Tonkin
Vinh
Da Nang
Quy Nhon
Nha Trang
Da Lat
Ho Chi Minh City
Vung Tau
1 Thanh Diem
2 Phan Dong
3 Trieu Duong B
4 Lan 2 Sluice
5 Song Cau Main Canal
6 Kim Doi 2 - Trinh Xa
7 Trac Huong Weir
8 Ap Bac Nam Hong
9 Soc Son
10 Lien Son Canal
11 Dai Dinh
12 Van Thai A
13 North Hung Hai Main Canal
14 Do Neo
15 Chanh Duong
16 Da Do
17 Van Lam - Van Giang
18 South Thai Binh
19 Tam Lac - Nguyet Lam
20 Nhue River
21 Dan Hoai
22 Co Do - Van Thang
23 Khai Thai
24 Phu Sa
25 Vinh Tri 2
26 Huu Bi 2
27 Yen Lenh
28 Nam Ninh
29 South Ninh Binh
30 Van Sluice
N
0 10 20 30 40
Kilometers
THAI NGUYEN
BAC GIANG
VINH PHU
BAC NINH
QUANG NINH
21°00'N
Hanoi
HANOI
HAI DUONG
HUNG YEN
HA TAY
HAI PHONG
THAI BINH
HOA BINH
HA NAM
Gulf of Tonkin
NAM DINH
NINH BINH
National Capital
City/Town
Core Subproject
Other Subproject
River
International Boundary
Boundaries are not necessarily authoritative.

02-4155 HR

I. PROJECT DESCRIPTION

1. The need to rehabilitate and upgrade the water resources infrastructure in the Red River Delta (the Delta) prompted the Government of Viet Nam to seek Asian Development Bank (ADB) assistance in 1989. Subsequently, an appraisal mission for the Project was fielded in December 1990. Because of the urgent need to rehabilitate seriously degraded infrastructure, a project preparatory technical assistance (TA) was not conducted. In 1991, ADB agreed to the Government's request to give priority to the rehabilitation of the dyke providing flood protection for Hanoi. This, together with uncertainties about the resumption of ADB operations in Viet Nam, delayed loan processing. In 1993, ADB fielded two missions to update the appraisal. A loan of SDR40.4 million was approved in December 1994.

2. The Red River Delta Water Resources Sector Project (the Project) was to promote economic growth and reduce poverty in the Delta by financing a 5-year time slice of the Government's $300 million investment plan for water resources infrastructure in the Delta. Rapid and sustainable increases in agricultural production and incomes on smallholder farms throughout the Delta were to be achieved by removing the constraints imposed by inadequate drainage and irrigation. A sector approach was adopted for the execution of the Project as the Government had (i) a well-articulated sector development plan, (ii) demonstrated capacity to implement small to medium-scale projects, and (iii) well-established cost-recovery mechanisms in the sector.

3. The Project, with an estimated cost of $75 million, aimed at upgrading and rehabilitating water resources infrastructure servicing about 100,000 hectares (ha) through the execution of 20 to 30 subprojects costing up to $3.0 million.[1] The Project also intended to strengthen (i) the operational management of the Bac Hung Hai irrigation and drainage system—the largest such system in the Delta—and (ii) the capacity for environmental monitoring in the Delta. The Project was to be executed by the Ministry of Water Resources with the assistance of the provincial water resources services. A 5-year implementation period was expected with the Project due for completion in September 2000. A $1.4 million advisory TA approved in conjunction with the Project aimed at strengthening the capacity of sector agencies in planning, design, construction, and the management of irrigation and drainage systems.

4. In December 1995, the Ministry of Water Resources was merged with other ministries to form the Ministry of Agriculture and Rural Development (MARD). At the provincial level, the provincial water resources services were integrated into the departments of agriculture and rural development (DARDs).

II. EVALUATION OF DESIGN AND IMPLEMENTATION

A. Relevance of Design and Formulation

5. Project design was appropriate to the needs of the Delta's drainage and irrigation systems at the time. Limited investment had been undertaken in the sector for many years, and many of the larger structures were at or close to the end of their serviceable life and some of the war damage had not yet been fully repaired. The Project aligned closely with Viet Nam's development priorities at the time, as expressed in the 1993 Water Resources Development

[1] Four core subprojects were fully appraised during project preparation.

Plan and its national development priorities. The Project's focus on medium-scale projects was appropriate in view of MARD's implementation capacity and experience.

B. Project Outputs

1. Upgrading and Rehabilitation of Water Resources Infrastructure

6. The appraisal targets for infrastructure upgrading—the Project's main component—have been fully realized. A total of 30 subprojects have been implemented and are complete except for minor works financed from provincial sources.[2] Also, start-up problems still need to be resolved under two subprojects.[3] The subprojects include drainage, irrigation, and combined drainage and irrigation subprojects (Appendix 1). The 30 subprojects benefit a total area of about 530,000 ha and around 2.3 million farm households compared with the appraisal estimates of 100,000 ha and 1.5 million households, respectively. The main factor for the significant larger coverage has been the inclusion of a number of subprojects for upgrading main systems serving areas larger than envisaged at appraisal.[4] Works included construction or rehabilitation of pumping stations, of drainage outfall and irrigation intake sluices, and of irrigation and drainage canals. As per project design, subprojects generally did not include upgrading and rehabilitation of secondary, tertiary, and on-farm systems.[5] As a result, the full potential project benefits cannot be realized as constraints at the lower system levels have not been addressed. Furthermore, the Project did not include measures to address system operational issues, thereby also limiting realization of additional benefits in a number of subprojects.

7. Most subproject works were undertaken based on MARD's standard design and cost norms.[6] These norms resulted in structures with low investment costs but subsequent high maintenance costs. Also, insufficient investments were made in safety measures associated with major pump stations. Given the financial constraints faced by the irrigation and drainage management company (IDMCs), several of the subproject works are likely to retain their design capacity over a shorter period than assumed for subproject appraisal.

2. Improvement of the Operational Management of the Bac Hung Hai Irrigation and Drainage System

8. The operational performance of the Bac Hung Hai irrigation and drainage system, the largest irrigation system in the Delta covering 200,000 ha, was to be improved under the Project. Limited investments were planned to improve monitoring and control of the system's major intake and other control structures. Since the communication and control equipment was installed only in 2001, it is too early to assess whether the equipment will indeed improve Bac Hung Hai's operational performance. However, it is unlikely that the limited project intervention will have a measurable impact considering the complex issues involved in improving the

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2 The minor works are mainly for improvement of tertiary and on-farm canals.

3 The Thanh Diem core subproject and the South Ninh Binh subproject. The start-up problems are both associated with problems with the pumps installed under the subprojects.

4 An example is the North Hung Hai subproject under which selected sections of the system's main drainage-cum-irrigation canals were dredged, benefiting 134,000 ha. Because of the large area benefiting from this subproject, the investment cost per hectare is low ($43/ha).

5 This was in accordance with government policies prevailing during project design and implementation. Investments in lower-level systems were to be undertaken by provincial and local authorities using their own resources.

6 During project implementation, MARD adopted higher standards for steel coatings.

system's performance as highlighted in the diagnostic survey carried out under the Project's advisory TA.

3. Improved Capacity for Environmental Monitoring

9. As envisaged at appraisal, MARD's Institute of Water Resources Planning (IWRP) was provided with laboratory equipment to assist it to undertake comprehensive water quality analysis. Since 2001, MARD has been undertaking a 5-year delta-wide water quality monitoring program for which it is using this laboratory equipment. Further strengthening and expansion of the program will be undertaken through the Second Red River Basin Sector Project (SRRBSP).[7]

C. Project Costs

10. At appraisal, total project cost was estimated at $75.0 million with foreign exchange costs of $22.0 million (29%) including $1.9 million for service charges on the ADB loan during project implementation. ADB was to provide a loan of $60.0 million equivalent to meet 80% of the project cost. In January 2001, loan proceeds equivalent to $1.5 million were cancelled and applied to the 2000 Emergency Assistance for Flood Damage Rehabilitation.[8] A further $1.3 million was cancelled in November 2002.

11. Total project expenditure amounted to $73.7 million, $1.3 million below the appraisal estimate, comprising $17.3 million of foreign exchange and $56.4 million equivalent of local currency costs. Although the overall project expenditure is basically the same as the appraisal estimate, expenditures incurred against a number of expenditure categories vary quite significantly. Major variances are for civil works, pumps, and associated equipment, and for land acquisition. The combined expenditures for subprojects in terms of civil works, pumps, and equipment total $57.8 million, $9.3 million below the appraisal estimate. Less investment in pump stations is the major factor for the lower expenditures. Expenditure on land compensation exceeds the appraisal estimate by a large margin, i.e., $3.8 million compared with the appraisal estimate of $0.5 million. Higher resettlement and land acquisition requirements than foreseen at appraisal, together with increased compensation payments during project implementation, are the main factors for the increased expenditures. Inclusion of local consulting services for preparation of feasibility studies for the SRRBSP is the main reason for the increase in the expenditures against the consulting services category from $0.7 million to $1.9 million. Project administration was added as an expenditure category during project implementation and a total of $3.2 million was spent under this category, equivalent to 5% of total project cost.

12. As a result of the depreciation of the SDR during implementation and the cancellation of $2.8 million, ADB's financing was reduced to $51.6 million, $8.4 million lower than originally envisaged. On the other hand, the Government's financing increased by $7.2 million from $15.0 million to $22.2 million. The increase in expenditures on land compensation has been a main factor in the increased government financing. ADB's overall financing share fell from 80% envisaged at appraisal to 70% while the Government's share increased from 20% to 30%.

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7 ADB. 2001. *Report and Recommendation of the President to the Board of Directors on a Loan to Viet Nam for Second Red River Basin Sector Project.* Manila.

8 ADB. 2000. *Emergency Assistance for Flood Damage Rehabilitation*. Manila.

D. Disbursements

13. Loan disbursement began in 1996. The loan closing date was extended twice, first by 9 months from 30 September 2000 to 30 June 2001, and then by 6 months from 30 June 2001 to 31 December 2001 in line with the extended implementation period. The loan account was kept open until October 2002 to enable the final payment under a letter of credit opened for an equipment supply contract. Actual disbursement reached $51.6 million.

14. To facilitate disbursement, an imprest account with a maximum ceiling of $3.0 million was established for the central project office (CPO) at the State Bank of Viet Nam in December 1995. Contract awards and disbursements remained low until 1998, mirroring slow implementation progress (Appendix 2). Annual contract awards peaked in 1999 with total contract awards of $40.1 million. With the implementation of most of the subprojects under way, annual disbursements peaked in 2000 at $14.1 million.

E. Project Schedule

15. The Project was to be completed over 5.5 years between early 1995 and 30 September 2000 (Appendix 3). Construction of three of the four core subprojects had begun by the time of loan approval.[9] However, despite this early start, project implementation remained slow until mid-1998 due to several factors: (i) the late fielding of the loan-financed consultants in November 1996;[10] (ii) this exacerbated the difficulties faced by MARD in preparing appraisal reports acceptable to ADB and delayed the start of subprojects; (iii) within MARD, approval of feasibility studies, detailed designs, and tender documents for subprojects took significantly longer than envisaged;[11] and (iv) MARD's initial unfamiliarity with ADB's procedures added to the delays. The need to minimize disruption of crop production limited construction periods and therefore slowed implementation of several subprojects. Furthermore, shortage of counterpart funds from central government sources adversely affected project implementation, especially during the initial 4 years.[12] Several subprojects included works entirely funded by provincial sources and some provinces faced difficulties in providing the funds on a timely basis, resulting in delayed implementation of the provincially funded works. As a result of these factors, the Project was completed on 31 December 2001, 15 months behind the appraisal target, but with some provincial funded works still incomplete. The Project's benefit monitoring and evaluation (BME), commencement of which was delayed until late 1999 as a result of MARD's initial reluctance to undertake such a program, will end in early 2003.

F. Implementation Arrangements

16. A sector approach was to be followed for the Project's main component of the upgrading and rehabilitation of the water resources infrastructure. With all potential subprojects already firmly identified by the Government at the time of appraisal, this approach was not fully adopted. No new subprojects were included during project implementation but adjustments in scope were made in a number of the subprojects. The predetermined subprojects were checked against the selection criteria. The requirement to limit the total cost of each subproject to $3.0 million if a

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[9] Implementation of two core subprojects started in late 1993 and the third one in late 1994. Implementation of the fourth subproject commenced in early 1996 as government regulations required a reappraisal because of a cost increase.

[10] In contrast to the project consultants, the TA-financed consultants were fielded on time in August 1995.

[11] Typically, 2 years were required to complete the preparatory activities and approval procedures.

[12] Government regulations issued in 1998 pertaining to counterpart funds from central government sources for externally funded projects improved counterpart fund flow from 1999 onward.

special review by ADB was to be avoided, discouraged the adoption of a more effective holistic approach.[13] As a result, upgrading and improvement works for a single system was in a number of cases packaged into two or three different subprojects, each costing less than $3.0 million. This added to the number of feasibility studies to be prepared by MARD and precluded a holistic approach to design, implementation, and monitoring.

17. Project organization and management during implementation followed the structure and arrangements envisaged at appraisal but with some modifications. The existing CPO within MARD responsible for implementation of all externally funded water resources projects[14] was strengthened to assume the overall responsibility for implementing the Project. For the Project's water resources infrastructure component, MARD enlisted external resources to perform some of the tasks to be performed under the Project. State-owned design companies and the Water Resources University (WRU) of Hanoi were appointed to undertake feasibility studies as well as initial environmental examinations and social assessments; prepare appraisal reports, designs, and tender documents; and assist in construction supervision. The day-to-day implementation of subprojects was delegated to five subproject offices (SPOs).[15] The provincial authorities were responsible for resettlement, land acquisition, and other provincially funded activities. MARD engaged a local joint-venture company to assist in the procurement and installation of large equipment, such as pumps and motors. The Project's BME program was entrusted to the Viet Nam Institute for Water Resources Research (VIWRR).

18. MARD's standard practice for contract supervision was, however, adopted for the execution of subprojects, i.e., joint supervision by the SPO, the design company (or University), and the IDMC, but with the SPO having ultimate responsibility. This practice reflects the preproject situation in the sector when the SPOs, design companies, and contractors were still arms of the Ministry of Water Resources. The independent third-party supervision intended at appraisal was therefore not realized.

19. Resettlement and land acquisition were more extensive than expected, despite efforts to minimize these through design adjustments (Appendix 4). Furthermore, compensation payments were increased as a result of adjustments in the Government's legal framework for resettlement after project appraisal. In view of this, MARD recognized in late 1997 the need for the establishment of a resettlement unit within CPO. ADB supported the establishment of this unit through an advisory TA.[16] CPO's resettlement unit prepared a resettlement framework for all remaining resettlement activities. It also assisted the concerned provincial authorities to prepare a resettlement plan for the only subproject that required a full resettlement plan according to ADB's policy on involuntary resettlement adopted in late 1995.

G. Conditions and Covenants

20. The Government and MARD generally complied with the loan covenants (Appendix 5). However, some covenants in the area of project execution and operation and maintenance were partly complied with. Although the Government provided the required counterpart funds to complete the Project, it faced difficulties in providing sufficient funds on a timely basis during the

[13] Five subprojects had costs exceeding the $3.0 million threshold.

[14] CPO was also responsible for the implementation of Loan 1259-VIE: Irrigation and Flood Protection Rehabilitation Project, approved in October 1993.

[15] The six project construction management boards were reconstituted into five SPOs following reorganization in 1995. The number of SPOs was reduced to three in 2001 when most of the subprojects were completed.

[16] ADB. 1998. *Technical Assistance to Viet Nam for TA 3064-VIE: Strengthening Resettlement Management Capacity in MARD*. Manila.

first 4 years of project implementation. MARD on its part did not undertake initial social assessments during subproject formulation in accordance with ADB guidelines. This resulted in a missed opportunity for meaningful participation by the primary stakeholders in subproject formulation, design, and implementation. In most cases, MARD did not submit subproject appraisal reports to ADB prior to its approval of subprojects. This made it essentially impossible to incorporate ADB suggestions for modifications to subproject scope and design except where these entailed minor adjustments. Although the Government and MARD made strong efforts to minimize resettlement needs and mitigate the impact of resettlement on affected households, compensation payments were not always made on time.

21. Full recovery of major recurrent maintenance cost of the whole drainage and irrigation system in which subprojects were located was one of the selection criteria. However, this has not proved feasible for most of the project IDMCs. Their revenues streams from irrigation fees are often insufficient to meet regular operation and maintenance needs, let alone major repair and rehabilitation costs. Maintenance works usually receive low priority in terms of budget allocation (except for major structures like pump stations) and insufficient funds are generally allocated to the upkeep of system infrastructure. The subprojects have not made a significant contribution to increasing revenues from irrigation fees. Institutional issues, including the reliance on agricultural cooperatives for irrigation fee collection and the IDMCs' obligation to provide services regardless of the level of fee payments, prevent the generation of sufficient revenue from irrigation fees. The Project's design did not provide support for addressing these institutional issues.

H. Technical Assistance (TA 2233)

22. The TA was intended to strengthen the capability of MARD in planning, design, construction, and management of irrigation and drainage projects (Appendix 6). TA activities were undertaken essentially as originally planned. Most of the activities were undertaken with the assistance of international consultants recruited under the TA. Consultant inputs were 36 months—3 months longer than envisaged. The performance of the consultants and subcontractors was generally satisfactory. Difficulties were encountered with counterpart staff, particularly early in the TA period.

23. The TA produced a series of satisfactory outputs including (i) eight comprehensive technical reports containing recommendations for improvements in project planning, design, execution, and system operation; (ii) three technical training courses; and (iii) an overseas study tour. Eight MARD staff were trained as master trainers, and 106 people from various water sector agencies benefited from the training courses. The closing date of the TA was extended to rerun the training courses, procure equipment, and liquidate the TA account.

24. Despite meeting its scheduled outputs, the TA is rated only partly successful. MARD has not adopted relevant TA outputs, apart from some of the training courses. The TA therefore has not made a significant impact on MARD's operations in planning, designing, constructing, and managing irrigation and drainage systems. However, the TA's environmental and gender field studies and the diagnostic review of the operational performance of the Bac Hung Hai system have assisted in the formulation of follow-on projects, such as the SRRBSP.

I. Consultant Recruitment and Procurement of Goods and Services

25. As per appraisal, a team of international consultants was recruited in accordance with the ADB *Guidelines on the Use of Consultants* to facilitate project implementation during the

initial period. Recruitment was delayed by about 18 months, mainly due to MARD's unfamiliarity with ADB procedures and to administrative inefficiencies. In line with the appraisal estimate, a total of 27 person-months of consulting services were rendered within a period of 15 months.

26. Civil works and equipment were to be procured in accordance with ADB's *Guidelines for Procurement*. As envisaged at appraisal, all civil works were awarded on the basis of local competitive bidding (LCB) among prequalified contractors except for the civil works for the core subprojects, which were awarded on the basis of direct selection.[17] Most civil works contracts were awarded to state-owned enterprises. No major problems were encountered with the civil works contracts. However, the setting of cost ceilings by the Government put pressure on contract prices.

27. Large equipment (pumps, motors and transformers for pumps, and gates for large outfall structures) were to be procured through international shopping (IS) for contracts up to $0.5 million and through international competitive bidding (ICB) for contracts over $0.5 million. Subsequent to the appraisal update mission in 1993, MARD however proceeded with the local procurement of such equipment for three core subprojects with a total value of $0.5 million using prevailing government procedures. Following ADB's Inception Mission in mid-1995, ADB agreed to this procurement on a retroactive basis considering the special circumstances of the delayed loan approval. At the same time, ADB agreed to MARD's request to procure equipment worth $0.9 million for the fourth core subproject through IS to expedite its implementation. Procurement of large items of equipment for other subprojects was undertaken through the appraised procurement arrangements, with generally one separate contract for each subproject. This resulted in the award of 10 ICB and seven IS contracts with a total value of $9.7 million (Appendix 7).

