### I. Introduction and Context

#### Country Context

1. Pakistan has extraordinary strategic endowments and enormous development potential, and its strategic location, vibrant population, low dependency rates, and extensive irrigation network are potential sources of long-term growth. A number of critical areas will have to be addressed to meet this potential growth. In particular, weak revenue mobilization, inefficient public spending, shortages of reliable infrastructure, and conflict and insecurity represent major obstacles to economic development and poverty reduction. While Pakistan has seen periods of high growth and impressive economic and social performance, these trends have historically not been sustained, and recent efforts to promote strong growth and poverty reduction have stalled amid economic, political and security turmoil.

#### Sectoral and Institutional Context

2. Despite its declining share of Pakistan’s Gross Domestic Product (GDP) # estimated at 22% in 2009 - agriculture remains central to the country’s economy. It is the single most important source of employment and exports, accounting for two-thirds of employment and 80% of exports. Because of its arid climate, irrigation is vital to agricultural production and it represents more than 95 percent of the total consumptive use of water. Pakistan relies on the largest contiguous irrigation system in the world, the Indus Basin Irrigation System (IBIS), to provide basic food security (90 percent of food production). However, this massive infrastructure is deteriorating and is in need of modernization along with reforms to improve the allocation of water as well as the efficiency of its use. Moreover, competition for water is growing among Pakistan’s provinces, and demand from irrigation, industry, domestic use, and the environment is rising. Significant new investment is critical, not only in irrigation, but also for other uses of water, including power generation, urban-industrial, and domestic supplies. Only 50 percent of Pakistan’s population is served by a formal water supply system and less than 10 percent have access to sanitation and water treatment services. Alarmingly, per capita water availability is declining. At the same time, there is uncontrolled pollution of surface and groundwater from agriculture, industry and Pakistan’s rapidly growing cities.

3. The key challenges in the irrigation sector are: (i) low surface water delivery efficiency (only about 35-40 percent from the canal head to crop root zone); (ii) water distribution inequities; (iii) lack of storage capacity and control structures; (iv) wasteful on-farm water use and low water productivity; (v) waterlogging and salinity; (vi) poor operation and maintenance (O&M) and low cost recovery; and (vii) a constrained investment climate. These issues are a manifestation of institutional weaknesses in the sector, which is mainly due to the near exclusive control by public sector entities, characterized by the usual inefficiencies of centralized bureaucracies, lack of corporate skills, and poor client (farmer) focus and accountability.

4. Pakistan has made progress in reforming irrigation institutions through programs that the Bank has been supporting for more than a decade. Irrigation management is being decentralized at the canal command level and the farmers’ participation is being enhanced through distributary/minor canal level farmers organization (FOs). In particular, Sindh and Punjab provinces have made considerable progress and hundreds of FOs has been developed in many canal commands. The institutional reform program is time intensive, and involves complexities that would take time to resolve, consolidate and show tangible outcome. The Bank has ongoing operations to deepen and broaden the institutional reform program to improve the long term sustainability of the IBIS. In parallel, it is vital to improve irrigation applications practices, modernize delivery and application systems, and enhance water use efficiency and productivity that would generate substantial benefits and help to solidify reform program. Since water, not land, is the major constraining factor to increasing production, water conservation is fundamental for ensuring food production/security in future. The project aims to improve water conservation, demand management, and water productivity by scaling up tested technologies: (i) watercourse improvements to enhance delivery of water from distributary canals to the field, which is the part of the system where losses are highest; (ii) laser land leveling that improves field irrigation application efficiency, seed germination, and fertilizer
use effectiveness; and (iii) installation of drip and high efficiency irrigation systems which improves water efficiency, conservation, productivity and crop diversification.

Relationship to CAS

5. The proposed project is fully in line with the FY10-13 Country Partnership Strategy (CPS). The CPS is organized around four pillars: (i) improving economic governance; (ii) improving human development and social protection; (iii) improving infrastructure to support growth; and (iv) improving security and reducing the risk of conflict. This project is guided by the strategic principles of the third pillar by engaging in a program that would strengthen irrigation infrastructure and agricultural competitiveness. By supporting Pakistan’s water use efficiency and encouraging technology that would promote crop diversification and increase productivity, the proposed project is supports Bank’s particular emphasis on improving the efficiency of irrigation systems.

