IMPLEMENTATION COMPLETION AND RESULTS REPORT
(IBRD-40280; IDA-28700)

ON

A LOAN

IN THE AMOUNT OF US$60 MILLION

AND

A CREDIT

IN THE AMOUNT OF SDR 61.8 MILLION
(US$90 MILLION EQUIVALENT)

TO

THE PEOPLE’S REPUBLIC OF CHINA

FOR

THE GANSU HEXI CORRIDOR PROJECT

June 27, 2007

Rural Development, Natural Resources and Environment Sector Unit
Sustainable Development Department
East Asia and Pacific Region

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CURRENCY EQUIVALENTS
(Exchange Rate Effective April 30, 2007)

Currency Unit = Yuan (CNY)
CNY 1.00 = US$0.12955
US$1.00 = CNY 7.719

FISCAL YEAR
July 1-June 30

ABBREVIATIONS AND ACRONYMS

CAS   Country Assistance Strategy
CPS   Country Partnership Strategy
DID   Difference in Difference
DO    Development Objective
ERR   Economic Rate of Return
GDP   Gross Domestic Product
ha    Hectare
ICR   Implementation Completion Report
ID    Irrigation District
IDA   International Development Association
IP    Implementation Progress
ISR   Implementation Supervision Report
Kg    Kilogram
M&E   Monitoring and Evaluation
MIS   Management Information System
MTR   Mid-Term Review
NPV   Net Present Value
PDO   Project Development Objective
PMO   Project Management Office
QEA   Quality at Entry
QAG   Quality Assurance Group
QSA   Quality of Supervision
SAR   Staff Appraisal Report
SARS  Severe Acute Respiratory Syndrome
SRBWRMB Shule River Basin Water Resource Management Bureau
WBOB  World Bank Office, Beijing
WTO   World Trade Organization
WUA   Water User Association

Vice President  Jim Adams
Country Director  David Dollar
Sector Manager  Rahul Raturi
Project Team Leader  Sari Söderström
ICR Team Leader  Sari Söderström
The People’s Republic of China

The Gansu Hexi Corridor Project

Implementation Completion and Results Report

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## A. Basic Information

<table>
<thead>
<tr>
<th>Country</th>
<th>China</th>
<th>Project Name</th>
<th>Gansu Hexi Corridor</th>
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<tr>
<td>Project ID</td>
<td>P003594</td>
<td>L/C/TF Numbers</td>
<td>IBRD-40280; IDA-28700</td>
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<td>06/27/2007</td>
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<td>SIL</td>
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<td>People’s Republic of China</td>
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<td>US$150.0 million</td>
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<tr>
<td>Implementing Agency</td>
<td>The Gansu Provincial Project Management Office</td>
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## B. Key Dates

<table>
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<th>Process</th>
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<td>11/12/2004</td>
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<td>Mid-term Review</td>
<td>06/12/2000</td>
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## C. Ratings Summary

### C.1 Performance Rating by ICR

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<th>Outcome</th>
<th>Rating</th>
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<td>Risk to Development Outcome</td>
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<tr>
<td>Bank Performance</td>
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<tr>
<td>Borrower Performance</td>
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</table>

### C.2 Detailed Ratings of Bank and Borrower Performance by ICR

<table>
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<tr>
<th>Bank</th>
<th>Ratings</th>
<th>Borrower</th>
<th>Ratings</th>
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<td>Quality at Entry</td>
<td>Unsatisfactory</td>
<td>Government</td>
<td>Unsatisfactory</td>
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<tr>
<td>Quality of Supervision</td>
<td>Satisfactory</td>
<td>Implementing Agency</td>
<td>Satisfactory</td>
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<tr>
<td>Overall Bank Performance</td>
<td>Moderately Satisfactory</td>
<td>Overall Borrower Performance</td>
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### C.3 Quality at Entry and Implementation Performance Indicators

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<tr>
<th>Implementation Performance</th>
<th>Indicators</th>
<th>QAG Assessments (if any)</th>
<th>Rating</th>
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<td>Potential Problem Project at any time?</td>
<td>No</td>
<td>Quality at Entry (QEA)</td>
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<td>Problem Project at any time?</td>
<td>Yes</td>
<td>Quality of Supervision (QSA)</td>
<td>Highly Satisfactory (supervision of safeguards) Moderately Unsatisfactory (QSA)</td>
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<td>DO rating before Closing</td>
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D. Sector and Theme Codes

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<th>Actual</th>
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<td>General agriculture, fishing and forestry sector</td>
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<td>20</td>
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<td>General water, sanitation and flood protection sector</td>
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<td>Irrigation and drainage</td>
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<thead>
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<th>Theme Code (Primary/Secondary)</th>
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<th></th>
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<tr>
<td>Land administration and management</td>
<td>Secondary</td>
<td>Secondary</td>
</tr>
<tr>
<td>Other environment and natural resources management</td>
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<td>Secondary</td>
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<tr>
<td>Other rural development</td>
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<td>Primary</td>
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<td>Pollution management and environmental health</td>
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<td>Rural services and infrastructure</td>
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E. Bank Staff

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<thead>
<tr>
<th>Positions</th>
<th>At ICR</th>
<th>At Approval</th>
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</thead>
<tbody>
<tr>
<td>Vice President</td>
<td>James W. Adams</td>
<td>Russell Cheetham</td>
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<td>Country Director</td>
<td>David R. Dollar</td>
<td>Nicholas C. Hope</td>
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<tr>
<td>Sector Manager</td>
<td>Rahul Raturi</td>
<td>Joseph R. Goldberg</td>
</tr>
<tr>
<td>Project Team Leader</td>
<td>Sari K. Söderström</td>
<td>Lang Seng Tay</td>
</tr>
<tr>
<td>ICR Team Leader</td>
<td>Sari K. Söderström</td>
<td>-</td>
</tr>
<tr>
<td>ICR Primary Author</td>
<td>Sergiy Zorya</td>
<td>-</td>
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F. Results Framework Analysis

Project Development Objectives

The objectives of the project were: (a) to alleviate poverty of some 200,000 poor farmers from the resource-poor areas of central and south-east Gansu Province by emigrating and settling on newly developed irrigated land in the Hexi Corridor; (b) to increase agricultural production in Gansu Province, especially in food grains and commodity crops; and (c) to protect and restore degraded environments.

The project focused on the development of new irrigated lands and improvement of water facilities for existing irrigated land to improve the livelihoods of resettling people who, at appraisal, lived in dire poverty in the poorest counties of Gansu Province. The project area in the Shule Basin is part of the Gobi Desert. It is very arid and windy, with naturally saline soil conditions; the development and the sustainability of irrigation, land reclamation, soil leaching and forest windbreak establishment are essential for agricultural production and resettlement.
Revised Project Development Objectives

The project had changes in scope which were recorded in the revised Legal Agreements in 2004. However, the original project development objectives were not revised. The major revisions were a reduction in the number of voluntary resettlers from 200,000 to 75,000 and a reduction in the area of land to be reclaimed from 54,610 ha to 27,213 ha.

(a) Project Development Objectives Indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Baseline Value</th>
<th>Original Target Values</th>
<th>Revised Target Values ¹ (MTR)</th>
<th>Actual Value Achieved at Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Indicator 1</strong> <em>Per capita net income</em> (RMB)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value</td>
<td>Project total: 248</td>
<td>Project total: 1,564</td>
<td>Project total: 1,830</td>
<td>Project total: 1,850</td>
</tr>
<tr>
<td></td>
<td>Changma: 1,601</td>
<td>Shuangta: 1,720</td>
<td>Huahai: 2,575</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>September 22, 1995</td>
<td>June 30, 2006</td>
<td>December 31, 2006</td>
<td>December 31, 2006</td>
</tr>
<tr>
<td>Comments</td>
<td>The Value Achieved was 118.3 percent of the SAR target and 101.1 percent of MTR target. The project total <em>per capita</em> net income is weighted by the number of resettlers in the three irrigation districts (Changma, Shuangta, Huahai).</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| **Indicator 2** *Changes in food grain production* (tons) | | | | |
| Value     | Project total: 7,200 | Project total: 215,100 | Project total: 120,300 | Project total: 108,000 |
| Date      | September 22, 1995  | June 30, 2006          | December 31, 2006        | December 31, 2006          |
| Comments  | The Value Achieved was 50.2 percent of the SAR target and 89.8 percent of MTR target. The unmet targets of food grain production, set at appraisal and MTR, do not necessarily imply negative result but reflect the shift from production of food grains to production of higher-value cash-income crops (see Indicator 3). |

| **Indicator 3** *Gross agricultural output* (million RMB) | | | | |
| Value     | Project total: 740  | Project total: 1,989   | Project total: 1,475     | Project total: 1,957      |
| Date      | September 22, 1995  | June 30, 2006          | December 31, 2006        | December 31, 2006          |
| Comments  | The Value Achieved was 98.4 percent of the SAR target and 132.7 percent of MTR target. The values of gross agricultural output are reported in nominal prices. Farm-gate prices at completion did not differ greatly from those at appraisal, implying that real prices (if adjusted for inflation) were even lower. Food prices declined as a result of China’s WTO accession in 2001, but began rising in 2003 as a result of an increase in world market prices and in domestic demand. At the same time, the newly-reclaimed irrigated area at completion was half of appraisal estimate (see Intermediate Outcome 4). |

¹ The second MTR (in 2003) set revised targets for the Key Performance Indicators associated with the Project Development Objectives and the Intermediate Outcomes; these are included here. The Intermediate Outcome Indicators #3 and #4 were formally revised through a letter of amendment dated November 12, 2004 and counter-signed on November 17, 2004.
### Indicator 4 Distribution system efficiency of irrigation canals (percent)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Baseline Value</th>
<th>Original Target Values</th>
<th>Revised Target Values (MTR)</th>
<th>Actual Value Achieved at Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>September 22, 1995</td>
<td>June 30, 2006</td>
<td>December 31, 2006</td>
<td>December 31, 2006</td>
</tr>
<tr>
<td>Comments</td>
<td>The Value Achieved was 100.0 percent of the SAR target and 100.0 percent of MTR target.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Indicator 5 Cost recovery ratio (as water fees to O&M expenses)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Baseline Value</th>
<th>Original Target Values</th>
<th>Revised Target Values (MTR)</th>
<th>Actual Value Achieved at Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>September 22, 1995</td>
<td>June 30, 2006</td>
<td>December 31, 2006</td>
<td>December 31, 2006</td>
</tr>
<tr>
<td>Comments</td>
<td>The Value Achieved was 85.4 percent of the SAR target and 110.7 percent of MTR target. The original target value of 1.57 is not comparable with the actual result. The original target was based on 98,200 ha of rehabilitated and new irrigated lands. At completion, the total irrigated area was 70,400 ha and, if recalculated, the original target would have been about 0.8. Note that the typical cost recovery ratio in Gansu province is reported at 0.6-0.7.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Indicator 6 Overall vegetation cover area (percent)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Baseline Value</th>
<th>Original Target Values</th>
<th>Revised Target Values (MTR)</th>
<th>Actual Value Achieved at Completion or Target Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>September 22, 1995</td>
<td>June 30, 2006</td>
<td>December 31, 2006</td>
<td>December 31, 2006</td>
</tr>
<tr>
<td>Comments</td>
<td>The Value Achieved was 139.1 percent of the SAR target and 102.0 percent of MTR target.</td>
<td></td>
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(b) Intermediate Outcome Indicators

### Indicator 1 Per capita grain production (kg)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Baseline Value</th>
<th>Original Target Values (from approval documents)</th>
<th>Revised Target Values (MTR)</th>
<th>Actual Value Achieved at Completion or Target Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>September 22, 1995</td>
<td>June 30, 2006</td>
<td>December 31, 2006</td>
<td>December 31, 2006</td>
</tr>
<tr>
<td>Comments</td>
<td>The Value Achieved was 59.7 percent of the SAR target and 74.3 percent of MTR target. The reduction in <em>per capita</em> grain production reflects the increased quality of the structure of agricultural output (crop pattern) and is the result of a gradual shift to cash crops (such as cotton, Chinese herbs, and spices) supported by the access to irrigation and changing market incentives. See Indicator 2.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indicator</td>
<td>Baseline Value</td>
<td>Original Target Values</td>
<td>Revised Target Values (MTR)</td>
<td>Actual Value Achieved at Completion</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------</td>
<td>------------------------</td>
<td>----------------------------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td>Indicator 2</td>
<td><em>Per capita gross agricultural output</em> (RMB)</td>
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<td></td>
</tr>
<tr>
<td>Value</td>
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<td>-</td>
<td>Project total: 3,385</td>
<td>Project total: 5,043 Changma: 4,206 Shuangta: 6,668 Huahai: 4,852</td>
</tr>
<tr>
<td>Date</td>
<td>-</td>
<td>-</td>
<td>December 31, 2006</td>
<td>December 31, 2006</td>
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<td>Comments</td>
<td>The Value Achieved was 149.0 percent of MTR target.</td>
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<td>Indicator 3</td>
<td><em>Improved irrigated area</em> (’000 ha)</td>
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<td>Value</td>
<td>Project total: 18.8 Changma: 11.5 Shuangta: 5.8 Huahai: 1.5</td>
<td>Project total: 43.6 Changma: 27.4 Shuangta: 12.4 Huahai: 3.8</td>
<td>Project total: 43.6 Changma: 27.4 Shuangta: 12.4 Huahai: 3.8</td>
<td>Project total: 43.6 Changma: 27.4 Shuangta: 12.4 Huahai: 3.8</td>
</tr>
<tr>
<td>Comments</td>
<td>The Value Achieved was 100.0 percent of the SAR target and 100.0 percent of MTR target.</td>
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<tr>
<td>Indicator 4</td>
<td><em>Newly reclaimed irrigated area</em> (’000 ha)</td>
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<td>Comments</td>
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<tr>
<td>Indicator 5</td>
<td><em>Total irrigation water supplied</em> (million cubic meters)</td>
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<tr>
<td>Comments</td>
<td>The Value Achieved was 68.8 percent of the SAR target and 100.5 percent of MTR target.</td>
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<tr>
<td>Indicator 6</td>
<td><em>Water charges collected</em> (million RMB)</td>
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<tr>
<td>Value</td>
<td>Project total: 4.55</td>
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<td>Project total: 34.92</td>
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<td>Indicator 7</td>
<td><em>Operation and maintenance expenses</em> (million RMB)</td>
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<tr>
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## G. Ratings of Project Performance in ISRs

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<tr>
<th>No.</th>
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<th>DO</th>
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<td>15</td>
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<td>Satisfactory</td>
<td>39.54</td>
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<tr>
<td>16</td>
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## H. Restructuring

<table>
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<tr>
<th>Restructuring Date</th>
<th>Board Approved PDO Change</th>
<th>ISR Ratings at Restructuring</th>
<th>Amount Disbursed at Restructuring (US$ million)</th>
<th>Reason for Restructuring &amp; Key Changes Made</th>
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<tr>
<td>11/12/2004</td>
<td>No</td>
<td>U</td>
<td>74.69</td>
<td>The water utilization ratio at appraisal was set at 92 percent of the estimated water flow. This was adjusted to 65 percent at MTR to correspond to international practice in water resources management. Accordingly, the number of voluntary resettlers was reduced to 75,000.</td>
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I. Disbursement Profile

[Graph showing disbursement profile with three lines: Original, Formally Revised, and Actual. The x-axis represents years from 1996 to 2004, and the y-axis represents US $ millions from 0 to 200. The graph illustrates the growth over time.]
1. Project Context, Development Objectives and Design

1.1 Context at Appraisal

1.1.1 This project was one of a series of Bank-assisted poverty reduction projects in China supporting the government’s Ninth Five-Year Plan. The project aimed to promote the Bank’s overall goal of poverty reduction as articulated in the 1997 report “Rural Development from Vision to Action” in which China was identified as one of the focal countries.

1.1.2 The project was designed to be consistent with the Country Assistance Strategy (CAS) of 19951 that supported income-generation programs in lagging regions, upgrading of marginal agricultural lands, major water storage, and irrigation and drainage development. At the time of project preparation, the voluntary resettlement of poor households from resource-poor to relatively resource-rich areas was considered to be an important element to reduce absolute poverty and prevent further environment degradation. This was also in line with the Poverty Reduction Strategy jointly developed by the government and the Bank in the 1990s.

1.1.3 The rationale of Bank support for the project was that: (a) the Bank had significant experience in addressing poverty in China in the most difficult environments; (b) the Bank sought to develop a prototype large-scale settlement project integrated with irrigated agriculture for future scaling-up; (c) enhanced knowledge transfer would occur during project preparation and implementation; (d) the Bank’s involvement would improve project implementation and induce institutional reforms in the management of natural resources; and (e) the Bank’s assistance would leverage additional domestic resources for poor project counties.

1.2 Original Project Development Objectives and Key Indicators

1.2.1 The project development objectives (PDOs) were: (a) to alleviate poverty of some 200,000 poor farmers from the resource-poor areas of central and south-east Gansu Province by emigrating and settling on newly developed irrigated land in Hexi Corridor; (b) to increase agricultural production in Gansu, especially in food grains and commodity crops; and (c) to protect and restore degraded environments.

1.2.2 The project focused on the development of new irrigated lands and the improvement of facilities for existing irrigated land to improve the livelihoods of resettling people who lived in dire poverty in the poorest, mountainous counties of Gansu Province. The project area in the Shule River Basin, part of Gobi Desert, is very arid and windy with naturally saline soil conditions, thus the development of irrigation, land reclamation, soil leaching and forest windbreak establishment were considered to be essential for the sustainability of the resettlement and agricultural production.

1.2.3 The Key Performance Indicators (KPIs) to monitor the achievement of the PDOs were specified in three broad groups (increased agricultural production, poverty reduction and environment protection) and included, among others: (a) changes in per capita income; (b) total

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1 Close collaboration was established resulting from the 1992 sector study “China: Strategies for Reducing Poverty in the 1990s” and the International Conference on Poverty Issues in China held in Beijing.
production of grain and cash crops; (c) per capita grain production; (d) distribution system
efficiency of irrigation canals and water cost recovery; (e) rehabilitated and newly reclaimed,
irrigated areas; and (f) overall vegetative cover.

1.3 Revised PDO (as approved by original approving authority) and Key Indicators, and
reasons/justification

1.3.1 The original PDOs were not revised, but in 2004 the project had changes in scope which
were recorded in amendments to the Legal Agreements. The main changes included a reduction
in the number of immigrant farmers (from 200,000 to 75,000) and a corresponding reduction in
the area of land reclamation (from 54,610 ha to 27,213 ha).

1.3.2 The project was intended to address complex issues related to water resources and land
development under challenging environmental conditions. In addition, it involved the creation of
new administrative areas (townships) and moving 200,000 people to new and difficult conditions.
For these reasons, the Borrower originally proposed a project implementation period of twelve
years. In view of the rapidly changing economy and implementation conditions in China, the
Bank did not consider such a long project implementation period to be advisable and in a
compromise an implementation period of ten years (already unusually long by the Bank’s
standards) was agreed upon. At the time, the Bank did not have alternative lending instruments
that could accommodate phased project implementation. Instead, in the legal agreements it was
agreed that a two-stage Mid-Term Review (MTR) would be used to adjust the project.

