THE REPUBLIC OF IRAQ

DATA COLLECTION SURVEY ON WATER RESOURCE MANAGEMENT AND AGRICULTURE IRRIGATION IN THE REPUBLIC OF IRAQ

FINAL REPORT

April 2016

Japan International Cooperation Agency
(JICA)
NTC International Co., Ltd.

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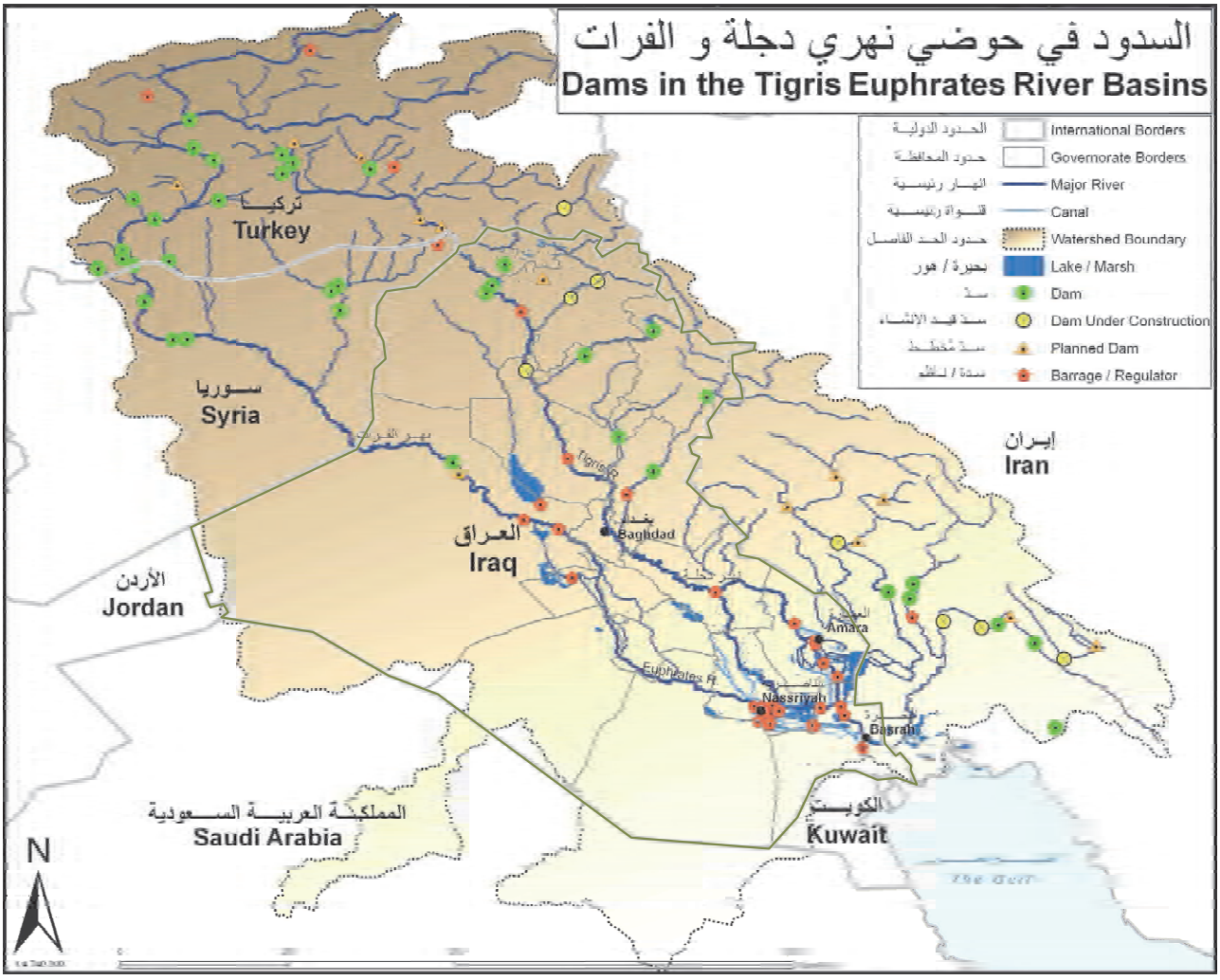
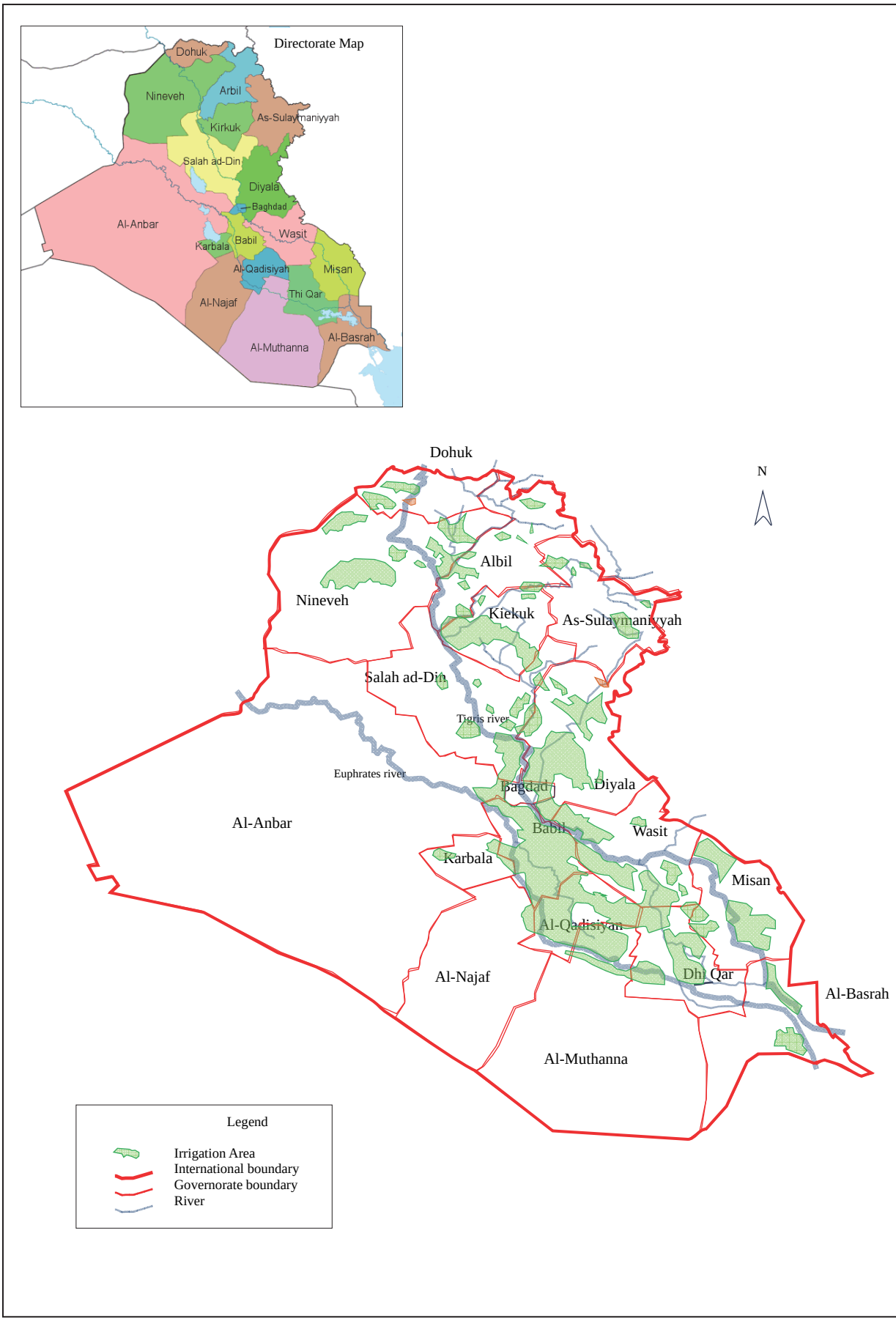
16-008

Iraq and Surrounding Countries

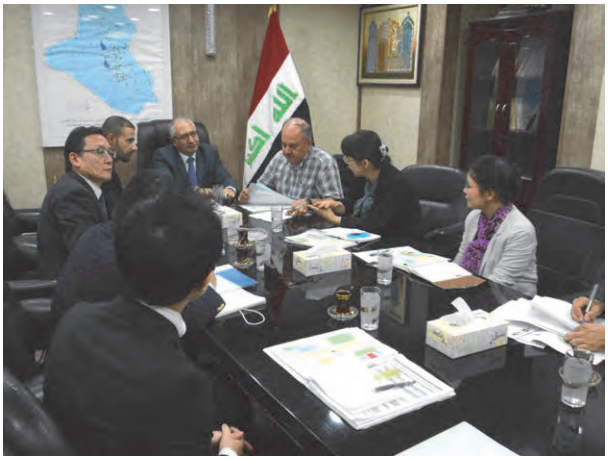


Watershed of Tigris and Euphrates Rivers



Location Map of Irrigation Areas

Photographs

	
Kick-off meeting with MoWR officials at the conference room of MoWR Both parties exchange observations of Inception report.	Explanation to D.G. Directorate of Legal and Contracts of MoWR on the project formulation (Conference room at MoWR)
	
