I. Introduction and Context

A. Country Context

Since it embarked on a series of economic reforms starting in 1978, China has gradually shifted from a centrally-planned to a market-led economy. During this period, the economy has grown at a remarkable annual rate of about 10 percent and more than 500 million people have been lifted out of poverty. But to sustain this rapid pace of development, China still has to address a number of challenges, including (a) maintaining high growth rates in the face of a complex external environment still reeling from the global economic crisis, (b) managing the resource demands and the environmental consequences of rapid growth; and (c) reducing high inequalities in incomes and opportunities.

With rapid industrialization and increased urbanization, the share of the agriculture sector in total GDP declined from 30% in 1980 to 10% in 2010. However the role of the agricultural sector remains essential to the country’s overall economic growth, rural employment, and poverty reduction. More than 36 percent (279 million people) of the total labor force is employed in the agricultural sector which feeds 1.3 billion people or 20% of the world population, with less than 11% of the world agricultural land. Maintaining sustainable food self-sufficiency, raising
farmers’ incomes, and constructing the “New Socialist Country side” are top priorities on the government’s development agenda, as articulated in the 12th Five Year Plan (FYP 2011-2015).

The FYP also outlines China’s commitment to reduce greenhouse gas emissions, and “actively cope with” and “increase adaptability to” climate change. It describes China’s plans to accelerate research, development, and application of low carbon technologies in a number of sectors including agriculture. It calls for improving the levels of adaptation to climate change of certain key sectors “such as agriculture, forestry and water resources “, and for enhancing the monitoring, reporting, and prevention of extreme climatic events.

B. Sectoral and Institutional Context

China’s rapid agricultural productivity growth has been widely credited with initiating industrialization, inducing rapid reduction in poverty, and improving food security. Effective institutional reforms, especially the rural household contract responsibility system for farm land, coupled with market liberalization and rapid technological adoption has helped promote a dramatic expansion in agricultural output. China’s agricultural output grew at the rate of 4.6 percent per annum over the last three decades, more than four times its population growth rate. Grain crops are the most important in terms of area harvested (50% of total cultivated area), and value of output (40% of total value of agriculture output). Grain production increased from 325 mmt to 547 mmt over the last thirty years. The total land allocated to grains however declined from 117 million ha to 109 million ha, indicating that the increase in production was driven by productivity gains.

Investment in irrigation, coupled with land saving technological change (improved seed varieties and fertilizers), and aided by market reforms played a key role in generating output growth. Total irrigated area increased from about 45 million ha in 1978 to nearly 60 million ha in 2009, now covering approximately half of the total cultivated area. Irrigation expansion also enabled a significant increase in the production of cotton, oilseeds, fruits and vegetables, and forage crops. Cotton production more than doubled and oil crops production tripled over the past three decades. As the economy grew and incomes rose, the demand for more quantity and quality, greater variety, higher value, and safer food has been going up. Meeting this rising demand for a more diversified and grain intensive diet will continue to be a priority for Chinese policy makers. Maintaining food availability, however, will have to be balanced with addressing environmental and resources sustainability, limited land and water resources, and increased climatic variability.

Despite past success, the Chinese agricultural sector is facing renewed development challenges today. These include.

Vulnerability to Climate Change. The effects of a changing and variable climate are already visible and are expected to accelerate in the future. Average annual surface temperature increased by 1.2°C over the last 50 years, and the increase was much faster in the north and northeastern provinces. Regional variations in precipitation have become more pronounced, with average precipitation levels dropping in the north, northeast, and northwest parts of the country while increasing in the south and southeast. Though overall average precipitation may increase, there is a growing concern that in some regions, rain is no longer available or is reduced at the
critical stages of crop development. Extreme climatic events are also becoming more severe, with longer droughts occurring in the north and more severe floods affecting the southern part of the country.

Agriculture and water resources are particularly vulnerable to the changing climate. Annual crop losses due to drought in the Northeast, for example, are projected to rise 50 percent by 2030, reaching RMB 11.5 billion or about 12 percent of total agricultural output for the region\(^1\). Coping with the significant variability of future climatic impacts may require geographic shifts in agricultural production and more flexible and efficient water resources management. It also requires building the capacity of agricultural support institutions and related stakeholders (e.g. research, extension, agro-meteorology, etc.), and improving the services delivery mechanisms to provide sound and real time advice to farmers.