28. CPO's initial unfamiliarity with IS and ICB procurement procedures caused problems and delays with the procurement of the first supply contracts. These were mainly caused by the inadequate standards of technical specifications and shortcomings in bid evaluation. As CPO gained experience through the first contracts, no major problems were experienced with subsequent contracts.

29. For large pump stations, the contracts for civil works, equipment supply, and installation were separate. In some cases, the procurement and delivery of equipment was completed well before the civil works were ready for pump installation. This created a problem for the suppliers, as commissioning and testing were parts of the supply contracts. It also involved storage expenditures before the pumps were required.[18] The separation of investments into individual subprojects for a single system because of the $3 million cost threshold resulted in separate procurements for adjacent pumping stations managed by the same IDMC. This has resulted in adjacent pump stations constructed with similar duties but fitted with pumps from different manufacturers, complicating maintenance for the IDMC.

J. Performance of Consultants, Contractors, and Suppliers

30. The performance of the international consultants was satisfactory. The consultants produced useful reports, manuals, and guidelines to facilitate project implementation. However,

[17] At the time of appraisal, government procurement regulations were being revised to bring them more into line with those of external financing agencies. ADB therefore agreed to procure the civil works for the four core subprojects through direct selection in accordance with prevailing government regulations.

[18] For example, the pumps for the Khai Thai, Thanh Diem, and Yen Lenh subprojects had to be kept in store for 2 years before installation.

the impact of this material on the preparation of feasibility studies, environmental examinations, social assessments, and other implementation processes was minimal. The fact that the consultants were fielded late and their limited inputs were provided over a relatively short period contributed to this outcome.

31. Generally, the performance of the local civil works contractors was satisfactory in relation to local standards. However, the quality of the works varies, with some contractors able to produce high quality outputs and others not achieving acceptable standards. Although the structures are generally structurally sound, the concrete work of some of them is poor, especially in terms of finish. For some structures and canal lining, inadequate soil compaction has resulted in differential settlement. On the other hand, a number of dredging contracts were executed to a high standard with appropriate spoil disposal. The performance of the local and international suppliers of equipment has generally been satisfactory. A number of supply contracts for pumps had to be extended because of delay in the completion of the pump houses, clearly a factor beyond the control of the supplier.

K. Performance of the Borrower and the Executing Agency

32. Although the government funds required to complete the Project were provided, the central Government faced difficulties in providing sufficient counterpart funds, especially during the initial 4 years. In terms of resettlement and land acquisition, the Government took steps during implementation to bring its regulations more into line with ADB's policy on involuntary resettlement. As a result, the level of compensation payments and resettlement assistance for affected households under the Project were increased following a government decree issued in April 1998, and the central and provincial governments provided the additional budget required for this. Overall, the performance of the Government has been satisfactory.

33. At project commencement, MARD had limited experience in executing externally assisted projects. This caused problems during the early stage of project implementation as MARD was not fully aware of ADB's sector approach and ADB procedures and requirements. Also, MARD's complex and time-consuming review and approval procedures adversely affected implementation. However, during project implementation, MARD introduced measures to streamline a number of procedures by delegating more responsibility to CPO. Although MARD strengthened CPO to handle the increased workload as result of the Project, its resources remained limited.[19] CPO had little control over the design companies and the WRU engaged for subproject preparation and assistance in construction supervision. They were appointed by other MARD agencies or the DARDs and without terms of reference reflecting the specific requirements under the Project. This contributed to CPO's difficulties in preparing appraisal reports at standards acceptable to ADB.[20] Since CPO and the SPOs reported independently to the senior management of MARD, CPO also had little control over the SPOs. This led to coordination and reporting problems between CPO and the SPOs, particularly during early implementation. Although the SPOs have generally been effective in construction management, they have not been able to consistently enforce full compliance with contract specifications.

34. MARD took timely action when it became clear that additional capacity for resettlement and land acquisition activities was required through the establishment of a resettlement unit.

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[19] CPO staff dedicated to the Project varied between three and five experts, plus support staff.

[20] The persistent shortcomings in subproject appraisals included the lack of clarity on the rational and scope of the subproject, insufficient information on cost recovery, a usually cursory analysis of environmental impacts, and inadequate social impact assessments.

MARD could have been more proactive in pursuing and adopting recommendations made by the project and TA consultants and improving implementation practices not meeting current best practices. However, considering the overall public administrative environment in which it had to operate, MARD's overall performance has been satisfactory.

35. The performance of the design companies and the WRU has been variable. The national design company and the larger provincial design companies performed satisfactorily in relation to the engineering aspects of subproject preparation and implementation. The performance of the other companies was partly satisfactory. However, all design companies and the WRU were unable to fully comply with ADB's environmental and social requirements. The fact that MARD did not have appropriate cost norms for environmental examinations and social assessments contributed to this. As the design companies and the WRU were not engaged by CPO and were without clear terms of reference reflecting ADB requirements, CPO was unable to control the quality of the appraisal reports. VIWRR, engaged by CPO with comprehensive terms of reference, performed satisfactorily in undertaking the BME program.

L. Performance of the Asian Development Bank

36. Project and TA appraisal was a major challenge, especially as it was undertaken without the benefit of a project preparatory TA. Such a TA would have been beneficial as ADB's understanding of sector issues was limited. The initial difficulties experienced during project implementation suggest that ADB was too optimistic about MARD's institutional readiness to adopt ADB's sector approach and procedures for project implementation. Following loan and TA approval, ADB provided extensive guidance to MARD whose staff were initially unfamiliar with ADB procedures and requirements. In view of this, ADB fielded three missions during the first 2 implementation years while annual missions were fielded during the remaining years. During the early stage of project implementation, ADB displayed flexibility in the application of its procurement guidelines to accommodate government procurement procedures, which were at that time being revised with the assistance of ADB and the World Bank.[21] Throughout the implementation period, ADB continued to advise MARD on subproject preparation, environmental examinations, social assessments, design standards, construction supervision, and quality control, as well as resettlement. ADB also persuaded MARD to undertake BME. ADB provided timely assistance to improve resettlement planning through the provision of TA. However, following the completion of the services of the project implementation consultants, ADB should have taken a firmer stand on the quality of the subproject appraisal reports by insisting on minimum standards. This would have improved the quality of subproject preparation during the later phase of project implementation. In terms of TA supervision, ADB should have more vigorously pursued the formal review and adoption of relevant TA outputs by MARD. Overall, ADB's performance in appraising and supervising project implementation is rated satisfactory.

[21] ADB assistance was provided through TA 2061-VIE: Institutional Strengthening of Special Procurement Unit of the State Planning Committee, for $100,000, approved on 14 February 1994 and TA 2247-VIE: Institutional Strengthening of the National Office for Procurement Evaluation, for $600,000, approved on 20 December 1994.

III. EVALUATION OF PERFORMANCE

A. Relevance

37. The Project was considered highly relevant by the Government at the time of its design in the early 1990s. The country's water resources infrastructure was developed over many years but with little new investment since the 1960s. As a result, much was old and in many cases dilapidated. The Project was designed within the framework of the 1989 Water Resources Sector Development Plan, as revised in 1993. The improvement of agricultural productivity in the major irrigation areas of the Red River and Mekong deltas was a key plank of government policy—to improve the country's balance of payments and rural incomes.

38. By the time of completion in 2001, the Project remained relevant to national economic goals, such as the maintenance of rapid growth in gross domestic product. However, it had become somewhat less relevant as a result of new government and ADB poverty reduction strategies. These continue to promote rural development and agricultural productivity but have a sharper focus on the central region of Viet Nam. The rural population of the Delta has a higher income than that of the central region. While there are pockets of poverty, most of the population has a reasonable standard of living and has increased its income levels substantially since economic liberalization in the late 1980s.

39. The 30 subprojects implemented under the Project have demonstrated the Project's relevance of its main component. Upgrading and improvement of water resources infrastructure in the Red River Delta have remained a high priority for the Government and ADB continues to support the Government in this through the SRRBSP. Despite the lack of a specific poverty focus, the Project is classified as relevant.

B. Efficacy in Achievement of Purpose

40. The Project's purpose was to create a sustainable increase in food crop production from smallholder farms in the subproject areas. Farmers in the Delta, including those in the subproject areas, have achieved rapid productivity gains since the early 1990s. This has been due to a reduction in the restrictions facing farmers, improved input supplies, increased security of tenure, and the wide introduction of new high-yield varieties, particularly for rice.

41. Project BME provides a wealth of data on agricultural productivity and farm financial performance in the subproject areas.[22] However, the late start of benefit monitoring, and the approach to impact assessment, with no analysis of the without-project situation, limit its usefulness. District and provincial agricultural statistics from the General Statistical Office (GSO) provide useful control area data for many subprojects. From this analysis, it appears that the direct benefits of improved irrigation and drainage have been relatively low.[23] While the statistics suggest that limited change has resulted from project investments, farmer interviews conducted during the Project Completion Review (PCR) Mission in almost every case indicated (i) that farmers thought that the investments assisted them in their agricultural activities, and (ii) that they had made a significant contribution to increased yields.

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[22] The BME program includes a baseline and two follow-up surveys in all 30 subprojects.

[23] In the longer term, as existing pump stations become unserviceable and irrigation and drainage canals deteriorate, it is expected that productivity in the subproject areas would fall in the absence of project investments. However, GSO crop production statistics suggest that the Delta's farmers and the IDMCs are skilled in keeping the infrastructure functioning.

42. The Delta is the food-basket of northern Viet Nam, and a key contributor to the national economy. It is therefore vital that infrastructure is maintained and developed over time. Although the short-term impact of the Project on yield may not have been as great as anticipated, its impact area of 530,000 ha is substantially larger than the 100,000 ha envisaged at appraisal. However, project impacts have been limited by two factors: (i) the fact that investments were not undertaken in the context of long-term planning for improving overall system performance through operational and infrastructure interventions, and (ii) the limited participation of the primary stakeholders in subproject development and design. The Project missed an opportunity to initiate a more holistic and participatory process in system rehabilitation and upgrading. Nonetheless, the efficacy of the Project is rated satisfactory.

C. Efficiency in Achievement of Outputs and Purpose

43. All project outputs were achieved, though often with delays. MARD's initial unfamiliarity with ADB procedures and sector approach contributed to this. Efficiency of implementation varied between subprojects, with some implemented efficiently and others with implementation problems as illustrated in Section II. The efficiency would have been enhanced if the subprojects had been planned within a river basin planning framework. However, overall, the project outputs were realized efficiently against a backdrop of the prevailing project implementation environment in Viet Nam.

44. To assess the Project's efficiency in terms of increased agricultural production, the economic internal rate of return (EIRR) was estimated for the four core subprojects. The Lan II sluice construction in South Thai Binh was complemented by two additional subprojects (Kien Giang River dredging and the Tam Lac/Nguyet Lam sluice construction) and the three were analyzed together (Appendix 8). The six subprojects are reasonably representative of the range of subprojects implemented. The two irrigation subprojects (Tam Lac/Nguyet Lam and Thanh Diem) have improved dry season irrigation to target areas and improved silt deposition, assisting in maintaining soil productivity. The four drainage subprojects have reduced the extent and duration of flooding in the wet (summer) season. The rates of return for the four cases range between 4% and 17%, compared to the 21% projected for the core subprojects during appraisal.[24] The two drainage pump station subprojects (Phan Dong and Trieu Duong) demonstrate low EIRRs (4% and 6% respectively), for a number of reasons: (i) drainage only benefits the wet season crop; (ii) cost per hectare was high in the case of the Phan Dong ($770 per hectare drained);[25] (iii) in both cases, little direct benefit was evident compared to control areas due to the virtual absence of flood-inducing major storms since 1994; and (iv) project investments were limited to the main drainage system (or part of it) without addressing constraints in the secondary and tertiary drainage systems.[26] Despite the low apparent returns, farmers interviewed during the PCR Mission generally reported favorably on the drainage subproject facilities.

45. The actual yield gains were less than predicted at appraisal. However, at PCR, the net impact of these gains was reduced by the fact that yields in and outside the project area generally have been trending upward at approximately the same rate. Productivity gains have resulted from improved varieties and husbandry as well as from improved irrigation and

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[24] The appraisal projected EIRRs to range between 15% and 20% for the additional subprojects.

[25] The high investment cost is largely because of the higher pumping rate required per hectare (up to 6 liters/sec/ha for drainage compared to 2 liters/sec/ha for irrigation).

[26] Nonagricultural benefits have not been taken into account for the evaluation of the subprojects. These are likely to be more significant for drainage subprojects than for other subprojects.

drainage. A second key factor limiting economic performance has been the decline in the economic price of rice over the period from about $1,650/ton (t) in 1994 to $1,250/t in 2002. Although the EIRRs of several of the 30 subprojects implemented under the Project, especially the drainage pump subprojects, are likely to be less than estimated at appraisal due to various factors illustrated in the foregoing paragraphs, the Project represented an efficient use of resources.

D. Preliminary Assessment of Sustainability

46. In general terms, project outcomes are likely to be sustainable. Viet Nam has a long history of keeping water resources infrastructure functioning with limited maintenance expenditure. This is evidenced by the high proportion of pumps and motors still operating in the Delta around 40 years after installation. Irrigation service fees are well accepted, and a high proportion of farmers in the Delta meet their commitments. Where low fee recovery is evident, it mainly results from farmers believing that the level of service provided (e.g., in terms of irrigation supply) is too low to warrant compliance. Other factors are poverty, water conflicts, and the reliance on agricultural cooperatives for fee collection. When major repairs or essential replacement works are needed, IDMCs can generally count on financial assistance from the provincial or central government. In addition, IDMCs receive subsidies to cover the electricity costs associated with operating drainage pump stations.

47. While there are sound prospects for the pumps installed under the Project to achieve a reasonable service life, the IDMCs need to apply more effort to maintenance and major repair. While an old pumping station with 40 units of 1,000 cubic meter (m^3)/hour pumps could continue to operate with limited maintenance, the modern pump stations with five units of 8,000 m^3/hour pumps are more demanding. In view of the planned future investments in upgrading and replacing pump stations, MARD needs to monitor the performance of the pumps and their maintenance. Valuable lessons can be learned from such monitoring.

48. In common with other public sector investments in Viet Nam, some project facilities are deteriorating rapidly, partly as a result of low technical standards and the associated low cost norms, and poor construction. Some deterioration is superficial but in other cases it is more severe, such as the cracks in buildings, differential settlement of structures, subsidence of lined canal banks, nonfunctioning gates, and broken water stops. While the structures are unlikely to experience failure, the deterioration will generate future repair and replacement costs. Higher design standards could have avoided or delayed such costs.[27]

E. Environmental, Sociocultural, and Other Impacts

49. The Project has generally resulted in neutral to positive environmental outcomes. Higher silt intake has assisted in maintaining soil quality and limiting fertilizer inputs. Improved drainage has a more immediate and widespread positive environmental impact. All beneficiaries with whom the PCR Mission discussed these issues indicated a general improvement of health status, resulting from higher water flows in canals and reduced period of inundation during floods—factors in the spread of waterborne disease. The BME program shows that most of the

[27] For example, the severe rusting of steel support structures in the substations will mean that renovation of all substations is likely to be required within 10 years of construction. This could have been prevented with the application of anti-rust paint to all exterior steel and iron.

water bodies are turbid and high in fecal and total coliforms, but that most parameters are within Vietnamese or World Health Organization limits.[28]

50. The Project's BME program also confirms that farmers in the Delta use high levels of fertilizer and chemicals, though this is not a function of the Project. Integrated pest management is being quite widely adopted and is promoted by extension services. Cooperatives visited by the PCR Mission employ one to four part-time extension officers, who are paid a basic wage from revenues generated from irrigation fees. This represents a valuable asset and means that new technology can be piloted and extended rapidly.

51. About 2.3 million farm households have benefited to some degree from project investments, with a further 400,000 nonfarm households benefiting from improved drainage. The social assessment carried out by the PCR Mission in four subproject areas confirms this (Appendix 9). The equitable system of land allocation within the communes has ensured that project benefits have been widely distributed to villagers. Resettlement and compensation procedures were generally implemented effectively. Most compensated or resettled persons interviewed by the PCR Mission expressed the view that they had been fairly compensated and had received adequate assistance for resettlement. However, families whose houses were damaged due to nearby piling operations for structures complained that they faced difficulties in receiving compensation payments as the resettlement and compensation plan did not foresee such damage.[29] One adverse impact observed by the PCR Mission has been the reduction and loss of income of families engaged in fishing activities in one of the subprojects[30] due to the reduction of saline water intrusion as a result of the Project.

52. Agricultural work in the Delta is mainly evenly divided between men and women as confirmed by the BME reports. The main impact on labor due to the Project has been a reduction in labor inputs due to improved water levels in canals, and a reduced need to replant following inundation. Both men and women undertake these jobs, though transplanting is mainly done by women.

53. Overall, the Project is positive from a social perspective. Insofar as the Project contributed to increased agricultural production, it assisted in the general rise in farm incomes evident in the Delta. While farm size limits the extent of affluence, with an average of only around 0.24 ha per farm family, many farmers are generating reasonable cash incomes by processing agricultural by-products through livestock. The health effects of the Project are positive—a significant social benefit. The Project did not specifically target poorer areas within the Delta, but has nonetheless assisted in the general reduction in poverty reported by BME studies.

IV. OVERALL ASSESSMENT AND RECOMMENDATIONS

A. Overall Assessment

54. The Project was implemented as planned. The Project's investments have covered about 530,000 ha, significantly larger area than the 100,000 envisaged at appraisal. In general,

[28] Extensive water quality testing is being undertaken under the BME program. On average, about six samples are taken under each subproject annually from irrigation and drainage canals.

[29] These families did receive compensation, but with a delay.

[30] Lan II subproject in the South Thai Binh system.

the investments have addressed important irrigation and drainage constraints. BME, though conducted in an intensive manner, only began in late 1999 and has not identified mechanisms to define the without-project situation. Analyses undertaken by the PCR Mission of GSO data indicate that comparable yield gains have been made in subproject areas and nearby districts that did not benefit from project investments. For this reason, combined with a significant decline in the economic price of rice, the EIRR ranges from 4% to 17% for the four core subprojects analyzed. Taking into account the Project's rating against ADB's five evaluation criteria (relevance, efficacy, efficiency, sustainability, and institutional and other development impacts) the Project is rated successful.

B. Lessons Learned

55. The Project has shown that Viet Nam's water resources sector institutions have considerable experience and capacity to design and execute infrastructure projects and manage complex irrigation and drainage investments. At the same time, the Project and its implementation have highlighted a number of lessons that are relevant for further support for developing and managing Viet Nam's water resources sector.

1. Design and Implementation

56. Getting the design of subprojects right is the key to project performance and impact. The Project employed a traditional approach to subproject design, focusing almost entirely on primary infrastructure. A more participatory and holistic approach to design should result in improved outcomes. Future project designs therefore should include extensive consultation with the primary stakeholders (farmers, water management groups, and IDMCs). Examples of contributions that these stakeholders can make to system design include identification of investment needs in secondary and tertiary drainage and irrigation systems, alignment and level of canals and drains, location of major structures, and placement of spoil from excavations.

57. Under future projects, project planning should be based on a river basin development approach. It should also be undertaken within an overall system context and should address key constraints in an integrated manner. While the design of the Project did not place any particular limit on the scale of subproject investments, in practice, CPO and the design companies attempted to remain within the $3.0 million limit, above which subprojects had to be approved by ADB review missions. This resulted in a fragmented and truncated approach in the case of a number of subprojects. Artificial cost limitations should not of themselves drive subproject selection.

