



## 1. Project Data

### Project ID

P125496

### Project Name

CN- Integrated Modern Agr. Development

### Country

China

### Practice Area(Lead)

Agriculture and Food

### L/C/TF Number(s)

IBRD-83210

### Closing Date (Original)

31-Dec-2019

### Total Project Cost (USD)

200,000,000.00

### Bank Approval Date

27-Dec-2013

### Closing Date (Actual)

31-Dec-2020

### IBRD/IDA (USD)

### Grants (USD)

Original Commitment

200,000,000.00

0.00

Revised Commitment

200,000,000.00

0.00

Actual

200,000,000.00

0.00

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## 2. Project Objectives and Components

### a. Objectives

As per the Loan Agreement (LA, 2014) and the Project Appraisal Document (PAD, 2013), the objective of the China Integrated Modern Agriculture Development Project was ***“to develop sustainable and climate resilient agricultural production systems in selected areas of Gansu, Hunan, Jiangxi, and Liaoning Provinces, Xinjiang Uygur Autonomous Region and Chongqing Municipality”***.



For the purpose of assessing the extent to which the objective of this project was achieved in this Review, the PDO will be divided into two parts, and will be referred to in Section 4 as Objectives 1 and 2 as follows:

**Objective 1:** Develop climate-resilient agriculture production systems

**Objective 2:** Develop sustainable agriculture production systems

**b. Were the project objectives/key associated outcome targets revised during implementation?**

Yes

**Did the Board approve the revised objectives/key associated outcome targets?**

No

**c. Will a split evaluation be undertaken?**

No

**d. Components**

According to the ICR (paragraph 8), the project aimed to finance investments in 33 counties in Gansu, Hunan, Jiangxi, and Liaoning provinces; Xinjiang Uygur Autonomous Region; and Chongqing Municipality. Criteria used to select project areas were clustered arable land with adequate water resources but with infrastructure and technology gaps, areas that were vulnerable to climate shocks, had potential for agricultural modernization with demonstrative impacts, access to markets etc. To achieve the PDO, the project was structured under the following four components:

**Component 1: Irrigated Agriculture Infrastructure Improvement (Appraisal cost: \$202.68 million; Actual cost: US\$204.38 million).** This component aimed to improve irrigation and drainage systems for reliable and efficient management and delivery of water, including irrigated agriculture and water productivity through better water use efficiency, adoption of water-saving techniques and monitoring of water use. Activities financed included: (i) dredging and cleaning irrigation and drainage channels, canal lining and structures, pumping stations, irrigation wells, and small water storage systems; (ii) high-efficiency irrigation systems, such as sprinkler, micro, and drip irrigation systems; (iii) water monitoring, measurement, and management through construction/installation of water measurement structures, monitoring of the annual amount of groundwater pumped for irrigation in three northern provinces (Xinjiang, Gansu, and Liaoning), preparation and implementation of groundwater management plans for six counties in the northern provinces, and piloting crop evapotranspiration monitoring in three selected counties; and (iv) rehabilitation of farm access roads and on-farm rural power transmission lines.

**Component 2: Enhanced Climate-Smart Agricultural Practices (Appraisal cost: US\$66.04 million; Actual cost: US\$65.82 million).** World Bank defines Climate-Smart Agriculture as range of interventions - policies, practices and innovations - that aim to increase agricultural productivity, promote resilience and lower emissions. This component would complement investments in Component 1 on improved irrigation infrastructure and water delivery activities by improving productivity of irrigated agriculture with an aim to promote resilience and reduce farmers' vulnerability to adverse climatic events. Activities financed included: (a) soil conservation and land management practices such as land leveling, improved tillage practices, use of crop residues, improved soil fertility management, development of multi-purpose agro-ecological activities (e.g. shelterbelts, greenbelts, and windbreaks) and environmental monitoring; and (b) promotion of



climate-adaptation oriented agronomic techniques, including: (i) integrated pest management; (ii) green and non-polluting production systems; (iii) farm-based demonstrations and extension of improved varieties and technologies, and green/plastic houses; and (iv) applied research on technical or policy-related measures to adaptation for climate change in agriculture.

**Component 3: Institutional Strengthening and Capacity Building (Appraisal cost: US\$28.63 million; Actual cost: US\$20.75 million)** This component aimed to improve the capacity of farmers, farmer organizations, and institutions to promote sustainable and climate-resilient agriculture. Activities included: (i) training and study tours; (ii) awareness building, education, and communication on climate-smart agriculture; (iii) establishment and strengthening of Water Users Associations (WUAs) for improved Operations and Maintenance (O&M) of on-farm irrigation infrastructure and water management; (iv) support to farmer associations (FAs) and farmer cooperatives (FCs) for improved service delivery, access to markets, and farmer-based adaptation to climate change etc.; (iv) provision of technical assistance on water conservation, agronomy, horticulture, climate change, research and extension etc., through mobile expert teams and provision of equipment to farmers and farmer groups.

**Component 4: Project Management Support (Appraisal cost: US\$15.29 million; Actual cost: US\$14.76 million).** This component supported relevant agencies to manage, implement, supervise, and monitor project activities and progress. Activities financed included project surveys, design, and construction supervision, including project management functions such as the development of a Management Information System (MIS) and Monitoring and Evaluation (M&E) system.