**Overexploitation of water resources and low water productivity** - Overall, China ranks with the bottom 25 percent of countries in water availability per capita. The share in total water use by agriculture is 64 percent. Overexploitation of water resources, including withdrawals from rivers, and overdraft of ground water resources causing a drop in water tables, is a common problem particularly in the Northern dry regions of the country. Raising irrigation system efficiencies and improving water productivity are key to better manage water resources in agriculture. It is reported that average water productivity for grains is around 0.7-0.8 kg/m\(^3\) in China, which is much lower than the levels of 2.0-2.5 Kg/m3 recorded in the more industrialized countries. More efficient and productive water use may be achieved through the rehabilitation and improvement of outdated, dilapidated and old irrigation and drainage infrastructure, ensuring adequate operation and maintenance of irrigation systems, promoting water saving irrigation technologies, adopting enhanced agricultural water management practices, and strengthening the capacity of farmers, water user associations, and other stakeholders involved.

**Overuse of Chemical inputs.** China has one of the highest rates of fertilizer and pesticides utilization in the world. The intensive use of chemical inputs has led to (i) degradation of soil fertility; (ii) pollution of water systems; (iii) higher emissions of green house gases (GHG); (iv) lower profits to farmers; and (v) increasing concerns about food safety. Field evidence suggests that fertilizer use in some areas could be cut by 30-60% with little or no loss of crop yields. An integrated nutrient management approach which incorporates technical measures (soil and water testing, non point source pollution monitoring), capacity building (extension and training to farmers), policy aspects (revisiting the subsidies for fertilizers’ manufacturers), and institutional interventions (role of farmers groups in knowledge transfer) is required to address this problem.

**Functioning of Farmer Cooperatives** There are around 24 million farmers who are members of about 210,000 registered cooperatives\(^2\). Some concerns have emerged about the development, governance, and performance of the cooperatives. Most of the cooperatives are organized along the “company + households” model, with a greater influence by companies (or by larger households) in the ownership, management, and decision-making. This structure also appears to be favored by local governments who tend to extend greater services and support to such cooperatives. Farmers’ cooperatives have an important role to play, particularly given the small

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\(^1\) Woetzel et al. (2009)

\(^2\) Deng et al (2010)
and fragmented nature of Chinese farms, in facilitating access to markets for small producers and integrating them into higher value commodity chains. They are also a major conduit of knowledge and services to their members. The development of cooperatives needs to be supported and monitored to ensure that farmer-led cooperatives are able to make their own decisions and that the benefits accrue to all members equitably.

C. Relationship to CAS

The project contributes to three of the five pillars of the Bank’s Country Partnership Strategy for China (2006-2010) namely: (a) sustaining rural livelihoods and expanding access to basic social and infrastructure services, particularly in the rural areas; (b) managing resources scarcity and environmental challenges through conserving water resources and improving land management; and (c) Improving public and market institutions.

II. Proposed Development Objective(s)

A. Proposed Development Objective(s)

The proposed Project Development Objective is to support sustainable and climate resilient agriculture production systems in selected areas of Gansu, Hunan, Jiangxi, and Liaoning provinces; Xinjiang Autonomous region; and Chongqing municipality. This will be achieved by investing in (i) water conservation infrastructure improvement, (ii) enhanced climate-smart agricultural practices, and (iii) institutional strengthening and capacity building.

B. Key Results

Key Performance Indicators may include: (a) area of farm land benefiting from climate resilient agriculture systems established; (b) increased irrigation water use efficiency; (c) improved agricultural productivity from adoption of climate smart agricultural practices; (d) increased numbers of improved water user associations and active cooperatives.

III. Preliminary Description

A. Concept

The Integrated Modern Agricultural Development Project (IMAD) would finance investments in 34 counties/prefectures/cities in the six participating provinces/regions/municipalities. An approach that balances infrastructure improvement with the promotion of climate smart agriculture practices and the strengthening of the involved institutions and their sustainability is contemplated. Interventions would be tailored to the local conditions and will be determined in consultation with line bureau staff, technical institutions, farmer groups, local private sector
representatives and local government. Project areas are selected based on specified criteria such as clustered arable land with adequate water resources but with infrastructure and technology gaps, vulnerability to climate shocks, potential for agricultural modernization with demonstrative impacts, access to markets, etc. The total cost is estimated at about $314 million, comprising an IBRD loan of US$200 million and counterpart funding of $114 million. Counterpart funds comprise allocations from the six provinces/regions/municipalities and farmers contribution. The GOC will pass on the Bank loan, as grants, to the provinces. The project would have four components.

1. Description

Component 1 – Water Conservation Infrastructure Improvement (Indicative 60%- 65% of total cost)

This component seeks to improve farmland infrastructure and the reliability and efficiency of irrigation and drainage systems. It aims at stimulating irrigated agriculture output by increasing water productivity and improving water use efficiency in the targeted areas. Activities will be customized for each target area based on the analysis and the stakeholders input related to constraints and opportunities. Activities financed under this component may include civil works and equipment associated with: (a) systems design and rehabilitation of irrigation and drainage infrastructure (canal lining, dredging, cleaning of earth canals and drain channels, small weirs, bridges, culverts, gates, etc.); (b) water-saving irrigation (drip, sprinklers, furrow, and low pressure pipelines); (c) local water resources storage systems and farm ponds; (d) rehabilitation and electrification of pumping stations and existing tube wells; (e) water monitoring and measurement structures and equipment (flow measurement devices, ground water monitoring); and (f) farm and field access roads.