58. The Project has shown that physical interventions do not necessarily lead to improved irrigation fee collection—one of the Project's objectives. Specific activities need to be integrated in the project design to address cost-recovery issues, taking into account the role of the provincial people's committees in setting irrigation and drainage fees, the performance of the IDMCs in providing irrigation and drainage services, and the role of the cooperatives and their water management groups. In-system irrigation and drainage conflicts also need to be understood and addressed. For future projects, inclusion of reform measures to improve the performance of water sector institutions should be considered, besides the physical interventions.

59. Future projects need to ensure that parallel downstream investments required from provinces, cooperatives, or farmers are made in a timely manner. In several of the Project's subproject areas, investments in the secondary and tertiary canal systems have been less than

optimal, resulting in lowered system performance and an inability to fully capitalize on project investments.

60. Since the management of most of the irrigation and drainage systems is under the jurisdiction of provincial governments, provincial stakeholders should take a lead role in upgrading and rehabilitating intraprovincial systems under future projects. Under the Project, except for complex components such as large pump stations, and large outfall and intake sluices, implementation of several subproject components could have been delegated to the provinces with sufficient implementation capacity.

61. Although the Project's BME program is being implemented successfully, it highlights (i) the desirability of commencing BME at an early stage of project implementation, (ii) the need to monitor control areas as well as benefiting areas, and (iii) the desirability of maximizing the use of secondary data. It is important for future projects that BME is not seen as an end in itself, but rather as a valuable tool which can feed into the management of existing, and the design of new, subprojects.

2. Institutional Strengthening

62. The Project and the TA were intended to assist in the development of Viet Nam's water resources institutions. In practice, their impact has been limited. The Project and TA experience highlights the difficulties in encouraging institutions to adopt new approaches to planning and management. A careful assessment is required during project and TA design of the agency's receptiveness to new institutional and operational concepts and the potential to operationalize them. Furthermore, TA inputs should be planned in a phased manner so that in case of insufficient support and ownership on the part of the executing agency, the TA can be reformulated, rescheduled or, in the worst case, terminated.

C. Recommendations

63. Being the first water resources sector project for which a project completion report has been prepared since the resumption of ADB's operations in Viet Nam in 1993, the experience gained under the Project is of particular relevance for follow-on water sector projects. Some of the lessons learned from the Project have already been built in to the design of the SRRBSP. However, several actions or activities should be undertaken to enhance the impact of the Project, the SRRBSP, and other successor projects. If the Project is selected for postevaluation, its output should be available in time so that it can provide an input to the midterm review of the SRRBSP. The postevaluation should therefore be undertaken in early 2004.

64. The recommendations specific to the Project and the TA as well as more general recommendations for future projects in, and policy and strategy for, Viet Nam's water resources sector are presented in Appendix 10. The more general recommendations, which are not only applicable for Viet Nam but also have wider relevance in the region include:

(i) for rehabilitation and modernization projects, the scope of the project (and subprojects in the case of *sector* projects) should be determined on the basis of a participatory diagnostic survey of the whole system including main, secondary, tertiary and on-farm levels; the diagnostic survey should look into physical and nonphysical aspects that determine the present level of system performance and potential for improvement.

(ii) for water resources *sector* projects:

(a) identification and screening of subprojects should be undertaken within a basin context; the portfolio of investment opportunities should be demonstrably linked to an overall basin plan;

(b) a “sector-level” environmental examination should be carried out to reduce the environmental analyses required at the subproject level;

(c) the depth of social, environmental, institutional, and technical analysis and the documentation needed for subproject appraisal and approval needs to be clarified and agreed between ADB and the executing agency during project preparation; and

(d) arbitrary cost ceilings should not be set for subprojects in order to avoid dividing activities within the same system. It could be more appropriate to use a ceiling based on cost per hectare coupled with a description of works that normally would not be included in the project because of their complexities and costs and an indication of the typical subproject cost to ensure a reasonably wide geographic spread of subprojects.

(iii) For advisory TAs aimed at capacity building and improving executing agency operations and procedures, upfront agreements need to be reached on the arrangements to review and approve TA outputs and subsequently incorporate them in the executing agency’s procedures and operations. These aspects should be an integral part of TA design. TA inputs should be scheduled in a phased manner so that in case of insufficient support and ownership on the part of the executing agency, the TA can be reformulated, rescheduled or, in the worst case, terminated.

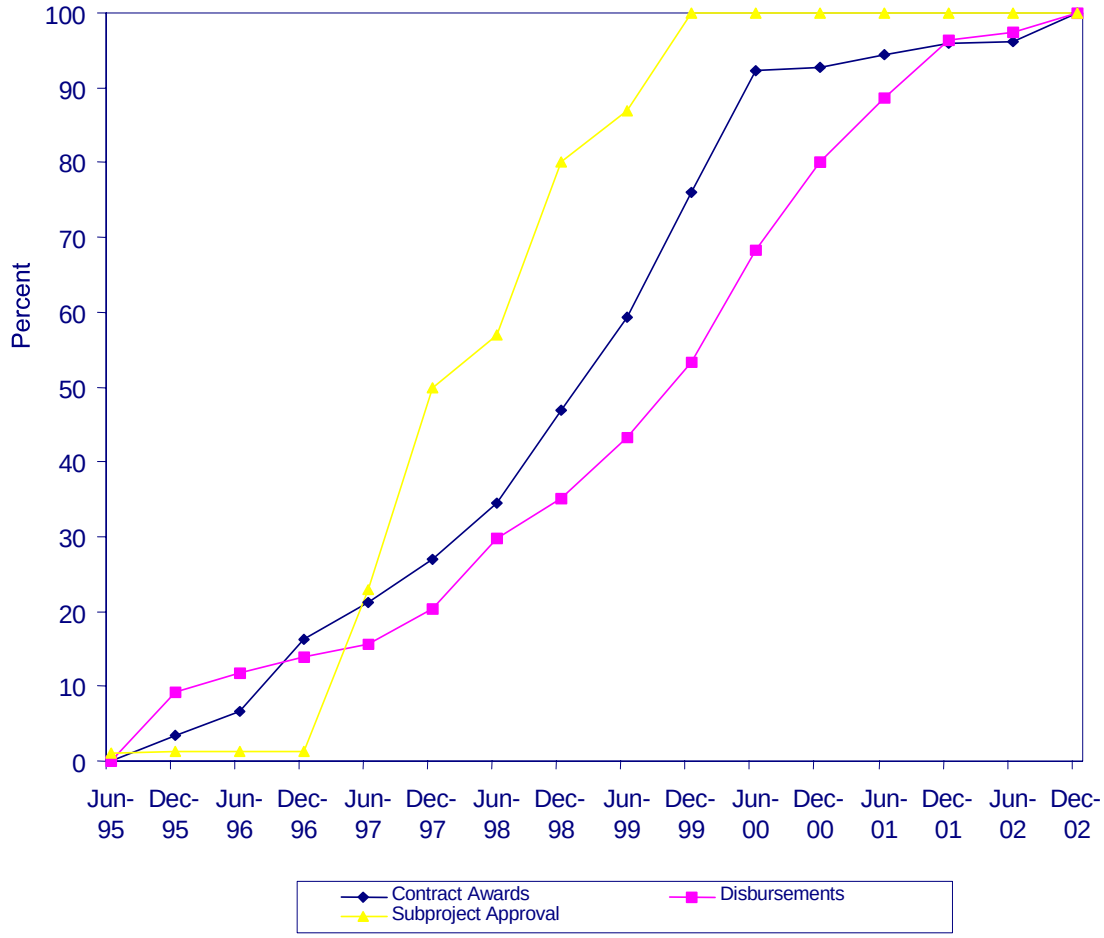
SUBPROJECT DETAILS

		Population			Benefited Area (ha)			Cost		
Subproject	**Province(s)**	**Total**	**% Farm house-holds**	**Farm house-holds**	**Irrigated**	**Drained**	**Total[a]**	**Total Cost ($'000)**	**Cost/ha ($)**	**Main Subproject Component**
Khai Thai	Ha Tay	62,100	90	12,420	4,000	4,200	4,200	3,085	735	Drainage pump station
Yen Lenh	Ha Nam	62,428	86	11,931		4,472	4,472	2,789	624	Drainage pump station
Nhue River System	Ha Noi/ Ha Thay	2,818,773	73	457,268	53,769	57,486	57,486	3,782	66	Drainage pump station, irrigation intake sluices and embankments
South Ninh Binh	Nam Dinh	360,565	85	68,107		14,010	14,010	1,849	132	Drainage pump stations
Dan Hoai	Ha Tay	334,466	80	59,461	19,270	650	19,270	1,763	91	Irrigation pump stations
Co Do Van Thang	Ha Tay	86,072	85	16,258		6,035	6,035	1,884	312	Drainage pump station
Phu Sa	Ha Tay	235,187	88	45,992	10,150		10,150	1,195	118	Irrigation pump stations
Huu Bi II	Nam Dinh	131,019	91	26,495		11,250	11,250	2,147	191	Drainage pump station
Vinh Tri II	Nam Dinh	194,165	86	37,107		20,006	20,006	2,324	116	Drainage pump station
Van Sluice	Ninh Binh	657,660	80	116,917	36,799		36,799	1,674	45	Dredging
Nam Ninh	Ninh Binh	81,567	98	17,763		7,210	7,210	2,511	348	Drainage pump station
Trieu Duong B	Hung Yen	65,800	90	13,160		3,958	3,958	1,331	336	Drainage pump station
Do Neo	Hai Duong	71,585	91	14,476	628	3,910	3,910	2,553	653	Drainage pump station
Van Lam - Van Giang	Hung Yen	345,834	94	72,241	14,936	2,942	134,053	2,724	43	Irrigation pump stations
North Hung Hai System	Hay Dung/ Hung Yen	2,400,951	90	480,190	118,000	134,053		3,053		Dredging
Van Thai A	Bac Ninh	73,095	90	14,619	518	4,329	4,329	2,186	505	Drainage pump station
Lan II Sluice						34,000		3,770		Drainage outfall sluice
Tam Lac- Nguyet Lam	Thai Binh	767,030	90	153,406	8,296		34,000	2,105	308	Irrigation intake sluice
South Thai Binh System						32,048		2,938		Dredging
Da Do System	Hai Phong	463,995	91	93,830	18,254	22,454	22,454	2,979	133	Drainage outfall sluice
Chanh Duong System	Hai Phong	190,250	90	38,050	14,141		14,141	2,897	205	Irrigation intake sluice
Phan Dong	Bac Ninh	26,384	80	4,690	992	2,267	2,267	1,748	771	Drainage pump station
Kim Doi - Trinh Xa	Bac Ninh	531,329	85	100,362	18,000	7,607	18,000	2,775	154	Drainage pump station
Thanh Diem	Vinh Phuc	222,000	95	46,867	7,574		7,574	3,727	492	Irrigation pump stations
Dai Dinh	Vinh Phuc	250,050	90	50,010	9,012		9,012	2,241	249	Irrigation pump stations
Lien Son System	Vinh Phuc	556,605	93	115,032	20,300		20,300	1,999	98	Irrigation intake sluice
Thac Huong	Thai Nguyen	455,535	73	73,898	30,000		30,000	1,214	40	Irrigation intake sluice
Song Cau River Canal System	Bac Giang/Hiep Hoa, Viet Yen, Tan Yen & Phu Binh	461,912	73	74,932	27,500		27,500	1,770	64	Dredging
Ap Bac-Nam Hong	Ha Noi	252,132	70	39,221	9,268		9,268	1,803	195	Irrigation pump station
Soc Son System	Ha Noi	65,686	89	12,991		2,789	2,789	1,875	672	Drainage pump station
Total		**12,224,173**		**2,267,694**	**421,407**	**375,676**	**534,443**	**70,691**	**132**	

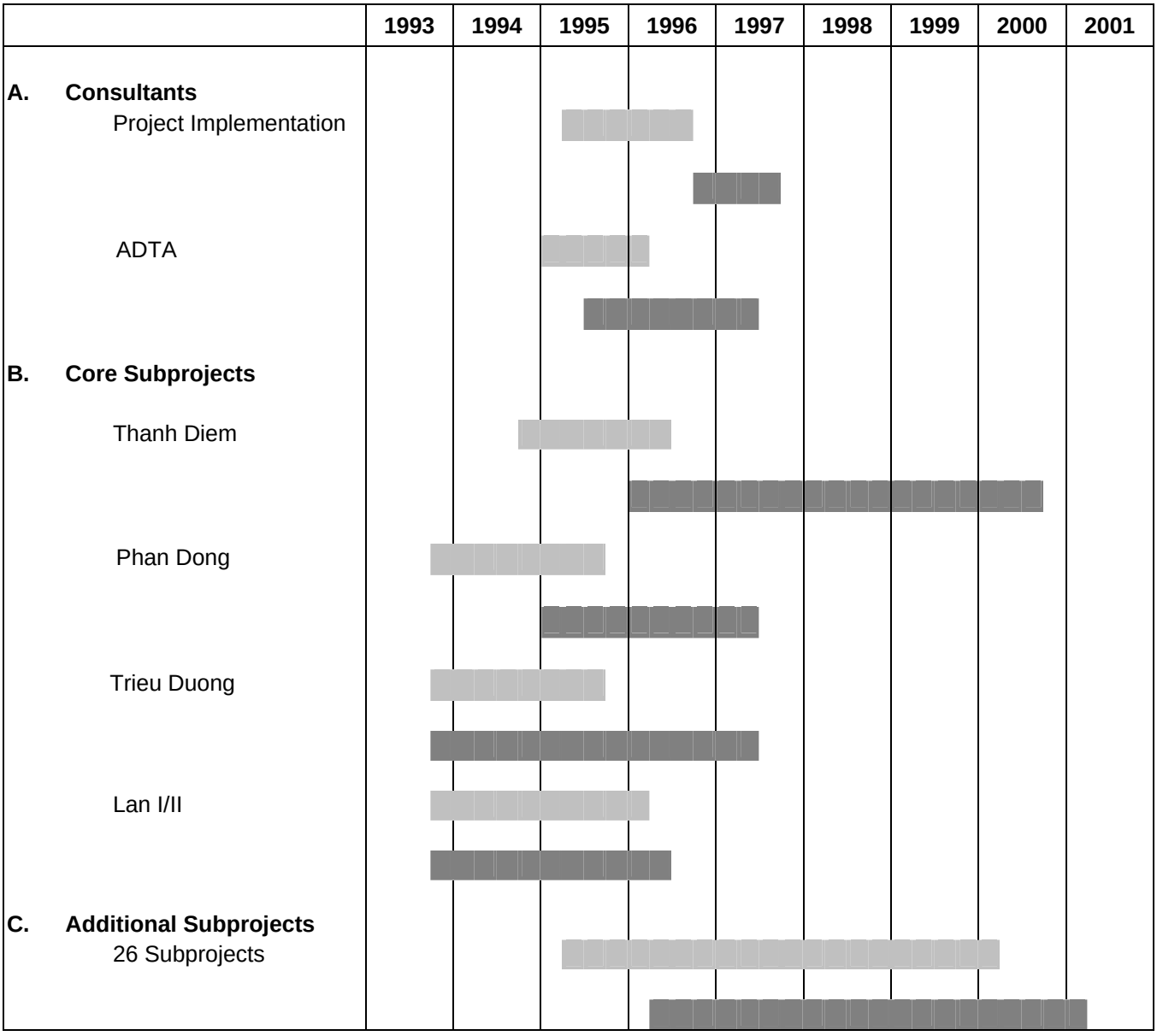
= core subproject. ha = hectare.

[a] Some areas are both irrigated and drained. The total therefore is not a direct addition of irrigated and drained areas.

CONTRACT AWARDS AND DISBURSEMENTS



PROJECT IMPLEMENTATION SCHEDULE



ADTA = advisory technical assistance.

RESETTLEMENT AND COMPENSATION

Subproject	Land Affected (ha)			Affected Households	
	Total	Permanent	Temporary	Total	Households Resettled
Thanh Diem	14	12	2	792	20
Cau River Canal System	141	137	4	269	0
Kim Doi-Trinh Xa	21	20	1	0	0
Phan Dong	1	1	0	26	26
Thac Huong	53	27	26	116	0
Ap Bac-Nam Hong	0	0	0	0	0
Soc Son System	27	12	15	18	4
Lien Son System	117	105	12	702	2
Dai Dinh	62	41	21	205	0
Van Thai A	10	4	6	244	17
Trieu Duong B	3	2	1	0	0
North Hung Hai System	390	390	0	6,800	0
Do Neo	12	4	8	500	1
Chanh Duong System	123	112	11	2,683	1
Da Do System	57	51	6	812	12
Van Lam-Van Giang	17	4	13	302	2
South Thai Binh System	216	209	7	2,527	12
Tam Lac-Nguyet Lam	7	6	1	63	8
Lan II Sluice	41	19	22	0	0
Nhue River System	25	23	2	20	9
Dan Hoai	1	0	1	3	0
Co Do-Van Thang	15	2	12	0	0
Khai Thai P/S	15	7	9	550	0
Phu Sa	0	0	0	0	0
Vinh Tri II	6	1	4	94	4
Huu Bi II	6	1	5	30	12
Yen Lenh	10	1	9	200	14
South Ninh	3	0	3	58	18
North Ninh Binh	6	3	4	1	1
Van System	213	213	0	946	0
Total	**1,610**	**1,408**	**203**	**17,961**	**163**

= core subproject.
Source: central project office.