1.3.3 By the time of the first stage of the MTR, a number of serious design flaws had surfaced
and a severe shortfall in counterpart funding had had a negative impact on project implementation.
The two-stage MTR (2000 and 2003) was used to mitigate the design shortcomings (described in
Section 2.1) and issues that arose during implementation (described in Section 2.2).

1.4 Main Beneficiaries

1.4.1 At the time of project preparation, the average per capita rural income of the project area
significantly exceeded the average for Gansu Province and even more so for the eleven intended
emigration ("move-out") counties located in central and south-eastern Gansu. Most households
in the move-out areas lived in absolute poverty with per capita annual income below RMB300
caused by the poor resource base, a deteriorating environment and increasing population pressure.
The project intended to resettle 200,000 people to the relatively resource-rich Yumen City,
Guozhou County (formerly Anxi County) and selected state farms in the northern Hexi Corridor.
The intended target population included a large number of ethnic minorities living in Yongjing,
Jishishan and Lixian counties of eastern Gansu.

1.4.2 During the MTR process, the scope of the resettlement was reduced to 75,000 people (see
Sections 1.6 and 2.1 below). The actual number of resettlers at the time of completion was
75,378. These included 62,000 people directly moved by the project (37,908 people to Changma
Irrigation District (ID), 9,419 people to Shuangta ID and 14,673 people to Huahai ID) and 13,378
“self-moved” people under the local authorities’ permission (for which residential identification
cards - hukou – were issued). The self-moved people came from 43 national/provincial level
poverty counties in Gansu and included more than 7,000 people from the project’s original eleven
move-out counties. Their relocation to the Hexi Corridor was mainly stimulated by the
infrastructure and income-generating opportunities created by the project.
1.5 Original Components

1.5.1 There were seven components in the project as designed in the PAD. The costs shown below included provisions for price and physical contingencies. The components were:

(a) the **Changma Dam** (US$41.25 million) on the Shule River was designed to provide storage of about 194 million m³ of water for irrigation. The design required 131 families (566 people) to be involuntarily resettled from the reservoir site and 172 ha of cultivated land acquired.

(b) **Irrigation and Drainage** (US$143.30 million) to improve irrigation facilities for an existing area of 43,300 ha and to develop 54,600 ha of new irrigated land in three irrigation districts.

(c) **Agriculture Support** (US$3.37 million) for agricultural machinery, seed production and processing, extension and research.

(d) **Livestock Development** (US$2.86 million) for improvement and establishment of a livestock extension network, the supply and production of improved livestock, fodder production and feed processing, and credit for livestock production activities.

(e) **Environmental Protection and Management** (US$10.33 million) for afforestation (forestry development) and for soil and water conservation activities.

(f) **Voluntary Emigration and Land Settlement** (US$44.51 million) for 200,000 immigrant farmers to newly developed irrigated land in 16 new townships and 160 villages.

(g) **Institutional Strengthening and Support** (US$14.61 million) through the provision of training, technical assistance, equipment, vehicles and essential facilities.

1.5.2 The construction of the Changma Dam and the irrigation facilities provided the basis for agricultural development and income generation for the resettlers in the existing and newly-reclaimed irrigated areas. The project set the institutional arrangements and financed the capacity-building activities to ensure a high distributional efficiency of the irrigation system and the cost recovery of operating and maintenance expenses (O&M). The Voluntary Emigration and Land Settlement component enabled the resettlement and the preparation of agricultural land for resettlers. At the same time, the Agricultural Support and the Livestock Development components helped the resettled farmers to produce new crops and livestock, mainly through training and extension services and also through a “one-time” provision of agricultural inputs. Finally, the Environment Protection and Management component encouraged afforestation in support of environmentally sustainable development.

1.6 Revised Components

1.6.1 The original components were revised through the MTR process and recorded in the Amendments of the Development Credit Agreement due to significant changes in project scope. The main changes included a reduction in the number of immigrant farmers from 200,000 to 75,000 and a corresponding reduction in the area of land reclamation from 54,610 ha to 27,213 ha.²

² The scale of the original components was adjusted twice. During the MTR in FY2000, it was agreed to reduce the number of resettlers from 200,000 to 95,000. During the second MTR in FY2003, the decision was made to reduce the number of resettlers to 75,000.
Other project activities were also revised accordingly, including the construction of canals and on-farm works, land improvement, agricultural, forestry and livestock development activities related to the settlers, the establishment of new townships, villages, schools, hospital and clinics, etc. In addition, the MTR included the government's policy decision not to finance commercial seed-processing companies, commercial livestock-breeding farms, and commercial forestry farms, and to reduce agricultural equipment purchases (farmers financed this themselves with direct government subsidies). The number of project components remained unchanged but their scale and financing amounts were altered. The major changes are presented below:

(a) **Irrigation and Drainage**: There was a reduction in: (i) the area of land reclamation and on-farm works from 54,610 ha to 27,213 ha; (ii) the total length of branch canals from 952.6 km to 340.9 km; (iii) the length of branch drainage canals from 412.3 km to 116 km; and (iv) the quantity of roads, power transmission and communication lines, and other related small facilities. Funds were reallocated to finance two small hydro-electric power stations on the main canals and to establish farmer water users’ associations (WUAs) in the irrigation districts.

(b) **Agricultural Support**: There was a reduction in number of technical extension stations at the township level (from 16 to 6) and in the purchase of agricultural machinery (from 304 sets to 57). Funds were reallocated to add an extension station in one of the state farms and to cover for additional soil desalinization measures on demonstration areas (13,467 ha). Funds for commercial seed-processing companies were cancelled.

(c) **Livestock Development**: The number of livestock extension stations at the township level was reduced (from 16 to 6). The area of commercial forage production was reduced (from 11,060 ha to 2,441 ha). Funds were reallocated to provide 30,000 sheep for immigrant households. The development of commercial feed- and fodder-processing companies and commercial livestock-breeding farms were cancelled, along with the provision of related fencing and tubewells.

(d) **Forestry Development and Environment**: The number of township extension stations was reduced (from 11 to 6). The number of natural forest stations was reduced from 5 to 3; on-farm field forest belts were reduced from 3,053 ha to 1,200 ha; and household orchard development was reduced from 2,667 ha to 1,000 ha. The commercial forest farms in Yumen and Guazhou and the 1,000 ha firewood forest were cancelled. Funds were reallocated to support: (i) the Changma upper reach natural forest station; and (ii) water-soil conservation, grassland for wind and sand protection, and cultural heritage protection.

(e) **Voluntary Resettlement**: The number of immigrant farmers was reduced from 200,000 to 75,000. Correspondingly, the number of new townships and hospitals were reduced from 16 to 6, new villages from 160 to 57, new primary and middle schools from 176 to 66, and new clinics from 160 to 57. Resettlement-related infrastructure (roads, water and power supply, etc.) was reduced accordingly.

**1.7 Other Significant Changes**

1.7.1 No other significant changes were made to the project.

**2. Key Factors Affecting Implementation and Outcomes**

**2.1 Project Preparation, Design and Quality at Entry**

2.1.1 The PDOs were set clearly in the context of the CAS and the government’s strategy for poverty reduction. The specific activities planned to achieve the project’s poverty reduction objective built on the experience of previous “poverty-reduction-through-voluntary-resettlement”
programs in Gansu, the results of which were considered very positive in reducing absolute poverty and providing greater level of incomes after resettlement on newly-irrigated lands.

2.1.2 However, there were four major shortcomings in the project design, which had significant negative impacts on project implementation: (a) environmental issues; (b) institutional issues; (c) social issues; and (d) technical preparation.

2.1.3 Environmental Issues. Insufficient attention was paid to environmental issues during preparation and appraisal. The basin-level rate of water utilization agreed upon was very high (at 91.7 percent). During implementation, increasing attention in China was paid to the sustainability of water resources management, and eventually the Gansu Provincial Planning Commission started questioning the sustainability of the project’s water withdrawals and requested that an ecological study be carried out to evaluate the water balance in the Shule River Basin. The Shule Basin Ecology Study investigated the water balance required for both the project area and ecological uses downstream of the Changma Reservoir and concluded that there was a need for a strong, province-level river basin management agency to protect the basin’s water ecology and environment, and specified the amount of water that needed to be reserved for ecological demands along the lower reaches of the Shule River. Consequently, during the MTR, the water utilization rate was revised downwards to 65 percent, which is in accordance with international standards. Although the concept of “ecological water requirement” was acknowledged at the national decision-maker levels only as recently as 2000, it had been a commonly accepted concept internationally for some years; the Bank Task Team should have paid closer attention to this fundamental design issue at the time of preparation and appraisal.

2.1.4 Institutional Issues. At the time of appraisal, a prefecture-level water resource management bureau for the Shule River was agreed to be sufficient for the project although integrated water basin management was already a widely-accepted best practice inside the Bank and internationally. The Bank’s Supervision Team had to exert extreme pressure and push significant policy reform finally to convince Gansu to concede that a province-level bureau would be more effective in handling the complex issues of water allocation among competing uses within the prefecture borders and water-use control to stay within the extremely tight water budget for the whole river basin. The establishment of the Province-level Gansu Shule River Basin Water Resources Management Bureau (SRBWRMB) was eventually finalized, even if not as quickly as the Bank would have wished. SRBWRMB establishment is a major accomplishment for Gansu and at project completion is highly appreciated by the local, provincial and the national governments. The Ministry of Water Resources (MWR) has recognized the importance of this achievement by giving Gansu a special award for integrated river basin management. It is unlikely that this achievement would have taken place without continuous pressure from the Bank’s Task Team and strong support from the Gansu Water Resources Bureau.

2.1.5 The positive institutional impact that eventually was achieved was further strengthened by the establishment of 87 WUAs which were originally not included in the project design. The WUAs are now managing the operation and maintenance (O&M) of the irrigation systems in the three irrigation districts under the project, ensuring efficient water use, and facilitating the collection of water fees which fully cover the O&M expenses (still a rare achievement in China). The institutional reform at the top (the establishment of SRBWRMB) and the establishment of WUAs at the grassroots level “closed the loop”, enabling a positive cycle of sustainable water resource management in the project areas.
2.1.6 **Social Issues.** No stakeholder assessment or social assessment that systematically would have identified the project’s key stakeholders and their views of and attitudes towards the project was carried out. While a social assessment was carried out in the move-out counties, no such assessment was undertaken in the receiving counties (receiving local governments and communities in Jiuquan Prefecture). This left the Bank’s Supervision Team unaware of many of the complexities which caused the reluctant attitude of Jiuquan Prefecture/Municipality toward the project and their wariness in accepting re-settlers from the other poorer prefectures. A major issue was that the large inflow of poor households would at least initially reduce the average *per capita* GDP of the relatively better-off Jiuquan (which would adversely affect the development reputation of Jiuquan).

2.1.7 With continuous internal negotiations and consultations between the provincial and prefecture governments during implementation, the thrust to relocate people to the resettlement sites gained renewed momentum as the major irrigation works were completed and land preparations were initiated. In addition, the reduction in the number of re-settlers as a result of the water balance issue eased the pressure on Jiuquan.

2.1.8 **Technical Preparation.** The extent of soil salinization in the selected irrigation areas was seriously underestimated during appraisal, causing significant delays and cost increases for land reclamation. The large share of extremely saline soils in the newly-reclaimed areas (about 65 percent) required particular attention. Intensive research was undertaken in close collaboration with several international institutes to prepare land typing based on remote sensing, with detailed descriptions of soil structure, salt content and treatment required, and the classification of their potential use in agriculture. Extension workers and farmers received on-site training in various soil-leaching techniques for different types of soil and groundwater conditions. Guidelines and manuals were prepared and trainees participated in actual soil leaching of selected pilot areas under the guidance of experienced technical personnel.

2.2 **Implementation**

2.2.1 Internal factors that had a significant impact on project implementation related to: (a) the shortage of counterpart funds; (b) the introduction of a national program encouraging potential re-settlers to stay in the move-out areas; and (c) construction delays.

(a) **Counterpart Funds.** From the outset, progress on all project components was slow because of counterpart funding shortages. At appraisal, the Bank’s Task Team was informed that national poverty reduction funds would be allocated to cover a large part of the required counterpart funds (forty percent). However, the regulations for use of national poverty reduction funds were changing and relevant provincial departments knew prior to negotiations that the project would not be eligible to use those funds. Consequently, counterpart funds for the project were short by 40 percent before the project even had started implementation. The Bank Supervision Team became aware of this situation only later, when the lack of counterpart funding started to have an impact on project implementation.

(b) **National Program Supporting Move-Out Areas.** In the late 1990s, the central government introduced a national program entitled the “Grain for Green Program” to rehabilitate forest and grassland areas in resource-poor areas (mainly in the western areas of the country) which had

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3 The extension stations in the project areas have gained substantial and unique experience in tackling severe salinity problems. This experience is worth transferring to other countries where land and water is very scarce and soil salinity hampers agricultural production.
been damaged by poor farming practices (especially farming on steeply sloping land). This program provided subsidies and grain for farmers to take sloping land out of grain production and to plant trees and forage instead. The program supplemented the move-out farmers’ income and changed their incentives for moving out to the Shule River Basin in the harsh Gobi Desert. This was another rationale for reducing the number of re-settlers. The introduction of the Grain for Green Program was also the reason for the cancellation of the project’s environmental investments in the move-out areas 4 as these activities were to be covered by the national program.

(c) Construction. The collapse of a section of the Changma Dam silt diversion tunnel (caused by geological conditions) in 1998 significantly delayed the completion of the dam and ancillary works. The collapse also delayed the availability of additional water needed for land reclamation, land leaching and crop production which, in turn, delayed the relocation of re-settlers. In addition, the completion of bidding, evaluation and selection for ten key construction contracts for irrigation and drainage works was delayed because of the Borrower’s lack of experience in following the Bank’s procurement guidelines 5. The delay in procurement contributed to the slow construction of irrigation facilities for the settlement sites. The Severe Acute Respiratory Syndrome (SARS) outbreak in 2002-2003 further slowed procurement and construction progress (see paragraph 2.2.3 below).

2.2.2 The Bank’s Supervision Team was very flexible in addressing the design problems and in adapting to unexpected events. The Mid-Term Reviews in FY00 and FY03 6 tried to cope with the loss of the national poverty reduction funds, to bring attention to ecological sustainability and social development, and to adjust the project activities accordingly. The targeted number of beneficiaries was reduced along with the newly reclaimed irrigated areas, and the water utilization rate was adjusted to 65 percent to ensure the sustainable use of water and to protect the downstream environment 7. Although Gansu was able eventually to make up part of the counterpart funding shortage by obtaining funding through national treasury bonds issued by the central government, the lack of timely availability of the funds at the project site continued to hamper implementation progress throughout the life of the project.

2.2.3 One important external factor affected the project implementation; the outbreak of SARS in China in late 2002 basically stopped movement for some six months between and within provinces, and Bank-supported operations along with the government’s own programs were basically suspended during this time period. Project personnel were unable to travel within counties and were to a large extent called on to support the control of the outbreak.

2.3 Monitoring and Evaluation (M&E) Design, Implementation and Utilization

2.3.1 The project was supported by a survey-based M&E system, consisting of three parts: (a) involuntary resettlement for the Changma Reservoir; (b) voluntary emigration and land

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4 The “Grain for Green” program provided compensation for farmers for converting low economic-value cultivated land to ecological purposes in northern and western parts of China. In 2006, the subsidy equaled approximately RMB200 per mu plus a certain amount of grain.

5 A special training program was arranged in Yumen City by the Beijing Office of the Bank in October 2000 to strengthen the project’s procurement capacity.

6 The detailed changes to the project components induced by the MTR are described in Section 1.6.

7 At completion, the reserved ecological water balance of 260 million m³ was fully consistent with the recommendations in the Shule River Basin Ecological Study. This is approximately 25 percent of the annual runoff of the Shule River.
settlement; and (c) environmental monitoring of land and water resources. Output and outcome indicators were selected for each project component.

2.3.2 The National Research Center for Resettlement of Hehai University monitored and evaluated annually the socio-economic well-being of 131 households (of a total of 139 households) involuntarily relocated by the construction of the Changma Reservoir and resettled mainly in Huahai ID (and also in Yumen City and Changma ID). The M&E was undertaken during 2000-2002. The progress of involuntary resettlement was regularly reported to project management and the Bank for information and action. The Bank reviewed the quality of the involuntary relocation and deemed it to be fully in accordance with both government regulations and Bank safeguards.

2.3.3 The Voluntary Resettlement Program was also supported by an external M&E mechanism conducted by Lanzhou University in Gansu, designed to advise program implementation in the local social context of Hexi Corridor in accordance with the project’s voluntary resettlement plan. The annual surveys and reporting lasted for ten years until the 2006 report. The M&E reporting covered all major aspects of socio-economic conditions of “move-out” areas (11 poverty counties in south-east Gansu Province) and “move-in” areas (in the Shule River Basin), with a focus on the progress achieved in resettlement implementation, development of the new settlements and livelihood rehabilitation of the resettled households. Besides examining physical construction, social services and production arrangements in the new sites (eight in total), a sample size of about 2,000 resettlers (500 households) was annually selected for surveys of incomes and expenditures (from agriculture and labor out-migration, and in the new sites and old move-out villages), living environment and satisfaction indexes. Tracking progress on output and outcome indicators and other socio-economic indicators across “move in” and “move out” areas, these surveys yielded high-quality data for the M&E of the voluntary resettlement program.

2.3.4 The project was also supported by Environmental Monitoring and Evaluation conducted in project “move-in” and “move-out” areas. The Water Environment Center of the Gansu Hydrology and Water Resources Investigation Bureau, the Gansu Agriculture Engineering Planning Institute, and other relevant universities and institutes were sub-contracted to conduct M&E on parameters for surface and groundwater, meteorological data, water table, soil quality and ecological environment. M&E techniques used included surveys, field investigations and research. Various reports were prepared regularly for the PMO.

2.3.5 In addition to the M&E system, a computerized Management Information System (MIS) was set up to collect and monitor financial and physical progress data from technical bureaus and units implementing the various project components. Procurement and financial reports detailed all works, project expenditures and supporting documents for disbursement from loan/credit proceeds. Progress reports were prepared semi-annually. The various M&E systems helped greatly to inform on the status of project implementation and also facilitated the evaluation discussions at completion. However, an integrated M&E system that would have measured overall project efficiency, performance and outcome was never put in place.

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8 These included the reports on “Annual Environmental Management”, “Water Resources Balance and Reservoir Groundwater Level Prediction”, “Anxi Grassland Ecological Environment Monitoring”, “Meteorological Monitoring and Analysis” and “Soil Monitoring and Evaluation”.
2.4 Safeguard and Fiduciary Compliance

2.4.1 The project triggered Bank safeguard policies on environment, dam safety, resettlement and indigenous people. The Bank supported the project’s compliance with safeguard policies through supervisions which were rated by QAG in late 1999 as “Highly Satisfactory.”

2.4.2 Environment. The PMO established monitoring stations for water and soil quality and controlling the environmental issues during construction. Particular attention was paid to the ecological water balance and soil salinity after the major construction works were completed. The monitoring of water table and changes in soil salinity allowed for improving the drainage systems and for mastering soil desalinization measures.

2.4.3 The establishment of the SRBWRMB has greatly improved the implementation of the Bank’s environmental safeguard policies, and integrated ground- and surface-water management has become a reality. Changma, Shuangta and Chijinxia Reservoirs became jointly operated and regulated on flood control and supply of water for irrigation and other uses. Since its establishment, SRBWRMB has released about 200 million m³ of water annually for downstream natural reserve areas to protect the ecological system.