**e. Comments on Project Cost, Financing, Borrower Contribution, and Dates**

**Project costs:** The project cost at approval was US\$313.14 million, and the actual project cost at completion was US\$315.82 million (101 percent of appraised estimate) (ICR, annex 3).

**Financing:** Per the Loan Agreement (Feb. 27, 2014), IBRD credit (Loan no. 8321) for US\$200.00 million contributed to financing the project.

**Borrower Contribution:** Borrower contribution during appraisal was estimated to be US\$113.14 million. At project closing, it amounted to US\$115.82 million.

**Dates:** The project was approved on December 27, 2013 and became effective on May 21, 2014. The Mid-term Review (MTR) was conducted on April 12, 2017. The original project closing date was December 31, 2019, which was extended, and the project was closed on December 31, 2020.

**Restructurings:** The project was restructured three times (December 05, 2017, May 21, 2019, and November 06, 2019). The details of the restructurings are as follows:

First Restructuring, December 2017: As per the Restructuring Paper (2017), the MTR mission (April 2017) found that the project had been able to achieve cost savings. The two key reasons identified were: (i) the competitive bidding process had resulted in cheaper-than-expected contracts for many investments (especially civil works); and (ii) depreciation of the RMB vis-à-vis the US dollar since the project became effective. When the project was prepared, part of the IBRD loan was reserved for physical contingencies and price contingencies—a total of USD 32.18 million. Due to the savings, on both procurement and the exchange rate, there were sufficient resources to ensure financing of all project activities, and therefore the



contingency funds could be allocated to finance project investments. Based on these findings, a level-2 restructuring was recommended. The following changes were made:

- An amount of US\$32.18 million contingency resources was allocated towards all three project components. Reallocations of resources across expenditure categories were also made, including modifying the disbursement percentages for civil works.
- The Results Framework was revised. The PDO-level outcome indicator on “Total farmland area served with improved irrigation and drainage services” was downgraded to an intermediate outcome indicator. As per the ICR (paragraph 24), this action was pursued because the information associated with this indicator was an input to the PDO outcome indicators on water and crop productivity. A new PDO-level indicator on “Share of high-standard farmland in selected areas where at least two new sustainable or climate-resilient practices or technologies promoted by the project have been adopted” was added to reflect the number of farmers adopting a set of climate resilient and sustainable agriculture approaches. A few indicator target values were modified to make them consistent with the reallocations of proceeds from the loan. On balance, the downgrading of an original PDO indicator to an intermediate indicator and the addition of a strong PDO indicator on climate-resilient practices meant the level of ambition for the project had been enhanced.

Second Restructuring, May 2019: The Government reorganization that began in early 2018 transferred the responsible agency for the project, State Office of Comprehensive Agriculture Development (SOCAD) from the Ministry of Finance (MOF) to Ministry of Agriculture and Rural Affairs (MARA) (ICR, paragraph 23). The government decided that the responsibility for implementation of the Project would remain with MOF, but under another MOF institution (Center of Budget Evaluation). This required an amendment of the Loan Agreement and the Disbursement Letter (DL) allowing the Center of Budget Evaluation (CBE) under the Ministry of Finance to be the new project implementing entity.

Third Restructuring, November 2019: According to the Restructuring Paper, due to the reorganization of the Chinese government, there were significant institutional and staffing changes at national, provincial, and county levels, including the transfer of the implementing agency referred to earlier. This led to a delay of about one year in project implementation and disbursement, though some planned project activities were continued to be implemented. To complete the implementation of critical activities and fully disburse the loan, the project’s closing date was extended.

Despite changes in the Results Framework and PDO indicator, including revision of target values for few indicators, this review did not find evidence that the project had reduced its level of ambition. In fact, as noted above, the revised targets made the objective more ambitious. Thus, this review will not use a split rating methodology. The revised PDO and intermediate indicators will be used against which to assess this project’s achievements under Section 4 of this review.

### 3. Relevance of Objectives

#### Rationale



**Country and Sector Context.** Since late 1970s, China's economy grew at an annual rate of about 10 percent and more than 500 million people have been lifted out of poverty. This has been a remarkable achievement of economic development and poverty reduction. During this period, though the country's share of the agriculture sector in total GDP declined (from 30% in 1980 to 10% in 2010), the sector's role remained critical for the country's rural economic growth, rural employment, and poverty reduction. At appraisal, more than 36 percent (279 million people) of the total labor force were employed in the agricultural sector which fed about 20% of the world population, with less than 11% of the world's agricultural land (PAD, paragraph 1). These successful outcomes were a result of key reforms implemented in the sector, along with investments in irrigation, and technologies for improved seed varieties and fertilizers. According to the PAD and ICR, during the last three decades until 2013, China's agricultural output grew at a rate of 4.6 percent per year, more than four times its population growth rate (PAD, paragraph 4; ICR, paragraph 1).