Kick-off meeting with MoA officials at the office of MoA Both parties exchange observations of Inception report.	Meeting with MoP at office of D.G. Planning Both parties discussed about project formulation
	
Courtesy call to the Minister of MoA JICA side explained the progress of the irrigation sector loan and further project formulation process.	Meeting with representatives of WUA assisted by the JICA technical cooperation project Phase 1. (Conference room of MoWR)

	
Office of AL-Zaidiya WUA Site field work to investigate WUA activities during the second field survey (Dhi-Qar District)	AL-Zaidiya WUA office JICA team conducted hearing investigation on water management, farming practice of WUA (Dhi-Qar District)
	
Piet Ghzayel WUA Photo shows the eastern portion of the farmland. Farmers have yet started cultivation in the dry season. (Basrah District)	Piet Ghzayel WUA Photo shows intake located along the Tigris river. (Basrah District)
	
Piet Ghzayel WUA Framers individually divert canal water by their own pumps. (Basrah District)	Piet Ghzayel WUA Photo shows secondary canal for irrigation located at elevated area of the farmland. Maintenance was in good condition. (Basrah District)

	
Al Manthori WUA Drip irrigation devices owned by the individual farmers. Photo shows small tank and pump. (Basrah District)	Al Manthori WUA Drip irrigation site. Saline concentration was not observed. (Basrah District)
	
Agricultural research institute at Basrah District Shade net effectively protected nursery.	Nursery production Research institute has a role of extension service of vegetable cultivation.
	
Research activities using drip irrigation. Multing with plastic sheet could minimize evapo-transpiration from soil surface. (Agricultural research institute, Basrah District)	Monitoring of nursery planting with low nylon sheet cover of 0.7 m high. (Agricultural research institute, Basrah District)

	
Al Okaily WUA Meeting with WUA members on project management (Basrah District)	Al Okaily WUA: Photo shows pivot type sprinkler installed using subsidy system of MoA. Water is directly diverted from the Tigris river. (Basrah District)
	
Workshop on WUA assistance at Basrah during second field survey with participation of four related Governments.	Photo shows representatives from central Governments in the Basrah Workshop (D.G, Leal, MoWR, PMAC AI, Project Director of the technical cooperation project phase 1)
	
Workshop on WUA assistance Assistant program has discussed in the Workshop after site visits in and around the Basrah District.	Workshop on present WUA management with participants of PMTs from existing WUA assistant projects prior to that with central Government officials

Data Collection Survey on Water Resource Management and Agriculture Irrigation
in the Republic of Iraq

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Abbreviations

ACZ	Agro Climatic Zone
DAC	Development Assistance Committee
EIRR	Economic Internal Rate of Return
EU	European Union
FAO	Food and Agriculture Organization
FFS	Farmer Field School
GDP	Gross Domestic Product
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
ICT	Information and Communication Technology
ISF	Irrigation Service Fee
I/P	Implementation Plan
JICA	Japan International Cooperation Agency
KRG	Kurdistan Regional Government
MoA	Ministry of Agriculture
MoE	Ministry of Environment
MoP	Ministry of Planning
MoWR	Ministry of Water Resources
NDP	National Development Plan 2013-2017
O&M	Operation and Maintenance
PCM	Project Cycle Management
PMAC AI	Prime Minister's Advisory Commission - Agricultural Initiative
PMT	Project management Team
SAPI	Special Assistance for Project Implementation
SWRLI	Strategy for Water and Land Resources in Iraq
TDS	Total Dissolved Solids
UNHCR	United Nations High Commissioner for Refugees
UNDP	United Nations Development Programme
USAID	US Agency for International Development
PDM	Project Design Matrix
WUA	Water Users Association

Unit

Dunam	1.0 dunam = 0.25 ha
BCM	Billion cubic meter
ppm (=mg/lit)	Part per million

Currency

US$	US$1.00=¥ 120
IQD	IQD1.00=¥0.10

Chapter 1 Background and Objectives of This Survey

1.1 Background of the Survey

The Republic of Iraq's (hereafter referred as Iraq) social and economic infrastructure was deteriorated due to 3 wars since 1980's, and its economy declined because of economic closure for more than 10 years. On the other hand, it is being recovered and developed thanks to international assistance. In Iraq Agricultural sector employs 21.6%[1] of the total workforce. Hence, agricultural sector is quite important to secure job opportunities, where unemployment is serious, especially in local areas with less job opportunities other than agriculture.

Iraq's total national land is 434,000km^2[2], which is 1.2 times larger than Japan. While total agricultural land in Iraq was 8.5 million ha in 2011, 4.15 million ha of land were cultivated and 3.66 million ha of land were irrigated. However, both are declining in recent years. Climate in Iraq is generally categorized as continental, subtropical or semiarid type of climate, whereas Mediterranean climate prevails in the mountainous area of northern and north-eastern region. Precipitation is seasonal, and wet season is between December and February except in northern and north-eastern Iraq where November to April is wet season. While annual average precipitation in Iraq as a whole is 216mm, it fluctuates from 1,200mm in north-eastern areas to less than 100mm in southern areas[3]. Almost all national land does not have enough precipitation (annual average precipitation of 500mm is needed for rain-fed agriculture), and hence, irrigation is essential for agriculture.

The major water resources of Iraqi irrigation system are Tigris and Euphrates rivers, 25 dams and reservoirs, 275 pump stations, and irrigation canal network of 27,000km long[4]. These rivers are transnational. Development of large dams and agricultural irrigated lands in the upstream countries has decreased water flow into Iraq. Additionally, ISIL[5] has emerged in the central and western Iraq in 2014 and has temporally occupied the Mosul dam, the largest dam in Iraq, located in the Tigris river basin, and it makes Iraq's water resources unstable.

Iraq's agricultural land is decreasing. Available water is declining in spite of irrigation facilities exist in irrigated lands[6], and salt accumulation lessened available agricultural lands. When it comes to Iraqi agriculture as a whole, including rain-fed, further shrink of agricultural lands has been warned due to inappropriate and inadequate administrative functions under the unstable security situation. Iraqi agriculture faces low productivity because of old agricultural infrastructure, and lacks of agricultural technology and knowledge. Situations to the south of Baghdad are worse, where most of Iraqi agricultural lands exist and are disadvantageous in terms of water use. As demands for

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1 CIA - The World Factbook, https://www.cia.gov/library/publications/the-world-factbook/geos/iz.html
Other workforces go to; industry: 18.7%, services: 59.8% (2008 est.) According to the above website, "GDP - composition, by sector of origin:" are; agriculture: 3.3%, industry: 64.5%, services: 32.2% (2014 est.)

2 ibid

3 FAO (2009) "Irrigation in the Middle East region in figures – AQUASTAT Survey 2008" edited by Karen Frenken, FAO Land and Water Division, (http://www.fao.org/docrep/012/i0936e/i0936e00.htm)
Randy Schnepf (2004) "Iraq Agriculture and Food Supply: Background and Issues" (http://digital.library.unt.edu/ark:/67531/metacrs7103/m1/)

4 Iraq side's presentation material in project formulation for "Project for Spreading Water Users Associations for the Efficient Use of Irrigation Water"

5 Islamic State in Iraq and the Levant

6 Due to decline in river flow caused by water intake by upstream countries, malfunction of irrigation facilities caused by insufficient maintenance, and inappropriate water management

efficient water use heightened in that part of Iraq, implementation of improvement in maintenance techniques relevant to irrigation facilities, implementation of optimal water distribution, improvement of awareness of water saving, and application of water saving technology to agricultural sector are emergent challenges. Agriculture is an important sector in Iraq, but decreasing river flow from the upstream countries coupled with the ISIL occupation have made water resource in Iraq even more unstable. Therefore comprehensive measures should be taken urgently for efficient water use in agricultural sector that uses 77%[7] of all water resources..

1.2 Objectives of the Survey

Purposes of this Survey were to collect and confirm following information about Iraqi agriculture and water resources management through literature review and interviews.

1) Governmental policy and mid and long term plans for the water resources management, agriculture, and irrigation.
2) Current agricultural situation of Tigris and Euphrates river basin and irrigated areas in central and southern irrigated areas. Current situations and future vision of technology, methods of irrigation and maintenance.
3) Assistance trend of other donors

This Survey was implemented for the purposes to confirm the position of irrigation and agriculture in Iraq's comprehensive water resources management policy, and to review and improve JICA's assistance strategy from mid and long-term stand point of views.