STATUS OF COMPLIANCE WITH MAJOR LOAN COVENANTS

Document	Covenant	Status
Loan Agreement (LA) Section 4.02	The Borrower shall make available, promptly as needed, funds, facilities, services, land and other resources required, in addition to the proceeds of the loan, for the carrying out of the project and for the operation and maintenance (O&M) of project facilities.	Complied with. However, shortages of counterpart funds were experienced during project implementation and delays in resettlement and land acquisition were experienced.
LA Section 4.06(b)	The Ministry of Water Resources (MWR) shall (i) maintain separate accounts for the Project; (ii) have such accounts and related financial statements audited annually in accordance with auditing standards acceptable to the Asian Development Bank (ADB); (iii) furnish to ADB not later than 9 months after the end of each fiscal year, certified copies of such audited accounts and financial statements.	Complied with. MWR was merged into the Ministry of Agriculture and Rural Development (MARD) in 1995.
LA Section 4.07(b)	The Borrower shall furnish to ADB quarterly reports on the carrying out of the Project and on the operation and management of the project facilities.	Complied with.
LA Section 4.07(c)	Within 3 months after project completion, the Borrower shall prepare and furnish to ADB a report on the physical completion of the Project.	Complied with.
LA Schedule 5, para. 1	The Borrower shall ensure that the technical staff of the central project office (CPO) shall include at least two full-time staff members with qualifications and experience acceptable to ADB. After 1 year of the effective date of the loan, the Borrower and ADB shall review the composition of staff of the CPO and the staffing shall be increased or adjusted as necessary.	Complied with.
LA Schedule 5 para. 3	The Borrower shall ensure that MWR appoints as Subproject Managers the Managers heading the provincial construction management boards (PCMBs) and that each PCMB is staffed with a Deputy Manager, technical staff for design and construction, and administrative support staff. O&M services shall be provided by the provincial irrigation companies.	Complied with. In 1995, the five PCMBs were reconstituted into Subproject Offices (SPOs). O&M services are provided through provincial irrigation and drainage management companies (IDMCs) and dependent irrigation enterprises.
LA Schedule 5, para. 5	The Borrower shall ensure that (i) detailed designs prepared by the provincial water resources services (PWRS) shall be checked by the Design Control Division of the Construction Management Department, and (ii) arrangements for third party supervision of construction works shall be submitted to ADB for its concurrence.	Complied with. In 1995 the PWRS were integrated into the provincial departments of agriculture and rural development (DARDs).
LA Schedule 5, para. 6	The PWRS in each province in the project area, in cooperation with the Planning Dept. of MWR, shall be responsible for the identification and preparation of subprojects in its respective province. Upon preliminary approval by MWR, the PWRS shall prepare a detailed subproject appraisal report for submission to the CPO. The CPO shall submit to ADB for information or clearance, subproject appraisal reports at least 1 month prior to the approval by MWR of subproject implementation.	Partly complied with. In most cases MARD approved the subprojects and its investments prior to submission of appraisal reports to ADB.
LA Schedule 5, para. 7	To be eligible for inclusion in the Project, a subproject shall meet the following criteria: (a) the subproject shall entail the rehabilitation and/or	Complied with for (a), (b), and (c) but partly complied with for (d). Irrigation fees are set on a provincial basis and

Document	Covenant	Status
	upgrading of an existing irrigation and/or drainage system, including new structures in an existing system; (b) the subproject is certified by CPO as technically viable and environmentally and socially sound; (c) the economic rate of return of the subproject, as verified by the CPO, shall exceed 15%; (d) the incremental water fees expected as a result of the subproject, based on the estimated increase in crop production, shall be sufficient to finance the basic operating costs, including electricity charges for upgraded and/or rehabilitated pumping stations; and (e) CPO shall be satisfied that costs of major recurrent maintenance of the whole system shall be covered from the O&M budget of the system.	are not altered to reflect particular investments. The fees generally cover more than 90% of the operating costs of the IDMCs, with the balance met from the provincial budget. IDMCs' budgets are generally not sufficient to undertake the level of maintenance that will prevent a recurrent cycle of rehabilitation.
LA Schedule 5, para. 8	The first three subprojects appraised after the effective date shall be subject to clearance by ADB prior to recommendation for approval by MWR's Construction Management Dept. In addition, subprojects that meet any of the following criteria, shall be subject to prior clearance by ADB: (a) the estimated costs of the subproject are in excess of $3 million equivalent; (b) the subproject requires a major redesign of the canal network; (c) the subproject involves major works other than irrigation and drainage pumping station; or (d) the development costs of the subproject are in excess of $1,000 per ha. (e) subprojects mentioned under para. (a) above shall be subject to review by special review mission of ADB prior to clearance by ADB.	Complied with.
LA Schedule 5, para. 9(a)	As part of each subproject appraisal report, an initial environmental examination (IEE) and a summary initial environmental examination (SIEE) report shall be prepared in accordance with ADB's Environmental Guidelines for Selected Agriculture and Natural Resources Development Projects and an environmental impact assessment (EIA), if warranted. The EIA shall be submitted to ADB for its review and clearance prior to subproject approval by MWR. The SIEE shall require prior clearance by ADB in the case of a subproject mentioned in para. 8(a) or 8(b) or if the subproject involves resettlement affecting more than 20 families.	Complied with.
LA Schedule 5, para. 9(b)	The Borrower shall ensure that all subproject implementation plans are in compliance with relevant environmental legislation and regulations of the Borrower.	Complied with.
LA Schedule 5, para.10(a)	The Borrower shall ensure that as part of each subproject appraisal report, a social assessment shall be carried out in accordance with ADB's Guidelines for incorporating Social Dimensions into ADB Operations.	Partly complied with. Initial Social Assessments were undertaken but without meaningful participation of primary stakeholders.
LA Schedule 5, para. 10(b)	The Borrower shall take necessary steps to ensure that (i) subprojects are designed in such a way as to minimize the need to relocate people living in the	Partly complied with. Compensation payments not always made in full prior to commencement of construction.

Document	Covenant	Status
	Project area; (ii) all land, rights in or over land and other rights or privileges required for the implementation of the subprojects are acquired promptly; (iii) adequate budgetary allocations are made from for payment of compensation to persons displaced by the project; (iv) displaced persons are promptly, fairly and adequate compensated; and (v) compensation has been settled in full prior to commencement of construction. Details of compensation arrangements shall be included in the IEE for the subproject concerned and MWR shall keep ADB informed on the implementation of the arrangements made through regular benefit monitoring and evaluation (BME) reports.	
LA Schedule 5, para.10(c)	Where the social assessment and/or IEE in the subproject appraisal report identify losses of common grazing areas due to a subproject that will modify existing canal and/or dyke embankments, MWR shall, in consultation with the provincial authorities, assist the affected communities in intensifying the production of livestock forages from other land resources.	Not applicable. No loss of common grazing areas under any of the subprojects.
LA Schedule 5, para 11	MWR shall establish an environmental monitoring unit within the Institute for Water Resources Planning and Management and enhance laboratory facilities to provide a capability for monitoring water quality.	Complied with.
LA Schedule 5, para 12	Within 9 months of the effective date, MWR shall, in consultation with ADB, establish mechanisms and procedures for BME in accordance with ADB guidelines. MWR shall submit a BME report to ADB twice a year during project implementation and for 2 years after project completion, in a format acceptable to ADB.	Partly complied with. CPO prepared guidelines for BME in 1997. The BME program was initiated in late 1999 and will be completed in 2003.
LA Schedule 5, para. 13	The Borrower and ADB shall jointly carry out a comprehensive midterm review (MTR) of the Project 18 months after the effective date (i.e., November 1996).	Delayed compliance. MTR was carried out in November 1997.
LA Schedule 5, para. 14	The Borrower shall keep ADB informed of all policy decisions affecting the water resources sector.	Complied with.

TECHNICAL ASSISTANCE COMPLETION REPORT

<table>
<tr><td colspan="3">TA 2233-VIE: Capacity Building in the Water Resources Sector</td><td colspan="2">Amount Approved: $1,350,000
Revised Amount: -</td></tr>
<tr><td colspan="2">Executing Agency: Ministry of Agriculture and Rural Development (MARD) - formerly the Ministry of Water Resources) [1]</td><td>Source of Funding:
JSF</td><td>TA Amount Undisbursed

$28,609.27</td><td>TA Amount Utilized

$1,321,390.73</td></tr>
<tr><td colspan="3">Dates
Approval: 13 Dec 1994 | Signing: 19 Jan 1995 | Fielding of Consultants: 19 Aug 1995</td><td colspan="2">Closing Date
Original: Jan 1997 | Actual: April 1999</td></tr>
</table>

Description

At the time of appraisal and appraisal update of the Red River Delta Water Resources Sector Project (Loan 1344-VIE) between 1990 and 1993, water resources sector agencies had for some time been isolated from new developments in drainage and irrigation technology and management. In addition, there was limited awareness of environmental and social issues in the water resources sector. In response to this situation, the technical assistance (TA) was to transfer new technology and raise awareness in these areas within the Ministry of Agriculture and Rural Development (MARD), the Executing Agency (EA) of the Red River Delta Water Resources Sector Project (RRDWRSP)

Objectives and Scope

The objective of the TA was to strengthen the capability of MARD in planning, design, construction, and management of irrigation and drainage projects. The TA comprised five components: (i) introducing modern approaches to planning and design; (ii) improving environmental monitoring and assessment; (iii) assessing gender issues in the sector; (iv) improving system operational performance; and (v) developing short in-service training courses with an associated training of master trainers, and an overseas study tour. The TA was to be implemented over a 17-month period starting shortly after effectiveness of Loan 1344-VIE. MARD was designated as the EA while the Institute of Water Resource Planning (IWRP), the Water Resources University, and the Bac Hung Hai Irrigation and Drainage Management Company (IDMC) were to collaborate in the TA's implementation.

Against the backdrop of MARD's limited exposure to new developments in the water resources sector and the renewed support from multilateral development banks from 1993 and onward, the TA was relevant and its objectives and scope were appropriate. However, with MARD being a new EA for ADB, the design of the TA's implementation arrangements could have better taken into account uncertainties to successfully introduce new concepts and approaches. Up-front agreements on the arrangements to review and approve TA outputs and subsequently incorporate the outputs in MARD's procedures and operations would have been appropriate. Considering that the TA was a multi-component one, the designation of MARD's Training College for Hydraulic Works Staff as the TA's lead agency was not the most optimal decision. An institutionally more neutral agency within MARD as lead agency would have been more effective. Also, instead of the Bac Hung Hai system, the largest and most complex system in the Red River Delta, a less complex and more representative system would have been more appropriate as the locale for the TA's diagnostic survey for system operational performance. Improving the operational performance of the Bac Hung Hai system would require a stand-alone project.

Evaluation of Inputs

TA activities were undertaken essentially as originally planned and within the original TA budget. Most of the activities were undertaken with the assistance of international consultants recruited under the TA. The consultants subcontracted the development of the training courses to a specialized overseas institution as well as several other specific activities to local agencies. The performance of the consultants and its subcontractors was generally satisfactory. The eight counterpart staff who were first trained as master trainers participated actively in the development of the training courses thus ensuring their appropriateness for the local conditions. The consultants rendered a total of 36 months of services against the original provision of 33 person-months, and completed their assignment within the original contact amount. MARD appreciated the services provided by the consultants. Difficulties were encountered with counterpart staff, particularly early on during the TA implementation as a result of the institutional reorganization associated with the establishment of MARD. Although ADB provided satisfactory guidance for the TA implementation, ADB should have been firm in the establishment of a review committee with sufficient authority to approve TA outputs for incorporation in MARD procedures and processes.

[1] MARD is the successor of the Ministry of Water Resources which, together with other ministries, merged into MARD in late 1995.

Evaluation of Outputs
The TA has resulted in a series of satisfactory outputs in accordance with its design and terms of reference. The outputs include a series of eight comprehensive technical reports containing recommendations for improvements in project planning, design, execution, and system operations and three technical training courses based on 27 course units. All TA outputs have been translated into Vietnamese. Eight MARD staff were successfully trained as master trainers and the first runs of the training courses were supported by the TA. The study tour was also undertaken. The TA's main outputs were delivered within the original time frame. The closing date of the TA was extended with 27 months to rerun the training courses for additional MARD staff and to procure equipment for the operations of the Bac Hung Hai system. A total of 106 persons from various water sector agencies benefited from the training courses run with TA support. Their feedback about the contents of the training courses and their relevance has generally been positive.

Although MARD collaborated in delivering the TA outputs, it has not yet taken action to adopt TA outputs with the exception of some of the outputs related to training. MARD's Training College has included some of the course units in its regular training program. However, the eight master trainers were no longer active in regular training activities after TA completion.

Overall Assessment and Rating
The TA has is considered partly successful. It has delivered relevant outputs as per original TA design and within an appropriate time frame. However, the TA has not yet been able to make a significant difference in MARD's operations. The TA outputs also did not impact on the implementation of the RRDWRSP except for the strengthening of the capacity of the IWRP for water quality monitoring. On the other hand, the TA's environmental and gender field studies and the diagnostic review of the operational performance of the Bac Hung Hai system have assisted in the formulation of follow-on projects such as the Second Red River Basin Sector Project (Loan 1855).

Major Lessons Learned
While designing a capacity building TA for an EA not yet well known to ADB, extra care needs to be taken to assess the EA's receptiveness to and the possibilities for introducing new institutional and operational concepts. Furthermore, the arrangements for review and adoption of TA outputs should firmly be agreed together with performance criteria reflection ownership on the recipient EA to ensure that TA outputs are internalized by the EA. The TA inputs should be scheduled in a phased manner so that in case of insufficient support and ownership on the part of the EA, the TA can be reformulated, rescheduled or, in the worst case, terminated.

Recommendations and Follow-Up Actions
(i) MARD needs to set up a formal ad-hoc committee to review the technical TA outputs and take action to internalize those that are considered appropriate for its planning, design and implementation processes.
(ii) MARD could consider pursuing a separate stand-alone project for improving the operational performance of the Bac Hung Hai system through an holistic approach including institutional reforms accompanied with improved operation procedures and infrastructure improvement.

Prepared by Pieter M. Smidt Designation Principal Project Implementation Officer

SUMMARY OF SUPPLY CONTRACTS

No.	Subproject	Procure-ment Mode	Bidding Dates		MARD Approval	ADB Approval	Source	Amount $	Contract Signing	Completion Date	Equipment	
			Invitation	Opening							Quantity/ Type	Capacity
1	Lan II Sluice Generator	Direct					Viet Nam	16,150	23/12/96	15/1/1995	1	
2	Trieu Duong B P/S	Direct					Viet Nam	215,764	12/10/93	12/11/95	4/ vertical	7,800 m^3/h/pump
3	Phan Dong P/S and	Direct					Viet Nam	179,718	15/4/95	03/01/96	14 / vertical	900 m^3/h/pump
4	Transformers										3	50 kVA-750 kVA
5	Thanh Diem P/S	IS	20/06/96	20/08/96	13/01/97	12/10/96	India	1,281,064	17/01/97	26/06/01	10 / oblique	3,600 m^3/h/pump
6	Do Neo P/S	IS	29/02/96	05/02/96	26/10/96	10/07/96	Japan	959,669	30/03/97	26/01/00	9 / vertical	8,000 m^3/h/pump
7	North-East Soc Son P/S	ICB	16/10/97	15/12/97	05/04/98	18/06/98	Korea, Rep. of	510,270	26/08/98	11/08/01	3 / vertivcal	12,960 m^3/h/pump
8	Dai Dinh P/S	ICB	15/08/97	15/10/97	02/10/98	30/04/98	Germany	712,987	09/10/98	20/06/01	6 / submerged	8,000 m^3/h/pump
9	Van Thai A P/S	ICB	05/05/98	07/06/98	15/11/98	12/08/98	India	660,051	02/02/99	30/08/01	6 / vertical	12,600 m^3/h/pump
10	Phu Sa P/S	ICB	20/02/98	20/04/98	21/08/98	09/09/98	Korea, Rep. of	350,805	23/11/98	30/06/01	4 / submerged	10,080 m^3/h/pump
11	Co Do -Van Thang P/S	IS	31/07/98	31/09/98	25/11/98	21/12/98	Viet Nam	148,360	02/05/99	28/09/01	24 / vertical	4,000 m^3/h/pump
12	South Ninh Binh P/S	IS	27/10/97	27/12/97	13/05/98	30/05/98	Viet Nam	236,138	18/06/98	31/12/99	47/ vertical	4,000 m^3/h/pump
13	Huu Bi 2 P/S	ICB	15/08/98	15/10/98	28/01/99	02/10/99	Korea, Rep. of	824,580	04/03/99	31/12/01	4 / vertical	21,600 m^3/h/pump
14	Vinh Tri 2 P/S	ICB	15/09/98	15/11/98	03/02/99	25/03/99	PRC	793,144	21/05/99	21/12/01	3 / vertical	30,060 m^3/h/pump
15	Nhue River - Hau Banh P/S	IS	17/06/99	17/07/99	25/09/99	27/10/99	Viet Nam	85,455	24/12/99	12/04/02	12 / vertical	4,000 m^3/h/pump
16	Kim Doi 2 P/S	ICB	09/08/97	11/11/97	02/10/98	04/02/98	India	499,639	30/07/98	20/04/02	4 / vertical	12,600 m^3/h/pump
17	Khai Thai P/S	ICB	06/10/96	08/12/96	26/10/96	—	India	1,024,747	20/05/97	21/01/02	3 / vertical	25,200 m^3/h/pump
18	Yen Lenh P/S	ICB	12/05/96	02/03/97	09/04/97	08/05/97	Korea, Rep. of	1,068,830	30/10/97	15/05/01	3 / vertical	26,000 m^3/h/pump
19	Yen Lenh P/S - Transformers	IS	16/02/98	18/03/98	08/11/98	19/08/98	Singapore	85,340	01/05/99	15/05/01	6	1,600 kVA
20	Khai Thai P/S - Transformers									31/01/02	2	50 kVA
21	South Ninh Binh Transformer	IS	01/08/98	02/12/98	04/07/98	15/05/98	Viet Nam	87,552	21/07/98	31/12/99	1	30 kVA

= core subproject.

—not available, ADB = Asian Development Bank, ICB = international competitive bidding, IS = international shopping, kVA = kilovolt-ampere, m3 = cubic meter, MARD = Ministry of Agriculture and Rural Development, h = hour, PRC = People's Republic of China, P/S = pumping station.

Sources: Loan financial information system and central project office.

ECONOMIC REEVALUATION

A. Introduction

1. The same general methodology is used as for the appraisal. Project economic performance is estimated based on available information from the central project office (CPO) in relation to project costs, from the project benefit monitoring and evaluation (BME) system and agricultural production data contained in official statistics.

2. The major benefits expected from the Project were an increase in crop production due to improved yields and increased areas of cropping due to reduced flooding for drainage subprojects or improved irrigation water supplies for irrigation subprojects, particularly in the dry season.

B. Methodology and Assumptions

3. Project expenditure was estimated from Asian Development Bank (ADB) disbursement data and CPO records. Project costs are presented in Table C.1 of Basic Data.

4. Foreign investment costs were converted to 2001 constant dollar values using the average annual exchange rate and adjusting by the manufacturing unit value index as published by the World Bank. They were then converted to 2001 dong by dividing by the average 2001 exchange rate. Local costs were converted to 2001 dong using Viet Nam's gross domestic product deflator.

5. Project costs include the full cost of resettlement and compensation. Interviews by the Project Completion Review (PCR) Mission indicated that payments reflected the market prices of land and buildings reasonably closely, and there is therefore no need to shadow price land compensation payments.

6. Major repairs and replacement of equipment are allowed for in the project cash flow by allowing 10% of the total construction and equipment costs every 5 years following subproject completion. However, the Ken Giang River dredging project costs are not included, since river dredging would be required with or without the Project. The other two South Thai Binh projects are included at a rate of 5% of construction and equipment costs, since they are gravity schemes and should thus not be subject to the same level of major repair.

7. Irrigable and irrigated areas are based on BME estimates. For drainage schemes such as Phan Dong, Trieu Duong, and Thai Binh (Kien Giang canal improvement) the command area (i.e., the gross area drained) is substantially greater than the project area, since it includes urban areas, roads and other nonirrigable land. The drainage benefits to these areas may be significant, particularly if improved drainage prevents the flooding of urban areas, where damage from flooding and consequent economic loss can be substantial. However, only agricultural benefits are assessed, following appraisal methodology.

8. Irrigated area is the total area of summer, winter, and spring crops. The irrigation intensity is the ratio between the irrigated and the irrigable area. Nonpaddy crops include corn, vegetables (including potatoes, sweet potatoes and other vegetables), and other winter crops (mainly soybeans and groundnuts).

9. Cropped areas were estimated based on the subproject appraisal and BME reports supplemented by district agricultural statistics from the General Statistical Office (GSO) and information gathered during the PCR Mission and its social survey. The data do not always agree and in these cases, cropped areas intermediate between the datasets were used. BME began late in the project period (1999), and thus only limited use could be made of the BME data in relation to the 'before project' situation. Similarly, BME takes a before and after approach to benefit estimation, rather than a with and without approach. The only feasible method of obtaining without-project estimates (of both areas and yields) is through the use of data from adjoining districts or of the entire province within which a scheme is located, in order to attempt to eliminate externalities (such as technology, change in input use, or new varieties). This issue is discussed in Supplementary Appendix A.