2.4.4 In 2004, the Gansu Water Resources and Hydropower Investigation and Design Institute and Tsinghua University undertook research on the use of ground-water in the irrigation areas. The report analyzed the current status and projected an outlook for changes in ground-water levels between 2000 and 2030 for each of the project’s three irrigation districts. The study predicted a decrease in the ground-water levels north of the mountains while some increase was actually observed across irrigation districts. In Changma ID, the ground-water level slightly increased (0.3 m-0.6 m); in Shuangta ID, because of irrigation water diversion and ecological water discharge, the ground-water level also increased (0.12 m - 2 m); in Huahai ID, for similar reasons as in Shuangta ID, the ground-water level increased with about 0.4 m - 4m. These results were later confirmed by actual ground-water level data collected by Gansu Water Resources and Hydropower Investigation and Design Institute between the years 2001-2006. These increases in some of the irrigation districts indicate the need for continued monitoring of ground-water levels and possible future investments or measures to improve drainage.

2.4.5 The salt content of the water impounded by the Shuangta Reservoir, downstream of the Shule River, has also been monitored carefully because of the potential for salt build-up. The Water and Environment Monitoring Center of the Gansu Hydrology and Water Resources Investigation Bureau monitors salinity changes in the Shuangta Reservoir at intake, reservoir area and downside of Shuangta Dam. The monitoring data during 2000-2006 shows a decline in total salt content, mainly resulting from the increased water diversion from Changma Reservoir and improved drainage systems downstream.

2.4.6 A Cultural Investigation Report and Protection Plan for the Shule River Project was prepared by the Gansu Relics and Anthology Research Institute and the Guazhou Relics and Tourism Bureau. The Plan was followed during construction under the supervision of the PMO. As a result, those relics found remained protected and a list was prepared and provided to the Bank. Seven reports on cultural excavation and relics’ protection were submitted to the PMO and the Gansu Culture Protection Bureau.

2.4.7 Dam Safety. Three dams (Changma, Shuangta and Chijinxia Dams) triggered the Bank’s Operational Policy on Dam Safety (OP 4.37). An International Panel of Experts was appointed in accordance with the policy and was involved in project preparation and
implementation stages. The Panel of Experts inspected the sites three times and their comments were incorporated in the final dam designs. In 2001, the China Institute of Water Resources and Hydropower Research reviewed the safety status of the Changma Dam granting permission to initiate water storage. The Changma Dam was completed and operational in 2002 and is now operated by the Changma Reservoir and Hydropower Management Station. The Provincial Water Resources Bureau periodically reviews the dam and flood control emergency preparedness.

2.4.8 Involuntary Resettlement. The construction of the Changma Dam caused the involuntary resettlement of 580 farmers (139 households) in Shuixia Village of Changma Township, Yumen City. About 2,489 mu of farmland was inundated. The physical relocation of households started in May 2000 and was completed in November of 2000. Some 547 people moved into the newly-constructed Xixia village while 33 people decided to return to their old township.

2.4.9 The Changma Involuntary Resettlement Program was planned and implemented in conformity with OP 4.12, ensuring that all resettled households’ living standards were improved and their incomes enhanced. Infrastructure construction of the new site was completed before people moved in. Housing and social services such as schools, clinics and cultural centers, were established based on consultation with the relocated people. More than 5,500 mu of land was developed, including forestry and grassland. About 2,200 mu of farm land was allocated to the relocated households with each farmer receiving 4-5 mu of land. Intensive training on irrigation, desalination and techniques for economic cropping was provided to the farmers to enable them to adapt to their new living and production circumstances. Land quality in Xixia village was continuously improved and is now nearly equal to that in the old irrigation districts.

2.4.10 Indigenous Peoples. Resettlement was carried out based on social assessments covering all move-out areas and potential resettlers. About 30 percent of the resettlers belong to ethnic minorities, all of them moving voluntarily and with special consideration in regard to their culture and practices. Among them, Dongxiang accounted for 13.75 percent of the total and Hui accounted for 10.7 percent of the total. There were 65 Tibetan households and 7 Tu households.

2.4.11 According to tradition and custom, all Dongxiang (Muslim) and most Hui (Muslim) were settled in concentrated sites. According to the National Ethnic Minority Autonomous Law and the project design, the Qiduntan resettlement site was established as a Hui and Dongxiang Ethnic Minority Township. Other new sites, such as the Dushanzi sub-farm (township level), have also been populated mainly by Dongxiang people and are currently going through formalities to become ethnic minority townships. Tibetans and Tus (both Buddhists), consistent with their own requests, were mostly resettled in concentrated areas in the old irrigation districts. Ethnic beliefs and religions were respected in the new resettlement communities, including the construction of 21 mosques in all (Muslim) sites with separate cemeteries for each Hui and Dongxiang village.

2.5 Post-completion Operation/Next Phase

2.5.1 Post-completion operation will be greatly facilitated by the institutional arrangements created by the project. SRBWRMB at the river basin level and the WUAs as grassroots water management organizations, with active farmers’ participation at the field level, form an integrated system giving impetus to agricultural growth while ensuring environmental sustainability. The distribution system efficiency of irrigation canals is high, and full cost recovery of water charges provides a sound mechanism for continuous support of operation and maintenance and the long-term sustainability of the irrigation systems and facilities.
2.5.2 The main challenge in the post-completion phase will be to manage the increasing pressures for more intensive water and land use, and the trade-off between income generation and environment protection. Population growth and limited income opportunities beyond crop production in rural Gansu will require the continuous attention of the SRBWRMB on the technical efficiency of water supply and on-farm efficiency of water use in order to save water for other high-value uses. SRBWRMB will need to be pro-active in meeting the changes in water demand and to prevent environmental degradation. This includes, but is not limited to, the regulating of water fees and water supply. Moreover, a hydropower development plan (based on generating stations on the main canals) should be developed to utilize fully the potential for hydropower without damage to the environment, generating revenues to help fund SRBWRMB operations.

3. Assessment of Outcomes

3.1 Relevance of Objectives, Design and Implementation

3.1.1 The project’s objectives remain relevant to the Bank’s Country Partnership Strategy (CPS) 2006-2010 for China that aims to reduce poverty, inequality and social exclusion. The project also remains consistent with current government policies/poverty reduction strategy. The most recent "slogan" for the provincial government's poverty reduction strategy is: "Yi Ti Liang Yi" meaning "one body (village-based comprehensive poverty reduction) and two wings (agricultural skills training and mobility of labor, and agricultural industrialization and modernization)".

3.2 Achievement of Project Development Objectives

3.2.1 The PDOs were met. Many of the indicators for achievement of the PDOs exceeded the targets set at both appraisal and MTR.

3.2.2 The main indicator of the first project objective was to increase per capita income above the absolute poverty line in the project area, and it was fully achieved9. At completion, the net per capita income in the move-in project villages had increased by RMB 1,602 to about RMB 1,850 (to RMB 1,601 in Changma ID, RMB 1,720 in Shuangta ID, and RMB 2,575 in Huahai ID). The project’s per capita income targets were RMB 1,564 at appraisal and RMB 1,830 at MTR. Moreover, the quality of income significantly improved. The re-settlers shifted from the production of food grains for subsistence to production of cash crops, and are instead purchasing grain for household consumption and livestock. Furthermore the outlook for additional income growth and poverty reduction for households in the “move-in” areas is much more promising than for those staying in the “move-out” areas. A discussion of the types of welfare gains and how much of the reported gains could be attributed to the project is provided in Section 3.5 and Annex 4.

3.2.3 The substantial shortfall in achieving the appraisal targets, however, is that the number of project beneficiaries decreased from 200,000 to 75,387 people. The initial resettlement target was based on a level of water use which was too high, assuming as it did an overall water utilization rate of 92 percent (see Section 2.1). Once this assumption was revised to 65 percent,

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9 The project’s M&E system collected data on net per capita income but not on the poverty headcount measure. In 2006, the absolute poverty line in Gansu was RMB650 per capita and the relatively-poor poverty line was RMB956 (see Section 3.5, paragraph 3.5.3).
the resettlement and all associated activities had to be scaled-back, automatically leading to a qualitative rather than quantitative achievement of many of the project’s targets.

3.2.4 The project’s second objective, to increase agricultural production in Gansu Province, was fully achieved. While the targets of food grain production set at appraisal and revised at MTR were not met, the gross agricultural output in the project area exceeded both appraisal and MTR targets. This resulted from the shifts away from low-value grains to higher-value cotton, spices, herbs and vegetables which are well-suited to Shule Basin conditions. At completion, these cash crops accounted for about 80 percent of total cultivated land. The price effect was small because the nominal farm-gate prices of most agricultural outputs at completion were very similar to those at appraisal (the real prices were even lower if adjusted to inflation), and income growth was caused by the increases in yields on the smaller, newly-reclaimed irrigated areas (the actual reclamation irrigated area was 25,100 ha compared to 27,200 ha planned at MTR and 54,600 ha planned at appraisal) and especially the massive change to much higher-value crops.\textsuperscript{10}

3.2.5 The project’s third objective, to protect and restore degraded environments, was also achieved. The overall vegetation coverage of the area reached 15.3 percent, exceeding both the appraisal and MTR targets. In terms of irrigation, the efficiency of water-use is high. The target of distribution system efficiency of irrigation canals, set at 62 percent, has been achieved and the O&M costs are fully recovered through fees collected from water users. These are significant and rare achievements in China, where canal efficiency is usually well below 50 percent and cost recovery averages 60-70 percent (and is often much less).

3.3 Efficiency

3.3.1 The project’s Net Present Value (NPV) at completion is estimated at RMB 21.5 million. With an Economic Rate of Return (ERR) of 12.2 percent, the project’s rate of return about equaled the social discount rate (12 percent). The ERR of the largest component (Irrigation and Drainage) is 11.9 percent, with the lowest ERR in Changma ID (9.9 percent) and highest in Shuangta ID (14.4 percent). The NPV and ERR at completion are substantially lower than the NPV and ERR estimated at appraisal (because of the reduction in the project’s scale) but larger than those estimated at MTR. The MTR is more relevant comparator because of the similar project scopes with the ICR. With this in background, the project efficiency at completion was higher than expected at MTR. Annex 3 provides a comparison of the NPVs and ERRs of project components at appraisal, MTR and completion.

3.3.2 The project’s overall ERR critically depends on the Irrigation and Drainage Component which makes up 86.3 percent of the total investment.\textsuperscript{11} Its ERR was found to fluctuate between 7.6 - 12.0 percent in Changma ID, between 11.7 - 15.9 percent in Shuangta ID and between 7.9 - 15.7 percent in Huahai ID, using a simulation analysis of a 10 percent decrease/increase of the gross revenue from agricultural activities. Such fluctuations in gross revenues are possible and can be caused by changes in prices and yields of the agricultural products.

\textsuperscript{10} The gross agricultural output is expressed in nominal prices. At appraisal, food prices in China exceeded world market prices. After China’s WTO entry, food prices initially declined but increased starting 2003 following the increase in world market prices and domestic demand.

\textsuperscript{11} Note that the investment costs of project components for economic analysis differ from those in Table A of Annex 1. The project costs were allocated to crop, livestock, forest and hydro-electric power stations’ components based on the weights in total benefits.
3.3.3 The ERR is especially sensitive to changes in the price of cotton (the main crop). At completion, cash crops in Changma ID accounted for 63 percent of the total cropping area (with 91 percent in Shuangta ID and 85 percent in Huahai ID). A 20 percent fall in cotton prices at the farm-gate would result in a 2.2 percentage points decrease of the ERR. A 30 percent fall in cotton prices would reduce the Irrigation and Drainage component’s ERR from 11.9 percent to 8.6 percent. The largest decrease would be in Huahai ID where the ERR would decrease from 12.2 percent to 5.9 percent.

3.3.4 That the ERR significantly declines when cotton prices decline underscores the critical importance of sustainable irrigation systems, efficient farming and development of marketing infrastructure. It further highlights the importance of extension services in effectively transferring new knowledge to farmers on modern technologies for other crops and on prevention/mitigation measures against cotton pests. More generally, similar to this project, future poverty projects should include serious capacity building and institutional improvements for extension services to help farmers diversify and to prevent them from falling back into subsistence farming and poverty.

3.4 Justification of Overall Outcome Rating

Rating: Moderately Satisfactory

3.4.1 While the project was designed almost thirteen years ago, its basic objectives remain relevant to the government’s current plans to construct a “new socialist countryside”, although today much more attention is given to the environmental sustainability of development interventions. The project’s PDOs were met and the efficiency achieved is satisfactory, given that this was a poverty reduction project. Significant positive poverty reduction impacts, gender benefits and social developments were achieved and although the total number of the project beneficiaries was smaller than planned at appraisal it met the MTR target. Moreover, the outlook for further improvements for the poverty-stricken people who settled in the “move-in” areas is much more promising than for those remaining in the “move-out” areas (see Section 3.5). With this in view, the overall outcome of the project is rated as “moderately satisfactory.”

3.4.2 This rating is supported by the weighting calculation against the original PDOs and revised MTR targets (Annex 5). Although the MTR targets were not formally revised, they are useful to judge the achievement of the PDOs.

3.5 Overarching Themes, Other Outcomes and Impacts

(a) Poverty Impacts, Gender Aspects, and Social Development

3.5.1 Poverty. Significant improvements in the re-settlers’ welfare were recorded. At appraisal, the average annual per capita income of the future re-settlers in situ was estimated to be about RMB 248. At completion, the average per capita income estimated for the largest resettlement townships increased to RMB 1,810. Since the re-settlers were reallocated to new reclaimed areas, the increase in per capita income (RMB 1,562 per capita) can be fully attributed to the project. The results remain significantly positive even after the changes in per capita income in “move-in” areas is corrected for the changes in income in “move-out” areas (i.e., to allow for the changes which would have happened in the absence of the project - a “difference in difference” evaluation). Since the average per capita income in the “move-out” areas (“without
the project”) increased by RMB 968, the per capita income increase fully attributable to the project is RMB 594. Annex 4 presents a detailed analysis of the poverty impact.

3.5.2 The majority of the project’s “move-in” households succeeded in escaping absolute poverty by the year 2006. At the outset of the project, most of the res-ettlers were absolute poor, but in 2006 none of the surveyed households lived in absolute poverty using the Gansu poverty line of RMB 650. Only 38 percent still had a per capita income below the “relatively-poor” poverty line of RMB 956. However, while significant improvements in poverty reduction were achieved in comparison with Chinese poverty thresholds, the majority of the re-settlers (except some of those living in Huahai ID) continue to live below the Bank’s poverty line of US$1 per day (equal to about RMB 2,800 per capita). This raises the question of whether the Bank investment was justified and if there were better alternatives to the investment (e.g., investing in the “move-out” areas). For the latter, investment opportunities for economic and human development in the “move-out” mountainous areas were and continue to be extremely limited. For the former, the investment is seen as justified taking into account the positive future outlook for poverty reduction in the move-in areas. Since the relocation was delayed, most of the re-settlers did not achieve their full income potential from agriculture and off-farm activities at the time of the ICR, but their outlook is very promising as land productivity has great potential to increase, the reliable irrigation promotes diversification, and the farmers increasingly master new farm techniques (none of which can be said about the “move-out” areas).

3.5.3 Gender Aspects. While the project focused on enhancing household welfare in general, it also helped women to improve their well-being. Among the resettled people, more than 29,700 were women. Women laborers not only work in fields but participated in new site construction and labor mobility outside villages, which has become an important source of income that most resettled households rely on. In 2006, for example, 5,073 women in the project areas took outside work accounting for 47 percent of all off-farm laborers and their income added up to more than RMB 7.12 million, 48.4 percent of the total project area income from outside work (Table 1 below). On average, the women earned more than RMB 1,400 per person in 2006 in off-farm income, increasing their contribution to their families well-being which, in turn, increased their participation in household decision-making (according to survey, 75 percent of women took equal part in household decision-making.)

12 This is a conservative estimate. The project’s contribution was probably higher. The people in “move-out” areas obtained “Grain for Green” subsidy at approximately RMB200 per mu for conversion of cultivated slope land to grasses and forests. Excluding this subsidy from per capita income calculations in the “move-out” areas increases the project’s contribution to re-settlers’ income growth to about RMB800.
Table 1: Proportion of family income generated by women, 2006

<table>
<thead>
<tr>
<th>Move-out counties</th>
<th>Move-in townships</th>
<th>Surveyed HH</th>
<th>&lt; 10%</th>
<th>10%~30%</th>
<th>31%~50%</th>
<th>&gt; 50%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>HH</td>
<td>%</td>
<td>HH</td>
<td>%</td>
<td>HH</td>
</tr>
<tr>
<td>Dongxiang</td>
<td>Zahhua</td>
<td>48</td>
<td>10</td>
<td>21</td>
<td>29</td>
<td>61</td>
</tr>
<tr>
<td>Jishishang</td>
<td>Xiangyang</td>
<td>30</td>
<td>1</td>
<td>5</td>
<td>15</td>
<td>50</td>
</tr>
<tr>
<td>Tangchang</td>
<td>Lianghu</td>
<td>54</td>
<td>4</td>
<td>7</td>
<td>29</td>
<td>54</td>
</tr>
<tr>
<td>Minxian</td>
<td>Bijiatai</td>
<td>102</td>
<td>11</td>
<td>11</td>
<td>60</td>
<td>59</td>
</tr>
<tr>
<td>Hezheng Wudu</td>
<td>Qidun township</td>
<td>78</td>
<td>9</td>
<td>12</td>
<td>41</td>
<td>53</td>
</tr>
<tr>
<td>Linxia Lintang</td>
<td>Qidaogou</td>
<td>84</td>
<td>13</td>
<td>15</td>
<td>45</td>
<td>54</td>
</tr>
<tr>
<td>Yongjing Lixian</td>
<td>Shuangta</td>
<td>120</td>
<td>16</td>
<td>13</td>
<td>66</td>
<td>55</td>
</tr>
<tr>
<td>Dongxiang Dushangzi</td>
<td></td>
<td>60</td>
<td>10</td>
<td>16</td>
<td>35</td>
<td>58</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>576</td>
<td>74</td>
<td>13</td>
<td>320</td>
<td>56</td>
</tr>
</tbody>
</table>

3.5.4 **Social Development.** The resettlers directly benefited from project investments in irrigation infrastructure, agricultural and livestock support and financing of the resettlements. Positive externalities from environment protection and management accrued not only to the resettlers but also to other residents in the project area. Additional indirect benefits were obtained from the establishment of the WUAs and the improved extension services.

3.5.5 **Ethnic Minorities.** With production improvements and development of new opportunities for all resettlers, the incomes of ethnic minority communities were enhanced during and after resettlement. For Dongxiang people, the largest “move-in” ethnic minority group, per capita income grew from RMB 294 in 1997 to RMB 1,253 in 2006. In contrast to their hometown where they could plant only rain-fed crops, now they have mastered irrigated agriculture. According to the satisfaction survey carried out in the resettlement sites, 95 percent of the resettlers are satisfied with their new life.

**3.5.6 (b) Institutional Change/Strengthening**

3.5.6 The highlight of the institutional change induced by the project was the establishment of the SRBWRMB and the introduction of WUAs. Establishment of the SRBWRMB greatly improved project completion, ensured environmental water use for ecosystem protection and strengthened coordination among government line agencies. After project completion, the SRBWRMB will continue to play the key role in integrated management of water resources and ensure sustainable social, economic and environmental development of the Shule River Basin.