Despite these notable achievements, China is facing new development challenges related to climate change vulnerability, overexploitation of water resources and low water productivity, overuse of chemical inputs, and weak farmer organizations (ICR, paragraph 3). The country's average annual surface temperature rose by 1.2°C over the last 50 years, with greater impacts in provinces in the north and northeast. This has led to extreme climatic events, with longer droughts in the north and more severe floods affecting the southern part of the country (PAD, paragraph 6). Overexploitation of water resources has caused low water tables in the north, and water productivity has been low due to inefficiencies in the irrigation systems and weak capacity of the local institutions. On input use, China has one of the highest rates of fertilizer and pesticide use in the world which has resulted in soil fertility degradation, water pollution, and higher emissions of greenhouse gases (GHG), lower profits to farmers and increasing concerns about food safety (PAD, paragraph 6). Finally, institutions such as the Water User Associations (WUAs), Farmers Associations (FAs) and Farmers Cooperatives' (FCs) capacity continued to remain weak.

**Government Strategy.** At both appraisal and completion, the PDO remained in line with the Government of China's development priorities as articulated in the country's 12th Five Year Plan (2011-2015). According to the PAD (Paragraph 3), the Plan outlined China's commitment to reduce greenhouse gas emissions and improve adaptation to climate change. The document described China's plans to accelerate research, development, and application of low carbon technologies in several sectors including agriculture. At project closing, the PDO is found to be well aligned with China's priorities for the agriculture sector. The ICR (paragraph 28) stated that in February 2021, the Committee of the Communist Party of China and the State Council issued its annual policy guideline on agriculture and rural development, known as the "No. 1 Document" titled "Opinions on Comprehensively Promoting Rural Revitalization and Accelerating Agricultural and Rural Modernization". The document highlighted the following priority areas: (a) promoting green agriculture development; (b) developing modern agricultural and rural industries; (c) expanding the provision of rural infrastructure and public services; and (d) strengthening the governance of rural areas. Further, at the global level, China has committed to implementing Nationally Determined Contribution (NDC) under the Paris Agreement by adapting to climate change through interventions in agriculture, forestry, and water resources.

**Bank Strategy.** The project development objective is well-aligned with the Bank Group strategy in China. At appraisal, the project was in line with the Bank's Country Partnership Strategy for China (2013-2016) to support greener growth by promoting sustainable agricultural practices (i.e., improving water and farm productivity, research, and demonstration of climate-resilient agricultural production etc.) (CPS, 2013). During project implementation, and at closing, the PDO remained relevant and would support the pillar on promoting greener growth under the Bank's current Country Partnership Framework (2020-25).



The project contributes towards meeting the following objectives of the CPF: (i) demonstrate sustainable agriculture practices and improve food system quality and safety; (ii) decrease air, soil, water, and marine plastics pollution; and (iii) strengthen sustainable natural resource management.

In summary, the project's objectives were highly aligned with both the Government and World Bank strategies and appropriately pitched given the challenges facing the sustainable growth of the agricultural sector. The project's design addressed key development challenges faced by the sector related to climate change and implemented relevant sustainable and climate-resilient activities which were then mainstreamed in Government policies and programs. This project was a first effort to finance investments in climate-smart agriculture on a large scale covering six provinces, with appropriate indicators and targets, along with clear implementation structures led by a competent agency. The Relevance of this project's objective to Government and World Bank strategies and the agricultural development challenges in China is therefore rated High.

## **Rating**

High

## **4. Achievement of Objectives (Efficacy)**

### **OBJECTIVE 1**

#### **Objective**

To develop climate-resilient agriculture production systems.

#### **Rationale**

Theory of Change. Figure 1 in the ICR provided a retrospective Theory of Change (ToC) for the project. As per the ToC, the PDO would be achieved by carrying out soil conservation and improved land management practices (e.g., land leveling, improved tillage practices, soil fertility management through soil testing, precise or formula fertilizer application, organic fertilizer application, and soil fertility monitoring, shelterbelts, greenbelts, and windbreaks etc.), and by adopting climate smart techniques (integrated pest management, green and non-polluting production systems). Capacity building of farmers' organizations such as WUAs, FAs, and FCs would be strengthened through technical assistance provided by Mobile Expert Teams, training, study tours and information dissemination on climate-resilient agriculture. These project interventions would improve climate smart agriculture practices of farmers, along with the capacity of the local institutions (WUAs, FAs, FCs) strengthened which would lead to adoption of new climate-resilient practices or technologies by the farmers.

The achievement of this PDO was underpinned by the following assumptions: (i) successful demonstrations and uptake by farmers; (ii) good training programs and trainers are provided. The stated assumptions were logical, but it would have been useful had the assumption on training been better articulated. It is noted that the original PDO outcome indicator "Total farmland served with improved irrigation and drainage services",





which was downgraded to an intermediate outcome indicator remained in Figure 1 and not replaced by the revised indicator “Share of high-standard farmland in selected areas where at least two new sustainable or climate-resilient practices or technologies promoted by the project have been adopted”.

### **Outputs**

The following outputs were achieved to develop climate-resilient agriculture production systems (ICR, page 35). At project end, all indicators were fully achieved.