The counterpart agencies were Ministry of Water Resources (MoWR), Ministry of Agriculture (MoA), Prime Minister's Advisory Commission for Agricultural Initiative (PMAC AI), Ministry of Environment (MoE), and Ministry of Planning (MoP). Only literature collection has been done from MoE.

1.3 Survey Area

Survey area covers whole Iraq, especially central and southern part of Iraq in Tigris and Euphrates river basin. Regarding water resources, it includes upstream countries (Turkey and Syria) and Iran.

1.4 Survey Methods and Results

This Survey project not just collected existent materials and internet information, but implemented 5 field surveys and interviewed governmental officers through questionnaires. The outline of field survey is below.

[7] 77% includes evaporation from water storage (NDP states it is 64%)

Outline of Field Survey

	Field survey	Period	Contents
1.	First Survey	7 th of September 2015 to18 th of September 2015 (12 days)	Explanation about the project for concerned institutions and officers Explanation about questionnaires and analyses of collected information Preparation for field surveys and workshops at Basrah and Dhi-Qar.
2.	Second survey (1)	5 th of October 2015 to 16 th of October 2015 (12 days)	Field surveys of 5 WUA sites including 2 WUA sub-projects of irrigation sector loan project at Basrah and Dhi-Qar Workshops with governorate and central officers
3.	Second survey (2)	6 th of November 2015 to 14 th of November 2015 (9 days)	Investigation of irrigation agriculture projects Conferences with governmental officers based on questionnaires Extraction of issues to be solved related to water resources, irrigation, and agriculture, which were in advance suggested in the previous survey Data collection of farmers economic survey
4.	Third survey	4 th of December 2015 to 15 th of December 2015 (12 days)	Extraction of issues related to water resources, irrigation, and agriculture Extraction of issues related to irrigation agriculture and development of WUAs through workshops with governmental officers
5	Forth survey	22th of January 2016 to 3rd of february 2016 (13 days)	Contemplating and organizing the challenges in water resources management / agriculture and irrigation sector solutions as well as sharing research and survey results with Iraqi authorities

Information gathered is shown below. Implementation plan of this project and notes are described as well.

Surveyed items	Implementation plan of this project and notes
1) Confirmation of current Iraqi water resources management and irrigation agriculture i) Policies and plans related to water resources management, priorities of them, legal system, and administrative system ii) Policies and plans related to irrigation agriculture, priorities of them, legal system, and administrative system iii) Current situations and issues of water resources management and irrigation agriculture iv) Donors' past projects and their trends in assistance in the field of water resources management and irrigation agriculture v) Technologies and methods in the field of water resources management and irrigation agriculture, and the way of maintenance	• Review on NDP and collection and analyses of additional information • Analyze the laws related to water resources • Grasp WUA-related laws, their functions, and movements for amendment • Collect and analyze currently used technologies and methods in water resources management and maintenance • Grasp situations of project planning and budget implementation in water resources management and irrigation agriculture • Survey assistances from other donors • Investigate qualitative and quantitative situations of water resources
2) Information gathering on and analyses of Iraqi irrigation agricultural projects i) Achievements and current situation of rural irrigation projects (repair and exchange of pumps for irrigation and drainage) ii) Study and analyses of expected prioritized areas for modern irrigation facilities	• Grasp water network of irrigation facilities, and collect and analyze information on maintenance • Collect information on implementing structure (organization and jurisdiction) and budget allocation in irrigation and agricultural administration • Gather and analyze agricultural legal system of irrigation agriculture • Collect and analyze information on agricultural subsidy system for farming, agricultural dissemination • Collect and analyze information of JICA's "Project for Spreading Water Users Associations for the Efficient Use of Irrigation Water" and "Irrigation Sector Loan

Surveyed items	Implementation plan of this project and notes
	(including SAPI)" • Collect and analyze information of other donors' assistance for irrigation projects • Gather information on procedures of planning and implementation of irrigation projects, and operation as well • Collect information on expected prioritized areas and projects (information gathering on expected target areas and contents of a subsequent project of "Project for Spreading Water Users Associations for the Efficient Use of Irrigation Water") • Obtain and analyze information on farmers' current situations (especially, information on economic situation, irrigation administration, and WUA at around the target sites)
3) Extraction and analyses of issues to be solved in the field of Iraqi irrigation agriculture	• Decline in water resources, measures against salinity
4) Notes in implementing JICA's assistance for Iraqi irrigation agriculture	• Consider consistency between policies and regimes related to water resources and irrigation agriculture • Evaluate and analyze collaboration effects of technical cooperation projects and yen loan projects • Evaluate appropriate technologies for facilities to be installed, and for operation and maintenance of them
5) Information gathering on prioritized areas for irrigation agriculture. Study on appropriate irrigation and maintenance technologies and methods for the sake of JICA's assistance	• Role (and cost) sharing between the Government and residents in irrigation agriculture projects • Evaluate efficiency and sustainability of projects

Chapter 2 Current Situation of Iraq

2.1 National Land

Land area: Iraq is geographically located between 29°3”N-37°23”N and 38°47”E-48°39”E, bordering with Syria, Turkey, Iran, Kuwait, Saudi Arabia and Jordan, with an area of 434,000 km^2 (1.2 times that of Japan).

2.2 Climate

Climate wise Iraq can be classified as continental and sub-tropical semi-arid, with the northern and northeast mountainous area under Mediterranean influence. Rainfall is seasonal, with the exception of north and northeast part (wet season November to April), most of the rainfalls occur in the months of December to February.

On average the country receives 216mm of rainfall annually, varying from 1,200mm in the northeast to less than 100mm in the south (about 60% of the area)[8]. From Fig. 2.2.1[9], it is clear that over half of the land receives less than 500mm of rainfall annually, necessitating the practice of rain-fed agriculture and making irrigation a pre-requisite in farming. By Penman method, annual evaporation is estimated at around 1,900～2,000mm, a trend close to the 1,400mm～2,100mm in Fig. 2.2.2[10].

Fig. 2.2.1 Rainfall and Agro Zoning

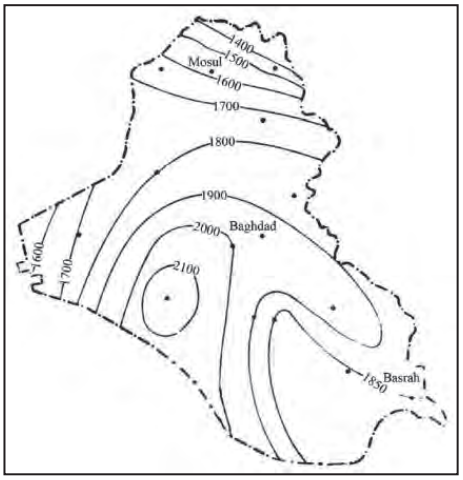

Fig. 2.2.2 Average Annual Evaporation

8 FAO (2009) “Irrigation in the Middle East region in figures – AQUASTAT Survey 2008” edited by Karen Frenken, FAO Land and Water Division, (http://www.fao.org/docrep/012/i0936e/i0936e00.htm)

9 Randy Schnepf (2004) "Iraq Agriculture and Food Supply: Background and Issues" (http://digital.library.unt.edu/ark:/67531/metacrs7103/m1/)

10 Nadhir A. Al-Ansari (2013) “Management of Water Resources in Iraq: Perspectives and Prognoses”, Engineering, Vol.5 No.8 (2013), Article ID:35541, 18 pages, DOI:10.4236/eng.2013.58080. (http://file.scirp.org/Html/6-8101946_35541.htm)

2.3 Administrative Set Up

As shown in Fig. 2.3.1, administratively the country is divided into 18 Governorates[11] (**محافظة**). Below to the governorate is the District (**قضاء**) level. Table 2.3.1 shows the names of the governorates and number of districts in each of the governorate.