3.5.7 In general, substantial institutional strengthening took place at various levels during project implementation, from the implementing agency down to the resettlement sites. Various kinds of training were provided to farmers, extension workers and the implementing agency. The implementing agency’s project supervision practices were adjusted to the supervision methods similar to those of the Bank.

3.5.8 At the grassroots level, the water management structure is supported by the WUAs that are managed by the farmers. The establishment of WUAs was not originally included in the project design, but was introduced by the Bank’s Supervision Team. Some 87 WUAs are in place in the project areas. The WUAs, combined with SRBWRMB, provides a well-functioning,
integrated water management system that will provide sustained impetus for agricultural growth while ensuring environmental sustainability in and beyond the project areas.

4. Assessment of Risk to Development Outcome

Rating: Moderate

4.1 The risk to the development outcome is considered to be “moderate”. The national government’s commitment to further reduce poverty continues to be one of the most important policy priorities. Increased funding is being channeled to the western areas of the country, including large sums being allocated for village-level development and rural infrastructure. The establishment of the SRBWRMB ensures the sustainable management of water resources across prefectures, and great attention is now being paid both to the ecological water balance and efficient use of the scarce water resources. Dam safety measures have been fully implemented, the distribution efficiency of irrigation channels is high, and full cost-recovery for water will ensure adequate future O&M of the irrigation systems.

4.2 The main risk posed to the development outcome is related to slower than expected soil desalinization of the reclaimed land. About 60 percent of the new reclaimed lands in the project area have required three to five years leaching, with some land plots where the salinity conditions proved much worse than expected needing up to eight years for adequate desalinization. While the project has made significant investments in desalinization measures, in capacity building of the extension services, and in subsidization of fees for water used for leaching, the extended time required for land development works reduced the project funds available for move-in households. Even though the SRBWRMB has prepared a plan aiming to use RMB 107 million of collected water fees annually for soil leaching, many post-project investments will need to be financed by local public funds and the households themselves. Therefore, the SRBWRMB has requested additional provincial funds to assist the move-in households in post-project agricultural extension.

4.3 Changes in market incentives also pose certain risks. Currently most farmers in the move-in areas specialize in cotton production which generates cash income and contributes to soil desalinization because of its salt tolerance. In the future, the profitability of cotton production may decline resulting in shifts from cotton to less salt-tolerant crops. The probability of a large decline in cotton profitability, however, is low in the Hexi Corridor, given the favorable climate conditions, the less favorable conditions for grains and the rising demand for textile and clothes inside and outside of China. In addition, the severity of soil salt problems can be expected to decline after a number of years of cotton production and leaching of salts out of the root zone.

4.4 The probability of continued spontaneous self-resettlement remains low, but if controls are relaxed the impact would be negative. At this point, local government has recognized the consequences of potential over-use of land and water resources and the importance of the environmental sustainability in the area. Adequate administrative measures have been put in place to prevent further resettlement (e.g., hukou issuance). Furthermore, the SRBWRMB controls the water supply, preventing its access by illegal users. The local government will have to continue closely to monitor and prevent any over-use of land and water to minimize risks to sustainability of the project development outcomes.
5. Assessment of Bank and Borrower Performance

5.1 Bank Performance

(a) Bank Performance in Ensuring Quality at Entry

Rating: Unsatisfactory

5.1.1 No QAG “Quality at Entry” review of the project was carried out.

5.1.2 Although the project was consistent with the government’s poverty reduction strategy and the Bank’s CAS, its design had several major shortcomings which had negative effects on achieving the development outcomes (see Section 2.1). A full ecological assessment focused on water should have been carried out for the Shule River Basin during project preparation, and downstream ecological water requirements should have been included in the water balance calculations. Similarly, better soil surveys should have been done to estimate accurately the required soil desalinization efforts. Furthermore, the Bank inadequately addressed the issue of integrated river basin and watershed management, significantly delaying the creation of a province-level river basin management bureau. Finally, the Bank did not require the completion of a social assessment covering both the “move-out” areas and the “move-in” areas which probably would have uncovered the wary attitude of the receiving prefecture toward the project as designed. All these drawbacks in the project design were mentioned in two QAG reviews (1999 supervision quality of safeguards, and 2004 supervision quality). In view of these major shortcomings, the Bank’s performance in ensuring quality at entry is rated as as “unsatisfactory.”

(b) Quality of Supervision

Rating: Satisfactory

5.1.3 In late 1999, the quality of safeguard supervision was rated by a QAG review (which included a field review) as “highly satisfactory”. The field review noted a number of problems with quality at entry but gave the project a “Highly Satisfactory” rating for supervision.

5.1.4 However, in 2004 a second QAG rated the quality of supervision during the period of FY2003-2004 as “moderately unsatisfactory”. The major reasons for the rating were reported as follows: “The project had serious design flaws as the proposed infrastructure development was not based on realistic assessment of resources for development and the poor communities who would derive the benefit. Throughout the period under review, the team grappled with these fundamental design problems and the lack of counterpart funding.”. Additional concerns raised at the 2004 QAG review included that “… little attention (had been) given to social development of the re-settlers …” and that the Supervision Team had not rated the project implementation as unsatisfactory earlier.

5.1.5 The ICR team, however, is of the opinion that the quality of supervision of the project as a whole has been “satisfactory” for the following reasons:

(a) Significant financial and human resources were provided for implementation support during supervision to mitigate the project design’s shortcomings and to assist the Borrower to address the evolving challenges. The Bank demonstrated a strong commitment to correcting the design problems and considerable flexibility in addressing them.
(b) The Bank’s Task Team successfully induced significant institutional reform through intensive dialogue and persuasion. The Prefecture-level Shule River Basin Water Resources Management Bureau was finally transformed into a Provincial-level Shule River Basin Water Resource Management Bureau. Compliance with the Bank’s environmental and social safeguard policies was supervised regularly, either by the main team or by specific technical experts. The establishment of the involuntary and voluntary resettlements was closely monitored by the Bank.

(c) When the larger-scale relocation became possible as the major irrigation and infrastructure works were completed, the Bank’s Supervision Team paid close attention to the timely completion of construction of schools, hospitals and other social infrastructure for resettlers and their children and their adequate staffing.

5.1.6 It should be noted that the 2004 QAG mainly raised problems of a “quality at entry” nature rather than of supervision, emphasizing the shortfall of counterpart funds at the outset and the inadequately-addressed ecological issues. Also, basically all the reasons for the unsatisfactory supervision rating were successfully resolved by the time of project completion.

(c) Justification of Rating for Overall Bank Performance

Rating: Moderately Satisfactory

5.1.7 Based on the “unsatisfactory” rating for Quality at Entry, the “satisfactory” rating for supervision of the project and the “moderately satisfactory” achievement of the PDOs, the Bank’s overall performance is rated as “moderately satisfactory.”

5.2 Borrower Performance

(a) Government Performance

Rating: Unsatisfactory

5.2.1 In spite of the strong political support and high attention to the project that eventually was received from the provincial government, and the efforts made to raise the counterpart funds after the MTR, the government’s performance is rated as “unsatisfactory”. Project implementation was severely constrained by the shortfalls in counterpart funds. The ineligibility of Gansu to utilize national poverty reduction funds for the project was suggested at lower levels at the time of appraisal but raised by Gansu only prior to or at the time of negotiations. Gansu should have undertaken quick measures at that time either to find alternative sources of counterpart funds or to adjust the project’s scale to match the actual funds available. It is likely that the relevant departments over-estimated their ability to replace the lost poverty reduction funds from other sources, and may also have under-estimated the impact of the loss of these funds on project implementation. On the other hand, had implementation gone according to plan it is likely that the long-term ecological impact of the project would have been severely negative given that ecological water requirements were not included in the original project design and water balance.

5.2.2 After the MTR, the problem of the counterpart funds was eased through high-level leadership attention at the provincial level and close attention given to the project by provincial leaders. At completion, the actual allocation of counterpart funds reached 85.6 percent of the MTR target. However, even with the additional funds project implementation was severely hampered by the untimely/uncertain allocations and the slow release of those funds to the project.
office. The planned infrastructure works were slowed down, resulting in delayed resettlement and consequently delayed agricultural growth and human development.

5.2.3 In addition, the provincial government exhibited weak coordination on resettlement and social issues. Registration of many resettlers had not been completed even at the time of the ICR mission. A remaining concern is the re-settlers on the two state farms who are still in the process of having their hukous transferred to the newly-created townships. Although the Bank acknowledges the associated complex institutional constraints to complete the issuance of the hukous, greater efforts could have been expected from the government to overcome these barriers to allow the relocated people to have as smooth and quick a transition as possible.

5.2.4 Finally, together with the Bank’s Preparation Team, Gansu government was also responsible for the major shortcomings in the project design as described in Section 2.1. These shortcomings greatly affected project implementation and reduced the achievement of the PDOs.

(b) Implementing Agency or Agencies Performance

Rating: Satisfactory

5.2.5 The performance of the implementing agency - the Gansu Provincial PMO - is considered to have been “satisfactory”. Implementation difficulties were acknowledged and addressed, even if not always as rapidly as the Bank would have wished. Despite the continuous lack of counterpart funds and the limited “construction seasons”\(^\text{13}\), the PMO was able to carry out project implementation to a high quality. Staff at all levels were highly qualified and extremely dedicated, working long hours under challenging and harsh conditions. The main institutional achievement - the establishment of SRBWRMB - can now serve as a demonstration model not only for China but also internationally.

(c) Justification of Rating for Overall Borrower Performance

Rating: Moderately Satisfactory

5.2.6 In view of the “unsatisfactory” rating for government performance, the “satisfactory” performance of the Implementing Agency and the “moderately satisfactory” achievement of the PDOs, the overall Borrower performance is rated as “moderately satisfactory.”

6. Lessons Learned

6.1 The main lessons from this project relate to: (a) the project’s length and complexity; (b) the project’s design and preparation; (c) the stakeholder and social analysis; (d) the importance of flexibility during implementation; (e) leadership attention; (f) securing counterpart funds; (g) institutional arrangements; and (h) M&E.

(a) The Project’s Length and Complexity. The project was extremely ambitious and its planned implementation period unusually long. To develop the water source, undertake land reclamation and development, provide for agricultural and other support, build townships and villages, resettle tens of thousands of people and establish a new river basin bureau under the

\(^{13}\) The construction season in the Hexi Corridor is from May to August, with construction activities in the remaining part of the year greatly constrained by severe weather conditions.
difficult and harsh, cold desert conditions of the project area was a daunting task. Proper synchronization and sequencing between infrastructure construction, water mobilization and land development on the one hand and social development on the other hand should have taken place over a longer period of time but instead had to be rushed. In hindsight, the project should either have been designed with a longer implementation period as originally requested by the Borrower (12 years or more) or have been split into two separate operations consisting of: (i) construction of the dam and main irrigation facilities; and (ii) resettlement, township and village establishment, construction of water distribution facilities, agricultural support, and forestry development. If designed today, the project could have been designed as a phased operation.

(b) **Project Design.** The main design flaws that surfaced during project implementation related to the lack of application of internationally-recognized best practice in proper water utilization ratio and integrated river basin management. There simply was not enough water, based on international water resource and ecological standards at the time of preparation. This was a fundamental flaw that should have been caught during the Bank’s intensive internal review process, but was not. It is imperative that the Bank uses effectively its quality control and support mechanisms, and internal formal and informal quality reviews, to ensure that no significant design flaws are introduced in projects financed by the Bank.

(c) **Stakeholder and Social Analysis.** This project demonstrates the importance of proper stakeholder and social analyses, particularly in the context of complex projects. Clearly, a thorough stakeholder analysis covering both “move-out” and “move-in” areas should have been carried out as part of project preparation. It is likely that such an analysis would have revealed the differing views which the provincial government and the receiving prefecture held with regard to the project.

(d) **Importance of Flexibility.** Flexibility during implementation encouraged the effective correction of the project’s design problems, raising attention to the various issues of environmental and economic sustainability and enabling completion of the project with relatively satisfactory achievement of the PDOs. It is important for the Bank’s supervision teams to be proactive and flexible and to respond in a timely manner to unexpected changes and difficulties during project implementation.

(e) **Leadership Attention.** Close leadership attention, at various levels and in various forms, is fundamental to successful project implementation and the resolution of issues arising during implementation in China. Such attention is also a key prerequisite for putting in place suitable institutional arrangements. Examples of effective leadership attention are: requests for regular progress and problem identification reports from lower levels, and personal review of annual funding requests. Without the close attention by senior leaders in Gansu, the project would not have been successfully completed.

(f) **Securing Counterpart Funds.** Difficulties with timely availability of adequate amounts of counterpart funding is a chronic issue in Bank-financed rural projects in China. This project in particular demonstrates that relying on counterpart funding sources outside the direct control of the implementing province is a major risk, as the inability of the project to make use of national poverty reduction funds had a significant impact on project implementation. To resolve this issue in future projects, the Bank and the Borrower should agree on a realistic proportion of counterpart funds based on the payment capacity of the province, specifying sources of the funds and minimum amounts per project component. Also, the project’s counterpart fund requirements must be included in the relevant provincial bureaus’ annual budgets, thus ensuring regular funding allocations as part of the province’s regular budget provisions.

(g) **Institutional Arrangements.** Integrating project activities with the Borrowers’ own programs and project implementation units within the existing institutional system ensures a
higher degree of ownership, enabling better delivery of funding and technical services. It also ensures more sustainable post-completion operations. In the case of this project, it was considered a poverty reduction project but was implemented by the water resources bureau instead of the poverty reduction office. Had it been designed as a water resources project with a poverty objective, results might have been better.

(h) Monitoring and Evaluation. The right concept of defining and measuring efficiency and performance is extremely important in order to monitor and evaluate a project’s poverty impact. In particular, in an environment as dynamic as China’s, the concept of a “before and after the project” comparison cannot properly capture the impact that can be attributed to a project and, hence, can lead to wrong assumptions in implementation and incorrect conclusions at completion. It is important to design M&E based on the “with and without” concept and also to integrate different components of the M&E system to allow for consistent and timely use of monitoring information.

7. Comments on Issues Raised by Borrower/Implementing Agencies

7.1 The preparation of the implementing agency’s internal implementation completion report and the Bank’s ICR took place in close cooperation, allowing for in-depth discussions on all technical issues. As a result, the Bank does not have any comments on the Borrower’s summary report as presented in Annex 7.

7.2 Gansu Provincial Government reviewed the draft ICR and submitted written comments (as presented in Annex 7) on the rating of the Borrower’s Performance and the Bank’s Performance. The Bank considered these comments carefully when finalizing the respective ratings, but concluded that no new evidence was presented justifying a revision in the ratings.
Annex 1. Project Costs and Financing

1.1 The total project cost was estimated at US$259.2 million (RMB2,697.6 million) at appraisal and re-estimated at US$229.8 million (RMB1,907.7 million) at the time of the MTR. The actual cost at project completion was US$211.46 million (RMB1,710.7 million). The actual cost at completion was about 82 percent (in US$) and 63 percent (in RMB) of the appraised estimate. The difference is being the result of exchange rate movements\(^{14}\). The cost reduction at completion was the result of the reduced project scope and scale for the voluntary emigration and land settlement: the reduction of the total number of resettlers from 200,000 to 75,000; the reduction of the area of land reclamation and on-farm works for newly developed irrigated land from 54,610 ha to 27,213 ha; and other related activities (see Section 1.6 of the main report).

1.2 The total actual project cost was about 92 percent of the total costs revised at the time of the MTR, decreased by about RMB18.4 million to RMB196.9 million. The decrease was primarily due to: (a) cost savings in procurement; (b) reduced price and physical contingencies; (c) lower investments for agricultural machinery (about 9 percent of MTR targets and 2 percent of SAR targets, due to the further adjustment made incorporating government’s new subsidy policy for agricultural machinery during project implementation which included project areas); (d) reduced numbers of sheep provided to households (because of the lack of the feed in the newly resettled areas, and difficulty in finding households willing to be responsible for loan repayment for sheep raising).

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\(^{14}\) The exchange rates were: at appraisal: US$1 = Y8.4 and SDR1 = US$1.4563; at completion US$1=Y8.09 and SDR1 = US$1.3859.
### (a) Project Cost by Component (in US$ Million equivalent)

<table>
<thead>
<tr>
<th>Components</th>
<th>Appraisal Estimate</th>
<th>MTR Estimate</th>
<th>ICR Actual</th>
<th>Percentage of Appraisal</th>
<th>Percentage of MTR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Irrigation and Drainage</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
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<td>77.57</td>
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<td>14.06</td>
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<td><strong>C. Livestock Development</strong></td>
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<td><strong>D. Environmental Protection and Management</strong></td>
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<td><strong>E. Voluntary Resettlement</strong></td>
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<td><strong>220.23</strong></td>
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<td><strong>229.84</strong></td>
<td><strong>211.46</strong></td>
<td><strong>81.58</strong></td>
<td><strong>92.01</strong></td>
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### (b) Financing (in US$ million)

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<tr>
<th></th>
<th>Appraisal Estimate</th>
<th>MTR Estimate</th>
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<th>Percentage of MTR</th>
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<td>102.60</td>
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<td><strong>Subtotal</strong></td>
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<td><strong>109.52</strong></td>
<td><strong>93.81</strong></td>
<td><strong>85.91</strong></td>
<td><strong>85.65</strong></td>
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<tr>
<td>Bank/IDA</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>259.20</strong></td>
<td><strong>229.84</strong></td>
<td><strong>211.46</strong></td>
<td><strong>81.58</strong></td>
<td><strong>92.00</strong></td>
</tr>
</tbody>
</table>
Annex 2. Outputs by Component

2.1 The project was basically completed within ten years as scheduled. The main output targets completed for each component compared to the appraisal and MTR estimate are summarized below:

2.2 **A. Changma Dam** (US$49.63 million, 94 and 138 percent of MTR and SAR cost estimate). The dam provides water to all the three irrigation districts. The dam is 54.8 m high with a crest length of 366 m and a zoned earth fill embankment with a central clay core; A side channel regulated spillway, with three gates (10 x 8 m), was built with discharge capacity of 1,570 m$^3$/second; an 8.0 m diameter concrete-lined 298 m long flood and silt flushing tunnel on the right abutment was built; the water intake concrete-lined tunnel (5.5 m in diameter x 499 m long) was built on the left abutment to divert water for irrigation downstream after passing through a surface powerhouse; the powerhouse was built behind left abutment of the dam with a total installed capacity of 14.25 MW (3 Francis turbines; 2 x 6.5 MW and 1 x 1.25 MW).

2.3 At project completion, a reservoir was created covering about 12 km$^2$ of area with a total storage capacity of 194 million m$^3$, out of which 80 million m$^3$ is dead storage. The reservoir is jointly operated with the Shuangta Reservoir and the Chijinxia Reservoir downstream, improving the irrigation guarantee of existing 43.6 ha and expended 27 ha of irrigation land, and provides 83 million m$^3$ of water for industry purpose. The power house generates 60 million KWH power.