- Land area leveled and soil physical conditions improved (Target:38,777; Actual: 53,443 ha)
- Area adopting balanced fertilization (including crop residues returns, organic fertilizer) (Target: 65,369; Actual: 87,346 ha)
- Area under integrated pest management or green or non-polluting production (Target: 67,253; Actual: 98,186 ha)
- Area under shelter and agroforest plantation (Target: 2,218; Actual: 2,522 ha)

The ICR (paragraph 68) noted that at the three stages of project implementation: baseline at the start of the project, follow-up prior to the mid-term, and at project closing, an impact assessment by an accredited third-party monitoring agency was conducted in all six provinces. The ICR did not provide details about the impact assessment but upon request, the project team shared with IEG a consolidated M&E report prepared by the Government. According to the M&E report, as part of the impact assessment, representative surveys were conducted of beneficiaries in each project county and simultaneously surveys were undertaken in a non-project adjacent area as comparison group with similar household characteristics. In addition, the ICR (Annex 7) provided excerpts from a Case Study conducted in one village (Niuwanggong Village, Laoqitai Town, Qitai County). According to the case study, due to the changes in modern fertilization method promoted by the project that mainly used flushing with the help of pressurized drip irrigation, farmers were able to save 8 to 10 kg per mu (unit of land measurement in China) of chemical fertilizer and cost per mu decreased by 21 Yuan.

### **Outcome**

The following PDO indicator was monitored, which was achieved:

- Share of high-standard farmland in selected areas where at least two new climate-resilient practices or technologies promoted by the project have been adopted (Target: 70 percent; Actual 73.3 percent)

In summary, the project met its output targets and PDO indicator, and the evidence provided in the ICR was judged to be credible. Thus, the efficacy with which Objective 1 was achieved is rated as Substantial.

**Rating**  
Substantial

## **OBJECTIVE 2**

### **Objective**

To develop sustainable agriculture production systems.



## **Rationale**

**Theory of Change.** To meet this objective, the ICR (Paragraph 39) stated that the project interventions included improvements in irrigation and drainage infrastructure by dredging and cleaning, canal lining to increase water conveyance efficiency, irrigation scheduling, building water storage systems and by introducing drought resistance crop varieties. Further, high-efficiency irrigation systems such as low-pressure pipeline water delivery systems, sprinklers, and micro and drip irrigation systems would be developed as per the demand of farmers based on their land and soil conditions, and investment and operations cost. The project constructed and installed water measurement structures and facilities for improved irrigation and drainage systems, including for groundwater monitoring. As per the ToC, these project interventions along with technical assistance and training to local institutions' (WUAs, FCs, FAs) for better O&M of on-farm irrigation infrastructure and improved water management for climate-change resilience would lead to improved irrigation infrastructure that would contribute towards meeting the PDO outcome indicator on increased water and agriculture productivity.

The ToC outlined the following key assumptions that underpinned the achievement of the PDO: (i) sufficient funds for infrastructure and O&M cost; and (ii) good training program and trainers provided.

## **Outputs**

The project completed the following outputs in achieving the objective of promoting sustainable agriculture production systems. Almost all targets were met.

- Overall irrigation water use efficiency (percentage) - LN Province (Target: 70; Actual: 70); GS Province (Target: 58; Actual: 61); XJ Province (Target: 64; Actual: 65.6); JX Province (Target: 66; Actual: 67); HN Province (Target: 65; Actual: 66); CHQ Municipality (Target: 56; Actual: 57). The indicator of "overall irrigation water use efficiency" was achieved through improvements in irrigation and drainage infrastructure, including high-efficiency irrigation systems such as drip, sprinkler irrigation systems.
- Volume of groundwater extracted Unit Meter (m3) – LN Province (Target: 5,380; Actual: 5,321); GS Province (Target: 2,636; Actual: 1,053); and XJ (Target: 4,178; Achieved: 4,045). Groundwater management plans were prepared and implemented for six counties in these northern provinces. Crop evapotranspiration pilots were also monitored in three selected counties.
- Area provided with new/improved irrigation or drainage services (Ha): Target: 98,031; Achieved: 102,497
- Farm roads constructed and rehabilitated (Km): Target: 2,594; Actual: 2,855

Additionally, the project implemented the following activities aimed at capacity building and institutional strengthening which were mostly achieved:

- Improved irrigated areas devolved to WUA for Village Committee and O&M (Target: 56,187; Actual: 59,682)
- Number of WUAs, Farmer Associations (FAs) and Farmer Cooperatives (FC) established (Target: 390; Actual: 390)
- Number of WUAs supported and delivered services to members (Target: 145; Actual: 156)
- Number of FAs supported and delivered services to members (Target: 25; Actual: 26)
- Number of FCs supported and delivered services to members (Target: 208; Actual: 195)





- Number of farmers (disaggregated by gender) who are members of farmer organizations (FAs/FCs/WUAs) (Target: 52,772; Achieved: 57,210)
- Number of farmers trained by the project disaggregated by gender and ethnic minority (Target: 12,879; Actual: 18,523)

### **Outcome**

At project closing, outcomes for both Water Productivity and Agriculture Productivity were achieved. Water productivity as well as agriculture productivity were measured for different crops across the regions. The results were as follows (ICR, paragraph 37 and 38):

#### **Water Productivity (kg per m3)**

- Maize: LN Province (Target: 1.90; Actual: 1.91); GS Province (Target: 1.56; Actual: 1.58)
- Wheat: XJ Uygur Autonomous Region (Target: 1.56; Actual: 1.59)
- Rice: JX Province (Target: 1.33; Actual: 1.33; HN Province (Target: 1.30; Actual: 1.36); and CHQ Municipality (Target: 1.27; Actual: 1.29).