Fig.2.3.1 Governorates in Iraq

Table 2.3.1 Governorates, District Names and Area

No.	Name of Governorate	Number of districts	Area (km^2)
1	Baghdad	6+Bagdad City	4,555
2	Ṣalaḥ ad-Din	7	24,363
3	Diyala	6	17,685
4	Wasiṭ	5	17,153
5	Misan	6	16,072
6	Basrah	6	19,070
7	Dhi-Qar	5	12,900
8	Muthanna	4	51,740
9	Qadisiyah	4	8,153
10	Babil	6	5,119
11	Karbala'	3	5,034
12	Najaf	3	28,824
13	Anbar	9	137,808
14	Nineveh	10	37,323
15	Dohuk	4	6,553
16	Arbil	7	15,074
17	Kirkuk	4	9,679
18	Sulaymaniyyah	10	17,023
	Total		434,128

Source: Area of Governorates and Number of District and Sub-District that affiliated as in 2010/2009, Ministry of Water Resources/ General Commission of Aria

2.4 Political, Fiscal and Economic Background

(1) Political background[12]

The Constitution and bicameralism in Iraq were established in 1925 during the British mandated territorial Mesopotamia. This became a full-fledged national assembly when the Kingdom of Iraq was established in 1932. The monarchy was later abolished by the revolution in 1958, and this was followed by 3 republican regimes. Under the Ba'ath Party of the 3rd republic regime, a new constitution was adopted in 1970 and the People (National) Assembly was established. As a result of the war in 2003, the interim Government was installed in 2004. In 2005, when a new Constitution was

[11] Iraqi Government set a new 19th governorate called Halabja divided from Sulaymaniyyah. Development of Hablaja is delayed due to national instability because of ISIL.

[12] Web site of Ministry of Foreign Affairs Japan http://www.mofa.go.jp/mofaj/area/iraq/data.html

established by the Transitional Government, the National Assembly became unicameral, with 328 proportionally elected seats of 4-year term. The 4th republic regime started in 2006. In 2014, President Fuad-Maasumu named the incumbent Hyder Al-Abati as the Prime Minister.

(2) Fiscal and economic background

The economy is growing alongside the increase of oil production. The GDP per capita (US$6,861: World Bank 2013) as well as population also continue to grow. According to the forecast of the International Energy Agency (IEA), with doubled crude oil production in 2020, Iraq will become the second largest oil exporter after Saudi Arabia.

Iraq's economic zones are concentrated around the northern, central and southern regions. In the north, business and trade prosper under the autonomous Kurdish Government. The central part, where Baghdad is located, is the center of politics and economy. The south with its harbors is the energy export base[13].

Revenues in 2015 (84% from crude oil) was about US$76.9 billion, while expenditure was about US$101.2 billion. The Central Intelligence Agency estimated that the current account balance was US$29.1 billion in 2014, with a foreign reserve of about US$74 billion (2014). For the total amount of trade, the IMF had indicated that export was US$79.5 billion and import US$50.4 billion (2014)[14].

2.5 Social Infrastructure

Since 1980, due to economic closure and the repeated wars, economic and social infrastructures have been severely damaged. Regarding the roads, the total length of highway, primary and secondary roads is about 48,000km, of which the maintenance of 60 % is in a state of neglect[15].

Port facility only exists along the waterway between Khor Abdullah and Khor Al Zubair in Basrah and along Shatt al-Arab river. Currently, the operational ports are the international commercial port called Umm Qasr Port and Khor Al Zubair Industrial Port. These ports have become the full-fledged major trading ports. However, both of the harbors face inadequate maintenance due to the impact of economic closure, sand sedimentation and ship wreckage, hindering navigation[16].

Safe water supply was widely distributed before the Gulf War. Since then appropriate maintenance had been neglected with no new investment. The stable supply of drinking water in the south, Basrah in particular which is the second largest city in Iraq, has become difficult, with salinization. Regarding sewage condition, in Baghdad where sewage system had been relatively developed, dilapidation over the years is common. In less developed rural areas, the occurrence of cholera is a health problem. In addition, due to lack of proper waste treatment facilities such as landfills, percolation of untreated water into groundwater is becoming a serious environmental concern.

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13 Web site of Iraq Committee: http://www.iraq-jccme.jp/basic/

14 Web site of Ministry of Foreign Affairs Japan: http://www.mofa.go.jp/mofaj/area/iraq/data.html

15 World Bank, Project Appraisal Document on a Proposed loan in the amount of US$355 Million to the Republic of Iraq for a Transport Corridors Project, Nov 2013

16 JICA, Report on Pre-assessment of Port Sector Rehabilitation Project (2)

In the electricity sector, based on the "Power Supply Master Plan" of November 2006, restoration of power generation and distribution network as well as new projects has been implemented. However, the current generation capacity of about 7,000-8,000MW is insufficient to meet the peak demand of 13,000MW, and thus on an average the nation still suffers from more than 12 hours of power outage. Except for the urban areas, communication infrastructure (telephone, post office and the Internet) remains undeveloped, inhibiting vigorous economic activity and stable civic life.

Regarding medical care facility, hospital-centered healthcare system had been developed all over the country in the 1970s to early 1980s. It was renowned as the best in the Middle East, covering 97% of urban population and 71% in rural areas. However, since 1980 due to the conflicts, economic closure and political turmoil, the medical system continues to deteriorate. Repair and new investment, renewing and replacing the decrepit medical facilities and equipment have not been sufficient.[17] Especially, in the area with Internally Displaced Peoples (IDPs), shortage of medical services is a serious problem[18]。

Education facilities, dilapidated by years of conflict, are also insufficient. Under these circumstances, about 3 million school-age children have no access to education with standard[19]。

2.6 Security

Since June 2014, ISIL, armed combatant forces/groups, has expanded into northern and western Iraq. To counter this, the Iraqi forces, in coalition with the US, have started air strikes in bombarding ISIL strongholds. ISIL strengthened its influence in Nineveh governorate in the north and Anbar in the west, and in May 2015, ISIL had occupied Ramadi and Fallujah in Anbar. To re-take these positions, the Iraqi forces are carrying out military attacks.

[17] JICA, Preparatory Survey Report on Health Sector Reconstruction Project, 2011

[18] UNOCHA, Iraq Humanitarian Needs Overview 2015, 2015

[19] In places with many IDPs, schools are being used as shelters to accommodate IDPs (UNOCHA, Iraq Humanitarian Needs Overview 2015, 2015）。

Chapter 3 Water Resource, Irrigation and Agriculture Status

3.1 Overview of Irrigation System

The irrigation systems in Iraq, diverting its water mainly from the Tigris and Euphrates river, is comprised of 25 dams and weirs and 275 pumping stations, with a total network of about 27,000 km[20](see Annex 8). Recent development of large dams and irrigated farmlands in neighboring countries situated in the upstream of the Tigris and Euphrates rivers, is causing reduction in the flow into Iraq, and thus, is becoming a problem. In addition, occupation of the Mosul dam in the Tigris basins by ISIL, a destabilizing force in Syria and in central and western Iraq since 2014, had also contributed to water use instability.

3.2 Current State of Water Resources

3.2.1 River Discharge

Tigris and Euphrates rivers are the main water resources. After the confluence at al-Qurnah in Basrah, it is called as Shat al Arab and empties into the Arabian Sea. About 71% of the discharge flows from Turkey, 6.9% from Iran, 4% from Syria and only 8% from the watershed in Iraq[21].

Blessed by the Tigris and Euphrates rivers, water resource in Iraq, as compared with the neighboring countries, was relatively abundant in the 70s'. However, since the 70s', due to dam constructions both in Turkey and Syria, the discharge of the Euphrates river within Iraq had decreased, resulting in poor water quality. This phenomenon had affected Iraqi's water resource security and accordingly its water strategy.

Fig. 3.2.1 and Fig. 3.2.2 show the discharge of the Tigris and Euphrates rivers. In the Tigris river, the discharge peaked at about 49.22 billion m^3 (averaged over 1933-1998) and decreased to about 32.64 billion m^3 (averaged over 1999-2014), a drop of about 33.7%. Likewise, in the Euphrates river, the discharge varied from 30.26 billion m^3 (average of 1933-1972) to 23.59 billion m^3 (average of 1973-1989). In the recent years it has decreased to about 16.90 billion m^3 (average of 1990-2014), or a decrease of 44.1%.