2.4 **B. Irrigation and Drainage** (US$98 million, 94 and 82 percent of MTR and SAR cost estimate). This component supports various project activities. At project completion, an additional total of 71,454 ha of land (43,600 existing land and 27,854 new developed land) is benefiting from irrigation. Irrigation is provided by 2 headworks, 218 km of trunk canals, 94 km of main canals, 330 km of branch canals and 500 km of lateral canals, and 160 km of drainage canals. Provision of irrigation greatly improved crop productivity, land desalination, afforestation, and soil and water conservation. The irrigation system also provides environment water to downstream preserved areas and protected ecosystem of the district. An information modernization system was also established modernizing the management of the SWRB.

2.5 **Agricultural Support and Services** (US$3.98 million, 86 percent of MTR cost estimate and 131 percent of SAR, mainly for increased investments in improving saline land). The actual outputs achieved under this component included: (i) improvement of 13,467 ha of saline land (100 percent of ICR targets) with the establishment of demonstration sites (620 ha, 100 percent of MTR expected targets); (ii) supporting extension service centers in Yumen, Guanzhou (Anxi) and two state farms (100 percent and 150 percent of MTR and SAR targets respectively), six agricultural extension stations in newly established townships and sub-farms (100 percent of MTR targets and 40 percent of SAR targets due to the reduced number of voluntary settlers and townships); (iii) procured 5 sets of agricultural machinery for 5 administrative villages (about 9 percent of MTR targets and 2 percent of SAR targets, due to the adjustments made incorporating government’s new subsidy policy for agricultural machinery); (iv) agricultural research for land improvement, soil testing and monitoring, etc (about RMB0.3 million, about 20 percent of MTR and 25 percent of SAR estimate).

2.6 Through the newly developed irrigated land and soil improvement, the agricultural output has increased substantially. In the existing irrigation areas, the annual food grain production was about 77,465 tons at completion (about 96 and 198 percent of MTR and SAR estimate respectively), despite decline of the total grain area cultivated (about 40 and 88 percent of the
MTR and SAR estimate). The decline in grain area was caused by falling grain prices after the government withdrew the grain subsidy and freed the grain market. Cropping pattern was appropriately adjusted to reflect the market demand. Commodity crop areas at completion increased from 11,500 ha to about 25,385 ha with total production increased by about 90,874 ton (about 665 and 83 percent of SAR and MTR estimate); thereby more than off-setting the reduction in grain production. In the newly developed irrigation area, cash crop production areas increased by about 18,446 ha with total production increased by about 224,664 ton (about 207 and 116 percent of SAR and MTR estimate).

2.7 **Livestock Development** (US$1.38 million, about 57 and 58 percent of MTR and SAR estimate, the investment was reduced mainly due to smaller investment in sheep raising by farm households (43 percent of the total MTR estimate). According to MTR adjusted targets nine veterinary extension stations have been established in Yumen, Guazhou (Anxi), the two state farms, and six newly established townships and sub-farms (100 percent of MTR targets and 50 percent of SAR targets due to the reduced number of resettlers and townships). Civil works and equipment for two forage seed production and extension bases in newly reclaimed area have been completed (100 percent of MTR and SAR targets). Establishment of 2,531 ha forage land by farm households has been completed (103 percent of MTR and 23 percent of SAR target due to the reduced number of resettlers). Furthermore, the project financed 1,066 breeding sheep, 1,117 sows, and 94,627 chicken (total RMB4.66 million, about 100 percent of MTR, and 89 percent of SAR targets). Investment for cattle had been switched to sheep, sow and chicken due to market demand in the local areas. Sheep raising only completed RMB0.25 million (836 sheep, three percent of the MTR estimate) due to lack of the feed in the newly reclaimed areas and difficulties in finding households willing to be responsible for loan repayment for the sheep raising.

2.8 **Forestry Development** (US$5.42 million, about 117 and 174 percent of the MTR and SAR estimate). This component aimed to protect the fragile land from wind erosion and enhance eco-environments for crop production and human habitation in the newly developed irrigation areas. The project increased the vegetative cover from 4.2 percent to 15.3 percent (139 percent of SAR estimate and 102 percent of MTR estimate). A total of 7,215.8 ha of forests were financed under the component (about 126 percent of the MTR targets). This includes planting eco-environment protective forest belts (2,043.5 ha, about 536 and 100.03 percent of SAR and MTR targets respectively), primary and secondary windbreaks and on-farm trees about 1,487 ha planted along the canal networks (about 124 percent of MTR targets), farm orchards (268.1 ha), and nurseries (42 ha), soil and water conservation forestry (3381.5 ha). In addition, 13 forestry service centers and stations have been established in Yumen, Guazhou (Anxi), State Farm, six newly established townships and sub-farms, and Changma Upper Reach Natural Forestry Reserve Area (100 percent of MTR targets).

2.9 **Environment Protection** (US$4.41 million, about 108 and 78 percent of the MTR and SAR cost estimate). With the forestry development described in section 2.8, the ecological environment in the whole Shule River Basin has been effectively protected by the project. The project systematic environmental protection measures had been carried out including the water environment protection, air pollution control and noise control at the construction sites during the project implementation; over 200 million m³ water per year of environmental flow provided for ecological system in the irrigation district and downstream natural conservation areas; establishment of the sound monitoring and evaluation system/monitoring stations to monitor the soil and water quality (surface and groundwater); experiments for improvement of saline-alkali soil (about 14, 247 ha saline wasteland and 13,607 ha wind eroded sandy land had been converted to farmland in oasis, the desert has changed into green oasis to regulate basin micro-climate and reduce the water loss and soil erosion, and protect ecological environment); water and soil...
conservation works for grass grids, plantation of trees, canal dredging, and garbage treatment (Y8.86 million financed, about 400 percent of ICR estimate); and the rehabilitation, monitoring and evaluation of move-out area, especially about Y122.4 million from government subsidy (about 904 percent of SAR estimate,) financed for land reversion of forestry in move-out area, including freezing and prohibition of cultivation of steep slope land (more than 25 degree), afforestation, land terracing, and planting of shrubs and grass.

2.10 **Voluntary Resettlement** (US$26.07 million, about 99 and 71 percent of the MTR and SAR estimate). The output targets of this component were revised significantly during the MTR process. The number of resettlers were reduced from 200,000 to 75,000, and all other project output targets were reduced accordingly (see section 1.6). At project completion, 75,387 resettlers from 11 of the poorest counties in Gansu had voluntarily emigrated and settled on the new developed irrigated land under the assistance and subsidies as project planned (about 100.5 percent of MTR target), all new infrastructures and facilities for public services in the new sites had been constructed and established, including 6 new townships (100 percent of MTR targets), 46 administration villages (about 81 percent of MTR target), 50 primary schools (about 88 percent of MTR target), 6 middle schools (about 100 percent of MTR target), 6 hospitals (about 100 percent of MTR target), 46 clinics (about 81 percent of MTR target), and total RMB67.75 million invested in road, water and power supply (about 110.8 percent of MTR target). In addition, all other components supported the newly developed irrigation areas including irrigation and drainage facilities, land and soil improvement, agricultural production technologies and services, quality seed production, rural roads and electricity, and WUA development.

2.11 **Institutional Strengthening and Development** (US$22.6 million, about 101.6 percent of MTR estimate and 177.7 percent of SAR estimate). Various activities including water management system reform, research, training, study tours, technical assistance, project M&E, and provision of office facilities provided under the project were fully completed, achieving substantial results in strengthening the management and technical capabilities of PMOs at all levels.

(a) **Water Resources Management System Reform.** The water resources management system was reformed and strengthened by establishment of the Shule River Water Resources Management Bureau of Gansu Province, WUAs (87 WUA established in all existing villages in project areas – a sub-component added during the MTR), and an Automatic Information Monitoring and Simulation Management System for monitoring. The management system reform ensures integrated water resources (including surface and groundwater) management in Shule River Basin, joint operation of the three reservoirs, environmental protection for irrigation district and downstream areas, and sustainable development of Shule River Basin; increases farmers’ participatory management and secures water fee collection; and information management of the river basin by provision of effective and scientific means of tracking surface and groundwater supply and quality, and decision making support in improvement of irrigation and water resources management measures in the Basin.

(b) **Research, Training, Study Tours, Technical Assistance, and M&E:** A number of applied research and studies were satisfactorily carried out by international, national and provincial research institutions and experts (with consultancy assistance from Canada Jiahua hydro-power engineering group, China Academy of Water Resources and Hydro-power Science, Xian Industry and Science University, Gansu provincial Academy of Water Resources and Science, and Yumen Agricultural Extension Center, etc.) at a total cost of about RMB1.86 million. The applied research and studies covered various aspects including dam safety, saline lands improvement, water saving irrigation, impact of soil salinity in Shuangta Reservoir, crop protection and cultivation, livestock breed variety, forestry development and management, and river basin water
resources and irrigation management, etc. The research and study results are relevant and have been disseminated in the project area during project implementation.

(c) Training completed included PMOs’ staff training at a total investment of about RMB4.28 million (122 percent of MTR estimate and 104 percent of SAR estimate), covering topics in: (i) procurement, disbursement, and M&E; (ii) operation, maintenance and management of large irrigation areas and hydropower stations; (iii) water resources monitoring, simulation and dispatch in Shule River Basin; (iv) management of large-scale human settlements; (v) optimization of agricultural production in arid regions, covering crops, livestock and forestry; and (vi) drainage and water and soil salinity control. Farm households/settlers’ training was carried out about 72,396 person-times (about 60 percent of SAR target due to the reduced number of settlers). This training covered areas such as: irrigation technology, arable farming, fruit growing, and livestock production. The overseas and local study tours involved a total of 303 person-times (about 103 percent of MTR and SAR targets). Eleven overseas study tours on various technical training topics took place to USA, Australia, European and Canada, involving a total of 72 person-times (about 116.13 percent of MTR targets).

(d) Monitoring was carried out by independent institutes. The impact of the voluntary resettlement was monitored and annually evaluated by Lanzhou University. A total of 10 monitoring reports from 1997-2006 were prepared by the Shule River Project Implementation Office covering all project areas. Surface and ground water and soil quality were monitored and evaluated by several Water Environment Center of Gansu Hydrology and Water Resources Investigation Bureau and other relevant universities and institutes. Annual Environmental Management Reports and several other environmental reports concerning water and soil quality and cultural relic protection were prepared and send to the Bank and government authorities.

2.12 Key outputs by components are presented in the Table 2A.1 below. The numbers are based on data provided by the Borrower:

**Table 2A.1: Major project outputs**

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<thead>
<tr>
<th>Item</th>
<th>Unit</th>
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<th>MTR</th>
<th>ICR</th>
<th>ICR/MTR (%)</th>
<th>ICR/SAR (%)</th>
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<td></td>
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<tr>
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<td>100.00</td>
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<td><strong>2. Agricultural Support</strong></td>
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<tr>
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<td>5.00</td>
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<td>Research</td>
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<td>1.20</td>
<td>1.51</td>
<td>0.30</td>
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<td>Land desalinization</td>
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<td>13,467</td>
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</tr>
<tr>
<td>Item</td>
<td>Unit</td>
<td>SAR</td>
<td>MTR</td>
<td>ICR</td>
<td>ICR/MTR (%)</td>
<td>ICR/SAR (%)</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>------</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td><strong>3. Livestock Development</strong></td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
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<td>1.00</td>
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<td>100.00</td>
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<td>1.00</td>
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<td>6.00</td>
<td>100.00</td>
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<td>Forage Seed Prod. Base</td>
<td>No.</td>
<td>2.00</td>
<td>2.00</td>
<td>2.00</td>
<td>100.00</td>
<td>100.00</td>
</tr>
<tr>
<td>Forage Seed</td>
<td>ha</td>
<td>11,060</td>
<td>2,441</td>
<td>2,530</td>
<td>103.64</td>
<td>22.88</td>
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<td>Livestock Breeding</td>
<td>RMB mill.</td>
<td>5.21</td>
<td>4.66</td>
<td>4.66</td>
<td>100.00</td>
<td>89.44</td>
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<td>Sheep Raising</td>
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<td>1.00</td>
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<td>100.00</td>
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<td>100.00</td>
<td>100.00</td>
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<tr>
<td>State Farm Forestry Extension Centre</td>
<td>No.</td>
<td>NA</td>
<td>1.00</td>
<td>1.00</td>
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<td>Township Forestry Station</td>
<td>No.</td>
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<td>6.00</td>
<td>6.00</td>
<td>100.00</td>
<td>54.55</td>
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<td>Natural Forestry Station</td>
<td>No.</td>
<td>5.00</td>
<td>3.00</td>
<td>3.00</td>
<td>100.00</td>
<td>60.00</td>
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<td>Changma Upper Reach Natural Forestry Station</td>
<td>No.</td>
<td>NA</td>
<td>1.00</td>
<td>1.00</td>
<td>100.00</td>
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</tr>
<tr>
<td>Farm Fields Forest Belt (new irrigation area)</td>
<td>ha</td>
<td>3,053.33</td>
<td>1,200</td>
<td>1,075</td>
<td>89.66</td>
<td>35.24</td>
</tr>
<tr>
<td>Household Orchard</td>
<td>ha</td>
<td>26,66.67</td>
<td>1,000</td>
<td>268</td>
<td>80.34</td>
<td></td>
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<tr>
<td>Environment Forest</td>
<td>ha</td>
<td>380.01</td>
<td>2043</td>
<td>2,043</td>
<td>100.00</td>
<td>537.74</td>
</tr>
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<td>Nursery</td>
<td>ha</td>
<td>73.33</td>
<td>53.33</td>
<td>42.00</td>
<td>78.75</td>
<td>57.28</td>
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<td><strong>5. Environment Protection</strong></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Environmental Monitoring</td>
<td>RMB mill.</td>
<td>34.19</td>
<td>27.92</td>
<td>20.03</td>
<td>71.74</td>
<td>58.58</td>
</tr>
<tr>
<td>Rehabilitation of Emigrated Source Areas*</td>
<td>RMB mill.</td>
<td>13.50</td>
<td>0.90</td>
<td>122.04</td>
<td>13560</td>
<td>904</td>
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<tr>
<td>Cultural Heritage Protection</td>
<td>RMB mill.</td>
<td>NA</td>
<td>2.95</td>
<td>2.37</td>
<td>80.34</td>
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<tr>
<td>Water-soil Conservation</td>
<td>RMB mill.</td>
<td>NA</td>
<td>2.23</td>
<td>9.86</td>
<td>442.15</td>
<td></td>
</tr>
<tr>
<td>Wind &amp; Sand Prevention</td>
<td>Ha</td>
<td>NA</td>
<td>NA</td>
<td>449.00</td>
<td></td>
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<tr>
<td>Wind &amp; Sand Prevention</td>
<td>RMB mill.</td>
<td>NA</td>
<td>NA</td>
<td>3.40</td>
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<td><strong>6. Voluntary Resettlement</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>People Settled</td>
<td>person</td>
<td>200,000</td>
<td>75,000</td>
<td>75,378</td>
<td>100.50</td>
<td>37.69</td>
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<td>Built Middle School</td>
<td>No.</td>
<td>16.00</td>
<td>6.00</td>
<td>6.00</td>
<td>100.00</td>
<td>37.50</td>
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<tr>
<td>Primary School</td>
<td>No.</td>
<td>160.00</td>
<td>57.00</td>
<td>50.00</td>
<td>87.72</td>
<td>31.25</td>
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<tr>
<td>Hospital</td>
<td>No.</td>
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<td>6.00</td>
<td>6.00</td>
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<tr>
<td>Clinic</td>
<td>No.</td>
<td>160.00</td>
<td>57.00</td>
<td>46.00</td>
<td>80.70</td>
<td>28.75</td>
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<td>Township Office and Other Facilities</td>
<td>No.</td>
<td>16.00</td>
<td>6.00</td>
<td>6.00</td>
<td>100.00</td>
<td>37.50</td>
</tr>
<tr>
<td>Village Office and Other Facilities</td>
<td>No.</td>
<td>160.00</td>
<td>57.00</td>
<td>46.00</td>
<td>80.70</td>
<td>28.75</td>
</tr>
<tr>
<td>Infrastructure for Road, Water and Power Supply</td>
<td>RMB mill.</td>
<td>3.80</td>
<td>61.15</td>
<td>67.75</td>
<td>110.79</td>
<td>1782.89</td>
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<tr>
<td><strong>7. Institutional Development</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training of Migrant Farmers</td>
<td>RMB mill.</td>
<td>924.30</td>
<td>355.00</td>
<td>229.00</td>
<td>64.51</td>
<td>24.78</td>
</tr>
<tr>
<td>Project Mgmt staff training</td>
<td>RMB mill.</td>
<td>4.12</td>
<td>3.52</td>
<td>4.28</td>
<td>121.59</td>
<td>103.88</td>
</tr>
<tr>
<td>Overseas Study Tours</td>
<td>person-times</td>
<td>62.00</td>
<td>62.00</td>
<td>72.00</td>
<td>116.13</td>
<td>116.13</td>
</tr>
<tr>
<td>Local Study Tours</td>
<td>person-times</td>
<td>233.00</td>
<td>233.00</td>
<td>231.00</td>
<td>99.14</td>
<td>99.14</td>
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<tr>
<td>WUA Development</td>
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<td>100.00</td>
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<tr>
<td>M &amp; E/Management</td>
<td>RMB mill.</td>
<td>80.00</td>
<td>151.76</td>
<td>171.74</td>
<td>113.17</td>
<td>214.68</td>
</tr>
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</table>

* RMB1.22 million financed by government subsidy of land reversion for forestry in move-out counties from 2003-2006.
Annex 3. Economic and Financial Analysis

3.1 Methodology and Assumptions. The economic rate of return (ERR) and Net Present Value (NPV) at completion have been recalculated using data from the project M&E system. Methodology and assumptions used are very similar to those adopted at appraisal and Mid-Term Review (MTR) to maximize comparability. The data on output/input prices, wages, water and electricity prices, yields and other data were updated from appraisal and MTR. The ERR and NPV were calculated across four out of seven project components and the overall project ERR was obtained as the investment-weighted average of the four ERRs.

3.2 Estimates of the NPV and ERR are based on the data collected from three irrigation districts (ID) of the project: Changma ID, Shuangta ID and Huahai ID. Actual investment costs reported by the project were used to account for investments. In calculating the ERR for the component, investments in overall institution building and dam construction were incorporated on a pro rata basis as a cost. At the ICR, the Irrigation and Drainage Component accounted for 86.3 percent of total project investments, Forestry Development Component for 4.8 percent, Livestock Development Component for 1.8 percent and Hydropower Stations Component for 7.1 percent.

3.3 Net Present Value and Economic Rate of Return. The project NPV at completion was estimated at RMB21.5 million. With the ERR at 12.2 percent, the project’s rate of return just equals the social rate of return (Table A3.1). For the project’s Irrigation and Drainage Component (the project’s largest component), the NPV and the ERR are the lowest in Changma ID where the new reclaimed area is the largest on which it takes longer to reach the production potential prevailing on the existing irrigated areas, and where the natural conditions to produce cotton – the most profitable cash-generating crop in Gansu Hexi Corridor – are least favorable. The project NPV estimate at completion is much lower than the one estimated at appraisal but larger than estimated at MTR. This is because of the changes in the project’s scale during the MTR and economic reasons, as explained below.