#### **Agriculture productivity (kg per ha):**

- Maize: LN Province (Target: 9,591; Actual: 9,608); GS Province (Target: 8324; Actual: 9,854) ha).
- Wheat: XJ Uygur Autonomous Region (Target: 5,899; Actual: 6,085)
- Rice: JX Province (Target: 6,558; Actual: 6,560); HN Province (Target: 6,505; Actual: 8,475); CHQ Municipality (Target: 7,530; Actual: 8,329)

The ICR (Annex 7) reported additional results based on Case Studies conducted in project areas:

- High-efficiency irrigation systems that integrated water and fertilizer led to increased wheat yield from 300–350 kg per mu to more than 600 kg per mu and the average irrigation water consumption per mu decreased from 600 m3 to 300 m3. The input cost per mu decreased by 33.78 yuan and the net income of farmers increased by about 400 yuan per mu. Similar benefits were found with other crops (maize, melon, gourd) (Niuwanggong Village, Laoqitai Town, Qitai County)
- With the installation of PE pipe efficient water-saving irrigation system, time to irrigate far-away fields in the village reduced from “3-5 days to within a few minutes”. Irrigation cost was saved through annual water cost per mu reduced by 50,000 yuan annually (Nantai Township, Jinxian County, Jiangxi Province)

The evidence on achievements provided by the ICR on outputs and outcome indicators demonstrate that the project was successful in achieving Objective 2 to develop sustainable agriculture production systems. Thus, the efficacy with which Objective 2 was achieved is rated as Substantial.

**Rating**  
Substantial



## OVERALL EFFICACY

### Rationale

The project was successful in increasing the share of farmland in project areas to adopt at least two new sustainable or climate-resilient practices or technologies (PDO indicator #1) by 73.3 percent as compared to 70 percent (Target exceeded by 105 percent). The project also increased water productivity (PDO indicator #2) and agriculture productivity (PDO indicator #3). By project completion, water productivity increased in the range of 15 percent to 27 percent against targets set in all the provinces while agriculture productivity increased between 12 percent to 44 percent (ICR, paragraph 37 and 38). Finally, most intermediate outcome indicators were met or exceeded. This review therefore concludes that the overall efficacy with which the project's objectives were achieved was Substantial.

### Overall Efficacy Rating

Substantial

## 5. Efficiency

### *Ex Ante*

At appraisal (PAD, paragraph 55), an economic and financial analysis was conducted based on crop models representing major crops for each of the counties covered by the project which were aggregated at provincial levels. The benefits quantified in the model included: (i) increase in yields between the “with” and “without” project interventions; (ii) an increase in the multiple cropping index for the southern provinces of Jiangxi, Hunan, and Chongqing municipality; and (iii) shift in the project area away from wheat and maize in favor of higher value crops (fruits and vegetables) in the northern provinces of Gansu and Liaoning, and Xinjiang Uygur Autonomous Region. Based on the model, the Economic Rate of Return (ERR) was estimated at 18.6 percent for the project. Among the provinces covered by the project, the ERR varied from 15.5 percent to 23.3 percent. The financial rate of return (FRR) for the project was estimated at 16.7 percent and ranged from 13.4 percent to 20.6 percent between provinces. The PAD stated that the project did not quantify other benefits such as those that would result from reduced water losses or environmental benefits from less use of fertilizer and pesticides. In this respect, the analysis had underestimated additional likely benefits of the project.

### *Ex Post*

At project closing, the ICR (Annex 4) stated that a standard cost-benefit analysis was conducted to re-assess the economic and financial viability of the project based on the same methodology used in appraisal. The EFA analysis used actual project costs, which included both physical infrastructure and institutional strengthening activities. Future projections were based on the performance of current operations.

According to the ICR (Annex 4, paragraph 4), like appraisal, the EFA was also based on the analysis of quantifiable benefits generated by the project that included (i) an increase in yield between the “with” and “without” scenarios; (ii) an increase in cropping intensity for the southern provinces of Jiangxi, Hunan, and Chongqing; and (iii) a partial shift in area away from wheat and maize in favor of higher value crops (fruits and



vegetables) in the northern provinces of Xinjiang, Gansu, and Liaoning. One additional parameter included in the model was the financial benefits from decreased use of agricultural inputs (fertilizer, pesticides) due to land leveling, improved tillage practices, use of crop residues and mulching, soil testing, and precise/formula fertilizer application etc. The project achieved these results based on investments in physical infrastructure that improved water delivery, conveyance, and water use efficiency of irrigation and drainage systems in the project areas. Climate-smart agricultural practices implemented by the project such as balanced fertilization, improved tillage practices, organic fertilizer use, and biological pest control decreased the use of chemical fertilizers and pesticides. The crops selected for each of the provinces, yield increases for the crop types, and decrease in fertilizer/pesticide use are presented in paragraph 5, 6 and 7 of Annex 4. Benefits of reduced fertilizer use that had environmental/health impacts and improved service delivery due to institutional strengthening that was not quantified and was not included in the analysis.