[20] Iraq side's presentation material in project formulation for "Project for Spreading Water Users Associations for the Efficient Use of Irrigation Water"

[21] Application of CE-QUAL-W2 on Tigris River in Iraq

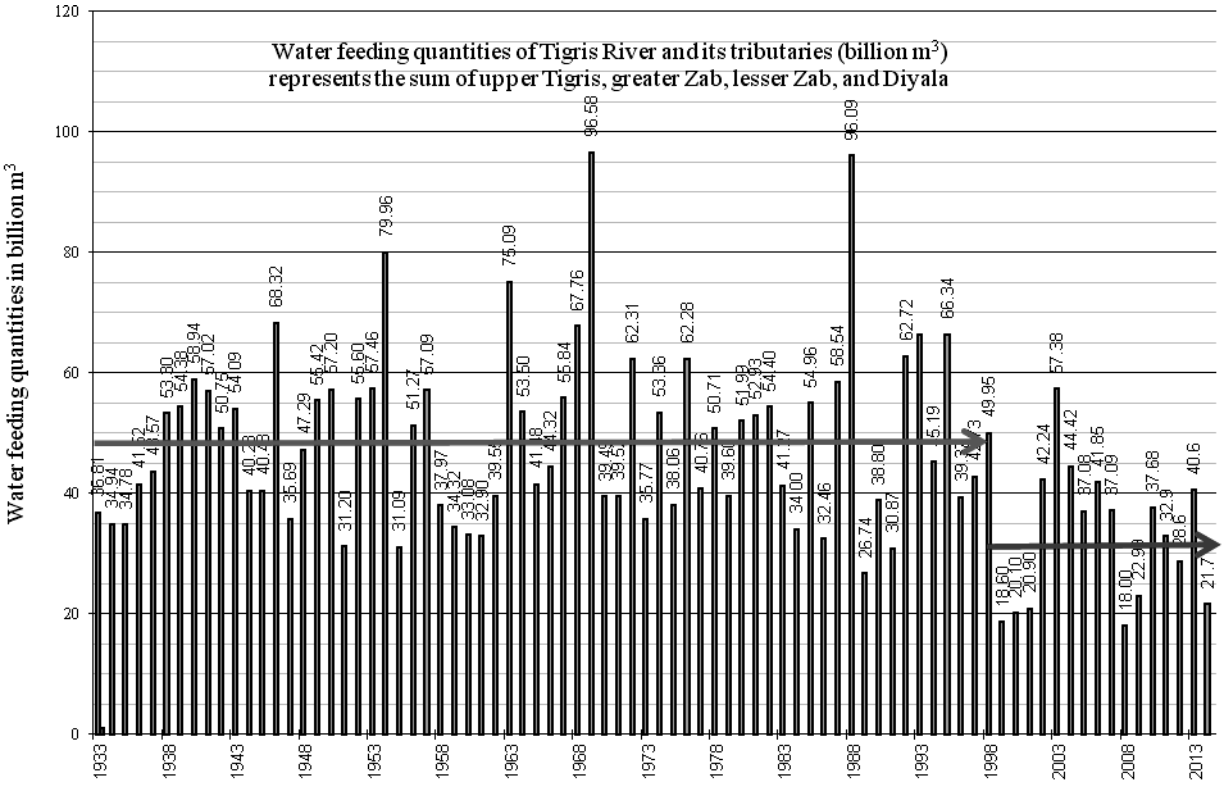

Fig. 3.2.1 Discharge in the Tigris River (at Iraqi border)

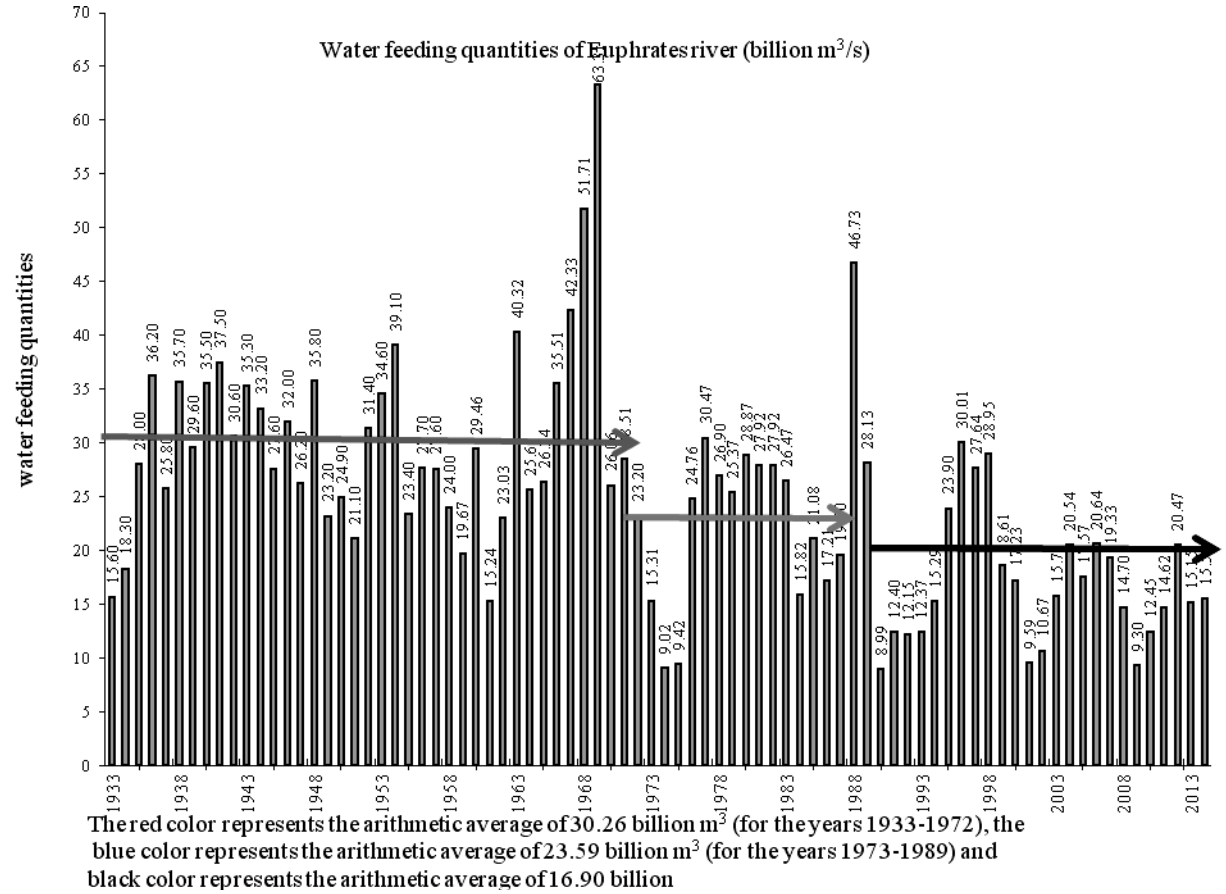

Fig. 3.2.2 Discharge in the Euphrates River (at Iraqi border)

The following is current river flow of Tigris and Euphrates rivers.

Table 3.2.1 Discharge in the Tigris and Euphrates Rivers (Water feeding quantities of the Tigris, Euphrates rivers)

Average feeding quantities of the Tigris river (Upstream of al Mosul dam)		Period	Percentage of decline
Normal average	21.2 billion m^3	1932-1988	100.0 %
After climatic change and/or upstream developments	14.98 billion m^3	1999-2013	70.7 %
Average feeding quantities of the Euphrates river (Iraq-Syria borders)			
Before dam constructions in Turkey & Syria	30 billion m^3	1932-1972	100.0 %
After Keban dam construction (Before Ataturk dam)	23.5 billion m^3	1973-1989	78.3 %
After Ataturk dam construction	19 billion m^3	1990-1999	63.3 %
After climate change, or after the irrigation project in the upstream region	15.2 billion m^3	2000-2013	50.7 %

Source: Water and Agricultural Current Situation of Iraq (Presentation by Aun Diab Abdullah; MoWR, Dr. Abdulkareem Hamad Hassan; MoA

Notes: Different from discharge shown in Fig. 3.2.1, 3.2.2

3.2.2 Ratio of Watersheds and Water Resources

Iraq, located in the basins of the Mesopotamia plain, is dependent of most of its water resources from the Tigris and the Euphrates rivers. The watersheds can be classified into the following 5 categories.

- Euphrates 42%
- Tigris 36%
- Great Zab 8%
- Lesser Zab 5%
- Diyala 9%

3.2.3 Storage Facilities and Groundwater Use

Table 3.2.2 outlines the existing dams, ponds and lakes.

Table 3.2.2 Outline of Existing Dams and Lakes

Name	Watershed	Water use (billion m^3)	Hydropower (Mega watts)	Year completed
Mosul dam	Tigris	11.11	750 main dam 60 regulatory dam 200 pump storage	1986
Dukan dam	Lesser Zab	6.8	400	1959
Darbandikhan dam	Diyala	3.00	240	1961
Hemrin dam	Diyala	2.45	50	1981
Haditha dam	Euphrates	8.28	660	1986
Duhok dam	Duhok	0.047	-	1988
Adhaim dam	Adhaim	1.5	27 (yet constructed)	1999
Tharthar dam	Tigris	85.39*1		1957
Habbaniyah reservoir	Euphrates	3.31		
Total		121.89		

*1: Gross capacity (of which 35.81 billion m^3 is sediment capacity).

Source: NDP 2013-2017.

Besides the large-scale dams, smaller dams have also been constructed for water supply, animal use, and to facilitate migration into the desert region. Water in these reservoirs is also used for agriculture. Being constructed at the tributaries, the reservoirs, besides supplying non-contaminated water when discharge runs low, also recharge groundwater. Most of the small dams are constructed in Western desert, Eastern and the Kurdistan region, with total storage capacity reaching 119.204 million m^3. According to the NDP 2013-2017, water storage capacity of 116 million m^3 is currently being constructed in Misan, Anbar, Kirkuk, Diyala and Wasit governorate.