10. Yields are drawn from a combination of GSO and BME data, again attempting to eliminate as far as possible the effect of externalities. In several cases, the subproject comprises a large part of a district (e.g., Trieu Duong) or almost the whole of a number of districts (e.g., the three Thai Binh subprojects which cover all of the within-dyke area of the three districts south of the Tra Ly River). This permits GSO statistics on area and yield to be used as a "control" in order to attempt to assess what might have happened if the project had not been implemented. GSO data were therefore sought from GSO on crop areas and yields in the project districts, nearby districts and the relevant provinces. The full dataset is included in Supplementary Appendix B. As an example of the type of data used, the information for South Thai Binh (the subproject area) and the four districts north of the Tra Ly River, which are within the North Thai Binh irrigation area which was selected as the control (Table A8.1). The data indicate that spring paddy yields and area trends have been virtually identical over the period 1996 to 2001. For summer paddy, yield has increased more rapidly in the northern area than in the south, while area trends suggest a more rapid growth in the south than in the north with a gain of about 1,000 hectares (ha) in the south, much of which can be attributable to improved drainage under the project.

Table A8.1: Crop Area and Yield Data for South and North Thai Binh Province

Thai Binh Province		1993	1994	1995	1996	1997	1998	1999	2000	2001	Trend 1993-2001 (%)	Trend 1996-2001 (%)
South Thai Binh Districts												
Spring paddy area	'000 ha	29.1	32.5	32.6	32.9	33.1	33.3	33.5	33.6	33.8	1.3	0.5
Average yield	t/ha	6.5	6.3	6.7	6.8	6.4	6.0	6.4	6.7	6.3	(0.2)	(0.4)
Total Production	'000 t	**189.2**	**204.5**	**216.9**	**223.3**	**210.4**	**201.0**	**213.9**	**227.0**	**211.9**	**1.1**	**0.1**
Summer paddy area	'000 ha	32.8	33.3	33.4	32.8	33.5	33.8	33.8	34.1	34.0	0.4	0.6
Average yield	t/ha	5.3	4.1	5.5	4.6	4.5	5.4	5.5	5.6	4.6	0.7	1.8
Total Production	'000 t	**173.3**	**138.1**	**184.0**	**150.6**	**151.2**	**181.6**	**184.3**	**189.7**	**155.4**	**1.2**	**2.5**
Winter crop Area	'000 ha	—	—	—	8.1	9.3	8.2	7.9	7.0	7.2	(4.1)	(4.1)
Winter crop - maize area	'000 ha	—	—	—	2.3	2.6	1.4	1.1	0.9	0.8	(21.1)	(21.1)
Average yield	t/ha	—	—	—	3.5	3.5	3.6	4.0	4.0	4.1	3.9	3.9
Total Production	'000 t	—	—	—	**7.9**	**9.2**	**5.2**	**4.6**	**3.8**	**3.5**	**(18.0)**	**(18.0)**
North Thai Binh Districts												
Spring paddy area	'000 ha	53.4	50.6	50.8	51.2	51.0	51.4	51.5	51.9	52.1	0.0	0.4
Average yield	t/ha	5.5	6.4	6.6	7.0	6.4	6.0	6.6	6.6	6.6	1.0	-0.3
Total Production	'000 t	**296.1**	**322.3**	**336.7**	**356.0**	**326.1**	**309.9**	**338.7**	**340.3**	**343.9**	**1.1**	**0.1**
Summer paddy area	'000 ha	53.2	52.7	52.7	52.9	53.1	53.2	53.3	53.5	53.5	0.2	0.2
Average yield	t/ha	5.8	4.0	5.4	4.7	4.6	5.5	6.1	5.5	5.3	1.6	3.5
Total Production	'000 t	**308.0**	**210.4**	**285.4**	**250.3**	**242.7**	**292.5**	**322.8**	**293.5**	**282.7**	**1.8**	**3.7**
Winter crop Area	'000 ha	—	—	—	21.5	22.1	18.6	19.6	17.1	16.9	(5.3)	(5.3)
Winter crop - maize area	'000 ha	—	—	—	6.3	6.7	3.7	3.2	2.6	2.5	(19.9)	(19.9)
Average yield	t/ha	—	—	—	3.5	4.0	3.7	3.8	4.0	4.2	2.9	2.9
Total Production	'000 t	—	—	—	**22.1**	**27.0**	**14.0**	**12.0**	**10.4**	**10.4**	**(17.6)**	**(17.6)**

— = not available. ha = hectare, t = ton.
Source: General Statistical Office district agricultural production data.

11. The major inputs required for the crops budgeted with and without the Project are based on the results of the BME surveys (of 20 or 30 households per subproject).

12. Based on the areas, yields, prices, and input costs, the estimated economic net value of production, without and with the Project, is derived. The difference between the two is the change in economic value of production resulting from the Project. Although there is underemployment in rural areas of the Delta, labor is not shadow priced, reflecting the approach adopted at appraisal. This is probably a realistic approach since many men and women from the Delta move to Hanoi or other regional towns on a seasonal basis to take on casual work, for example in the building trade, with earnings of around D30,000 per day. Nonetheless, a shadow wage rate of 75% of the average assumed value of D12,000 per day is tested in a sensitivity analysis in Section 4.

13. The economic price of unhusked rice (paddy) is calculated based on the estimated export value of rice from the project areas based on the published value of Thai rice shipped from Bangkok. Corn price is based on import parity price for corn from US Gulf ports. Economic prices are estimated for urea, triple superphosphate, and muriate of potash, based on import parity price. Time series data for both rice and corn as well as for fertilizers are taken from World Bank data.

14. The price of paddy in economic terms has fallen substantially since appraisal, when the level was estimated at D1408/kg, or about D1990/kg in 2001 dong. The implications of a stable rice price at the appraisal level are tested in Section D.

15. The EIRR is calculated over 25 years (1994–2018) with no residual value, based on the expected life of major project investments.

C. Subproject Economic Performance

1. Thanh Diem Irrigation Subproject[1]

16. The Thanh Diem subproject comprised two irrigation pump stations and limited upgrading of primary irrigation canals. The irrigation area serviced by the Project comprises around 20% of the area of Vinh Phuc province, which is probably a reasonable control for the project area—that is yield and area gains would be expected to be greater on a percentage basis in the project area than in the province as a whole. Although Thanh Diem was one of the four core subprojects, and the feasibility study was completed in December 1993, in practice the secondary pump station was only completed in 1998, servicing the northern irrigation area. The primary pump station was completed in late 2001, but problems with the inclined pumps have prevented full use of the system and at the time of the PCR, only eight out of 10 pumps were operational. The Me Linh irrigation and drainage management company expects that the remaining two pumps will be repaired before the 2002 dry season at a cost of around D110 million per pump. These costs are included in the subproject costing.

17. Although the main pump station was only completed in 2001, and was not fully commissioned at the time of the PCR, some benefits were reported to have been generated from the secondary pump station on the Ca Lo River from 1999. BME provides little guidance on changes resulting from the subproject as the only farm budget data available are from 2001.

18. The main change estimated to result from project investments is an additional area of around 300 ha sown to spring rice by 2002 and around 250 ha planted to upland crops such as corn and vegetables. The change would mainly be experienced in the northern sector, where previously water was received from the adjoining irrigation scheme in Dong Anh district to the east. The new pump stations, when fully operating, should relieve dry season water shortages in both the northern and southern areas and reduce the need to for cooperatives to use small lift pumps to irrigate their command areas. A reduction of around 10 days work per crop for both summer and spring paddy is estimated to result. Compared to some of the pump drainage subprojects, few secondary or unquantified benefits are evident in Thanh Diem.

19. The base case EIRR for Thanh Diem is estimated at 17%. Shadow pricing labor at 75% of market rates would marginally reduce the EIRR. However, the result is highly sensitive to labor inputs (which greatly affect the implicit profitability of paddy production). Thus if no labor savings result from project interventions, the EIRR would decline to around 9%. Use of a standard conversion factor of 0.9 would increase the EIRR to 18%. At the appraisal paddy price of D1990/kg in 2001 dong, the EIRR would be around 24%.

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1 See Tables A8.3-A8.5.

2. Phan Dong Drainage Subproject[2]

20. The Phan Dong subproject is situated in Yen Phong district in Bac Ninh province. Bac Ninh and Bac Giang are subdivisions of the old Ha Bac province. The Phan Dong pumping station services around 2,300 ha of which 1,850 ha are irrigated or about 27% of the area of Yen Phong district. The pumping station was completed in July 1996, suggesting that its main impact would have commenced in 1997.

21. Both Bac Ninh province and Yen Phong district have seen major gains in summer rice production, with yield gains of 10% and 15% per year in paddy yields over the 1997 to 2001 period, respectively. This trend reflects the views of farmers within the Phan Dong pump station area, who considered that both the reliability and productivity of summer cropping had increased greatly as a result of the pump station. Farmers in Yen Trung commune, perhaps the highest commune in the Phan Dong pump station catchment, reported that previously they had waited until the flood season ended in August to plant their summer paddy crop, but that now they planted in early July. However, so far the drainage system connecting to the Phan Dong pump station has not been fully effective and in each of the past 2 years they have had to replant part of the July-sown crop.

22. Yields have also increased rapidly for spring rice, though more slowly than for summer rice. In this case, the Bac Ninh province yields increased more rapidly than those for Yen Phong district, suggesting that the pump station had no impact on spring rice production (as would be expected). Winter crop areas and yields have declined steadily over the period since 1997. In Yen Phong district, the decline was pronounced, averaging almost 16% per year over the past 4 years, compared to a 3% drop in Bac Ninh province (and a small gain in Bac Giang). While it is conceivable that the improved drainage resulting from the Project could have influenced this outcome (e.g., with improved summer drainage reducing residual moisture available for the winter crop) the link is too tenuous to take into account in economic analysis.

23. Overall, economic gains are estimated to result from a potential increase in the summer rice crop area of 600 ha and an increase in yield of around 700 kg/ha. A saving in labor of 20 days/ha is also estimated for the summer crop. Indirect benefits from reduced flooding should include improved health status among those living in flooded areas, and reduced damage to infrastructure such as canals, roads, and, in high flood seasons, structures.

24. Overall subproject EIRR is estimated at 4%, a low level, and below the national opportunity cost of capital, which is of the order of 8% in real terms (i.e., net of inflation). While the yield and area parameters assumed are considered to be reasonably optimistic, further work during the remaining BME period could include a more detailed analysis of yield and area.

25. The EIRR is moderately sensitive to changes in assumptions; shadow pricing labor to 75% of the market rate increases the EIRR to 7%. If all project capital expenditure were compressed into 2 years (1996 and 1997) and the project period retained at 25 years, the EIRR would increase to 6%. The EIRR is sensitive to the price of paddy, with a stable 1994 paddy price increasing the EIRR to a more acceptable 9%.

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2 See Tables A8.6–8.

3. Trieu Duong Drainage Subproject[3]

26. The Trieu Duong subproject covers an area of around 3,800 ha comprising almost all of the district of Tien Lu in Hung Yen province. The drainage area of the Trieu Duong pump station comprises almost the majority of Tien Lu district inside the Song Luoc dyke in the south. The adjoining district of Phu Cu suffers similar drainage problems to Tien Lu prior to the construction of the pump station and forms a useful control.

27. The pump station was completed in 1995, and it is therefore unfortunate that statistics for Tien Lu were not available for the 1993–1996 period. However, the overall data for Phu Tien district (which previously included both Tien Lu and Phu Cu districts) provide some information on the longer-term trends in yields in the area.

28. Improved drainage would be expected to have its main impact in the summer cropping season. Over the period since 1997, yields in the two districts have been virtually identical, and both have increased at an average rate of over 6% per year. In the preproject period, yields in the two districts combined were around 4.0 tons (t)/ha compared to 5.5 t/ha over the past 4 years. Since the control district yields have been identical to those of Tien Lu district, the proportion of this gain that can be attributed to project investments is low. Spring paddy yields would not be expected to benefit greatly from improved drainage. In practice, both districts are highly productive, achieving around 6 t/ha production in 2001.

29. Despite the lack of demonstrated improvements against the control area, BME results and interviews with local farmers during the PCR Mission suggest that some communes have benefited significantly from the Project. Overall, a gain in yields of summer rice of 400 kg/ha is estimated together with an increase in area of about 600 ha. This results in increased production of around 4,200 tons of paddy per year, compared to the without-project situation. However, the relatively low economic price of paddy limits the profitability of paddy even at the higher assumed yield and the net benefits resulting from the yield and area gains are only in the order of D3 billion per year. At this rate, the EIRR is 6.1%. Shadow pricing labor at 75% of the market rate increases the EIRR to 8.2%, indicating that the majority of subproject economic benefits accrue to family labor. If the price of paddy had maintained its appraisal level, Trieu Duong would have achieved an acceptable 13.5% EIRR.

4. Thai Binh Drainage and Irrigation Subprojects[4]

30. Three subprojects were implemented in the South Thai Binh irrigation area: (i) the Lan II sluice, which controlled water levels in the Kien Giang River and reduced salt water intrusion; (ii) the Tam Lac and Nguyet Lam sluices, which improved irrigation water flows and quality to the central part of the irrigation area; and (iii) the dredging of the Kien Giang River, the main drainage way for the South Thai Binh scheme. The Lan II sluice and the dredging of the Kien Giang River serve the same drainage area of about 58,000 ha, of which about 34,000 is agricultural land.

31. Thai Binh province has two main irrigation areas, north and south of the Tra Ly River. The South Thai Binh irrigation area includes three districts, Vu Thu, Kien Xuong, and Tien Hai—from west to east, south of the Tra Ly River. In order to place the performance gains indicated

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3 See Tables A8.9–11.

4 See Tables A8.12–14.

by BME in perspective, crop area and yield data were obtained from the GSO on spring and summer rice production and on winter crop areas as summarized in Table A8.1 above.

32. The provincial and district data show a slowly increasing area of spring and summer rice. Yields were more or less stable for spring rice in both South and North Thai Binh. Summer rice showed a fairly steady increase, by an average of 1.3% per year for the province and 0.7% for the three South Thai Binh districts. The North Thai Binh irrigation area substantially outperformed the South Thai Binh area, with summer rice yield gains averaging 1.6% per year. The gains since 1993 for the three districts were 2.0% for Vu Thu, no change for Kien Xuong, and 0.7% for Tien Hai, with the last expected to demonstrate the greatest gains from the Lan II sluice subproject. These data could show a marginal advantage in the early years of the Project to Tien Hai compared to Kien Xuong.

33. As in the case of two of the other three core subprojects, few benefits are evident based on the official statistics at this stage. However, the relatively recent completion of the Kien Giang dredging (December 2001) and the Tam Lac/Nguyet Lam sluices (December 1999) would suggest that future benefits may be higher than those demonstrated to date. The Lan II sluice was completed in April 1996 and should have demonstrated drainage benefits in the summer of that year.

34. In relation to winter crops, areas in the subproject districts have declined from 8,100 ha to 7,200 ha over the last 6 years. As identified by interviews during the PCR Mission, but not by BME, the area of maize has declined steeply from 2,263 ha to 843 ha over the past 6 years. This has been offset to some degree by a steady increase in yield, which rose from an average of 3.5 t/ha to 4.1 t/ha, the same rate of increase as the North Thai Binh districts.

35. In addition to the direct agricultural benefits of the subprojects, the improvement of drainage particularly has a number of secondary benefits. Improved water quality results in health benefits for residents, while the improved intake of silt from the two sluices enhance long-term soil quality. Other benefits identified include improved boat access to Thai Binh from the Red River to the Kien Giang River, with 50 t boats now able to access the system and transport (for example) building materials to Thai Binh town. The Kien Giang River itself can now comfortably handle 100 t vessels. Previously the sluice and canal provided access to 15 t vessels. This has provided benefits in terms of reduced transport costs, but has also reduced the number of vessels used for transport and employment of boat crews.

36. Prior to the construction of the Lan II sluice, salt water entered the Kien Giang River, allowing ready entrance to a range of brackish water species of fish and shrimp. The interviews conducted during the PCR Mission indicated that several hundred households supplemented their income through fishing in the river. Around 50 families depended on fisheries for a significant part of their household income. However, the controlled water regime in the lower river has reduced the fish and shrimp populations. The commercial or semi-commercial fishers report that average daily earnings have now fallen by around 85% from their peak of D15,000-D20,000 per day. This would equate to a loss of around D150 million ($10,000) per year in total, which would not affect project economic performance, but which may very likely be a major issue for the families involved.

37. Overall, it is estimated that the improved drainage and irrigation situation through the interventions under the three subprojects should allow an increase in summer-cropped area of about 10% compared to the without-project situation by 2004. Summer paddy yields are estimated to increase by 0.2 t/ha and spring paddy yields by 0.1 t/ha. A decrease of 15 days in

farm family labor input is estimated for both summer and spring rice production. An increase of about 1,250 ha (10%) in vegetable area is also assumed.

38. Overall EIRR on these assumptions is estimated at 12.1%. Shadow pricing labor at 75% of the market rate would reduce this marginally to 10.7%. Reducing the marginal increase in paddy yield for summer paddy from 0.2 t/ha to 0.1 t/ha would reduce the EIRR to 10.4%. At the appraisal economic paddy price of D1990/kg, the EIRR increases to 17%.

D. Overall Economic Performance

39. The four cases analyzed above are reasonably typical of the spread of investments made under the Project. Assuming that (i) the Phan Dong and Trieu Duong subprojects represent the 13 drainage pump subprojects implemented under the Project and 40% of the Project's total investment in subprojects, and (ii) the Thanh Diem and Thai Binh subprojects represent the remaining 17 subprojects and remaining investment costs in subprojects, the Project's overall EIRR would probably fall between about 8% and 12%.

40. The sensitivity estimates for each subproject, included in their respective sections, are summarized below in Table A8.2, together with the average EIRR for the four core subprojects. Although there are variations between subprojects, economic viability is little affected by application of a 0.9 standard conversion factor to project capital and operation and maintenance (O&M) costs. Use of a 75% shadow wage rate increases the EIRR significantly for the two drainage pump station subprojects and reduces it for Thanh Diem and Thai Binh. At the appraisal paddy price, the EIRR increases significantly for all subprojects, with overall average EIRR increasing from 10% to over 15%.

Table A8.2: Summary of Sensitivity Analysis (%)

	Base Case	SCF 0.9	Appraisal Paddy Price D1990/kg	Shadow Labor Rate 75%
Thanh Diem	17.1	18.0	24.6	16.4
Phan Dong	4.3	4.6	9.4	6.6
Trieu Duong	6.1	6.4	13.5	8.2
Thai Binh	12.1	12.7	17.1	10.7
Average (weighted)	**11.0**	**11.6**	**16.3**	**10.5**

SCF = standard conversion factor.