The analysis used a discount rate of 6 percent, which as per the project team's communication with IEG is in line with the discount rate recommended by China's National Development Commission. The time used for future projection of the project was 15 years. Based on the analysis, the project's ERR was estimated at 20 percent (compared to 18.6 percent in appraisal). The ERR for the provinces ranged from 17 percent to 25 percent. The financial rate of return (FRR) was found to be 18 percent and ranged between 15 percent to 22 percent among the project provinces.

**Administrative and Institutional Efficiency:** The project was implemented over a 7- year period and included three restructurings. For most part of project duration, implementation went smoothly, including on financial management and procurement matters. However, in 2019, the Government reorganization, institutional and staffing changes at the national, provincial, and county levels led to a delay of about one year in project implementation which resulted in the extension of the project's closing date by one year. Even with the longer than planned implementation period and monitoring of multiple activities across 33 counties in 6 provinces, the actual administrative cost for the project of 5 percent (US\$14.76 million out of total project costs of US\$315.82 million) was reasonable.

In summary, despite the implementation delays the project faced towards the end, the ERR of 20 percent and FRR of 18 percent is comparable to the rate estimated at appraisal (18.6 percent and 18 percent respectively) and justify a rating of Substantial for Efficiency.

## Efficiency Rating

Substantial

a. If available, enter the Economic Rate of Return (ERR) and/or Financial Rate of Return (FRR) at appraisal and the re-estimated value at evaluation:

	Rate Available?	Point value (%)	*Coverage/Scope (%)
Appraisal	✓	18.60	0 <input type="checkbox"/> Not Applicable
ICR Estimate	✓	20.00	0 <input type="checkbox"/> Not Applicable



\* Refers to percent of total project cost for which ERR/FRR was calculated.

## 6. Outcome

The project's objectives were highly aligned with both the Government and World Bank strategies, and therefore the Relevance of Objectives in this project was rated high. The overall Efficacy of the project was rated Substantial. The project met or exceeded targets for most of its intermediate indicators, and the outcome to develop sustainable and climate-resilient agricultural production systems was achieved based on the achievement of its PDO indicators. Efficiency was rated Substantial with an attractive ex-post ERR and FRR. This review concludes that this project achieved its objectives with minor shortcomings and therefore its overall outcome is rated "Satisfactory".

### a. Outcome Rating

Satisfactory

## 7. Risk to Development Outcome

The ICR identifies three key risks to development outcomes in the following areas: Technical, Financial and Government ownership/commitment.

- On technical risks related to investments made by the project to improve the assets of irrigation infrastructure, the project was successful in transferring their responsibility to WUAs for periodic operations and maintenance financed by farmers' contributions of cash and/or kind. This practice has been successful in similar irrigation projects in the country and therefore poses minimal technical or sustainability risks.
- Regarding financial risks, project investments led to higher crop yields with increased land and water productivity, thereby increased the profitability from crop production. The ICR foresees profitability to be a key factor in incentivizing farmers to continue engaging in sustainable agriculture and irrigation practices promoted by the project.
- Finally, the ICR pointed out to strong commitment and ownership from the Government to sustain outcomes from the project. There is evidence that project interventions related to sustainable agriculture practices (i.e., land leveling, improved tillage practices, soil fertility management, promotion of integrated pest management, green and non-polluting production systems etc.) have been mainstreamed into several Government's policies such as Guidelines on the Development of Green and Low-Carbon Economic Systems, Guidelines on the Construction for High-Standard Farmland for Food Security, and the Technical Guidance and Management for High-Standard Farmland Construction. (ICR, paragraph 89)

## 8. Assessment of Bank Performance

### a. Quality-at-Entry



According to the ICR (paragraph 57), the Integrated Modern Agriculture Development (IMAD) Project was the first effort to implement climate-smart agriculture (CSA) on a large scale in China, covering six provinces across the country from south to north in various agro-climatic zones. The project design benefited from extensive consultations with various technical line departments in each province (weather, water, agriculture, and forestry), research institutes and local farmers, to identify and design project interventions (PAD, paragraph 50). It also learned lessons from a GEF project on Mainstreaming Climate Change (CC) in irrigated agriculture which was under implementation during project preparation.

During project preparation, a comprehensive analysis of risks was undertaken, and an Operational Risk Assessment Framework was prepared (PAD, Annex 4). Mitigation measures were well defined and appropriate. Most of the risks were of the low to moderate nature, except for external risk identified which was associated with climate change uncertainty due to multiple projection models. As per the PAD, the country had adequate knowledge on the direction of the change though there was still uncertainty about its magnitude in relation to future water availability and demand, droughts, floods etc. In terms of mitigation measures, the project would continue to learn from the latest research and application of climate smart techniques in agriculture based on work done by the Chinese Academy of Agricultural Sciences as well as other applied research institutes on Climate Change adaptation in agriculture and water resources sectors in various provinces.

The project was well aligned with Government priorities. The project selected appropriate implementing agency (SOCAD) which had extensive experience implementing Bank projects covering wide geographic areas and project interventions at provincial and county levels. Further, the project M&E was found to be well designed and had minor revisions related to classification of outcome and intermediate outcome indicators (ICR, paragraph 59).

Based on the above assessment, Quality at Entry is rated Satisfactory.