6. The Bank has a long history of partnership and collaboration with Pakistan in the water sector. As a key partner and principal donor, it has provided support to several main interventions in the development of the IBIS, including (i) facilitating the Indus Water Treaty negotiations between Pakistan and India; (ii) establishing the Indus Basin Development Fund that supported the construction of Mangla and Tarbela dams and several inter-river link canals and barrages; (iii) formulation of the Salinity Control and Reclamation Program (SCARP-1968); (iv) formulating the Revised Action Plan for Irrigated Agriculture in 1979; (v) assisting in the development of the Water Sector Investment Planning Study (WSIPS) in 1991; and (vi) providing guidance on the Drainage Sector Environmental Assessment in 1993 which contributed to the development of the Ninth Five Year Plan. Most importantly, the Bank developed the Irrigation and Drainage Strategy of 1994 (grey cover Pakistan: Irrigation and Drainage # Issues and Options 11884-PAK) and the Pakistan Water CAS (Pakistan’s Water Economy Running Dry, 2005 34081-PK) that led to a major shift in the I&D sector of Pakistan and the implementation of the current institutional reform agenda. The Bank has supported several On Farm Water Management Projects and has helped to introduce innovation in these operations in all provinces of Pakistan. The Government recognizes the Bank’s continuous and positive role in the I&D sector, and particularly sees a natural role for the Bank in this project. The Bank’s involvement is also crucial for ensuring proper implementation of the Project innovation and introduction of new technologies. In addition to its financing, the Government is seeking support from the World Bank for its knowledge, expertise and experience in the sector. Thus, the Bank’s involvement is crucial for achieving the project objectives.

II. Proposed Development Objective(s)

Proposed Development Objective(s)

7. The project’s main objectives are to improve water productivity. Improved water productivity will translate into greater agricultural output per unit of water used, and will be achieved through improved physical delivery efficiency, irrigation practices, crop diversification and effective application of inputs. The project’s objectives would contribute to increased agricultural production, employment and incomes, higher living standards and positive environmental outcomes.

Key Results

8. Performance towards achieving the development objectives will be measured through the following key performance indicators:

# Increased agriculture output per unit of water used;
# Increase in crop yields per acre of land and per acre foot of water;
# Change in cropping intensity due to better use of water;
# Crop diversification, increase in area under vegetables, orchards, floriculture and other high value crops; and
# Change in farm incomes.

III. Preliminary Description

Concept Description
9. The project is likely to consist of the following components:

10. Component A: Installation of High Efficient Irrigation Systems (US$202.6 million and IDA US$125.5 million). This component would consist of the following two sub-components:

11. Component A1: Installation High Efficiency Irrigation Systems (US$178 million and IDA US$113 Million). The component would support the installation of drip, trickle, bubbler, or sprinkler irrigation systems at the field level for high value, horticulture, vegetables, floriculture and other high value row crops. The irrigation systems would be installed by a service provider on a shared cost basis. The Government would carry 60% of the cost with the remaining 40% paid by the farmers. Such level of subsidy is justified given that this is new technology. The drip units would include a pumping unit, fertilizer tank, delivery fittings, filters, underground main pipeline, and delivery lines, etc. High efficient irrigation systems would be installed over 120,000 acres. These systems would be installed for orchards, vegetable, flowers and other high value row crops, thereby promoting crop diversification. Controlled application of water and non-water inputs would enhance crop productivity. A technical assistance package would be provided by the vendors to the farmers to promote adaptation of the new technology. In addition, technical assistance and training would be provided to the users through component C of this project. Successful installation and application of these irrigation systems would encourage the private sector to adopt this high efficient irrigation technology, as was the case of groundwater development, which was initiated by the government but brought to scale by the private sector.

12. Component A2: Strengthening of Precision Land Leveling Services (US$25 million with IDA US$12.5 million). Un-leveled fields cause wastage of water, resulting in low irrigation application efficiency and much lower yields. Laser land leveling saves up to 30% irrigation water, results in uniform seed germination, and increases fertilizer uptake efficiency which enhances crop yields of up to 20%. Under this component the laser leveling equipment would be provided to the service providers on shared cost basis. The service providers would provide the laser leveling equipment and tractors to interested farmers, who would use their own tractors to complete the leveling. A capacity for laser land leveling of about two million acres annually would be developed for which about 5000 laser leveling units would be provided. About 50% of the cost of the laser land leveling equipment would be provided by the service provider who also owns a tractor capable of operating the LASER unit.

13. Component B: Upgrading of Community Irrigation Systems (US$245.7 Million IDA US$172 million). The component would consist of three subcomponents:

14. Component B1: Watercourse Improvements in Canal Irrigated Areas. The component would assist Government efforts to improve watercourses (W/C), the tertiary level water distribution system where water losses are highest. Of the 140,000 total watercourses in irrigated areas of Pakistan, around 95,000 have been improved under various program supported by several donors. Punjab has about 58,000 watercourses in irrigated areas, out of which about 41,000 have been improved, leaving a remaining 17,000 in need of improvement.