3.4 At appraisal, all project components were expected to have a robust rate of return, allowing for high efficiency at completion. During the MTR, project components were revised and scaled down, and the investments costs were adjusted to the revised scope of the project components. In addition to revising the number of resettlers, existing and new reclaimed irrigated areas, structure of cropping areas, yields and prices, the MTR substantially changed the Livestock Development Component. From the ten original subcomponents of the Livestock Development Component, only three subcomponents remained after the MTR. Those included Forage Seed Production Base, Breeding Development and Livestock Production Base. At appraisal, the livestock subcomponents sought to establish large chicken and pig farms, but at MTR they were dropped due to changes in market conditions.

3.5 The ERR at completion includes the returns from five hydropower stations, the construction of which were financed by the project but the details for ERR analysis were unknown at appraisal.
Table A3.1: NPV (million RMB) and ERR (percent) of project components at project appraisal, mid-term review and completion*

<table>
<thead>
<tr>
<th>Project Components</th>
<th>Appraisal</th>
<th>MTR</th>
<th>ICR</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>NPV</td>
<td>ERR</td>
<td>NPV</td>
</tr>
<tr>
<td><strong>1. Irrigation and Drainage</strong></td>
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<td></td>
</tr>
<tr>
<td>Changma ID</td>
<td>227.5</td>
<td>15.8</td>
<td>-127.6</td>
</tr>
<tr>
<td>Shuangta ID</td>
<td>319.7</td>
<td>23.4</td>
<td>-36.3</td>
</tr>
<tr>
<td>Huahai ID</td>
<td>72.5</td>
<td>18.0</td>
<td>-32.6</td>
</tr>
<tr>
<td><strong>Subtotal Irrigation and Drainage</strong></td>
<td><strong>619.7</strong></td>
<td><strong>18.2</strong></td>
<td><strong>-196.5</strong></td>
</tr>
<tr>
<td><strong>2. Forestry Development</strong></td>
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<td></td>
</tr>
<tr>
<td>Protection Forestry</td>
<td>3.0</td>
<td>14.7</td>
<td>13.0</td>
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<tr>
<td>Fuel Wood Forestry</td>
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<td></td>
</tr>
<tr>
<td>Agro-Forestry**</td>
<td>91.4</td>
<td>22.8</td>
<td>7.9</td>
</tr>
<tr>
<td>Nursery</td>
<td>1.1</td>
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<td>-1.5</td>
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<tr>
<td>Fast Growing Forestry</td>
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<tr>
<td><strong>Subtotal Forestry Development</strong></td>
<td><strong>96.0</strong></td>
<td><strong>21.4</strong></td>
<td><strong>-3.8</strong></td>
</tr>
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<td><strong>3. Livestock Development</strong></td>
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<tr>
<td>Pasture Development</td>
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<td>Forage Seed Production Base</td>
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<td>Parent Layer Egg Chicks Farm</td>
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<tr>
<td>Parent Layer Meat Chicks Farm</td>
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</tr>
<tr>
<td>Breeding Pig (Lean Pork) Farm</td>
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<tr>
<td>Breeding Pig (Sow) Farm</td>
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<td>22.4</td>
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</tr>
<tr>
<td>Breeding Development</td>
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<td>40.4</td>
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<tr>
<td>Livestock Production Base</td>
<td>10.8</td>
<td>37.0</td>
<td>15.3</td>
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<tr>
<td><strong>Subtotal Livestock Development</strong></td>
<td><strong>58.0</strong></td>
<td><strong>29.1</strong></td>
<td><strong>58.4</strong></td>
</tr>
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<td><strong>4. Hydropower Stations</strong></td>
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</tr>
<tr>
<td></td>
<td>1.1</td>
<td>12.2</td>
<td>18.8</td>
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<td><strong>Total Project</strong></td>
<td><strong>774.1</strong></td>
<td><strong>17.1</strong></td>
<td><strong>-108.1</strong></td>
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</table>

* Social discount rate is 12 percent. ** Household fruit trees and orchards.

3.6 In addition to differences in prices and yields' assumptions at different stages and the delayed/reduced resettlement, changes in irrigation areas and in cropping patterns were the major determinants of the Irrigation and Drainage Component’s ERR and consequently the total project’s ERRs given the large share of this component in total project investments. The new irrigation area at MTR was adjusted downwards compared with appraisal but the actual reclamation area at completion exceeded the MTR target (Table A3.2). Moreover, tremendous changes were observed in the cropping pattern which was the result of shifts from grain production for subsistence to cash-generating crops such as cotton, spices, Chinese herbs, vegetables, hops and safflower. This strong supply response to market incentives allowed for increased benefits that, to some extent, compensated for the losses from the delayed/reduced resettlement and the smaller irrigation area.
Table A3.2: Key assumptions at appraisal, MTR and completion influencing the project’s efficiency.

<table>
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<th></th>
<th>SAR</th>
<th>MTR</th>
<th>ICR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Existing irrigation area, ha</strong></td>
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<td></td>
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<tr>
<td>Changma ID</td>
<td>33,590</td>
<td>33,707</td>
<td>33,707</td>
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<td>Shuangta ID</td>
<td>19,910</td>
<td>21,620</td>
<td>21,621</td>
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<td>Huahai ID</td>
<td>10,940</td>
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<td>9,202</td>
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<td>2,740</td>
<td>2,887</td>
<td>2,884</td>
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<td><strong>New irrigation area, ha</strong></td>
<td>42,060</td>
<td>20,080</td>
<td>23,232</td>
</tr>
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<td>Changma ID</td>
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<td>7,704</td>
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<tr>
<td>Shuangta ID</td>
<td>12,250</td>
<td>5,260</td>
<td>8,664</td>
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<tr>
<td>Huahai ID</td>
<td>5,370</td>
<td>3,620</td>
<td>6,864</td>
</tr>
<tr>
<td>Structure of sown area: ratio of grain to cash-generating crops</td>
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<td></td>
<td></td>
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<tr>
<td>Changma ID</td>
<td>79/21</td>
<td>40/60</td>
<td>37/63</td>
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<tr>
<td>Shuangta ID</td>
<td>60/40</td>
<td>20/80</td>
<td>9/91</td>
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<tr>
<td>Huahai ID</td>
<td>70/30</td>
<td>30/70</td>
<td>15/85</td>
</tr>
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<td>2,530</td>
</tr>
<tr>
<td>Number of elite livestock breeds:</td>
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</tr>
<tr>
<td>Cattle</td>
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</tr>
<tr>
<td>Pigs</td>
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<tr>
<td>Chicken, `000</td>
<td>315</td>
<td>18.5</td>
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</tr>
<tr>
<td>Sheep</td>
<td>677</td>
<td>1,066</td>
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</tr>
<tr>
<td>Number of sheep raised by households</td>
<td>30,000</td>
<td>836</td>
<td></td>
</tr>
</tbody>
</table>

3.7 The lower NPV (ERR) of the Livestock Development Component at completion compared to the one at MTR is the result of the slow progress in construction activities which caused the delayed resettlement and failure in predicting the demand of the resettlers for livestock raising. The move-in area is part of the Gobi Desert with very limited natural pasture. At the outset, the resettled households were preoccupied with land improvements and crop production activities. With no natural pasture and little forage available, investments into animal husbandry were reduced, resulting in the low ERR.

3.8 The value of separate calculations of the financial rate of return was considered negligible, as markets in China are now well integrated, prices have limited distortions and farmers are exempted from taxes.

3.9 **Sensitivity Analysis.** Given that the Irrigation and Drainage Component makes up 86 percent of the total investment, the project’s overall ERR critically depends on the ERR of this component. The ERR of this component was found to fluctuate between 7.6-12.0 percent in Changma ID, between 11.7-15.9 percent in Shuangta ID and between 7.9-15.7 percent in Huahai ID, given a 10 percent decrease/increase of the gross revenue from agricultural activities.

3.10 The ERR is particular sensitive to the changes in price incentives for cotton production. At project completion, cash-income crops, mainly cotton, but also spices, Chinese herbs and others, in Changma ID accounted for 63 percent of total cropping area, 91 percent in Shuangta ID and 85 percent in Huahai ID. A 20 percent decrease in cotton prices at farm-gate would result in a decrease of the ERR by 2.2 percentage points, with the highest decrease by 4 percentage points in Huahai ID and the lowest by 1 percentage point in Changma ID. A 30 percent fall in cotton prices would reduce the Irrigation and Drainage Component’s ERR from 11.9 percent to 8.6 percent. For Huahai ID, the ERR would decrease from 12.2 percent to 5.9 percent, while the declines in the remaining irrigation districts are smaller.
Annex 4. Poverty Impacts

4.1 Significant improvements in the resettlers’ welfare and poverty were recorded. At appraisal, the average annual per capita income of the future resettlers in situ was estimated to be about RMB248. At completion, the average per capita income estimated for the largest resettlement townships increased to RMB1,810 (see Table A of the Data Sheet). Since the resettlers were reallocated to the new reclaimed areas, the increase in per capita income (RMB1,562 per capita – Table A4.1) can be fully attributed to the project. The results remain significantly positive even after the changes in per capita income in “move-in” areas is corrected for the changes in income in “move-out” areas, i.e. to allow for the changes which would have happened in the absence of the project (a “difference in difference” evaluation). Since the average per capita income in the “move-out” areas (“without project”) increased by RMB968 (to RMB1,216), the per capita income increase, fully attributable to the project, is RMB594\(^{15}\).

Table A4.1: Total changes in net per capita income in “move-in” and “move-out” project areas in 2006 compared to the base situation in 1996

<table>
<thead>
<tr>
<th>Move-out</th>
<th>RMB</th>
<th>Move-in</th>
<th>RMB</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jishishan</td>
<td>782</td>
<td>Xiangyang (Shuangta ID)</td>
<td>1,353</td>
<td>571</td>
</tr>
<tr>
<td>Dongxiang</td>
<td>749</td>
<td>Zhahua (Changma ID)</td>
<td>1,005</td>
<td>256</td>
</tr>
<tr>
<td>Ming Xian</td>
<td>1,372</td>
<td>Bijiatan (Huahai ID)</td>
<td>2,327</td>
<td>955</td>
</tr>
<tr>
<td><strong>(simple) Average</strong></td>
<td><strong>968</strong></td>
<td><strong>1,562</strong></td>
<td><strong>594</strong></td>
<td></td>
</tr>
</tbody>
</table>

Note: (i) the average per capita income was approximately RMB248 at appraisal; (ii) the resettlement to “move-in” areas originated from “move-out” counties as shown in the table; (iii) for the move-in areas, the income data is derived from the project M&E, based on surveys of 180 households. In 2006, the total number of surveyed households in all “move-in” townships was 576; (iv) for the “move-out” areas, the income used is the township’s average as reported by the local statistical bureaus in 2006.

4.2 The smallest income increase was reported in Zhahua township (Changma ID) and the largest in Bijiatan township (Huahai ID). The differences in income growth were determined by the parallel income developments in the comparable townships (“move-out” versus “move-in”), the time of relocation and the quality of land the households were relocated to. Relocation to Changma ID was the largest and, thus delayed the most. In addition, Changma ID had the largest areas of newly-reclaimed land that required more time and investments (i.e., soil leaching and other desalinization measures) to reach the productivity of existing irrigated areas, and it is less suitable to cotton production, the major cash crop in the Hexi Corridor.

4.3 Although the project’s M&E system did not collect poverty headcount data, the income distribution across surveyed households sheds some light on the poverty situation. It suggests with high likelihood that the majority of the project’s “move-in” households succeeded in escaping absolute poverty by 2006. At the outset of the project, most of the resettlers were “absolute poor.” Table A4.2 shows that in 1999 the net per capita income of the most ‘fresh’ resettlers was below the absolute poverty line of RMB300\(^{16}\). In 2003, about 70 percent of the

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\(^{15}\) This is a conservative estimate. The project’s contribution was probably higher. The people in “move-out” areas obtained “Grain for Green” subsidy at approximately RMB200 per mu for conversion of cultivated slope land to grasses and forests. Excluding this subsidy from per capita income calculations in the “move-out” areas increases the project’s contribution to resettlers’ income growth to about RMB800.

\(^{16}\) The “absolute poverty line” includes food poverty, while the “relative-poor poverty line” combines both food and non-food poverty lines as determined by the provincial statistical bureau.
resettlers were still below both the absolute and relatively-poor poverty lines of RMB630 and RMB879 per capita, respectively. In 2006, however, none of the surveyed households lived in absolute poverty (the absolute poverty line at that time having been raised to RMB650), and only 38 percent still had a per capita income below the “relatively-poor” poverty line of RMB956. While the income distribution within the townships is not known and the poverty headcount may exceed the level ones presented in Table A4.2, the large poverty reduction impacts of the project on the resettled households is clear.

Table A4.2: Distribution of per capita income across surveyed households in the move-in areas, 1999-2006.

<table>
<thead>
<tr>
<th></th>
<th>1999</th>
<th></th>
<th>2003</th>
<th></th>
<th>2006</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average income RMB</td>
<td>No. of HH</td>
<td>% of HH</td>
<td>Average income RMB</td>
<td>No. of HH</td>
<td>% of HH</td>
</tr>
<tr>
<td><strong>Changma ID</strong></td>
<td>200</td>
<td>153</td>
<td>46.4</td>
<td>464</td>
<td>234</td>
<td>69.9</td>
</tr>
<tr>
<td>Zhahau</td>
<td>200</td>
<td>153</td>
<td>46.4</td>
<td>1,086</td>
<td>57</td>
<td>17.0</td>
</tr>
<tr>
<td>Qiduntang</td>
<td>335</td>
<td>60</td>
<td>17.9</td>
<td>871</td>
<td>78</td>
<td>15.1</td>
</tr>
<tr>
<td>Qidaogou</td>
<td>221</td>
<td>57</td>
<td>17.0</td>
<td>1,023</td>
<td>84</td>
<td>16.3</td>
</tr>
<tr>
<td>Shuangta</td>
<td>132</td>
<td>60</td>
<td>17.9</td>
<td>759</td>
<td>78</td>
<td>15.1</td>
</tr>
<tr>
<td><strong>Shuangta ID</strong></td>
<td>290</td>
<td>134</td>
<td>40.6</td>
<td>1,110</td>
<td>45</td>
<td>13.4</td>
</tr>
<tr>
<td>Xiangyang</td>
<td>315</td>
<td>101</td>
<td>30.6</td>
<td>896</td>
<td>27</td>
<td>8.0</td>
</tr>
<tr>
<td>Lianghu</td>
<td>200</td>
<td>33</td>
<td>10.0</td>
<td>1,636</td>
<td>18</td>
<td>5.4</td>
</tr>
<tr>
<td><strong>Huahai ID</strong></td>
<td>255</td>
<td>153</td>
<td>13.0</td>
<td>475</td>
<td>57</td>
<td>17.0</td>
</tr>
<tr>
<td><strong>Total project</strong></td>
<td>244</td>
<td>330</td>
<td></td>
<td>552</td>
<td>336</td>
<td></td>
</tr>
</tbody>
</table>

4.4 While significant improvements in poverty reduction were achieved by comparison with Chinese-poverty thresholds, the majority of the resettlers, except some of those living in Huahai ID, continue to live below the Bank’s poverty line of US$1 per day (equalling to about RMB2,800 per capita). This raises the question of whether the Bank investments were justified and if there were better alternatives to the investment (e.g., investing in the “move-out” areas). For the latter, investment opportunities for economic and human development in the “move-out” mountainous areas were and continue to be extremely limited. For the former, the investments can be seen as justified if one takes into account the positive future outlook for poverty reduction in the move-in areas. Since the relocation was delayed, most of the resettlers did not achieve their full income potential from agriculture and off-farm activities at the time of the ICR (see paragraph 3.5.5 in the main text), but their outlook looks very promising as land productivity has great potential to increase, the reliable irrigation promotes diversification, and as the farmers increasingly master new farm techniques (none of which can be said about the “move-out” areas). There, as population continues to grow, scarce natural resources continue to be over used, causing continued high reliance on subsidies such as “Grain for Green”.

4.5 Resettlement to Hexi corridor has significantly increased the income-generation opportunities both on- and off-farm. The project provided the irrigation infrastructure and water that enabled farmers to diversify from grains to more profitable cash crops. In 2006, the average ratio of planted area for grains and cash crops was 15/85 compared to the expected 70/30 at appraisal\(^\text{17}\). Furthermore, the resettled farmers have now received training in modern farm technologies and have had access to effective extension services. As a result, the income of

\(^{17}\) According to M&E information, in 2006 the net income (gross income from sales of main and by-products minus variable costs) from cotton, for example, was reported to be 63 percent higher than that of wheat, the main grain crop in the Gansu Hexi Corridor.
moved-in members of households from agriculture was six times as high as the income of any remaining members of the household in the “move-out” villages (Table A4.3). Similarly, by moving to the new areas some members of the resettled households increased their opportunities to earn off-farm.

<table>
<thead>
<tr>
<th></th>
<th>Move-in households</th>
<th>Move-out households</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total income</td>
<td>6,432</td>
<td>1,226</td>
</tr>
<tr>
<td>Income from agricultural activities</td>
<td>4,888</td>
<td>822</td>
</tr>
<tr>
<td>Income from crop production</td>
<td>4,434</td>
<td>581</td>
</tr>
<tr>
<td>Income from livestock production</td>
<td>454</td>
<td>241</td>
</tr>
<tr>
<td>Off-farm income</td>
<td>1,544</td>
<td>404</td>
</tr>
<tr>
<td><strong>Number of surveyed households</strong></td>
<td><strong>1,612</strong></td>
<td><strong>282</strong></td>
</tr>
</tbody>
</table>

Furthermore, the project, by investing in schools, kindergartens, clinics and hospitals, ensured the delivery of important public services to the resettlers. In the project’s move-in areas, the school participation rate was reported at 99.2 percent in 2006, compared to the average 96.8 percent in the move-out counties18. Now the resettlers’ children overnight at home with their families (instead of boarding) and spend less time to reach school; this is a significant benefit compared to many children in the “move-out” mountainous areas, which is not reflected in the school participation rate. The number of doctors per 1,000 people in the “move-in” areas increased from 0.65 in 2003 to 0.94 in 2006. The delivery and quality of better public services, therefore, has greatly improved the welfare of the resettlers and the future of their children, far exceeding the current income gains.