Table A8.3: Project Investment Costs, Crop Areas, and Incremental Benefits, Thanh Diem

		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Total
Investment Costs													
Total foreign cost	D bn	0.4	—	2.4	1.9	0.4	4.2	2.3	24.9	—			36.6
Total local cost	D bn	0.4	—	1.2	0.3	0.8	0.7	0.8	6.7	1.1			12.1
Total investment cost	D bn	0.8	—	3.6	2.2	1.2	4.9	3.1	31.7	1.1			48.7
Dollar equivalent	$ mn	0.1	—	0.3	0.2	0.1	0.3	0.2	2.1	0.1			3.5
Total O&M	D bn	—	—	—	—	—	3.8	3.7	3.6	3.6			14.6
Total cost	D bn	0.8	0.6	4.5	3.3	1.2	5.6	5.3	35.3	4.7			61.3
Economic Costs													
Foreign cost (2001 D)	D bn	0.7	—	4.0	2.9	0.5	4.9	2.6	21.0	—			36.5
Local cost (2001 D)	D bn	0.7	—	1.7	0.4	1.0	0.8	0.8	6.7	1.1			13.3
Total investment cost	D bn	1.4	—	5.6	3.3	1.5	5.7	3.4	27.7	1.1			49.8
Equivalent cost in 2001 $	$ mn	0.1	—	0.4	0.2	0.1	0.4	0.2	1.9	0.1			3.4
Incremental O&M costs	D bn	—	—	—	—	34	68	213	358	716			

		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005-18
Land Use - Without Project													
Irrigable area	'000 ha	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6
Nonirrigable area	'000 ha	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7
Irrigated area	'000 ha	16.9	16.8	16.8	16.8	16.8	16.4	15.9	16.5	16.5	16.6	16.7	16.8
Irrigated cropping intensity	%	223	222	222	222	221	216	210	218	218	219	220	221
With Project													
Irrigable area	'000 ha	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6
Nonirrigable area	'000 ha	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7
Total irrigated area	'000 ha	16.9	16.8	16.8	16.8	16.8	16.8	16.9	16.9	17.2	17.4	17.6	17.7
Irrigated cropping intensity	%	223	222	222	222	221	222	223	224	227	229	232	233
Cropped Area - Without Project													
Spring rice	'000 ha	5.5	5.8	6.1	6.4	6.7	6.8	6.8	6.8	6.8	6.9	7.0	7.1
Summer rice	'000 ha	7.1	7.1	7.1	7.1	7.1	7.1	6.5	7.1	7.1	7.1	7.1	7.1
Other	'000 ha	4.3	4.0	3.7	3.3	3.0	2.5	2.6	2.6	2.6	2.6	2.6	2.6
Total	'000 ha	16.9	16.8	16.8	16.8	16.8	16.4	15.9	16.5	16.5	16.6	16.7	16.8
With Project													
Spring rice	'000 ha	5.5	5.8	6.1	6.4	6.7	7.0	7.0	7.0	7.1	7.2	7.3	7.4
Summer rice	'000 ha	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.2	7.3	7.4	7.4
Other	'000 ha	4.3	4.0	3.7	3.3	3.0	2.8	2.8	2.9	2.9	2.9	2.9	2.9
Total	'000 ha	16.9	16.8	16.8	16.8	16.8	16.8	16.9	16.9	17.2	17.4	17.6	17.7
Without Project - Crop Yields													
Spring rice	t/ha	3.1	3.3	3.7	3.7	3.5	3.9	4.3	4.2	4.2	4.2	4.2	4.2
Summer rice	t/ha	2.9	3.4	2.5	2.8	3.6	3.9	3.5	3.4	3.4	3.4	3.4	3.4
Corn	t/ha	2.8	2.8	3.1	2.7	2.9	2.9	2.4	2.9	2.9	2.9	2.9	2.9
Vegetables	t/ha	16.4	16.4	16.4	16.6	16.4	16.4	16.6	17.6	16.8	16.8	16.8	16.8
Production (t)													
Spring rice	'000 t	16.9	19.2	22.5	23.4	23.5	26.4	29.2	28.6	28.6	29.0	29.4	29.8
Summer rice	'000 t	20.4	24.3	17.8	20.0	25.6	27.8	23.0	24.0	24.0	24.0	24.0	24.0
Total rice production	'000 t	37.4	43.5	40.3	43.3	49.1	54.2	52.2	52.6	52.5	52.9	53.4	53.8
Total value	D bn	106.4	124.5	126.8	125.4	139.9	122.6	105.3	99.1	101.5	107.7	112.3	117.1
Production costs	D bn	94.0	98.5	98.3	94.3	92.3	87.6	86.4	88.7	89.2	89.9	90.3	91.3
Net Value of Production	D bn	12.4	26.1	28.5	31.1	47.6	35.1	18.9	10.5	12.4	17.8	22.1	25.8
With Project - Crop Yields													
Spring rice	t/ha	3.1	3.3	3.7	3.7	3.5	3.9	4.4	4.3	4.6	4.6	4.6	4.6
Summer rice	t/ha	2.9	3.4	2.5	2.8	3.6	3.9	3.5	3.4	3.4	3.4	3.4	3.4
Corn	t/ha	2.8	2.8	3.1	2.7	2.9	3.0	2.6	3.1	3.1	3.1	3.1	3.1
Vegetables[1]	t/ha	16.4	16.4	16.4	16.8	16.6	16.6	16.8	17.8	17.0	17.0	17.0	17.0
Production (t)													
Spring rice	'000 t	16.9	19.2	22.5	23.4	23.5	27.2	30.8	30.1	32.7	33.1	33.6	34.0
Summer rice	'000 t	20.4	24.3	17.8	20.0	25.6	27.8	24.9	24.0	24.5	24.8	25.2	25.2
Total rice production	'000 t	37.4	43.5	40.3	43.3	49.1	55.0	55.7	54.1	57.1	57.9	58.7	59.2
Total Value	D bn	107.5	125.4	127.5	126.3	140.6	128.4	114.7	106.0	112.1	119.2	124.7	130.0
Total Costs	D bn	93.2	97.7	97.7	93.6	91.2	88.9	90.8	90.1	91.9	93.2	94.1	95.1
Net Value of Production	D bn	14.2	27.7	29.7	32.6	49.4	39.5	23.9	15.9	20.2	26.0	30.7	34.9
Incremental value	D bn	1.9	1.6	1.3	1.5	1.8	4.4	5.1	5.4	7.8	8.2	8.6	9.0

— = not available, bn = billion, ha = hectare, mn = million, t = ton.

Table A8.4: Financial Budgets for a Typical Farm Without and With the Project, Thanh Diem

		Without Project						With Project					
		Spring Rice	Summer Rice	Maize	Vege-tables	Other	Farm Total	Spring Rice	Summer Rice	Maize	Vege-tables	Other	Farm Total
Total farm area	ha	—	—	—	—	—	0.24	—	—	—	—	—	0.24
Cropping intensity (%)		90	93	11	19	4	218	93	93	13	21	4	224
Cropped area	ha	0.22	0.22	0.03	0.05	0.01	0.51	0.22	0.22	0.03	0.05	0.01	0.54
Farm output	D'000	1,449	1,215	128	761	50	3,554	1634	1215	152	856	53	3,910
Farm inputs		—	—	—	—	—	—	—	—	—	—	—	—
Seed	D'000	86	79	3	18	1	186	89	79	4	20		191
Fertilizer	D'000	339	351	66	114	26	871	367	351	70	127	26	940
Agro-chemicals	D'000	37	38	—	—	—	75	38	38	—	—	—	76
Other costs	D'000	181	187	—	—	—	368	186	187	—	—	—	373
Land preparation	D'000	—	—	—	—	—	—	—	—	—	—	—	—
Total inputs	D'000	643	655	69	132	27	1,499	679	655	74	147	26	1,580
Net farm income	D'000	806	560	59	629	23	2,055	955	560	78	709	27	2,329
Interest	D'000	—	—	—	—	—	95	—	—	—	—	—	102
Farm income	D'000	—	—	—	—	—	1,960	—	—	—	—	—	2,228
Family labor	pd/farm	45	45	6	11	2	109	44	43	6	12	2	109
Return/day	D'000	—	—	—	—	—	17.9	—	—	—	—	—	20.5

— = not available. ha = hectare, p/d = per day

Table A8.5: Economic Internal Rate of Return, Thanh Diem

(constant 2001 D billion)

Calendar Year	Project Year	Investment Cost[1]	Incr. O&M Cost	Total Cost	Incremental Benefit	Project Cash Flow
1994	1	1.4	—	1.4	—	-1.4
1995	2	—	—	—	1.6	1.6
1996	3	5.6	—	5.6	1.2	-4.4
1997	4	3.3	—	3.3	1.5	-1.8
1998	5	1.5	0.0	1.5	1.9	0.4
1999	6	5.7	0.1	5.8	3.8	-2.0
2000	7	3.4	0.2	3.6	4.3	0.6
2001	8	27.7	0.4	28.1	6.1	-21.9
2002	9	1.1	0.7	1.9	7.5	5.6
2003	10	4.4	0.7	5.1	8.1	3.0
2004	11	—	0.7	0.7	8.5	7.7
2005	12	—	0.7	0.7	9.0	8.3
2006	13	—	0.7	0.7	9.0	8.3
2007	14	—	0.7	0.7	9.0	8.3
2008	15	4.4	0.7	5.1	9.0	3.9
2009	16	—	0.7	0.7	9.0	8.3
2010	17	—	0.7	0.7	9.0	8.3
2011	18	—	0.7	0.7	9.0	8.3
2012	19	—	0.7	0.7	9.0	8.3
2013	20	4.4	0.7	5.1	9.0	3.9
2014	21	—	0.7	0.7	9.0	8.3
2015	22	—	0.7	0.7	9.0	8.3
2016	23	—	0.7	0.7	9.0	8.3
2017	24	—	0.7	0.7	9.0	8.3
2018	25	4.4	0.7	5.1	9.0	3.9
					Economic Internal Rate of Return	17.1%

O&M = operation and maintenance. — = not available.

Table A8.6: Project Investment Costs, Crop Areas, and Incremental Benefits, Phan Dong

		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Total
Investment Costs													
Total foreign cost	D bn	2.2	0.8	3.1	2.5	1.3	—	—	0.7	—			10.7
Total local cost	D bn	2.1	0.6	2.8	0.7	0.1	—	—	0.0	—			6.3
Total investment cost	D bn	4.3	1.4	5.9	3.2	1.5	—	—	0.8	—			17.0
Dollar equivalent	$ mn	0.4	0.1	0.5	0.3	0.1	—	—	0.1	—			1.5
Total O&M	D bn	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	—			1.0
Total cost	D bn	4.4	1.5	6.0	3.4	1.6	0.1	0.2	1.0	—			18.1
Economic Costs													
Foreign cost (2001 D)	D bn	3.5	1.4	5.1	3.8	1.7	—	—	0.7	—			16.3
Local cost (2001 D)	D bn	3.7	0.8	3.8	0.9	0.2	—	—	0.0	—			9.4
Total investment cost	D bn	7.2	2.3	8.9	4.7	1.8	—	—	0.8	—			25.7
Equivalent cost in 2001 $	$ mn	0.5	0.2	0.6	0.3	0.1	—	—	0.1	—			1.7
Incremental O&M costs	D bn			147	160	90	99	159	237	237			

		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005-18
Land Use - Without project													
Irrigable area	'000 ha	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Nonirrigable area	'000 ha	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Irrigated area	'000 ha	2.1	2.2	2.2	2.4	2.6	2.9	2.9	2.9	2.9	2.9	2.9	2.9
Irrigated cropping intensity	%	114	117	119	130	143	155	157	157	157	157	157	157
With Project													
Irrigable area	'000 ha	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Nonirrigable area	'000 ha	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Total irrigated area	'000 ha	2.1	2.2	2.2	2.6	2.9	3.3	3.5	3.5	3.5	3.6	3.6	3.7
Irrigated cropping intensity	%	114	117	119	139	159	179	187	189	191	193	196	199
Cropped Area - Without Project													
Spring rice	'000 ha	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Summer rice	'000 ha	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Other	'000 ha	0.3	0.4	0.4	0.6	0.8	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Total	'000 ha	2.1	2.2	2.2	2.4	2.6	2.9	2.9	2.9	2.9	2.9	2.9	2.9
With Project													
Spring rice	'000 ha	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Summer rice	'000 ha	0.4	0.4	0.4	0.6	0.7	0.8	0.8	0.8	0.9	0.9	1.0	1.0
Other	'000 ha	0.3	0.4	0.4	0.7	0.9	1.2	1.3	1.3	1.3	1.3	1.3	1.3
Total	'000 ha	2.1	2.2	2.2	2.6	2.9	3.3	3.5	3.5	3.5	3.6	3.6	3.7
Without Project - Crop yields													
Spring rice	t/ha	3.2	3.3	4.7	4.3	4.3	4.7	5.6	5.3	5.3	5.3	5.3	5.3
Summer rice	t/ha	2.9	4.1	2.4	3.3	4.0	4.5	4.6	4.4	4.4	4.4	4.4	4.4
Corn	t/ha	2.8	2.7	2.7	3.5	3.6	3.7	2.5	2.8	3.2	3.2	3.2	3.2
Vegetables	t/ha	10.2	10.2	10.2	10.2	10.5	11.2	11.3	11.3	11.3	11.3	11.3	11.3
Production (t)													
Spring rice	'000 t	4.4	4.5	6.5	5.9	5.8	6.5	7.6	7.2	7.2	7.2	7.2	7.2
Summer rice	'000 t	1.3	1.8	1.1	1.4	1.8	2.0	2.0	1.9	1.9	1.9	1.9	1.9
Total rice production	'000 t	5.6	6.3	7.5	7.3	7.6	8.4	9.6	9.2	9.2	9.2	9.2	9.2
Total value	D bn	12.6	15.6	20.2	21.3	25.4	26.8	25.7	23.5	24.4	25.4	26.1	26.8
Production costs	D bn	14.2	14.9	15.2	16.1	17.2	18.2	18.5	18.3	18.4	18.4	18.4	18.5
Net Value of Production	D bn	-1.6	0.7	5.0	5.2	8.2	8.6	7.2	5.1	5.9	6.9	7.7	8.4
With Project - Crop Yields													
Spring rice	t/ha	3.2	3.3	4.7	4.3	4.3	4.7	5.6	5.3	5.3	5.3	5.3	5.3
Summer rice	t/ha	2.9	4.1	2.4	3.5	4.2	4.7	4.8	5.1	5.1	5.1	5.1	5.1
Corn	t/ha	2.8	2.7	2.7	3.5	3.6	3.7	2.5	2.8	3.2	3.2	3.2	3.2
Vegetables	t/ha	10.2	10.2	10.2	10.4	10.7	11.4	11.5	11.5	11.5	11.5	11.5	11.5
Production (t)													
Spring rice	'000 t	4.4	4.5	6.5	5.9	5.8	6.5	7.6	7.2	7.2	7.2	7.2	7.2
Summer rice	'000 t	1.3	1.8	1.1	1.9	2.9	3.7	3.8	4.3	4.5	4.7	4.9	5.2
Total rice production	'000 t	5.6	6.3	7.5	7.8	8.7	10.2	11.4	11.5	11.7	11.9	12.2	12.4
Total value	D bn	12.6	15.6	20.2	23.0	28.7	31.1	31.0	29.1	30.4	32.0	33.2	34.5
Total costs	D bn	14.1	14.8	15.1	17.1	19.1	21.0	21.9	22.0	22.4	22.6	22.9	23.3
Net Value of Production	D bn	-1.5	0.8	5.1	6.0	9.6	10.1	9.1	7.1	8.0	9.3	10.3	11.2
Incremental value	D bn	0.1	0.1	0.1	0.7	1.4	1.6	1.9	2.0	2.1	2.4	2.6	2.9

bn = billion, ha = hectare, mn = million, t = ton. — = not available.

Table A8.7: Financial Budgets for a Typical Farm Without and With the Project, Phan Dong

		Without Project						With Project					
		Spring Rice	Summer Rice	Maize	Vege-tables	Other	Farm Total	Spring Rice	Summer Rice	Maize	Vege-tables	Other	Farm Total
Total farm area	ha						0.28						0.28
Cropping intensity (%)		74	24	15	44	1	157	74	45	15	54	1	189
Cropped area	ha	0.21	0.07	0.04	0.12	0.00	0.44	0.21	0.13	0.04	0.15	0.00	0.53
Farm output	D'000	1,767	472	218	1,395	9	3,853	1,767	1040	218	1,760	9	4,794
Farm inputs													
Seed	D'000	72	23	3	81	0	180	72	44	3	101	—	220
Fertilizer	D'000	379	123	28	134	1	664	379	232	32	166	1	811
Agro-chemicals	D'000	35	11		21		68	35	22		26	—	83
Other costs	D'000	174	56	5	26	0	261	174	106	5	32	0	318
Land preparation	D'000												
Total inputs	D'000	661	214	36	262	1	1,173	661	405	40	325	1	1,432
Net farm income	D'000	1,106	259	182	1,133	7	2,680	1,106	635	179	1,435	7	3,362
Interest	D'000	—	—	—	—	—	73	—	—	—	—	—	89
Farm income	D'000	—	—	—	—	—	2,607	—	—	—	—	—	3,273
Family labor	pd/farm	58	19	11	41	0	130	58	33	11	51	0	154
Return/day	D'000	—	—	—	—	—	20.1	—	—	—	—	—	21.3

ha = hectare, p/d = per day, — = not available.

Table A8.8: Economic Internal Rate of Return, Phan Dong
(constant 2001 D billion)

Calendar Year	Project Year	Investment Cost	Increm. O&M Cost	Total Cost	Incremental Benefit	Project Cash Flow
1994	1	7.2	—	7.2	—	-7.2
1995	2	2.3	—	2.3	—	-2.3
1996	3	8.9	0.1	9.1	0.1	-9.0
1997	4	4.7	0.2	4.9	0.4	-4.4
1998	5	1.8	0.1	1.9	1.2	-0.7
1999	6	—	0.1	0.1	1.3	1.2
2000	7	—	0.2	0.2	1.7	1.6
2001	8	0.8	0.2	1.0	1.9	0.9
2002	9	—	0.2	0.2	2.0	1.8
2003	10	1.3	0.2	1.5	2.3	0.8
2004	11	—	0.2	0.2	2.5	2.3
2005	12	—	0.2	0.2	2.8	2.5
2006	13	—	0.2	0.2	2.9	2.6
2007	14	—	0.2	0.2	2.9	2.6
2008	15	1.3	0.2	1.5	2.9	1.3
2009	16	—	0.2	0.2	2.9	2.6
2010	17	—	0.2	0.2	2.9	2.6
2011	18	—	0.2	0.2	2.9	2.6
2012	19	—	0.2	0.2	2.9	2.6
2013	20	1.3	0.2	1.5	2.9	1.3
2014	21	—	0.2	0.2	2.9	2.6
2015	22	—	0.2	0.2	2.9	2.6
2016	23	—	0.2	0.2	2.9	2.6
2017	24	—	0.2	0.2	2.9	2.6
2018	25	1.3	0.2	1.5	2.9	1.3
				Economic Internal Rate of Return		4.3%

O&M = operation and maintenance, — = not available.