### **Quality-at-Entry Rating** Satisfactory

#### **b. Quality of supervision**

During implementation, the project was closely supervised by the World Bank with a total of 15 missions (including virtual ones during the COVID-19 pandemic). The Bank team consisted of senior staff and consultants with strong technical background in irrigation infrastructure, climate-smart agriculture, and institutional capacity building. According to the ICR (Paragraph 86), the missions were candid and timely in reporting progress, highlighting issues, and proposing practical follow-up actions in the form of mission Aide Memoires, Management Letters, and Implementation Status and Results Reports. Over the project period, there were three task team leaders (TTLs) but their transition was found to be managed well with no negative impact on project implementation.

The first restructuring approved in December 2017 based on the recommendation of the MTR was found to be timely and relevant considering the changing operational environment and implementation issues that the project had confronted then. Cost savings were identified, and contingencies were allocated and reallocated amongst the project components. Towards the end of the project, because of Government reorganization, the project faced implementation delays. However, with the strong collaboration between



the Bank and the National Project Management Office, project activities continued to be implemented, and the Bank loan was fully disbursed by the end of the restructured project closing date. All along, the World Bank team provided adequate technical and implementation support, which was recognized in the ICR prepared by the client.

Overall, the Bank's performance is rated Satisfactory. This rating agrees with the ICR on its assessment of the Bank's Quality at Entry and Quality of Supervision to be Satisfactory.

### **Quality of Supervision Rating**

Satisfactory

### **Overall Bank Performance Rating**

Satisfactory

## **9. M&E Design, Implementation, & Utilization**

### **a. M&E Design**

At project appraisal, a Theory of Change (ToC) was not required, which was developed for the ICR (Figure 1). The original Results Framework included four PDO outcome and fourteen intermediate outcome indicators. Two of the four indicators (Increase in water productivity for major crops in project areas by province (kg per m<sup>3</sup>), Increase in agricultural productivity of indicator crops in project areas by province (kg per ha) were outcome oriented and were retained during implementation. Meanwhile, the other two PDO indicators [Total farmland area served with improved irrigation and drainage services (ha), Number of farmers who are members of organizations such as WUAs, farmers' associations (FAs), and farmers' cooperatives (FCs)], were output oriented and were therefore downgraded to intermediate indicators during the project's first restructuring. Overall, the results framework was sound, targets set were measurable with appropriate ambition levels.

The project's M&E was well designed, with roles and responsibilities on M&E clearly defined during appraisal for each of the implementing agencies at the county, provincial and national level. As per the PAD (paragraph 38), an MIS system would be set up to track both physical and financial progress.

### **b. M&E Implementation**

Implementation of M&E went smoothly during the project period. As planned during project preparation, M&E data were collected and analyzed, and reports were prepared on time by County Project Management Offices (CPMOs) and Provincial Project Management Offices (PPMOs). The MIS system was also effective in tracking physical and financial progress based on data from all project counties. Most of the data collected were consistent, except for some inconsistencies that were identified for a few intermediate indicators that were included in the World Bank's Restructuring Paper, the client's MIS records, and the 2018 and 2019 World Bank Implementation Status and Results Reports. According to the ICR (paragraph 71), these inconsistencies were corrected in the ICR.





Based on M&E design, each of the participating provinces hired external agencies to conduct baselines, impact assessments prior to mid-term, and at project closing. Details of these impact assessments were not provided in the ICR, but an M&E report prepared by the Government was shared with IEG by the project team. Social and environmental safeguards compliances were also monitored through external agencies, which were instrumental in conducting on-site monitoring during the COVID-19 outbreak. As per the ICR (paragraph 69), local agencies such as the Water Resources and Agricultural Bureaus participated in monitoring the project's implementation progress and quality of work as required by government regulations.

### **c. M&E Utilization**

During project implementation, timely available project M&E data were used to monitor progress on project activities. As per the ICR (paragraph 72), the data were helpful in identifying implementation bottlenecks as well as in determining reallocations of resources between the various components, an action which was taken during the project's first restructuring. Case studies were prepared to assess the effectiveness of project interventions and its contribution towards meeting the project's development objective. The ICR also stated that information collected via M&E were useful in identifying best practices that were shared between provinces by organizing workshops.

In summary, M&E is rated as Substantial. The project's M&E design was sound, and the project's MIS operated well at all levels of implementation. Under the Results Framework, targets set were achievable. Considering that this was a first project to nationally scale up investments in climate smart agriculture, the M&E could have benefited from deeper analytical studies which assessed types of climate-resilient practices and technologies that have greater impacts on outcomes. Accordingly, such findings could have been utilized for the project and for scaling up of such activities in other projects.