Total annual groundwater use in Iraq has reached 3.117 billion m^3, with the following usages.

Table 3.2.3 Groundwater Usage

	Usage	Percent
1)	Portable/Tap water and industry	4%
2)	Agriculture	48%
3)	Spring	1%
4)	Government irrigation projects	4%
5)	Ono-government irrigation project	43%

Source: Water and Agricultural Current Situation of Iraq

Groundwater, depending on storage condition and underground flow, can be classified into 5 physiographic categories: mountains, highlands, Al-Jazeera (Upper Mesopotamia), the desert area and alluvial plain (Lower Mesopotamia). Except for the alluvial plains, rechargeable and/or exploitable groundwater volume has been investigated as follows.

Table 3.2.4 Rechargeable and Exploitable Volume

Zone	Area（km^2）	Rechargeable（billion m^3/yr）	Storage capacity（billion m^3/yr）	Exploitable volume（billion m^3/yr）
Highland and mountains	42,962	2.633	1.087	3.720
Al-Jazeera (Upper Mesopotamia)	22,125	0.453	0.392	0.845
Desert area	168,000	0.930	1.590	2.520
Total	233,087	4.02	3.069	7.090

Source: National Development Plan

3.2.4 Sector Wise Water Use

The percentage of sector wise water use in 2015 is shown below. Agricultural use accounted for about 64%, a figure that undeniably has a huge impact on the current water shortage.

Table 3.2.5 Sector Wise Water Use

	Water use	Used water (BCM)	Ratio
1)	Tap water and industry	5.769	8%
2)	Agriculture	46.090	64%
3)	Inland fishery and animal husbandry	0.329	1%
4)	Wetland control	5.388	8%
5)	Discharge from Shatt Al Arab river	3.934	5%
6)	Evaporation from rivers	0.959	1%
7)	Evaporation from reservoirs	9.653	13%
	Total	72.122	100%

Source: Water and Agricultural Current Situation of Iraq

3.2.5 Water Quality

As mentioned in the above, the decrease in discharge in both the Tigris and Euphrates rivers has a huge consequence on the water quality.

In the Euphrates river, the discharge was 23.6 billion m^3 in the 1970's, and had dropped to about 16.9 billion m^3 in the 1980's, due mainly to dam constructions in Turkey and Syria. By 1989 salt concentration has increased to 1,000ppm. High salt content of the Tharthar Lake water that flows into the mid basin of Euphrates river has also contributed to the increase in salt concentration. Fig. 3.2.3 shows the observed TDS values in the water along the Euphrates river.

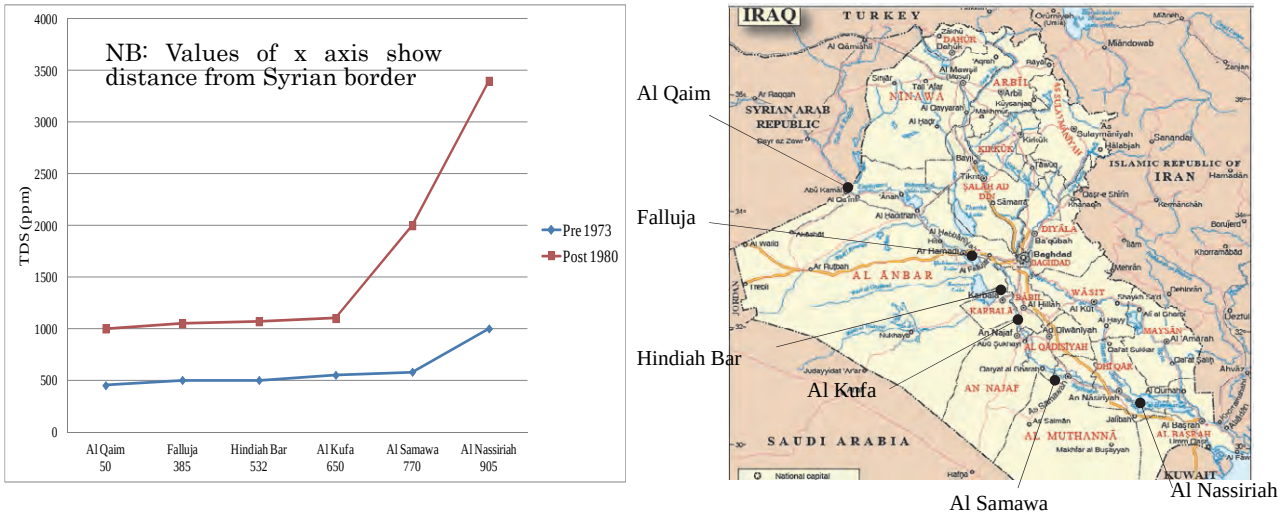

Fig. 3.2.3 Salinity of Euphrates River and Location of Observation Sites

Source: Study the Effects of Water level Depression in Euphrates River on the Water Quality

Regarding water quality of the Tigris river, TDS value at Turkish border is 280ppm but increased to 1,800ppm at downstream of Basrah[22]. This is the result of irrigation of highly intensive agriculture as well as the high evaporation. Fig. 3.2.4 shows TDS values in Tigris river. As evident from it, salinity is worse in downstream of the Mosul dam. This is greatly affected by the returning water from irrigation. The waters from Tharthar Lake and waste waters from Baghdad are also the culprits.

[22] Nadhir A. Al-Ansari (2013) "Management of Water Resources in Iraq: Perspectives and Prognoses", Engineering, Vol.5 No.8 (2013), Article ID:35541, 18 pages, DOI:10.4236/eng.2013.58080. (http://file.scirp.org/Html/6-8101946_35541.htm)

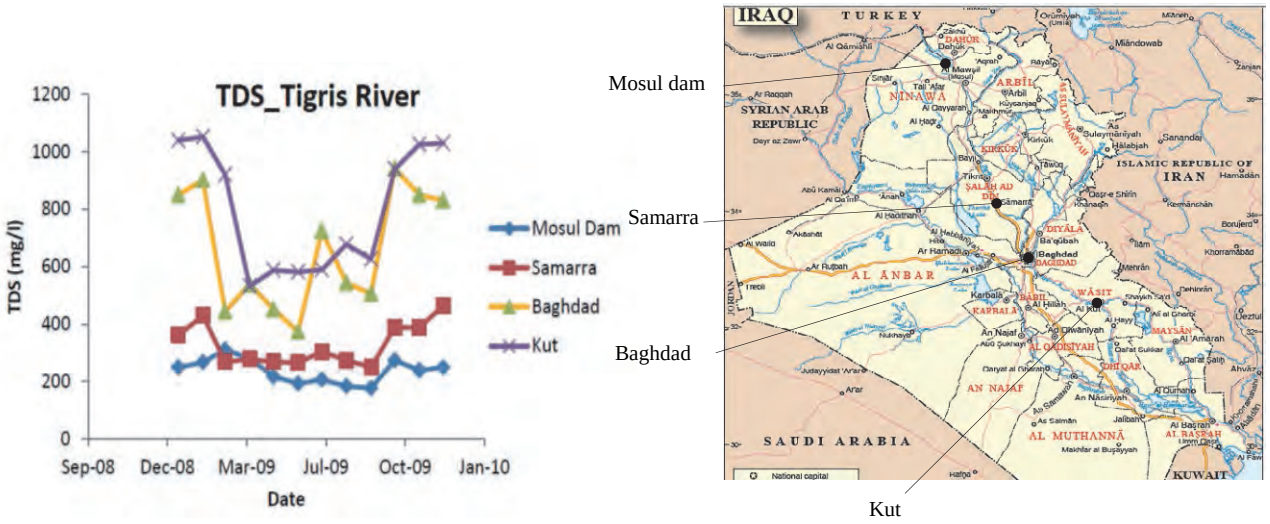

Fig. 3.2.4 TDS in the Tigris River and Location of Observation Sites
(Source: National Center for Water Resources Management)

Fig. 3.2.5, 3.2.6 present an inter annual prediction of Tigris and Euphrates rivers, their tributaries and water quality (TDS) between the present and 2035. Decrease of river flow of the Tigris and Euphrates rivers are especially prominent at their upstream areas. On contrary to this, the river flow at the middle and downstream areas of both rivers is not predicted to be decreased probably because the Government of Iraq anticipates large extension of the water saving policy for the agriculture and irrigation sectors, and the Government also has high expectations for project effects through promotion of the water saving irrigation projects.