Table A8.9: Project Investment Costs, Crop Areas, and Incremental Benefits, Trieu Duong

		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Total
Investment Costs													
Total foreign cost	D bn	3.2		3.0	2.5	—	—	—	—				8.7
Total local cost	D bn	3.2		1.5	0.9	—	—	—	—				5.7
Total investment cost	D bn	6.4		4.5	3.4	—	—	—	—				14.3
Dollar equivalent	$ mn	0.6		0.4	0.3	—	—	—	—				1.3
Total O&M	D bn	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2				0.8
Total cost	D bn	6.4	0.1	4.6	3.5	0.1	0.1	0.1	0.2				15.2
Economic Costs													
Foreign cost (2001 D)	D bn	5.1		5.0	3.8	—	—	—	—				13.9
Local cost (2001 D)	D bn	5.6		2.1	1.2	—	—	—	—				8.9
Total investment cost	D bn	10.7		7.1	5.0	—	—	—	—				22.8
Equivalent cost in 2001 $	$ mn	0.7		0.5	0.3	—	—	—	—				1.5
Incremental O&M costs	D bn	53	75	110	142	143	146	148	160				

		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005-18
Land Use - Without Project													
Irrigable area	'000 ha	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
Nonirrigable area	'000 ha	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Irrigated area	'000 ha	5.5	5.7	5.8	5.9	5.9	5.9	5.9	5.8	5.8	5.7	5.7	5.7
Irrigated cropping intensity	%	194	201	203	206	207	205	205	204	202	201	200	198
With Project													
Irrigable area	'000 ha	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
Nonirrigable area	'000 ha	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Total irrigated area	'000 ha	5.5	5.7	5.9	6.1	6.3	6.5	6.6	6.6	6.6	6.7	6.7	6.7
Irrigated cropping intensity	%	194	201	208	214	221	228	232	230	232	236	236	236
Cropped Area - Without Project													
Spring rice	'000 ha	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Summer rice	'000 ha	2.0	2.1	2.1	2.1	2.0	2.0	2.0	1.9	1.9	1.8	1.8	1.8
Other	'000 ha	1.2	1.3	1.4	1.5	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6
Total	'000 ha	5.5	5.7	5.8	5.9	5.9	5.9	5.9	5.8	5.8	5.7	5.7	5.7
With Project													
Spring rice	'000 ha	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Summer rice	'000 ha	2.0	2.1	2.2	2.3	2.5	2.6	2.6	2.6	2.6	2.7	2.7	2.7
Other	'000 ha	1.2	1.3	1.4	1.5	1.5	1.6	1.7	1.7	1.7	1.7	1.7	1.7
Total	'000 ha	5.5	5.7	5.9	6.1	6.3	6.5	6.6	6.6	6.6	6.7	6.7	6.7
Without Project - Crop Yields													
Spring rice	t/ha	4.8	4.3	5.4	5.7	5.7	5.7	6.1	5.9	5.9	5.9	5.9	5.9
Summer rice	t/ha	3.4	4.2	3.9	4.1	4.9	5.4	5.3	5.2	5.2	5.2	5.2	5.2
Corn	t/ha	2.8	2.7	2.6	2.3	2.7	3.1	2.1	1.6	2.4	2.4	2.4	2.4
Vegetables	t/ha	10.8	11.0	11.2	11.1	11.2	11.4	11.4	11.4	11.4	11.4	11.4	11.4
Production (t)													
Spring rice	'000 t	11.2	10.1	12.7	13.3	13.3	13.2	14.2	13.9	13.9	13.9	13.9	13.9
Summer rice	'000 t	6.7	8.8	8.2	8.5	10.1	10.8	10.3	9.9	9.7	9.5	9.3	9.1
Total rice production	'000 t	17.9	18.8	20.8	21.9	23.3	24.0	24.5	23.8	23.6	23.4	23.2	23.0
Total Value	D bn	42.6	49.4	59.1	58.9	65.5	56.9	50.2	43.8	46.1	48.3	49.8	51.3
Production costs	D bn	39.9	42.1	42.8	42.9	43.0	42.3	42.5	42.0	41.9	41.5	41.3	41.1
Net Value of Production	D bn	2.7	7.2	16.3	16.0	22.5	14.6	7.7	1.8	4.2	6.7	8.5	10.2
With Project - Crop Yields													
Spring rice	t/ha	4.8	4.3	5.4	5.7	5.7	5.7	6.1	5.9	5.9	5.9	5.9	5.9
Summer rice	t/ha	3.4	4.2	3.9	4.3	5.1	5.7	5.7	5.6	5.6	5.6	5.6	5.6
Corn	t/ha	2.8	2.7	2.6	2.3	2.7	3.1	2.1	1.6	2.4	2.4	2.4	2.4
Vegetables	t/ha	10.8	11.0	11.2	11.3	11.5	11.7	12.0	12.0	12.0	12.0	12.0	12.0
Production (t)													
Spring rice	'000 t	11.2	10.1	12.7	13.3	13.3	13.2	14.2	13.9	13.9	13.9	13.9	13.9
Summer rice	'000 t	6.7	8.8	8.7	10.0	12.6	14.6	14.7	14.2	14.4	15.0	15.0	15.0
Total rice production	'000 t	17.9	18.8	21.3	23.3	25.8	27.9	28.9	28.0	28.3	28.8	28.8	28.8
Total Value	D bn	42.6	49.4	60.1	62.0	71.1	64.8	59.0	51.5	54.7	58.4	60.5	62.7
Total Costs	D bn	40.9	43.5	45.2	45.8	46.7	47.4	48.6	47.8	48.5	49.1	49.0	49.2
Net Value of Production	D bn	1.7	5.8	14.9	16.3	24.4	17.4	10.4	3.7	6.3	9.3	11.5	13.5
Incremental value	D bn	-0.9	-1.4	-1.4	0.3	1.9	2.8	2.7	1.9	2.0	2.6	2.9	3.3

bn = billion, ha = hectare, mn = million, O&M = operation and maintenance, t = ton, — = not available.

Table A8.10: Financial Budgets for a Typical Farm Without and With the Project, Trieu Duong

		Without Project						With Project					
		Spring Rice	Summer Rice	Maize	Vege-tables	Other	Farm Total	Spring Rice	Summer Rice	Maize	Vege-tables	Other	Farm Total
Total farm area	ha						0.24						0.24
Cropping intensity (%)		85	94	11	42	3	235	85	94	11	42	3	235
Cropped area	ha	0.21	0.23	0.03	0.10	0.01	0.56	0.21	0.23	0.03	0.10	0.01	0.57
Farm output	D'000	1,959	1,881	102	1,175	28	5,117	1,959	2,027	102	1,236	28	5,353
Farm inputs													
Seed	D'000	86	81	2	227	1	396	86	81	2	227		396
Fertilizer	D'000	405	401	38	274	10	1,118	405	401	38	274	10	1,128
Agro-chemicals	D'000	35	39		18		91	35	39		18		91
Other costs	D'000	240	242	4	73	1	560	315	321	4	73	1	715
Land preparation	D'000												
Total inputs	D'000	766	763	44	591	12	2,164	840	843	44	591	12	2,330
Net Farm Income	D'000	1,193	1,118	57	584	16	2,953	1,119	1,184	57	645	16	3,023
Interest	D'000						121						122
Farm income	D'000						2,832						2,901
Family labor	pd/farm	56	60	8	23	2	150	56	57	8	23	2	146
Return/day	D'000						18.9						19.8

ha = hectare, p/d = per day.

Table A8.11: Economic Internal Rate of Return (EIRR), Trieu Duong

(constant 2001 D billion)

Calendar Year	Project Year	Investment Cost	Increm O&M Cost	Total Cost	Incremental Benefit	Project Cash Flow
1994	1	10.7	0.1	10.8		-10.8
1995	2		0.1	0.1	-1.6	-1.6
1996	3	7.1	0.1	7.2	-1.7	-8.9
1997	4	5.0	0.1	5.1	0.2	-4.9
1998	5		0.1	0.1	1.7	1.5
1999	6		0.1	0.1	2.5	2.3
2000	7		0.1	0.1	2.4	2.3
2001	8		0.2	0.2	2.0	1.8
2002	9	1.0	0.2	1.1	1.9	0.7
2003	10		0.2	0.2	2.3	2.2
2004	11		0.2	0.2	2.9	2.7
2005	12		0.2	0.2	3.2	3.1
2006	13		0.2	0.2	3.3	3.1
2007	14	1.0	0.2	1.1	3.3	2.2
2008	15		0.2	0.2	3.4	3.2
2009	16		0.2	0.2	3.4	3.2
2010	17		0.2	0.2	3.4	3.2
2011	18		0.2	0.2	3.4	3.2
2012	19	1.0	0.2	1.1	3.4	2.3
2013	20		0.2	0.2	3.4	3.2
2014	21		0.2	0.2	3.4	3.2
2015	22		0.2	0.2	3.4	3.2
2016	23		0.2	0.2	3.4	3.2
2017	24	1.0	0.2	1.1	3.4	2.3
2018	25		0.2	0.2	3.4	3.2
				Economic Internal Rate of Return		6.1%

Table A8.12: Project Investment Costs, Crop Areas, and Incremental Benefits, Thai Binh South

		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Total
Investment Costs													
Total foreign cost	D bn	8.2	3.5	15.8	3.0	8.2	16.0	9.0	3.7				55.6
Total local cost	D bn	4.0	2.2	4.9	1.3	10.7	19.7	2.2	0.1				45.2
Total investment cost	D bn	12.2	5.7	20.7	4.3	18.9	35.7	11.3	3.8				112.4
Dollar equivalent	$ mn	1.1	0.5	1.9	0.4	1.4	2.6	0.8	0.3				8.9
Total O&M	D bn	11.3	12.6	13.9	15.3	16.6	17.9	15.8	13.3				116.6
Total cost	D bn	23.8	18.7	35.0	19.0	35.5	53.6	27.1	17.0				229.6
Economic Costs													
Foreign cost (2001 D)	D bn	13.1	6.0	26.1	4.5	10.2	18.9	9.9	3.7				92.5
Local cost (2001 D)	D bn	7.1	3.3	6.7	1.7	12.7	22.1	2.4	0.1				56.1
Total investment cost	D bn	20.2	9.3	32.8	6.2	22.9	41.1	12.3	3.8				148.7
Equivalent cost in 2001 $	$ mn	1.4	0.6	2.2	0.4	1.5	2.8	0.8	0.3				10.0
Incremental O&M costs	D bn			696	763	1659	1792	2369	1990				9,269

		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005-18
Land Use - Without Project													
Irrigable area	'000 ha	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0
Nonirrigable area	'000 ha	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
Irrigated area	'000 ha	82.1	165.1	85.8	85.7	85.7	85.7	85.5	85.6	85.7	85.7	85.7	85.7
Irrigated cropping intensity	%	210	423	220	220	220	220	219	219	220	220	220	220
With Project													
Irrigable area	'000 ha	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0
Nonirrigable area	'000 ha	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
Total irrigated area	'000 ha	82.1	165.1	85.8	86.4	87.6	87.3	86.7	88.0	88.2	88.7	90.2	90.2
Irrigated cropping intensity	%	210	423	220	222	225	224	222	226	226	227	231	231
Cropped Area - Without Project													
Spring rice	'000 ha	32.5	32.6	32.9	33.1	33.3	33.5	33.6	33.8	33.8	33.8	33.8	33.8
Summer rice	'000 ha	33.3	33.4	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8
Other	'000 ha	16.2	99.2	20.2	19.8	19.6	19.5	19.1	19.0	19.1	19.1	19.1	19.1
Total	'000 ha	82.1	165.1	85.8	85.7	85.7	85.7	85.5	85.6	85.7	85.7	85.7	85.7
With Project													
Spring rice	'000 ha	32.5	32.6	32.9	33.1	33.3	33.5	33.6	33.8	33.8	33.8	33.8	33.8
Summer rice	'000 ha	33.3	33.4	32.8	33.5	33.8	33.8	34.1	34.0	34.0	34.5	36.0	36.0
Other	'000 ha	16.2	99.2	20.2	19.8	20.4	20.0	19.0	20.2	20.4	20.4	20.4	20.4
Total	'000 ha	82.1	165.1	85.8	86.4	87.6	87.3	86.7	88.0	88.2	88.7	90.2	90.2

Without Project - Crop Yields													
Spring rice	t/ha	6.3	6.7	6.8	6.4	6.0	6.4	6.6	6.2	6.3	6.3	6.3	6.3
Summer rice	t/ha	4.1	5.5	4.6	4.4	5.3	5.4	5.5	4.5	5.4	5.4	5.4	5.4
Corn	t/ha	2.8	3.0	3.5	3.5	3.6	3.9	3.9	4.0	4.0	4.0	4.0	4.0
Vegetables	t/ha	11.0	11.3	11.5	11.8	12.0	12.3	12.5	12.5	12.5	12.5	12.5	12.5
Production (t)													
Spring rice	'000 t	204.5	216.9	223.3	210.4	201.0	213.9	223.7	208.5	214.1	214.1	214.1	214.1
Summer rice	'000 t	138.1	184.0	150.6	144.7	173.0	175.6	179.4	146.8	177.1	177.1	177.1	177.1
Total rice production	'000 t	342.6	400.9	373.9	355.1	373.9	389.6	403.0	355.3	391.3	391.3	391.3	391.3
Total value	D bn	734.6	2,043.9	1,025.1	935.5	1016.2	883.5	795.5	658.0	730.1	771.6	801.8	831.4
Production costs	D bn	512.5	1,247.5	551.4	539.6	534.3	528.5	531.1	526.8	530.4	528.9	528.5	529.8
Net Value of Production	D bn	222.1	796.4	473.8	396.0	481.9	355.0	264.4	131.1	199.7	242.7	273.3	301.6
With Project - Crop Yields													
Spring rice	t/ha	6.3	6.7	6.8	6.4	6.0	6.4	6.7	6.3	6.4	6.4	6.4	6.4
Summer rice	t/ha	4.1	5.5	4.6	4.5	5.4	5.5	5.6	4.6	5.6	5.6	5.6	5.6
Corn	t/ha	2.8	3.0	3.5	3.5	3.6	4.0	4.0	4.1	4.1	4.1	4.1	4.1
Vegetables	t/ha	11.0	11.3	11.7	12.0	12.3	12.7	13.0	13.0	13.0	13.0	13.0	13.0
Production (t)													
Spring rice	'000 t	204.5	216.9	223.3	210.4	201.0	213.9	227.0	211.9	217.5	217.5	217.5	217.5
Summer rice	'000 t	138.1	184.0	150.6	151.2	181.6	184.3	189.7	155.4	190.5	193.2	201.6	201.6
Total rice production	'000 t	342.6	400.9	373.9	361.6	382.5	398.3	416.7	367.3	408.0	410.7	419.1	419.1
Total value	D bn	734.6	2,053.1	1,027.5	951.9	1052.1	917.8	827.7	704.3	782.6	826.8	869.1	900.7
Total costs	D bn	517.0	1,249.1	564.3	554.9	557.2	546.7	547.4	551.6	557.5	557.4	566.0	568.2
Net Value of Production	D bn	217.6	803.9	463.2	397.1	494.9	371.0	280.3	152.7	225.1	269.3	303.0	332.5
Incremental value	D bn	-4.5	7.5	-10.5	1.1	13.0	16.1	15.9	21.6	25.3	26.7	29.8	31.0

bn = billion, ha = hectare, mn = million, O&M = operation and maintenance, t = ton.

Table A8.13: Financial Budgets for a Typical Farm Without and With the Project, Thai Binh South

		Without Project						With Project					
		Spring Rice	Summer Rice	Maize	Vege-tables	Other	Farm Total	Spring Rice	Summer Rice	Maize	Vege-tables	Other	Farm Total
Total farm area	ha						0.23						0.23
Cropping intensity (%)		92	94	6	35	2	229	94	94	2	38	16	244
Cropped area	ha	0.21	0.22	0.01	0.08	0.01	0.52	0.22	0.22	0.01	0.09	0.04	0.56
Farm output	D'000	2,541	2,229	91	998	34	5,859	2,640	2,309	35	1,142	236	6,363
Farm inputs[a]		—	—	—	—	—	—	—	—	—	—	—	—
Seed	D'000	48	49	2	56	1	155	54	55	1	61		171
Fertilizer	D'000	359	367	23	228	9	977	399	396	13	266	67	1,141
Agro-chemicals	D'000	36	37		14		86	37	37		15		88
Other costs	D'000	179	182	1	59	1	421	183	181	1	65	4	434
Land preparation	D'000	—	—	—	—	—	—	—	—	—	—	—	—
Total inputs	D'000	621	635	27	357	10	1,640	673	669	15	407	70	1,835
Net farm income	D'000	1,919	1,594	64	642	24	4,219	1,967	1,640	21	734	166	4,528
Interest	D'000	—	—	—	—	—	106	—	—	—	—	—	123
Farm income	D'000	—	—	—	—	—	4,113	—	—	—	—	—	4,405
Family labor	pd/farm	50	50	4	21	2	126	47	47	2	22	11	129
Return/day	D'000	—	—	—	—	—	32.5	—	—	—	—	—	34.2

ha = hectare, p/d = per day, — = not available.

Table A8.14: Economic Internal Rate of Return, Thai Binh South

(constant 2001 D million)

Calendar Year	Project Year	Investment Cost	Incremental O&M Cost	Total Cost	Incremental Benefit	Project Cash Flow
1994	1	20.2	—	20.2	-5.6	-25.9
1995	2	9.3	—	9.3	8.2	-1.2
1996	3	32.8	0.7	33.5	-13.3	-46.9
1997	4	6.2	0.8	6.9	0.5	-6.4
1998	5	22.9	1.7	24.6	11.1	-13.5
1999	6	41.1	1.8	42.9	17.2	-25.6
2000	7	12.3	2.4	14.7	16.4	1.8
2001	8	3.8	2.0	5.8	19.5	13.7
2002	9	—	2.0	2.0	24.8	22.8
2003	10	—	2.0	2.0	26.3	24.3
2004	11	2.8	2.0	4.8	27.6	22.8
2005	12	—	2.0	2.0	30.8	28.8
2006	13	—	2.0	2.0	30.9	28.9
2007	14	—	2.0	2.0	30.9	28.9
2008	15	—	2.0	2.0	30.9	28.9
2009	16	2.8	2.0	4.8	30.9	26.1
2010	17	—	2.0	2.0	30.9	28.9
2011	18	—	2.0	2.0	30.9	28.9
2012	19	—	2.0	2.0	30.9	28.9
2013	20	—	2.0	2.0	30.9	28.9
2014	21	2.8	2.0	4.8	30.9	26.1
2015	22	—	2.0	2.0	30.9	28.9
2016	23	—	2.0	2.0	30.9	28.9
2017	24	—	2.0	2.0	30.9	28.9
2018	25	—	2.0	2.0	30.9	28.9
				Economic Internal Rate of Return		12.1%

O&M = operation and maintenance, — = not available.

SOCIAL ASSESSMENT

A. Introduction

1. Methodology

1. This report is based on the analysis of four core subprojects, comprising the Thanh Diem irrigation subproject (Me Linh district, Vinh Phuc province), the Phan Dong drainage subproject (Yen Phong district, Bac Ninh province), the Trieu Duong drainage subproject (Tien Lu district, Hung Yen province) and the South Thai Binh combined irrigation and drainage subproject (Thai Binh province). The latter subproject includes three subprojects, i.e., Lan II, Tam-Lac/ Nguyet-Lam and South Thai Binh Canal subprojects.

2. The rural sociologist of the Project Completion Review (PCR) Mission visited the four subproject areas during June–July 2002. Irrigation and drainage management company (IDMC), commune, and cooperative staff were interviewed and visits were made to two communes in each subproject area (four in the case of South Thai Binh). Unstructured individual and group interviews were held with farmers and other subproject area residents.

2. Social Conditions in the Red River Delta

3. The Red River Delta (the Delta) is the most densely populated area of Viet Nam. It comprises a network of dyked rivers and water courses, which enclose irrigation areas, villages, and towns. The total population of the delta is around 20 million, or 16 million excluding the major cities of Hanoi and Hai Phong. The rural areas of the delta are dependent on irrigated agriculture, with a focus on rice during the winter-spring and summer (wet) seasons. Farm size is small, averaging around 0.24 ha per farm family, and land distribution equitable, though the allocation of land use certificates in 1993 has tended to fix land use and allowed some accumulation by individuals. The Delta is relatively prosperous, with generally less than 10% of the population classed as living in poverty, compared to around 15% for the country as a whole.

B. Findings

1. Changes in Agricultural Production

4. The subprojects are considered to have basically met their objectives, i.e., they have promoted agricultural production in the beneficiary areas. This is, however, not yet fully achieved for Thanh Diem subproject, where the pump station has had trouble with its pumps. The repairs to the pumps are expected to be completed in early 2003.

5. The subprojects have exerted considerable positive impacts on agricultural production and on the living conditions of the beneficiary areas. Previously, these areas had irrigation and drainage facilities but their capacity was limited, with old machinery and poorly developed canal networks. With the upgrading of irrigation and drainage facilities under the Project, the local authorities can now improve irrigation supplies and effectively cope with inundation and waterlogging.

6. Drainage subprojects such as Trieu Duong and Phan Dong have made an important contribution to the increase in summer crop cultivated areas. The Tam Lac and Nguyet Lam irrigation sluices have brought into the paddy fields of Southern Thai Binh districts not only irrigation water but also a substantial amount of alluvium, which helps to improve soil fertility.