Component 2. Enhanced Climate–Smart Agricultural Practices (Indicative 20%-25% of total cost).

This component seeks to build on the improved irrigation infrastructure and water delivery activities in component 1 to improve the productivity of agriculture, increase farmer incomes, and reduce their vulnerability to adverse climatic events.

Activities financed under this component may include: (a) on-farm water saving technologies, such as land leveling, need-based irrigation, use of crop residues for mulch, wet-dry methods for rice cultivation, and green houses; (b) adaptation-oriented agronomic practices such as improved seeding technologies, demonstration of low carbon and conservation agriculture measures, crop rotations, diversification to drought/heat/frost/pest resistant varieties, and soil fertility management (e.g. soil testing, precise/formula fertilizer application, green manure, and

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3 Climate Smart Agriculture seeks to increase sustainable productivity, strengthen farmers’ resilience, reduce agriculture’s emissions and increase carbon sequestration. It strengthens food security and delivers environmental benefits. Climate Smart Agriculture includes proven practical techniques—such as mulching, intercropping, conservation agriculture, crop rotation, integrated crop-livestock management, agro-forestry, improved grazing and improved water management— and innovative practices such as better weather forecasting, more resilient food crops and risk insurance (Agriculture & Rural Development, The World Bank)
organic mulching); (c) *promotion of integrated pest management*, integrated nutrient management, and green, organic, and non-polluting production techniques; (e) improved *access to machinery*, farm equipment, technology, and extension services; (f) enhanced *post-harvest measures* to add value to agricultural products and mitigate against climate and market risks; (g) *agro ecological activities* to improve the resilience of the farm landscape and increase carbon sequestration (e.g. forest shelterbelts, greenbelts, and soil conservation measures); and (h) *adaptive research* on technical and policy issues related to climate change adaptation and mitigation (e.g. index- based risk transfer and insurance mechanisms, water pricing, low carbon agriculture, incentives for adoption of new technologies/policies, etc.).

**Component 3. Institutional Strengthening and Capacity Building (Indicative 10% of total cost)**

This component seeks to improve farmer and institutional capacity at various levels for sustainable and climate resilient irrigated agriculture. The component would be designed to fully integrate with and add value to the irrigation infrastructure and agriculture investments. Possible activities would include: (a) development and transfer of technical knowledge through training, study tours, and demonstration of innovative technologies that will contribute to information transfer to farmers and help them respond or cope with climate risks (e.g. early warning systems, real-time weather information and responses to farmers through Information and Communication Technology- ICT); (b) establishing and strengthening water user associations for operation and maintenance of local irrigation systems, monitoring and evaluating their performance, and integrating their support into existing programs; (c) promotion and support of farmer cooperatives to enhance services delivery, access to markets, and farmer-based adaptation to climate change; (d) awareness building, education, and communication on climate smart agriculture aimed at the wider farmer community and mainstreaming such aspects into the project institutions’ planning and programs; and (e) training for PMO staff at central, provincial, and county levels including training on World Bank procedures (financial management, procurement, safeguards, and project monitoring and evaluation).

The component would also finance technical assistance and equipment required to provide specialist and multidisciplinary expertise to farmer groups, and project institutions on various features of climate resilient agriculture (e.g. mitigation and adaptation to climate change in agriculture, environmental, social and economic aspects, application of GIS and remote sensing technologies, ET monitoring, environmental monitoring, decision support tools, and downscaling of climate impacts and interventions needed at the local level).

**Component 4. Project Management support (Indicative 5% of total cost).**

The purpose of this component is to strengthen the capacity at each level to manage, implement and monitor project and to establish and implement an effective project Monitoring and Evaluation system. Possible activities to be financed under this component include: (a) equipment and materials - computers, office equipment, training equipment, vehicles (if required); and (b) establishment of efficient project monitoring and evaluation (physical and financial progress, impact monitoring, safeguards monitoring, etc.), and management information systems and provision of other related consultancies.
IV. Safeguard Policies that might apply

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V. Tentative financing

Source: ($m.)
Borrower/Recipient: 114
IBRD: 200
IDA
Others (specify)
Total 314

VI. Contact point

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VII. For more information contact:

* By supporting the proposed project, the Bank does not intend to prejudice the final determination of the parties' claims on the disputed areas