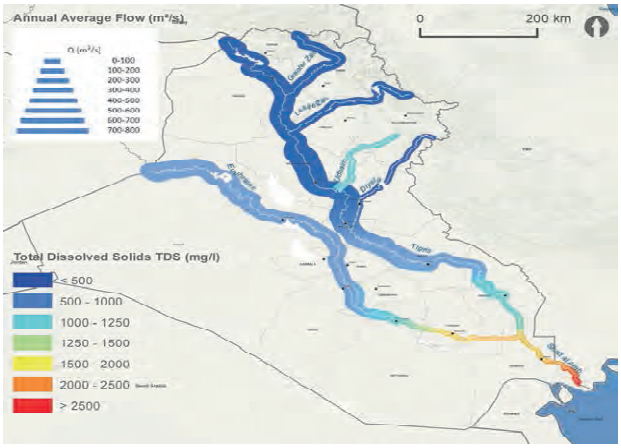

Fig. 3.2.5 River Discharge and Water Quality (Present)

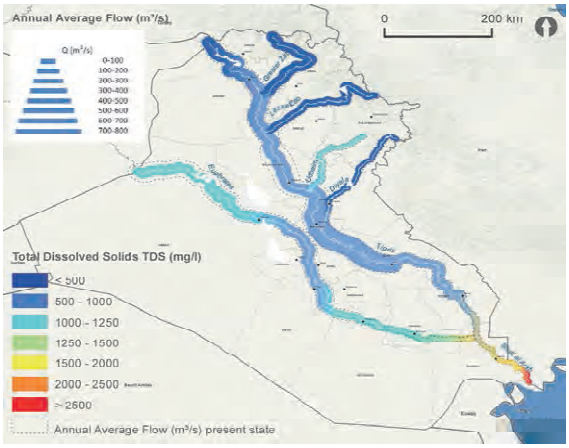

Fig. 3.2.6 River Discharge and Water Quality (2035)

Source: Water and Agricultural Current Situation of Iraq

Meanwhile, MoE reported that severe water salinization of over 2,000 mg/l has already been observed at the downstream areas and in the Euphrates river it was exceptionally high 1,500～2,000 mg/l.

Table 3.2.6 (salinity guidelines for irrigation by the FAO) indicates that EC 0.7-3.0 dS/m (700-3,000 μS / cm), or TDS 450-2,000 mg / l will have low to moderate effects on crops. In addition, salinity classification and effects on crop yields are described in the Managing Salinity in Iraq

Agriculture (Table 3.2.7). TDS 1,500-2,000 mg / l is classified as moderately saline (S2), and will lead to some decrease in yields. In the same document the effect by crops is also shown (Fig. 3.2.8). For wheat and Barley, salinity of classification S2 will not result in much yield reduction, indicating that it is effective to cultivate these crops in the rainy season when evapotranspiration is small and making measures such as water-saving irrigation is viable.

The data have been monitored by MoE, and it is a remarkable point that the water salinity varies seasonally.

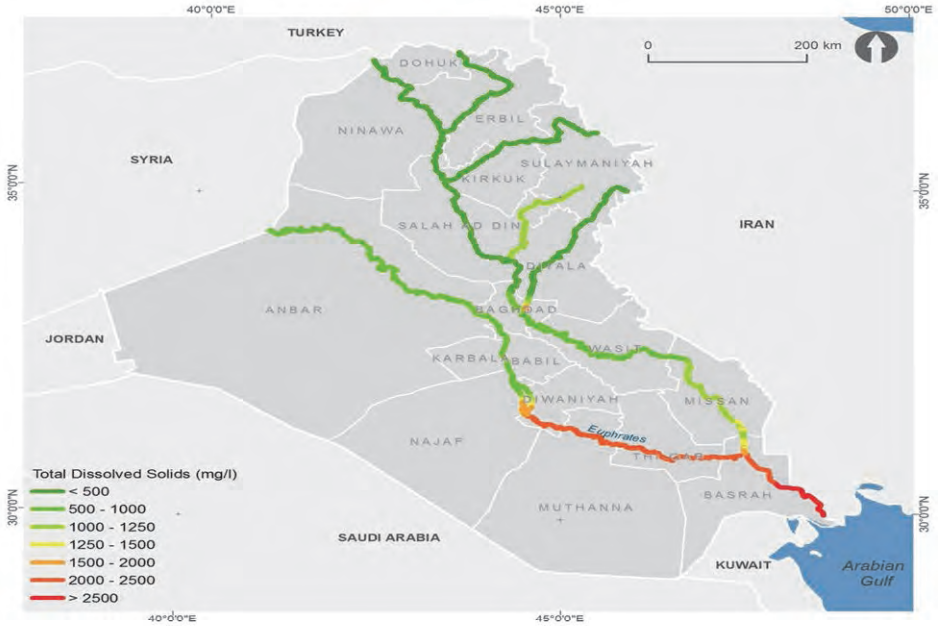

Fig. 3.2.7 Water Discharge and Salinization (MoE)

Source: Water and Agricultural Current Situation of Iraq

Table 3.2.6 Effect of Salinity in Irrigation

Salinity	Unit	Effect		
		None	Low to moderate	High
ECw (Electric conductivity)	dS/m	< 0.7	0.7 - 3.0	> 3.0
TDS (Total dissolved solids)	mg/l	<450	450 - 2,000	>2,000

Source: Guideline for Interpretation of Water Quality for Irrigation, FAO

Table 3.2.7 Soil Salinity Classification and Crop Responses

Salinity class	Salinity range (ECe, dS/m)	Crop responses
Non saline (S0)	0 - 2	Salinity effects on yield negligible
Slightly saline (S1)	2 - 4	Yield of very sensitive crops reduced
Moderately saline (S2)	4 - 8	Yield of many crops reduced
Highly saline (S3)	8 - 16	Only tolerant crops yield satisfactorily

Salinity class	Salinity range (ECe, dS/m)	Crop responses
Severely saline (S4)	16 - 32	Halophytes and a few tolerant crops yield satisfactorily
Extremely saline (S5)	>32	Often bare. Only very salt-tolerant halophytes grow

Source: Managing Salinity in Iraq's Agriculture, Iraq Salinity Assessment, International Center for Agricultural research in the Dry Areas: ICARDA

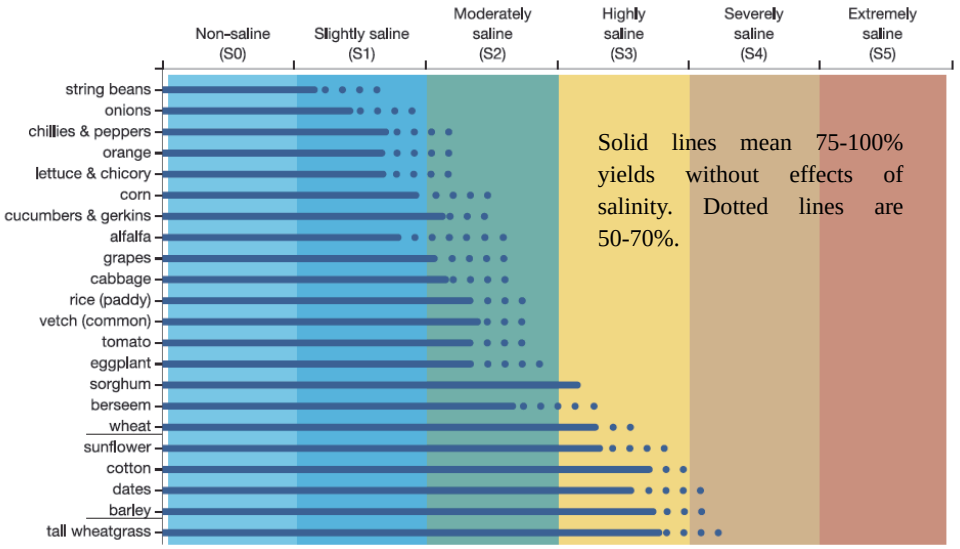

Fig. 3.2.8 Ability of Typical Iraqi Crops to Grow in Soil of Different Categories

Source: Managing Salinity in Iraq's Agriculture

3.3 Current Status of Irrigation

3.3.1 Irrigated Area and Cropping Ratio

About 16% or 7 million ha of area are arable land, of which about 5.985million ha is under irrigation or rain-fed[23]. In Iraq, irrigation is a must in the mid and southern regions, while rain-fed agriculture is practiced in some parts towards the north. About 64% of cultivated land is irrigated, of which 3.384 million ha is under surface irrigation (2.534 million ha within government projects, and 0.850 million ha non-government), 0.426 mil ha under groundwater irrigation (government project = 0.020 million ha, non-governmental= 0.398 million ha, inclusive of 0.007 million ha irrigated by spring). Rain-fed area is about 2.175 million ha. From these figures, it is clear that most of the irrigated lands are under the 142 existing or new government projects.