The Lan II sluice benefiting the same area has helped reduce intrusion of saline water which used to limit crop production. Statistical data do not show outstanding changes in paddy yield in the subproject areas compared to nearby areas, but qualitative data gathered at the grassroots level suggest that the above irrigation and drainage subprojects, along with the application of new crop varieties, fertilizers, and new techniques in paddy production have made a considerable contribution to the increase in paddy yields. They also have succeeded in ensuring stable supply of food to local smallholder families, who in the past often experienced crop failures due to inundation or drought.

7. Winter crop production did not develop as expected and has generally declined in the subproject areas. The reasons for this include: (i) winter crops involve high costs of inputs while the return to labor and investments is rather low; (ii) in the past, the winter crop was designed to make up for the food shortage that the summer crop could not overcome but now, food supply is secured and food shortage is no longer an uppermost concern of local smallholders; (iii) limited commercialization has been achieved for most winter crops, with crops such as maize being mainly used for livestock feed—onion production in Thanh Diem for marketing in Ho Chi Minh City is an exception; and (iv) because of increasing out-migration of labor to other economic fields, there are not enough farmhands for the winter crop.

2. Diversification of Household Economic Activities

8. Most of the beneficiary communes in the subprojects were previously regarded as economically hard-pressed areas characterized by poor quality or saline water affected fields, spoiled spring crops, rotten summer crops, and sole reliance for income on paddy cultivation. Benefit monitoring and evaluation sample surveys in the communes under the four core subprojects reveal that incomes from agriculture account for an average of 60% of total income of smallholder households. Most households still farm their own land and few families have transferred their land use rights to others in order to engage into nonagricultural activities. In recent years, diversification of economic activities has become a trend and a way for local smallholder households to improve their living conditions. Low-income smallholders households (less than D100,000/person/month) are mainly those who solely depend on agriculture. With the low per capita of cultivated land in the Delta, agriculture is not the only source of income generation. But adequate food supply is an important premise that allows the smallholders to actively engage in nonagricultural activities in order to generate additional income and improve their living conditions.

3. Other Beneficiaries

9. In addition to agricultural production, the subprojects have also given benefits to both paddy growers and the nonfarm population living in provincial towns and in district centers. The Trieu Duong and Phan Dong drainage subprojects have helped to improve the environment and to overcome illnesses and diseases prevalent in flooded areas such as skin diseases (fungal infections, itchiness, ulcerous skin), eye disease, cholera, rheumatism, and gynecological diseases affecting women working long hours in water. The South Thai Binh subproject has helped improve water transport.

4. Negative impacts

10. The construction and operation of the subprojects have resulted in some negative impacts on a section of the population. Because of the construction of pump stations and the enlarging of canals, families had to move their houses to other places or lost some part of their

cultivated land and gardens. Some families had their houses damaged due to nearby piling operations for structures. However, in general, compensation for the losses has been made adequately and fairly thanks to the efforts of the local authorities, the cooperation of the local inhabitants, and a satisfactory government compensation policy. In the case of the South Thai Binh subproject, the elimination of the intrusion of saline water into the area has resulted in the depletion of aquatic resources in various canals, which has eliminated the income previously obtained by poor smallholders engaged in fishing activities.

5. Consultation

11. For the management, operation and maintenance of the subprojects facilities, two groups have a direct influence in this regard: (i) the local smallholders, who are the main beneficiaries of the subprojects; and (ii) the irrigation and drainage management companies (IDMCs), which take over and operate the facilities upon their completion. Discussions held with the population and officials show that these two groups did not have an opportunity to take part in the preparation and execution of the subprojects. The IDMCs were simply requested to take over the completed facilities. The local smallholders pointed out that with some additional investments, subproject facilities would function more effectively. Because of the lack of consultation, the design process for the subprojects could not benefit from the relevant experience and knowledge of these groups with a strong stake in their success. Further, if both groups are associated with the supervision and execution of the subprojects, both the design and the construction quality would have been enhanced.

12. Giving a name to a subproject facility turned out to be a very sensitive issue. This seemingly small issue has caused undesirable consequences that have affected the pace of execution of subprojects and hurt the feelings of local inhabitants. Projects officials paid little attention to the importance of the names of the facilities and did not consult the local inhabitants over this. As a result, the names of several facilities have not been accepted by the local inhabitants and have even become the subjects of strong protests in the case of Thanh Diem pump station, Nguyet Lam sluice, and the Do Neo pump station. To the local inhabitants, the name given to a facility built in their own village is of particularly importance as it not only depicts the geographical location of a community but also symbolizes its history and cultural identity, and therefore is a matter of pride. Giving a name to a facility should therefore involve consultations with the local population and should be done before Project officials submit their proposal to the higher authorities for approval.

6. Relationship between the Irrigation and Drainage Management Companies and the Agricultural Cooperatives

13. In principle, the IDMCs are regarded as business organizations with the smallholder households as their customers. However, the agricultural cooperatives which act as a link between the IDMC and the smallholder households are also engaged in water-providing services. As a matter of general trend, the agricultural cooperatives conclude contracts with the IDMC for the supply of water from the main canals and only to a certain number of paddy fields, while the supply of water to all the remaining paddy fields is done by the cooperatives. Irrigation fees to be paid to the IDMCs are generally topped up with additional fees for the cooperatives. In addition, conflicts among the smallholders and communes further complicate the situation to varying degrees. For example, in days of heavy rain, communes close to the main canal close the drainage sluices for the more upstream communes in order to give priority to their own drainage operations. This then slows down the drainage of surplus rainfall in the whole area. In some cases, agricultural cooperatives refuse to conclude contracts with the IDMCs for the

supply of irrigation water while casting a blind eye on water stealing from the main canals by their own members. These actions hinder the efficient operation of the subprojects. In the complicated social conditions prevailing in rural areas, irrigation and drainage have become very sensitive issues. Efficient irrigation and drainage would help ensure social order and security, while the reverse might bring about negative reactions on the part of smallholders toward the subprojects, or possibly wider social unrest.

C. Lessons And Recommendations

1. The Importance of Social Aspects and Impacts

14. Most project reports have stressed the impact of the subprojects on agricultural production. But the reports pay little attention to the social impacts. Regular flooding or drought bring misery to the local inhabitants and thereby contribute to social unrest. So long as the social aspects and impact of project interventions are correctly understood and taken into account in the project design, the projects will have a positive impact on the society. Without an understanding of the social aspects, problems are likely to occur during project execution and subsequent operation and maintenance of irrigation and drainage facilities.

2. The Need for and Importance of Consultation

15. Irrigation and drainage projects are designed and executed to improve the life of the people and serve agricultural production. The smallholders and the operators of the project facilities are the two most important groups for achieving the intended outcomes. Consultation with these two groups during project design and allowing them to be associated with the execution of the projects are therefore needed. This requires the adoption of a participatory approach while preparing plans and designs as well as during the construction phase. This is of particular importance for the location of canals and structures (such as pump stations and control and crossing structures). There are examples of poor siting of subproject facilities, which continues to cause resentment among the local inhabitants.

16. Both the local inhabitants and the agricultural cooperatives play in important role in the operation and maintenance of irrigation and drainage systems, especially at the secondary and tertiary levels. But they also interact with the management of the primary systems. This has generally not been taken into account in the design of the subprojects. Future projects need to recognize the roles played by the cooperatives in distributing water and managing irrigation and drainage networks. They should become integral partners in project design and implementation.

17. The name of subproject facilities is important to local inhabitants, and care is therefore needed to ensure that it correctly reflects the location and the cultural identity. While this may seem a minor issue, a correct name in the eyes of the local people is necessary to ensure support for the construction and operation of the facilities.

3. Management and Maintenance

18. When a subproject is completed, its facilities are handed over to the local IDMC which will then operate and maintain them. Significant problems have cropped up during or after the transfer of some of the subproject facilities as the initial operations have revealed deficiencies and shortcomings. Under the present circumstances, the IDMCs are left alone to resolve these problems without the provision of the required funds. Future projects therefore need to have built in a mechanism to ensure that the agency that constructed the facilities will remain

responsible to assist the IDMC to correct such deficiencies and shortcomings and ensure that the facilities will function efficiently in accordance with the design.

4. Constraints to Production

19. Problems relating to primary irrigation and drainage systems are among a range of constraints facing the smallholders in the Delta. It is therefore important that the Government (including local government) make efforts to address the other constraints relating to, for example, marketing, processing, and credit provision.

5. Irrigation Fees

20. Smallholders, through their irrigation fees, are paying for the maintenance cost of the entire drainage systems. However, urban and industrial areas within the service area also benefit from drainage, but they do not pay fees. Since the smallholders are unfairly burdened with the entire maintenance cost (and also part of the "normal" operation costs), a drainage fee linked to the property tax should be considered for the urban and industrial areas to recognize the drainage services provided by the IDMCs.[1]

6. Safety

21. Several structures built under the Project are major ones such as the large pump stations and their transformers. They therefore raise safety concerns both in relation to the IDMC staff and the local residents. The pump houses need to be kept locked to prevent children gaining access, while access to pump suction areas needs to be restricted. Where appropriate, safety nets need to be installed to reduce the risk of children drowning. IDMCs also need to conduct information and education campaigns to ensure that local residents are fully aware of the dangers posed by pumps and the high-voltage transformers.

7. Negative Project Impacts

22. Few subprojects have resulted in adverse impacts. However, the South Thai Binh subproject is an example of a subproject that has caused some adverse impacts although the overall impact of the subproject is overwhelming positive. The elimination of intrusion of saline water in the subproject's waterways has affected the livelihood of some families who used to be engaged in fishing in the Ken Giang River. Also, the widening of canals or the construction of new canals without providing sufficient bridges has caused an adverse impact to some communes. These examples highlight the need to make more efforts to identify the likely adverse impacts and develop adequate mitigation measures during project planning and design. Comprehensive consultations are needed for this with all groups likely to be adversely affected requiring a change in attitude and approach by project officials and their consultants.

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[1] One large industrial enterprise in the service area of the Thanh Diem subproject is making contributions to the IDMC for its services. This is, however, an exception.

COUNTRY-SPECIFIC RECOMMENDATIONS

	Recommendations	Responsible Lead Agency(ies)	Schedule
A	**Project and TA Related**		
A.1	Provincial funded components that are not yet complete, need to be completed as soon as possible	MARD/Provincial Peoples Committees/ DARDs	All essential components completed by 31 December 2003
A.2	Start-up problems that have emerged since the commissioning and hand-over of subproject facilities need to be resolved as soon as possible	MARD/Provincial Peoples Committees/ DARDs	Problems resolved by 30 March 2003
A.3	In consultation with the local people, safety measures to prevent accidents for the large pumping stations constructed under the Project need to be reviewed; where such measures are inadequate, additional safety measures need to be put in place	MARD/IDMCs	Additional safety measures in place by 30 March 2003
A.4	For the drainage subprojects with large pump stations, the need for complementary investments need to be assessed in consultation with all stakeholders to ensure the effectiveness of the pump stations and maximize its impact in the service area	MARD/IDMCs	Need for additional investments identified by 30 March 2003; additional investments realized in 2003 and 2004 under the SRRBSP
A.5	A formal ad hoc committee needs to be established to review the outputs of the loan and TA consultants, and operationalize those that are considered appropriate for MARD's planning, design and implementation processes	MARD	Ad hoc committee chaired by concerned vice minister established by 31 January 2003; recommended outputs reflected in MARD's guidelines by 30 June 2003
A.6	A participatory research study to improve the effectiveness of investments in large external pumping stations and the associated drainage canal systems needs to be undertaken in line with the recommendations of TA 2233	MARD	To be undertaken under the research component of the SRRBSP
A.7	A program to monitor the technical performance and maintenance of large pumps installed under the Project needs to be undertaken for future planning and design	MARD	To be undertaken under the SRRBSP
A.8	If ADB selects the Project for postevaluation, its output should be available in time to provide input to the midterm review of the SRRBSP	ADB	Postevaluation to be undertaken in early 2004

	Recommendations	Responsible Lead Agency(ies)	Schedule
B	**Related to Viet Nam's Water Resources Sector**		
B.1.	**Project Formulation, Design, and Implementation**		
B.1.a	Comprehensive consultation with and participation by all stakeholders (farmers, farmers groups and women unions at commune level, IDMCs) should become an integral parts of project (and subproject in the case of a *sector* project) identification, design and implementation. MARD guidelines and cost norms for (sub)project preparation and implementation need to be adjusted to allow comprehensive stakeholder participation	MARD MARD	To be adopted under SRRBSP and future projects Comprehensive stakeholder consultations included in MARD's guidelines and cost norms for project preparation and implementation by 30 June 2003
B.1.b	For *sector* projects, identification and screening of subprojects should be undertaken within a basin context; the portfolio of investment opportunities should be demonstrably linked to an overall basin plan	MARD	To be adopted under SRRBSP and future sector projects
B.1,c	For *sector* projects, arbitrary cost ceilings should not be set for subprojects in order to avoid dividing activities within the same system. Instead, a ceiling based on cost/ha should be adopted coupled with a description of works that would not be included in the project (such as for instance large diversion works, large outfall structures and reservoirs) and an indication of the typical subproject cost to ensure a reasonably wide geographic spread of subprojects	MARD/ADB	To be adopted under SRRBSP and future ADB supported sector projects
B.1.d	The scope of the project (and subprojects in the case of *sector* projects) should be determined on the basis of a participatory diagnostic survey of the **whole** system including main, secondary, tertiary and on-farm levels; the diagnostic survey should look into physical and nonphysical aspects that influence system performance and potential for improvement	MARD	To be adopted under SRRBSP and future projects

	Recommendations	Responsible Lead Agency(ies)	Schedule
B.1.e	For *sector* projects, the depth of social, environmental, institutional and technical analyses and the documentation thereof needed for subproject appraisal and approval need to be clarified and agreed between ADB and MARD during project preparation; for projects with a number of typical subproject interventions, a "sector-level" environmental examination should be considered to reduce the environmental analyses requirements at subproject level	MARD/ADB	To be adopted for future ADB supported sector projects
	For externally financed *sector* projects with requirements related to environmental examination and impact assessments, social assessments, and resettlement planning that exceed those of MARD, the project's implementation guidelines need to provide the required resources so that these requirements are met	MARD/ADB	To be adopted for future ADB supported sector projects
B.1.f	For projects (or subprojects in the case of a *sector* project) that reduce salinity intrusion, the impact of reduced salinity on fisherfolk fishing in the water bodies within the (sub)project area need to be assessed. In case of adverse impacts, mitigation measures should be developed. If the adverse impacts cannot be mitigated, compensation need to be provides to the fisherfolk who will be adversely affected.	MARD	To be adopted under SRRBSP and future projects
B.1.g	For project (or subprojects in the case of a *sector* project) that include structures requiring pile foundations, the likelihood of damage to adjacent houses and other buildings as a result of the piling operations should be assessed and taken into account in preparing the resettlement and compensation plan	MARD	To be adopted under SRRBSP and future projects
B.1.h	For investments in drainage pump stations, a detailed analysis is to be undertaken to assess the economic returns of such pumping stations; the need for primary and lower level drainage systems to ensure timely drainage for the entire service area is be investigated in detail in close consultation with the primary stakeholders (farmers and communes)	MARD	To be adopted under SRRBSP and future projects
B.1.i	For projects executed by MARD, one agency needs to be fully responsible for coordination of all aspects of project implementation	MARD	To be adopted under SRRBSP and future projects to be executed by MARD

	Recommendations	Responsible Lead Agency(ies)	Schedule
B.1.j	Rehabilitation and modernization projects should be executed through PPMUs; MARD's subproject offices should only undertake complicated civil works that are beyond the implementation capacity of the PPMUs; clear project implementation guidelines outlining the responsibilities of each of the agencies should be prepared at the start of the project and project staff should be made familiar with these guidelines through workshops	MARD/Provincial Peoples Committees/ DARDs	To be adopted under SRRBSP and future projects to be executed by MARD
B.1.k	For projects requiring the involvement of design companies, short-listing of companies should be adopted; shortlisting should be based on the companies' capacity to meet project-specific requirements; design companies need to be engaged under well-defined terms of reference for the various tasks to be performed	MARD/Provincial Peoples Committees/ DARDs	To be adopted under SRRBSP and future projects
B.1.l	Adoption of a design approach that strikes a balance between minimizing investment costs and keeping O&M low during the life of the structure	MARD	To be adopted under SRRBSP and future projects
B.1.m	Procurement of pumps of similar duty and configurations for pumping stations within one IDMC should where possible be aggregated into one procurement package to facilitate O&M	MARD	To be adopted under SRRBSP and future projects
B.1.n	MARD should experiment with building large pumping stations through "turnkey" contracts which include all civil works, equipment and its installation and commissioning	MARD	To be undertaken under SRRBSP on experimental basis first
B.1.o	International best practices for contract supervision and quality control should be adopted, i.e., with appointment of independent consultants who undertake contract supervision in the capacity as "the engineer" on behalf of the "employer" as per Fédération International des Ingenieurs-conseils (FIDIC) guidelines. MARD should commence introducing such practices for international competitive bidding contracts	MARD	To be adopted under future projects to be executed by MARD
B.1.p	Services of international and local consultants should not be limited to preparing guidelines only but also include assistance in operationalizing, adjusting and evaluating the guidelines; consultants should be fully integrated in the project management team	MARD	To be adopted under SRRBSP and future projects

	Recommendations	Responsible Lead Agency(ies)	Schedule
B.1.q	BME systems (or project performance and management information systems) should include "controls" to permit assessment of what might have occurred in the absence of project investments. Maximum use should be made of reliable secondary data. BME systems should provide information that is useful not only to MARD but also to provincial authorities, IDMCs and other local stakeholders. BME should commence before (sub)project implementation to allow the establishment of a preproject baseline	MARD	To be adopted under SRRBSP and future projects
B.2	**Sector Policy and Strategies**		
B.2.a	The objective of rehabilitation and modernization projects should be more clearly linked to the Government's policy and strategies to improve the operational performance of the sector. Physical interventions should be accompanied by institutional (such as introducing Project Implementation Manual) and management reforms (such as rationalizing relationship between IDMCs and cooperatives, and reorganizing IDMC's organization based on hydraulic boundaries) at the system level. This requires a detailed analysis of the operational performance of the system as part of the feasibility study for the project (or subproject in the case of a *sector* project). Agreements to improve the operational performance need to be agreed upfront with all stakeholders (DARD/IDMC, water users groups, cooperative) before investments are made.	MARD/ADB	To be adopted under SRRBSP and future ADB supported projects
B.2.b	For projects requiring cofinancing from provincial sources in addition to financing from central sources, firm commitments need to be obtained from the provincial governments. Joint financing of all (sub)project components could be considered.	The Government/ ADB	For future ADB supported projects
B.2.c	To extend and eventually eliminate the current cycle of government financed major repair and rehabilitation projects; the Government should consider alternative financing mechanisms for system maintenance. Providing IDMCs with matching funds could be one option; these funds could match the funds allocated for maintenance by the IDMCs from its own resources. Nonagricultural beneficiaries of drainage services could also be charge for the maintenance of the drainage system.	The Government / ADB	To be considered for policy dialogue between the Government and ADB in the context of agriculture sector reforms

ADB = Asian Development Bank, BME = benefit monitoring and evaluation, DARD = Department of Agriculture and Rural Development, IDMC = irrigation and drainage management company, O&M = operation and maintenance, MARD = Ministry of Agriculture and Rural Development, PPMU = provincial project management unit, SRRBSP = Second Red River Basin Sector Project, TA = technical assistance.