18 The data for the “move-out” counties is based on information from Dongxiang, Jishishan and Minxian counties.
### Annex 5. Overall Outcome’s Ratings against Original PDOs and MTR targets

<table>
<thead>
<tr>
<th></th>
<th>Against Original PDOs</th>
<th>Against Revised MTR Targets</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Changes in per capita income (%)</strong></td>
<td>118.3</td>
<td>101.1</td>
<td></td>
</tr>
<tr>
<td>1. Rating</td>
<td>Highly satisfactory</td>
<td>Satisfactory</td>
<td></td>
</tr>
<tr>
<td>2. Rating value</td>
<td>6</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>3. Weight (% disbursed before/after PDO change)</td>
<td>64</td>
<td>36</td>
<td>100</td>
</tr>
<tr>
<td>4. Weighted value (2x3)</td>
<td>3.8</td>
<td>1.8</td>
<td>5.6</td>
</tr>
<tr>
<td>5. Final rating (rounded)</td>
<td>Satisfactory</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Per capita grain production (%)</strong></td>
<td>59.7</td>
<td>74.3</td>
<td></td>
</tr>
<tr>
<td>1. Rating</td>
<td>Satisfactory</td>
<td>Satisfactory</td>
<td></td>
</tr>
<tr>
<td>2. Rating value</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>3. Weight (% disbursed before/after PDO change)</td>
<td>64</td>
<td>36</td>
<td>100</td>
</tr>
<tr>
<td>4. Weighted value (2x3)</td>
<td>3.2</td>
<td>1.8</td>
<td>5.0</td>
</tr>
<tr>
<td>5. Final rating (rounded)</td>
<td>Satisfactory</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Change in gross agricultural output (%)</strong></td>
<td>98.4</td>
<td>132.7</td>
<td></td>
</tr>
<tr>
<td>1. Rating</td>
<td>Satisfactory</td>
<td>Highly Satisfactory</td>
<td></td>
</tr>
<tr>
<td>2. Rating value</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>3. Weight (% disbursed before/after PDO change)</td>
<td>64</td>
<td>36</td>
<td>100</td>
</tr>
<tr>
<td>4. Weighted value (2*3)</td>
<td>3.2</td>
<td>2.2</td>
<td>5.4</td>
</tr>
<tr>
<td>5. Final rating (rounded)</td>
<td>Satisfactory</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Distribution system efficiency (%)</strong></td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>1. Rating</td>
<td>Satisfactory</td>
<td>Satisfactory</td>
<td></td>
</tr>
<tr>
<td>2. Rating value</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>3. Weight (% disbursed before/after PDO change)</td>
<td>64</td>
<td>36</td>
<td>100</td>
</tr>
<tr>
<td>4. Weighted value (2*3)</td>
<td>3.2</td>
<td>1.8</td>
<td>5.0</td>
</tr>
<tr>
<td>5. Final rating (rounded)</td>
<td>Satisfactory</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cost recovery ratio (%)</strong></td>
<td>85.1</td>
<td>110.8</td>
<td></td>
</tr>
<tr>
<td>1. Rating</td>
<td>Moderately unsatisfactory</td>
<td>Highly satisfactory</td>
<td></td>
</tr>
<tr>
<td>2. Rating value</td>
<td>3</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>3. Weight (% disbursed before/after PDO change)</td>
<td>64</td>
<td>36</td>
<td>100</td>
</tr>
<tr>
<td>4. Weighted value (2*3)</td>
<td>1.9</td>
<td>2.2</td>
<td>4.1</td>
</tr>
<tr>
<td>5. Final rating (rounded)</td>
<td>Moderately Satisfactory</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Overall vegetation cover (%)</strong></td>
<td>140.6</td>
<td>103.1</td>
<td></td>
</tr>
<tr>
<td>1. Rating</td>
<td>Highly satisfactory</td>
<td>Satisfactory</td>
<td></td>
</tr>
<tr>
<td>2. Rating value</td>
<td>6</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>3. Weight (% disbursed before/after PDO change)</td>
<td>64</td>
<td>36</td>
<td>100</td>
</tr>
<tr>
<td>4. Weighted value (2*3)</td>
<td>3.8</td>
<td>1.8</td>
<td>5.6</td>
</tr>
<tr>
<td>5. Final rating (rounded)</td>
<td>Satisfactory</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

19 The reduction in per capita grain production does not translate into an unsatisfactory outcome – rather it is a positive sign that production shifted from food grains to higher-value crops as supported by Indicator 3.

20 Despite the small under-achievement, the outcome against original PDO is rated as “satisfactory” because the actual result is based on a cultivated area half that established as at appraisal target.

(a) Task Team members

<table>
<thead>
<tr>
<th>Names</th>
<th>Title</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lending</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lang S. Tay</td>
<td>Sr. Irrigation Engineer, Task Manager</td>
<td></td>
</tr>
<tr>
<td>Walter Ochs</td>
<td>Drainage Adviser</td>
<td></td>
</tr>
<tr>
<td>Youlan Zou</td>
<td>Resettlement Specialist</td>
<td></td>
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<tr>
<td>Robert Crooks</td>
<td>Environment</td>
<td></td>
</tr>
<tr>
<td>Qun Li</td>
<td>Financial Analyst</td>
<td></td>
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<tr>
<td>Xiaohong Yang</td>
<td>Disbursement Officer</td>
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<tr>
<td>Weizhen Zhang</td>
<td>Drainage (Consultant)</td>
<td></td>
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<tr>
<td>Yizhar Raz</td>
<td>Agronomist (Consultant)</td>
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<tr>
<td>Bruce Mitchellhill</td>
<td>Livestock (Consultant)</td>
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<tr>
<td>Jens Thomsen</td>
<td>Forestry Consultant</td>
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<tr>
<td>Naoya Fujimoto</td>
<td>Irrigation Engineer</td>
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<td><strong>Supervision</strong></td>
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</tr>
<tr>
<td>Lang S. Tay</td>
<td>Sr. Irrigation Engineer, Task Manager (retired)</td>
<td>EASRE</td>
</tr>
<tr>
<td>Richard Reidinger</td>
<td>Lead Water Resources Specialist, Task Manager</td>
<td>EASRE</td>
</tr>
<tr>
<td>Sari Söderström</td>
<td>Lead Operations Officer, Task Manager (retired)</td>
<td>EASRE</td>
</tr>
<tr>
<td>Daniel R. Gibson</td>
<td>Sr. Social Scientist</td>
<td>EASSO</td>
</tr>
<tr>
<td>Qun Li</td>
<td>Agricultural Officer</td>
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</tr>
<tr>
<td>Wanlong Lin</td>
<td>Agricultural Economist</td>
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<td>Ximing Zhang</td>
<td>Water Resources Specialist</td>
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<tr>
<td>Weiguo Zhou</td>
<td>Operations Officer</td>
<td>EASRE</td>
</tr>
<tr>
<td>Xiaokai Li</td>
<td>Water Resource Specialist/Dam Engineer</td>
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<tr>
<td>Xie Qingtao</td>
<td>Environmental Specialist</td>
<td>EASRE</td>
</tr>
<tr>
<td>Zhentu Liu</td>
<td>Procurement Specialist</td>
<td>EACCFC</td>
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<tr>
<td>George Radosevich</td>
<td>Water Law/River Basin Specialist</td>
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<td>Liu Houbin</td>
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<td>Peter Ting</td>
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<td>Eric Hansen</td>
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<td>Gary Wilson</td>
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<tr>
<td>Sari Söderström</td>
<td>Lead Operations Officer, Task Manager</td>
<td>EASRE</td>
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<tr>
<td>Qun Li</td>
<td>Agricultural Officer</td>
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<tr>
<td>Xiu Zh Chen Zhang</td>
<td>Project Assistant</td>
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</tr>
<tr>
<td>Sergiy Zorya</td>
<td>Sector Economist</td>
<td>EASRE</td>
</tr>
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</table>
### (b) Staff Time and Cost

<table>
<thead>
<tr>
<th>Stage of Project Cycle</th>
<th>Staff Time and Cost (Bank Budget Only)</th>
</tr>
</thead>
<tbody>
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<td></td>
<td>No. of staff weeks</td>
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<td><strong>Lending</strong></td>
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</tr>
<tr>
<td>FY93</td>
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<td>FY94</td>
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<td>FY95</td>
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<td>FY96</td>
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<td><strong>Total:</strong></td>
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Annex 7. Summary of Borrower's ICR and/or Comments on ICR

Borrower’s Comments on ICR


Representative Office of the World Bank in Beijing,

The report you submitted on April 30, 2007 was forwarded to Gansu Water Resources Department, Gansu Development and Reform Commission and Gansu Finance Department by the Administration of Agriculture Irrigation and Migrant Relocation of Gansu’s Hexi Corridor (Shule River Project Construction Management Bureau). The report is basically comprehensive and objective. After a further study of the report, we concluded that the Gansu Provincial Government played an important role in project preparation, its mid-term adjustment, completing the management structure, mobilizing supporting funds and properly settling various kinds of complicated problems during the relocation of the local people. The government adopted a series of effective measures for the smooth operation of the project and achieved remarkable results. At the same time, WB also did a lot of work in the preparation and implementation of the project. Scientific evaluation was made and many obstacles were identified and tackled during the construction thanks to the effort of WB, who made indispensable contributions to the due completion of the project and its functioning. It is because of the effective work of and the great importance attached by Gansu Provincial Government, together with the active work of WB, that the construction goals of the Shule River Project was fully realized.

Therefore, WB should change its comment on the performance of the Gansu Provincial Government from “Unsatisfactory” to “Satisfactory”, and its comment on WB performance should be revised as “Satisfactory” rather than “Moderately Satisfactory”.

With our best regards,


The Implementation & Completion Report on the Shule River Project of WB pertinently reviewed and assessed the achievements made during the implementation of the Hexi Corridor project for which Gansu province got loans from WB. However, the report graded the performance of the government as “Unsatisfactory” and that of WB “Moderately Unsatisfactory”. As far as we are concerned, this does not conform with the real situation of the province and the project implementation, and should be revised accordingly.

I. Changing the comment on the performance of the Gansu Provincial Government from “Unsatisfactory” into “Satisfactory”

The Gansu Provincial Government has always attached great importance to the WB funded Hexi Corridor project. During the more than 10 years from the initial planning to the accomplishment, the government organized for many times coordination meetings to solve major problems arising from the project. It also vigorously provided for the organization construction, project management, fund mobilization, etc, thus greatly facilitated the project implementation and realization.

(I) Great importance attached by the government to the establishment and completion of the organizational and management institution ensuring smooth implementation of the project.

The WB funded Hexi Corridor project was signed in 1996, and was listed as a key agriculture development project by the Gansu Provincial Government for the “Ninth Five-Year Plan” and the “2010 Prospects” of the province. The project was designated as a state-level key development project by relevant department. To ensure smooth implementation of the project, the provincial government established an Execution Committee for the project. The committee was chaired by the provincial governor. The Shule River Construction Management Administration was also established, and corresponding project offices were set up in Yumen City, Anxi County and the Provincial Agricultural Cooperation for the project construction and daily management. The establishment of the institutions provided for the effective management and operation of the project. Besides, during the implementation of the project, top provincial officials listened to reports for many times, organized coordinating conferences, and carried out in-depth investigations to make sure that the project was proceeding according to the plan.

(II) Successfully mobilizing the supporting fund and solving the problem of migrant relocation.

At the time when the project was signed, the total investment was calculated at 2.697 billion RMB, out of which around 1.26 billion RMB would come from the loans of WB, with 1.437 billion RMB of domestic supporting fund. After the 2004 mid-term adjustment, the total investment was reduced to 1.97 billion RMB, and the WB loan and domestic fund stood at 996 million RMB and 974 million RMB respectively. As of end of May 2007, a total of 968.54 million RMB of supporting funds had been mobilized, accounting for 99.44% of the expected amount. In the beginning of the project, because of national policy changes, the originally planned poverty-alleviation supporting fund could not be used for the construction of key projects, resulting in delays of supporting funds compared to the project plan in the first years. But during the implementation, the Gansu Provincial Government overcame the difficulty of a tight budget and arduous poverty-alleviation task, spared no efforts in mobilizing domestic supporting fund, and finally received 320 million RMB of national debt funds, offsetting the deficit in the domestic supporting fund. The domestic supporting fund was further supplemented in later period of the project implementation and some postponed subsidiary projects were finished on time.
Meanwhile, the provincial government also managed to find money for the community level investments and operation of 75,000 migrants, through earmarked transfers, facilitating the realization of the poverty-alleviation goals according to the timetable. In addition, to ensure the smooth completion of the follow-up programs, the Provincial Finance Department added some supporting funds for the project to the 2007 budget, quite satisfactorily solving the funding problem of the project.

Migration is a major development goal of the project. During the construction of the project, the provincial government consulted for many times with the local governments and competent departments for the relocation of migrants. Consensus was reached, local governments were able to bear the overall picture of the province in mind and actively participated in the construction and development of the project, and successfully integrated the migration work into the local administration. Also, policy and fund support was given to the community construction in the areas of culture, education and health for the migrants because of the local governments. At present, the hand-over of 3 migrant townships constructed within the framework of the project has been properly solved, and the hand-over of state-owned farms is underway. All these fully illustrate, that the local governments and people bore the overall picture in mind, and made great contribution to the smooth implementation of the Shule River project, as well as to the poverty-alleviation and well-off of the migrants. The WB ICR report’s statement that “Jiuquan area is reluctant towards the project, and is unwilling to accept migrants coming from poor areas” does not conform to the real situation.

(III) Improving the project design

The initial design of the project was carried out and accomplished more than 10 years ago. According to the requirements of competent departments of the country and WB, Gansu province asked designing companies with qualification to make elaborate designs for the project construction. The early idea was to fully utilize the water and land resources. As the plan turned out, utilization of water resources of the Shule River reached 91.6%. Whereas, there was little potential for sustainable development and eco-environmental water consumption. Having said that, with the adjustment of domestic policies, the Gansu Provincial Government made timely adjustment on the scale of the Shule River project, which was endorsed by WB. With the coordination of the provincial government, a conference assessing and evaluating the eco-environment of the river valley was held, and the project plan was modified for several times, further improving the water utilization efficiency and ensuring the water supply of the eco-environment construction.

To conclude, it is suggested that WB change the comment on the performance of the Gansu Provincial Government from “Unsatisfactory” to “Satisfactory”.
II. Statement of reasons against the comment on WB performance

During the preparation and implementation of the project, the performance of WB was satisfying.

(I) Timely adjusting the scale of the project, and making plan for the sustainable development of water resources utilization

At the very beginning, proceeding from the idea of fully utilizing the water and land resources in the Shule River valley and tackling the poverty of 200 million migrants in central-south Gansu as soon as possible, WB set the water utilization rate at 91.6%, in the special background of solving the grain problem of poverty-stricken farmers in Gansu. During the implementation of the project, WB, proceeding from the drainage water resources balance and eco-environment protection, made timely adjustment of the too-high water resources utilization rate and the development scale of 200 million migrants with 819,000 Mu of land, making the project more suitable for sustainable development. It has been proved that the provincial government and WB were right in making the mid-term adjustment of the project. Now, the goal of increasing individual income for barely poor population in the project area has been fulfilled comprehensively, with the migrants shifting from self-supporting grain production to the production of economic crops. More importantly, the prospect of increasing the income and poverty-alleviation of the farmers is more optimistic in the accepting areas than in the providing areas. The goals of increasing Gansu’s agriculture production and protecting & recovering the eco-environment have been comprehensively realized.

(II) Frequent supervision and examination, tackling key problems

During the implementation of the project (May, 1996—April, 2007), WB supervising team visited the Shule River project more than 20 times, altogether 113 person-times. The team was able to give rational, detailed, concrete and feasible opinions and suggestions to the party of Gansu in a timely, objective and candid manner, enabling the Gansu Provincial Government to study and solve such major issues as drainage institution management, bidding & procurement, quality process control, provincial supporting fund, settlement of voluntary and non-voluntary migrations, environmental protection, expenditure reimbursement, water administration system reform and association of water-consuming farmers. This provided strong support and help to the project management institutions for their accurate understanding of the WB policy and requirements and for improving their work in the project management.

(III) Introducing WB management methods, improving the project management level

During the construction of the project, many experts from WB had on-site visit to the project, and provided technical consultation and help in the field of dam safety, eco-environment protection, saline land improvement, bidding process, informationization of the irrigated areas, etc. This helped the management institutions in understanding correctly the WB policy and requirements, and helped established a set of more effective comprehensive management mechanism and procedures, pushing forward the party of Gansu to continuously strengthen the control over project process, quality and investment, and to improve the level of standard management of the project, which ensures the quality and effectiveness of the project. At the same time, this helped in the training of a group of talents good at WB project management, raising the management level of the project.
(IV) Spotting and solving problems, increasing the sustainability of the project

During the implementation of the project, WB raised the question of a too-high water utilization rate, which stood at 91.6%, adjusted the scale for land development and migrants relocation, suggested a 15% increase of forest and grassland area, and helped to solve such problems as water resources allocation, migrants relocation, saline land improvement and dam safety. WB also coordinated the solution of problems affecting the project construction, such as the supporting fund, water resources balance and environmental protection, making the project implementation and realization of the goals more sustainable.

(V) Pushing forward the reform of the drainage water resources management system, promoting democratic management in the irrigated area

WB supervising team followed closely the system reform of the water resources management of the Shule River drainage and gave feedbacks to the provincial government for many times. It also held meetings with competent department, put forward suggestions and requirements, helped established the water resources management institutions of the drainage, and actively promoted the water resources management system reform in the drainage area with the associations of water consuming farmers participating in the management. Under the guidance and help of WB, there came into being 87 associations of water consuming farmers in the Shule River irrigation area, and the water resources management system evolved from a simplistic one dominated by the government into a system involving industry management, social management and participation of water consuming farmers. WB played a very big role in the water resources management reform of the Shule River drainage area.

(VI) Scientific management methods and sense of responsibility endorsing the success of the project implementation

WB set an example for the working team of Gansu province, by the scientific rigorous and realistic working style.

Mr. Lang S. Tay, former TTL of WB paid 11 supervising visits to the project between 1995 and June 2000. He was able to, after discovering problems, put forward rational opinions and suggestions to the Gansu Provincial Government objectively and candidly. He helped lay a good foundation for the project by supervising and coordination the solution to problems such as institution establishment, bidding & procurement, migrants’ relocation, environmental protection, training & visit and supporting fund.

Mr. Richard Reidinger, former TTL project manager, organized 11-16 times of supervising visits to the project between June 2000 and October 2003. He actively proposed and urged the government to establish water resources management institutions in the drainage area, and develop associations of water consuming farmers. He suggested the project institutions to introduce advanced technology and management experience at home and abroad, for the promotion of water administration reform, and made remarkable achievement.

Mrs. Sari Söderström, TTL of WB, headed 16-21 supervisions to the project. She actively pushed forward the system reform for the water resources management and the water administration in the drainage area. She helped to promote the participation of the associations of water consuming farmers in the management system. Based on 10 years’ practice and experiences in the project, she did earnest and pragmatic work for the successful implementation of the project.

In November 2001, Mr. Daniel (Ritchie), who led a quality inspection team from WB headquarters, made such remarks, “The Hexi Corridor Shule River project is very well managed
among all WB projects. For three reasons, I am very much impressed: Firstly, the supervision work is aimed at solving problems. The problems are discovered, raised and tackled in the timely manner; Secondly, the two parties of the project demonstrated a great deal of flexibility regarding the solution of problems. It is very important to make necessary adjustment and take a flexible approach towards the solution of problems during the process of project implementation and supervision; Thirdly, relevant policies of WB were well observed and carried out. They are concerned with non-voluntary migration, environmental protection, dam safety, cultural heritage, ethnic minority, etc. My overall comment on the project is ‘very satisfactory’.

In conclusion, it is suggested that the comment on WB performance in the project should be changed from “Moderately Unsatisfactory” into “Satisfactory”.
Summary of Borrower’s ICR

1 Background

Located in the western part of Hexi Corridor of Gansu Province, Shule River Basin covers an area of 41.3 thousand km², with its mainstream river totaling 670 km in length and 1.031 billion m³ in terms of long term average runoff. The river basin includes three irrigation districts (IDs), namely Changma, Shuangta and Huahai, consisting of 27 townships and 3 state farms situated in Yumen City and Guazhou (previously Anxi) County. In order to solve the poverty problem for the tens of thousands people in the 11 counties in arid central Gansu province or in the high and cold mountainous areas of southern Gansu province, the provincial government put forward the strategy “developing the western area while aiding the central area through implementing poverty reduction and development program” and decided to develop the rich water and soil resources in the Shule River Basin through implementing the Hexi Corridor Project (the Project) following the World Bank policies for poverty reduction and environmental protection and improvement.