15. The innovations would be introduced to use concrete parabolic channel sections up to 8 feet (or U sections namely canalets) placed on leveled compacted earth with water tight joints, thus improving existing technology of brick lining. Where suitable and where farmers prefer, watercourses would be lined using traditional bricks with plaster. Also water turnout structures would be replaced with properly designed concrete structures (pucca nakas). The earthen sections of the watercourse would be improved using clean compacted soil. Efforts would be made to have private contractors/service providers construct such canalets and installed by the water users associations (WUAs). The project would provide technical assistance for layout and construction supervision to the WUAs. The length of the watercourses, installation of diversion structures, as well as other improvements to earthen sections of the watercourses would be in accordance with the current standard practice and optimized for each watercourse. WUAs would share the cost through providing labor, and the Government would provide canalets and other material. Approximately 6,500 watercourses would be improved. In canal commanded areas preference would be given to the areas where distributary level farmers' organizations have been formed.

16. Component B2: Completion of Partially Improved Watercourses. Many watercourses in Punjab were only partially (barely) improved in the early part of the program in the late 1970s. In order to fully realize the benefits, the improvement works on these watercourses would have to be completed. The project would cover completion of about 4,000 watercourses which have been partially improved in the past. Farmers would contribute skilled and unskilled labor (30 percent of the cost) with the Project funding the remaining cost.

17. Component B3: Improvement of Community Irrigation Systems in the Non-canal Commanded Areas. This component would cover watercourse improvements in the rainfed (Barani) areas, i.e. areas which are not in the command of barrage controlled irrigation but have localized irrigation schemes. These are generally small watercourses and the cost of improvement is less than in other areas. The project would cover about 4,000 watercourses in Barani areas. Farmers would contribute skilled and unskilled labor (about 30 percent of the cost of the improvement works) while the Project would carry the cost of the material.

18. Component C: Improved Agriculture Technology/Practices and Monitoring and Evaluation (US$ 10.3 million). This component would consist of the following two sub-components:

19. Component C1: Improved Agriculture Technology and Practices. The purpose of this component would be to enhance productivity of the irrigated lands. The activities under this component would include: (i) effective research, extension, and agricultural information services; (ii) participatory training for farmers, involving training of specific target groups in various agro-technical fields, farm management and irrigation agronomy; (iii) demonstration and assistance in improved and modern technologies and methods to increase agricultural production through better agronomic practices; and (iv) the establishment of a Farmers Information Service Desk. The Water Management Training Institute (WMTI), Lahore will provide training, research and extension support for adoption of modern irrigation water management and conservation techniques and technologies. Demonstration of new technologies is expected to result in crop diversification, and crop husbandry, horticulture, vegetables and floriculture, improved irrigation and drainage practices and better water management to improve water use efficiencies and reduce environmental degradation. This would include interventions to optimize field size, introduce land leveling and furrow irrigation, irrigation using drip, bubbler and sprinkler irrigation system and ways to adapt these technologies etc. For this purpose, demonstration plots would be developed in various parts of the project area to complement the direct assistance and to promote
new technologies. These activities would be complemented by a Farmers Information Services Desk in project areas to provide relevant information to farmers through different means (pamphlets, videos, radio, TV, weekly papers etc) and to advise them on making their farms more productive and sensitive to the market demands.

20. Component C2: Monitoring and Evaluation of Project Impact. This component would cover monitoring and evaluation (M&E) of the project’s impacts. This would be done primarily by using a sampling technique, as well as by conducting case studies, GIS systems, and satellite data. The M&E activities would provide continuous feedback on the project’s performance and impact of its various components to the Government of Punjab (GOPunjab), the Project Steering Committee (PSC), and the implementing agency, so that corrective actions could be undertaken in a timely manner. The M&E activities are likely to cover, but not limited to: (i) the impact of the I&D improvements on water use efficiency, groundwater levels and quality, and soil salinity; on-farm water use; cropping patterns and yields; and livestock population, health and production; (ii) socio-economic impacts and the impact on the level of employment, livelihood and household incomes in the project area; estimation of the project’s overall benefits and economic rate of returns etc. M&E would be carried out using latest technology such as satellite imagery and GIS systems, where necessary.

21. Component D: Project Management, Supervision, Technical Assistance, Training and Strategic Studies (US$27 million). This component would cover the cost of (i) project implementation and management, including mobilization of farmers, surveys, engineering and designs, implementation supervision and assistance to the farmers and suppliers, and ensuring quality of the works carried out by farmers and suppliers/vendors etc; (ii) project supervision and spot checks, covering quality and quantity aspects, by third party consultants based on which the funds would be disbursed; and (iii) strategic studies and pilot projects that would be identified during project implementation, and technical assistance, training, in particular training to the project staff (i.e. training of trainers) in crop diversification, shift to horticulture, vegetable and floriculture crops, operation and maintenance of the irrigation systems, and units installed under the project, etc.

22. The project cost is about US$438.9 million equivalent. Of this, the Government/IDA financing would be about US$300 million, and farmers’ contributions would come to about US$138.9 (about 32%). Details for costs by component and financing arrangements are given in Table 1.

Table 1: Project Cost and Financing Arrangements (US$ million)

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IV. Safeguard Policies that might apply

V. Tentative financing

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VI. Contact point

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