### **M&E Quality Rating**

Substantial

## **10. Other Issues**

### **a. Safeguards**

Social Safeguards: According to the PAD (paragraph 70), Social Assessment (SA) was conducted to facilitate free, prior, and informed consultations among the ethnic minority communities. The project activities in Xinjiang Uygur Autonomous Region and Liaoning Province would impact ethnic minorities (such as Yanqi, Bohu and Fukang counties in Xinjiang, Lingyuan and Zhangwu counties in Liaoning). The ethnic minorities were mostly Uygur, Kazak and Mongol, who were recognized within the definition of Indigenous Peoples (IP) (OP4.10). At the start of the project, an Ethnic Minority Development Plan (EMDP) was prepared based on consultations with ethnic minority groups in project areas, which was disclosed locally and on the World Bank website. As per the ICR (paragraph 78), third-party teams were commissioned by the client to monitor implementation of the EMDP. According to the third-party report, EMDP implementation was satisfactory and about 99 percent of the ethnic minorities surveyed were satisfied with the project's



activities (ICR, paragraph 79). As stated by the ICR (paragraph 79), “although not quantifiable through the project’s results framework or other mechanisms (such as beneficiary surveys), third party monitoring teams concluded that the project had generated positive impacts on their livelihoods, such as the provision of modern agricultural technologies and facilities for income generation and local community development initiatives”.

Under the project, all activities on infrastructure improvements were designed to rehabilitate existing facilities which did not require acquisition of additional land. Nonetheless, a Resettlement Action Plan (RAP) was prepared by each of the six project provinces, for any circumstances during project implementation that may extend infrastructure to areas outside the villages, in which case the World Bank Policy (OP/BP 4.12) on Involuntary Resettlement would be triggered.

## **b. Fiduciary Compliance**

Financial Management: At project appraisal, a financial management capacity assessment was conducted and actions to strengthen the project’s financial management capacity were agreed with the relevant implementing units (PAD, paragraph 64). During project implementation, the ICR stated that a sound financial management system was maintained, and the MIS system functioned as an effective tool for monitoring project implementation, including financial management. However, due to the 2018 reorganization of Government, institutional arrangements were changed. The National Project Management Office’s (NPMO) function was transferred to the Center of Budget Evaluation (CBE) which negatively affected financial management, particularly project disbursement for a short period (ICR, paragraph 82). No significant financial management issues were noted throughout implementation and all project audit reports were received with unqualified audit opinions.

Procurement: Procurement functions under the project were to be carried out by the NPMO, PPMOs and CPMOs. During project preparation, a capacity assessment of the different PMOs were conducted to assess their experience in implementing projects, staff skills, quality, and adequacy of supporting and control systems, and the legal and regulatory aspects (PAD, paragraph 65). The NPMO and most of the PPMOs had prior experience with Bank-financed projects. During project implementation, when the NPMO was transferred to CBE, the Bank’s fiduciary team carried out another capacity assessment and found the new implementing agency to be capable of managing the project (Restructuring Paper, 2019).

The project activities were guided by a procurement manual and there were no major procurement issues reported during project implementation. As per the ICR (paragraph 83), the World Bank team provided procurement-related implementation support and hands-on training to staff to ensure compliance with World Bank procurement policies and procedures.

## **c. Unintended impacts (Positive or Negative)**

None



d. Other

None

## 11. Ratings

Ratings	ICR	IEG	Reason for Disagreements/Comment
Outcome	Satisfactory	Satisfactory	
Bank Performance	Satisfactory	Satisfactory	
Quality of M&E	Substantial	Substantial	
Quality of ICR	---	Substantial	

## 12. Lessons

The ICR listed five lessons. The following two are highlighted that have broader applicability:

1. **A framework such as Climate Smart Agriculture provides a conducive structure for addressing integrated challenges of climate change, food security and capacity building of farmers' skills.** The package of interventions that focused on investments in irrigation infrastructure, combined with dissemination of knowledge and institutional development of farmer organizations (WUAs, FCs, FAs) was critical to yield the results that the project achieved. According to the PAD (paragraph 28), projects that focused on one dimension (e.g., infrastructure) may be easier to implement, but often do not lead to impacts such as improving farmer incomes without additional investments in on-farm technologies, and institutional support. Due to the integrated "Climate Smart" model, as stated by the ICR (paragraph 89), the project was influential in mainstreaming the integrated approach into national government policies and investment programs.
2. **Investments in institutional development of key stakeholders, particularly farmer organizations (WUAs, FCs FAs) are essential for the adoption and sustainability of technological change in agriculture.** One of this project's key components focused on institutional strengthening and capacity building of farmers through trainings, awareness building, education, and technical assistance on climate-smart agriculture, and in establishment of WUAs for improved O&M of on-farm irrigation infrastructure. As illustrated by the case studies (Annex 7), participation and ownership of farmer organizations in project interventions were critical in the uptake and adoption of new technologies and climate-resilient practices promoted by the project.

## 13. Assessment Recommended?



No

#### **14. Comments on Quality of ICR**

The outcomes reported in the ICR were found to be credible and were based on the project's M&E as well as third-party impact assessments conducted at various stages of the project. Useful case studies that demonstrated the impact of the project were also utilized (Annex 7).

The ICR summarized well the various activities implemented by the project, and linked evidence to outcomes though a more comprehensive discussion of the evidence would have been helpful.

The lessons learned included in the ICR were based on project experience. Considering that the project was the first to implement climate-smart agriculture (CSA) on a large scale in China, this section of the document could have benefited from further analysis of the evidence based on lessons.

The various sections of the document were consistent, and the narrative was candid. The structure of the document followed OPCS guidelines.

Overall, the Quality of the ICR is rated Substantial since shortcomings were minor.

##### **a. Quality of ICR Rating** Substantial