The feasibility study of the Project was completed in 1994. In October 1995, the World Bank conducted formal appraisal of the Project. With approval of the State Council, the Project was listed in the national Ninth Five Year Plan as the major project for Gansu Province. On July 2, 1996, the Government of P. R. China officially signed with the World Bank the Project Agreement, the Development Credits Agreement and the Loan Agreement for the Project, defining that a World Bank loan totaling USD 150 million would be used for the Project with an estimated total investment of RMB2.673 billion to support land reclamation of 54,600 ha, resettlement of 200 thousand people and irrigation development of 97,800 ha.

In 2002, a Mid Term Review (MTR) of the Project was conducted in line with common understanding reached between the provincial government and the World Bank on water resources bearing capacity of the Shule River Basin, eco-environmental protection and counterpart funding, resulting in reduction of resettlement scale from originally planned 200 thousand persons to 75 thousand persons, decrease of number of new resettlement townships/farms from 16 to 6, decrease of number of resettlement administrative villages from 160 to 57, land reclamation downsized from 54,600 ha to 28,533.33 ha, forest and grass coverage rate increased from 11% to 15%, water resources utilization ratio reduced from 91.6% to 64.5%, and the Project total investment reduced from RMB2.673 billion to RMB1.971 billion.

The Project was launched in May 1996 and accomplished in December 2006. The successful implementation of the Project had played an important role in solving the poverty problem for the tens of thousands resettles in the central and southern Gansu province, enhancing the sustainable social, economic and ecological development of the Shule River Basin in the Hexi Corridor.

2 Project Objectives

The main project objectives were: (1) to relocate 200 thousand (75 thousand as per MTR adjustment) people from the central and southeastern Gansu province where the natural conditions are poor to the new irrigation districts developed in the project areas within the Shule River Basin; (2) to upgrade and increase agricultural production in Gansu province, particularly grain and cash crops’ outputs; (3) to protect and restore the deteriorated eco-environment.

Through 10 years’ implementation, the Project had fully realized these three main objectives and each of its components had basically accomplished or exceeded the development goals defined in MTR, presenting outstanding economic, social and ecological benefits.
3 Achievements and Benefits of the Project

The Project had been completed as scheduled and given full benefits, including apparent economic, social and ecological benefits produced thanks to full completion of the water resources, resettlement, agricultural, forestry and livestock development components.

3.1 Construction of Water Engineering Works and Development of New Agricultural Irrigation Districts

- Funded by the Project, the Changma Reservoir, a grade-2 large scale reservoir with a storage capacity of 194 million m$^3$, was fully completed and put into operation. Under combined regulation together with Shuangta and Chijinxia reservoirs at the downstream, the Changma reservoir is now functioning to serve multiple purposes including runoff regulation, flood retention and control, agricultural irrigation, industrial and domestic water supply, ecological water delivery, fishery, tourism, hydro-power generation, etc. As a result, the historical problem of spring and summer droughts in the irrigation areas along Shule River was terminated.

- In the 3 IDs, the Project supported new and improved main canals of 681.64 km, main and branch drainage canals of 152 km, canals at branch level totaling 147 in number and 1094.6 km in total length, resulting in great increase of canal water use efficiency (from 54% to 62% for Changma ID, from 43% to 62% for Shuangta ID, from 54% to 62% for Huahai ID) and thus realization of the component’s objective as designed.

- The Project made it possible to ensure normal operation of and power generation by the 18 small-sized hydropower stations at the downstream of the river basin, the produced power totals 280 million kWh with a revenue of approximately RMB45 million.

- Water diversion and utilization increased from 430 million m$^3$ in 1995 to 926 million m$^3$ in 2006, which made it possible for developing new irrigation area of 27,854 ha and guaranteeing irrigation for the existing farm land of 43,600 ha, thus the irrigated area reached 71,454 ha in total. In 2006, the total water fee collected was RMB33.77 million, water supply for industrial uses totaled 82.75 million m$^3$, the amount of water reserved for ecological uses totaled 220 million m$^3$.

- The project area expanded from originally 13 townships and 3 state farms to 27 townships and 3 state farms, with agricultural population increased from 105,890 at appraisal time to 195,891.

- Along with full completion of the Project and implementation of integrated water resources management, regulation and utilization of water resources had been fully upgraded in the river basin, with canal water use efficiency upgraded greatly, flood pressure reduced and lives and properties of the local people in the downstream areas safeguarded.

- Project construction drove forward development of the local economy as a whole, and facilitated development of sectors including agriculture, forestry, animal husbandry and the others, providing not only strong guarantee for comprehensive agricultural development and resettlement, but also a solid foundation for all-rounded, coordinated and sustainable social and economic development in the locality.
3.2 Full Completion of Resettlement Tasks and Basic Realization of Poverty Reduction Objectives

By using the new resettlement approach of “preparing unified plan, setting up demonstrative pilot and implementing whole village relocation,” totally 75,378 thousand people (31,424 persons in the agricultural farms, 30,576 persons in the administrative areas of Jiuquan Municipality, and 13,378 persons of spontaneous relocatees) were relocated on a voluntary basis in the past 10 years from 11 counties in the central or southern parts of Gansu province, including Linxia, Hezheng, Yongjiong, Jishishan, Dongxiang, Minxian, Tanchang, Wudu, Lixian, Lintan, Zhouqu. Involuntary resettlement was implemented because of construction of Changma Reservoir, involving totally 580 people from 159 households. Community service facilities established for the resettlement purpose include buildings for the township governments, village committees, schools and hospitals/clinics for the 6 townships/farms, 57 administrative villages and 8 natural villages. Canals, access roads and tree belts had been completed in the newly established irrigation areas, and the resettlement areas had been served with adequate water and power supply facilities and roads. In 2006, the per capita net income of the relocatees reached RMB1,548, an increase by 500% compared with that of RMB300 when the resettlement was initiated, and the resettlement objective defined as “first year moving in, second year settling down, third year having ample food and clothes” had been basically realized.

3.3 Agricultural Restructuring and Increase of Both Agricultural Production and Farmers’ Income

Under the Project, adjustments were conducted to the scale of irrigation areas, irrigation system, ratios of cropping, forestry, and livestock raising in the overall agricultural sector, cropping mix. Totally 22,061.33 ha of land in the new irrigation areas had been leveled and equipped with auxiliary on-farm structures, salinity improvement had covered an area of 10,267 ha, desertification improvement and shelter trees had covered an area of 5,573 ha, forest land and grass land had reached 3,800 ha and 666 ha, respectively, so that forest and grass coverage rate in the project area had exceeded 15%. In 2006, livestock raised totaled 72 thousand heads and the agricultural production value in the irrigation areas increased to RMB1,034 million from that of RMB435 million at appraisal in 1996, ratio of grain and cash crops changed to 2:8 from previously 8:2, particularly cotton area reached 37,333 ha, resulting in farmers’ income increase by RMB250 million annually.

Income of the relocatees has been increasing year by year through cropping, livestock raising, processing and labor service operations, their per capita net income increased to around RMB1,500 in 2006 from that of below RMB600 before 2000, a net increase of RMB900. According to analysis of the per capita land occupation in rural areas of Gansu province, the newly reclaimed land can support 128 thousand people. If using the current per capita agricultural added value in the calculation, the annual net contribution of the Project to agricultural added value and GDP is RMB209 million and RMB260 million, respectively. In the new irrigation districts, irrigated oases with an area of 27,854 ha of productive land and well-developed tree belts had been formed with support of the Project and played an important role in increasing farmers’ production and income.

3.4 Eco-environmental Improvement and Harmonious Development of the IDs

For purposes of sustainable water resources utilization and eco-environmental protection, adjustments to the project scale were conducted during MTR, including reduction of water
resources utilization ratio from 91.6% to 64.5%, increase of forest and grass land coverage from 11% to 15%, reserve of ecological water use of 220 million m³. Since more than half of the newly reclaimed land of 27,846 ha was originally typical source area for wind erosion sands, the reclamation of such area improved the sand source area and the local climate through turning it into cultivated land and then oases. Combined regulation of the three reservoirs, including Changma, Shuangta and Chijinxia reservoirs, can ensure annual ecological water delivery of a total amount of 220 million m³ to the Ganhaizi natural reserve in Yumen City, Qioazi ecological reserve in Guazhou County, the national ecological reserve West Lake in Dunhuang City and the wind-break and sand dune fixing tree belts in the irrigation areas, so as to restore the natural ecosystems at the downstream, including the large area of popular diversifolia trees, effectively protect the eco-environment in the river basin and realize harmonious development of human and nature.

4 Major Factors Affecting Project Implementation

Constrained by the natural climate, project construction can only be possible from May to October in a year, even during such a short period, the construction has to stop for half a month on average due to windy and dusty weather, imposing great difficulties and heavy workload to the construction. As a result, quite a lot engineering projects could not be finished within one calendar year.

During construction of the Changma reservoir, collapse of the sediment discharge tunnel due to geological difficulties caused delay of construction of the auxiliary facilities (including the hydro-power station) and thus a one-year delay of water storage of the dam, though the main body of the reservoir was finished as scheduled. Consequently, there was a one-year delay for implementation of resettlement and other activities such as cropping, forestry and livestock raising, etc.

SARS occurred in China in 2003 covered a vast area and resulted in closure of transportation and impossibility for the construction teams to enter into the construction sites, and thus a one-year delay of project construction.

Due to change of national poverty reduction policies, poverty reduction funds could not be used to support construction of water engineering works and thus the counterpart funds originally committed to be sourced from the provincial poverty reduction office could not be made available, leaving a gap of counterpart funds of RMB600 million and causing incompletion of annual investment plans in the first years of project implementation. Through efforts made afterwards, the counterpart funding problem had been well solved, but it still held back in the early stage implementation of the PIP defined at project appraisal.

5 World Bank and Borrower Performance

5.1 World Bank Performance

The project team leaders and consultants of the World Bank had played an important role in the project preparation and implementation phases. Totally over 20 World Bank missions consisting of 113 members had come consecutively to inspect the Project implementation, providing in a proper and timely manner suggestions and recommendations that are objective and to the point to the project province. World Bank introduced into the project its scientific management theory, approaches and established an effective and integrated project management mechanism and corresponding procedures to facilitate strengthening control over project progress, construction
quality and investment by the project province. It also provided great assistance and guidance to ensure smooth project implementation, such as its coordination assistance in solving of problems relating to establishing river basin management institution, counterpart funding and environmental protection, etc, and its active efforts in supporting reform of irrigation water management system and participatory management by the WUAs (Water Users Associations). The World Bank project management team established a good example for the project province with its pragmatic, careful and precise working style and the practical, realistic working attitude aiming at constant improvement, which helped the province in the process of continuously upgrading project management towards a standardized level and thus ensured quality and benefits of the project implementation.

5.2 Performance by Gansu Provincial Government

Gansu provincial government paid great attention to the Project. It organized 14 times of provincial governor’s working conferences to discuss issues of project formulation, establishment of the river basin management institution, project organization and implementation, counterpart funding, resettlement arrangement, etc. and solve the problems encountered. Despite the very tight budget for construction purpose, the provincial Development and Reform Commission, Finance Bureau and Water Resources Bureau tried their best in raising funds to ensure timely allocation of counterpart funds and played an important role in ensuring smooth project completion.

5.3 Performance by the Shule River Project Construction and Management Bureau (Project Implementing Unit)

The Shule River Project Construction and Management Bureau (the Bureau) strictly followed the World Bank policies concerning dam safety, voluntary resettlement, involuntary resettlement, environment protection, ethnic groups and religion, land acquisition, cultural heritage protection, etc. In line with the World Bank procedures for project management and implementation, the Bureau conducted scientific and standardized project management and effective control over project investment, progress and quality, which had ensured the successful project implementation and full completion of tasks for all project components. The Bureau introduced advanced technologies and management skills at home and abroad into the project implementation process, consequently its management concept and project management level had been upgraded and a team of staff that is equipped with technical and managerial skills and familiar with the management procedures for World Bank project had been trained and developed. Because of its highly efficient and practical performance in the project implementation and management process, the Bureau was recognized as ‘Advanced Working Unit for World Bank Project Implementation in Gansu Province’ and ‘Work Unit with Advanced Civilization’ by the provincial government, and also ‘Working Unit with Advanced Civilization’ by the Ministry of Water Resources.
6 Lessons Learned

6.1 Major Positive Lessons

6.1.1 Sustainability of Irrigation District Development

6.1.1.1 Sustainability of Water Resources Management in the River Basin

The newly established Shule River Basin Water Resources Management Bureau and its functioning in formulating and implementing the long term plan for sustainable water resources utilization and water-saving society development provided institutional and systematized guarantee for unified planning, management, allocation, protection of water resources in the river basin, as well as effective and sustainable utilization of the water resources. In the three IDs, the management sections are now responsible for canals at the main and branch levels, while WUAs and their members take the management responsibility for the tertiary and quaternary canals, forming the integrated managerial model of ‘Water Supply Unit + WUA + Water Users’. By using information management in the river basin, sustainable water resources utilization has been realized to support sustainable economic, social and ecological development in the river basin.

6.1.1.2 Sustainability of Democratic Irrigation Management

Based on experience accumulated from the pilot WUAs, totally 87 WUAs had been established within the 3 irrigation districts of Yumen City and Guazhou County, covering 83 villages/village groups of 14 townships and 2 township level farms. Thus, democratic water management by the WUAs is implemented in the irrigation districts, with ‘Water Receipt System’ established to avoid irrelevant fees added into the water charge and reduce burdens to the farmers. The sound water charge collection and management system is effective in motivating the farmers to participate in irrigation management and construction activities and helpful in realizing democratic and standardized irrigation management. Meanwhile, as a systematized measure, 0.004 yuan/m³ out of the water charge collected had been designated for purpose of operation, management and maintenance funding of WUAs to ensure sustainability of democratic irrigation management.

6.1.1.3 Sustainability in Resettlement Arrangement

Voluntary resettlement in the project was based on experience from the major resettlement program (or the so-called ‘Liangxi Resettlement Program’) implemented in the province and obtained concern and policy support from the governments at all levels, as well as cooperation by relevant departments and industries. As a result, high standard and complete public service facilities had been set up in the resettlement areas, including school, hospitals, village committee offices, water and electricity supply facilities, roads and tree belts in the farming areas, etc. The national government provided through transfer payment or other channels the development funds to support social development in the resettlement communities. The resettlement areas had been handed over to the local governments for jurisdictional management, in order for their reliable economic and social development in the locality. With good performance in solving the issues and problems concerning production, living and development of the relocatees, the resettlement component under the Project had created successful experience for poverty reduction in Gansu province and is thus of great significance in providing guidance and useful reference to similar resettlement programs in China.
6.1.4 Sustainability of Water Resources Regulation Information Management System

Under the Project, an information management system for water resources regulation was established with an investment of over RMB30 million. Built on an optical cable of 309.6 km, 383 monitoring and measurement sites in the irrigation districts and 200 monitoring and control sites. The system consists of 6 sub-systems, namely integrated reservoir regulation, groundwater monitoring, flood prevention and simulation, gate monitoring and control, water measurement and office information management. Such a system can be used to undertake integrated and optimized regulation of water in the three reservoirs, rational allocation of both surface and underground water, prediction of flood, drought and water-logging disasters, monitoring on groundwater and the salinity dynamics, assessment of impacts of water engineering works on groundwater environment, etc, so as to provide references to support decision-making for sustainable water resources utilization and management, upgrade irrigation management and thus ensure full benefits of the Project.

6.1.5 Sustainability of Eco-environmental Protection and Construction

In accordance with water resources allocation plan for the river basin, water delivery of 220 million m³ had been conducted annually for uses by the ecological reserve areas at the downstream and windbreak and sand dune fixing trees. Large-scaled desert improvement and wind-breaking measures had been taken in the irrigation areas of resettlement locations, such as the ‘straw-grids’ measure covering an area of 466.67 ha in the Qidun township, a Hui nationality resettlement township located in Guazhou County and known by the local as ‘the World Storage of Winds ’, and with that measure, the local people realized the dream of building oases and settling down in the previously desert area. In the three IDs, totally 5,573 ha of windbreak tree belts were planted, forestry land reached 3,800 ha and grassland reached 666 ha, thus the forest and grass coverage rate reached more than 15% and a green shelter had been established. Additionally, an eco-environmental monitoring center was set up for the purposes of monitoring quality of water in Shule River, Shiyou River, Shuangta reservoir, Shijinxia reservoir, drinking water quality in the resettlement areas within the 3 IDs, quality of soil in the newly reclaimed land areas and the leached soil, and eco-environment recovery and improvement in the 11 move-out counties.

6.1.2 Agricultural Production Increase Realized through Salinity Improvement

Soil salinity improvement experiments under the Project first started at the Xiangyang resettlement area in Guazhou County, where there was a large reclaimed area with salinity problem featured by high salt content and great difficulty for improvement. Improvement measures such as leaching with open drainage canals, vertical leaching using flooding irrigation with great quantity of water and intermingle clay to drain salt through vertical holes were tested by the technicians and extended to the new IDs after having been proved to be successful. The technical specifications and operational manuals prepared and training course organized made it possible for over 10 thousand of farmer to master the biological and engineering measures in improving the saline land. Consequently, totally 10,000 ha of saline land reclaimed in the IDs had been successfully converted into stable and high yield land, with grain production increased by 40 million kg annually, cotton production increased by 2 million kg and the benefits generated totaling RMB66.9281 million. Successful improvement of the saline soil not only made the relocatees confident of salinity improvement in the project, provided them with the measures for improvement and laid the foundation for production and poverty shaking-off by the relocatees,
but also provided good reference and example for salinity improvement in Gansu province and even in the whole country.

6.2 Major Negative Lessons

Reviewing the project process, international and domestic awareness of environmental protection at the time of project appraisal time was not that adequate, especially for Gansu province, a province suffering water shortage problem, its emphasis of development was placed at that time on full water resources utilization to support irrigation development, so as to solve the poverty problem for its 200 thousand poor people. Along with social and economic development and project implementation, construction of water-saving society became the emphasis of development, with particular stress on eco-environmental protection and project sustainability. Based on such consideration, the World Bank and the Gansu province reached the agreement for adjusting water resources utilization in the river basin, thus water resources utilization ratio of the river basin was reduced to 64.5% from 91.6%, and, correspondingly, resettlement and land reclamation were downsized, while ecological water and forest coverage ratio were increased. The purpose of such adjustment is to allow for sustainable economic and social development in the river basin and to make the project implementation more realistic.

The major reason for counterpart fund allocation lagging behind the PIP is that, a total amount of RMB600 million of poverty reduction funds planned at project formulation stage as counterpart funds to the Project could not be made available to the project, due to changes of national poverty reduction policy afterwards. In the mid period of project implementation, the provincial government used the T-bonds to increase project investment and fill up the gaps of counterpart funding, so that the delayed several project components were completed as scheduled.
Annex 8. List of Supporting Documents

1. Staff appraisal Report on April 23, 1996
3. Implementation Completion Report and 9 sub-reports by Shule Project Management Bureau
5. Preparation Mission Aide Memoire in September 1994
6. Pre-Appraisal Mission Aide Memoire in May 1995
8. QAG’s Quality of Safeguards Supervision report 1999
9. QAG’s report: Quality of Supervision Assessment (QSA6) on 08/03/2004