Regarding cropping ratio, until 2011 the cropping ratio was 70%[24]. In 2011, due to the drought, cropping ratio decreased by about 20%. In Strategy for Water and Land Resources in Iraq (SWLRI) report, average cropping ratio is estimated at 85%.

3.3.2 Irrigation Efficiency

Current irrigation efficiency[25] is estimated at 30～40%[26]. Table 3.3.1 shows lining ratio of main canals, branch canals, and secondary canals. Approximately 20-24% of these are having concrete lining (see Annex 1). Lining ratio of distribution canals is as shown in table 3.3.2. Although MoWR did not tally the length of pipeline canal extension, SWRLI states that about 2% of canals will be pipelined.

Table 3.3.1 Length and Lining Ratio of Main, Branch and Secondary Canals

	main canals			branch canals			secondary canals		
	Lining	Earth canal	other	Lining	Earth canal	other	Lining	Earth canal	other
Length(km)	1,972	7,729	26	2,332	9,330	254	2,353	6,018	1,493
Ratio (%)	20	79	1	20	78	2	24	61	15

Source: MoWR

Table 3.3.2 Length and Lining Ratio of Distributary Canal

	Distributary canal			
	Lining	Earth canal	other	Total
Length(km)	7,860	7,264	3,422	18,546
Ratio (%)	42	39	18	100

Source: MoWR

The low efficiency can be, in the SWRLI, attributed to water losses along the structures. Lining ratio for main, branch and the secondary canal is 20%～24%, while for the tertiary canal it is 42%[27]. Also, insufficient leveling within plots also results in water loss, in particular flood irrigation.

From the software perspective, SWRLI points out that water is also lost due to improper gate

[23] SWLRI report, p.107

[24] SWLRI report, p.108. Equation = Winter CR + Summer CR + perennial crops CP×2

[25] SWLRI equation: Irrigation efficiency = Application efficiency × Conveyance efficiency × operation efficiency

[26] SWLRI report p.110

[27] Materials collected from MoWR

operation at the weirs and intakes. Some farmers arbitrarily pump water up to their own lands in the cases of open channels. The policy allowing farmers to pump water freely into their respective fields with no Irrigation Service Fee (ISF) naturally enhances the habit of water wastage and thus results in low water use efficiency. Farmers' low farming technology, improper practice of intermittent irrigation and lack of agricultural inputs are some of the other given reasons.

3.3.3 On-farm Irrigation Efficiency

Although no detailed data was obtained for the different irrigation methods at field level (Flood, furrow, sprinkler and drip irrigation), from the interviews conducted during this Survey, it was clear that most of the farmers practice flood irrigation.

Modern on-farm irrigation facilities such as sprinkler and drip irrigation are under the auspices of MoA. From the data obtained from MoA, area covered under the sprinkler method is about 99,000 ha (395,000 dunams: as of 2012 see Table 3.3.3）. From the Table, it is clear the geographical disparity of the command area is large. This can be explained by the fact that due to climatic factors and salt concentration, sprinkler irrigation is more commonly practiced in the north than in the south.

Table 3.3.3 Area under Sprinkler Irrigation

Table shows the results that were obtained through the use of previously erected systems currently operating Winter agricultural season (2011 - 2012)

Sequential No	Governorate	Sprinkler system*1		Cultivated area (dunams)	Production rate (Tons / dunams)	The amount of the total production of the cultivated area (tons)
		The number of fixed systems	Number of pivotal systems			
1	Kirkuk	460	72	13,882	0.895	12,425.7
2	Nineveh	569	387	55,478	0.617	34,253.2
3	Salah al-Din	182	3,144	225,952	0.927	209,679.9
4	Anbar	450	895	93,734	0.791	73,779.0
5	Wasit	2	2	155	0.909	141.0
6	Dhi-Qar	-	1	80	0.550	44.0
7	Baghdad	1	2	217	0.933	202.5
8	Diyala	13	11	1,547	0.798	1,235.6
9	Babil	5	37	4,240	1.000	4,245.0
10	Karbala	-	1	120	0.450	54.0
Total		1,682	4,552	395,405		336,059.9

Source: MoA

*1 : Including currently not operating system

3.3.4 Water Users Association

The initiative of Water Users Association (WUA） had been introduced by JICA's cooperation projects, "Capacity Development for Agriculture & Rural development for Iraq (as known as Karbala Project)", and "Project for Spreading Water Users Associations for the Efficient Use of Irrigation Water (phase 1)". As shown in Table 3.3.4, by the end of the phase 1 of the project, the total number of directly established WUA by the pilot project and those outside the project reached to 47.

Table 3.3.4 WUA established within and outside Pilot Project

Phase	Established WUA		
	By pilot project	Outside pilot project	Total
Phase-1（5PMTs）	4 (Kirkuk 2, Najaf, Salah ad-Din)	13 (Kirkuk), 2 (Wasit)	19
Phase-2（6PMTs）	4 (Babil, Dhi-Qar, Ishaque, Diyala)	5 (Mabain Al-Nahrain)	9
Phase-3（6PMTs）	7 (Karbala 2, Baghdad, Misan, Muthanna. Nineveh, Basrah)	4 (Baghdad), 5 (Basrah), 1 (Misan)	17
Total17PMTs	15	30	45
Others		2 (Musayab)	2
Total	15	32	47

Source: Final report of "Project for Spreading Water Users Associations for the Efficient Use of Irrigation Water"

It is evident from the table 3.3.5 that by the time of conduction of this Survey (January 2016), the number of WUA has increased to 70 by Iraqi governmental efforts. This can be attributed to the proactive interventions by Project Management Team (PMT) of the directorates that had supported their establishments.

Table 3.3.5 Number of WUA as of January 2016

Governorate (PMTs)	Number of WUAs	WUA in pilot project site
Nineveh	1	Established (1 WUA)
Kirkuk	15	Established (2 WUAs in 1 pilot site)
Diyala	2	Established (1WUA)
Anbar	0	Not established
Baghdad	14	Established (1 WUA)
Isahqi	1	Established (1WUA)
Mabain Al-Nahrain	7	Established (2 WUAs in 1 pilot site)
Musaib	3	PMT were added after pilot project
Babil	1	Established (1 WUA)
Karbala	3	Established (2 WUA)
Wasit	8	Established (3 WUAs in 1 pilot site)
Salah ad-Din	1	Established (1 WUA)
Najaf	1	Established (1 WUA)
Qadisiyah	0	No established
Muthanna	1	Established (1 WUA)
Dhi-Qar	1	Established (1 WUA)
Misan	2	Established (1 WUA)
Basrah	9	Established (1 WUA)
Total	70	

3.4 Agriculture Status

3.4.1 GDP of Agricultural Sector

The GDP figures of Iraq are described in table 3.4.1. Over 50% of the GDP and over 80% of the revenue come from oil, and thus indicate that the economy is over-dependent on oil sector.

Table 3.4.1 GDP of Iraq

Year	2011	2012	2013	2014
GDP at market prices (current billion US$)	185.750	218.001	232.497	223.508
GDP per capita (current US$)	5,839.31	6,650.23	6,882.41	6,420.37
GDP growth (annual %)	7.55	13.94	6.57	-2.12

Source: World Bank (http://data.worldbank.org/country/iraq)

Over the past one and half year, oil prices have plummeted drastically from US$110/barrel to

US$27/barrel, resulting in sharp decrease in national revenue. Since national development plans are budgeted based on oil revenues, implementation of many of the projects have become difficult. Table 3.4.2 shows the percentage of agriculture sector's contribution to GDP as estimated using data from MoP. It shows a decreasing trend i.e. from 8% in 2003 to less than 4% in 2013.

Table 3.4.2 GDP and Agricultural Contributions[28]

Year	Iraqi GDP (Million IQD)	Agricultural GDP (Million IQD)	Agricultural sector contribution to GDP (%)
2003	29,890,204	2,486,865	8.32
2004	53,532,870	3,693,768	6.90
2005	73,929,314	5,064,158	6.85
2006	96,016,983	5,568,985	5.80
2007	111,898,411	5,494,212	4.91
2008	158,583,123	6,042,017	3.81
2009	131,648,401	6,832,552	5.19
2010	163,084,444	8,366,232	5.13
2011	218,465,110	9,918,316	4.54
2012	253,128,929	10,403,599	4.11
2013	269,908,994	10,742,378	3.98

3.4.2 Land Use

The World Bank and FAO have indicated land use as shown in Table 3.4.3. Out of the total agricultural land, about 50% has been cultivated and of which about 40% are irrigated land, and share of irrigation land has shown an increasing trend in the recent years. ,

Table 3.4.3 Agricultural Land Use[29]

Year	Agricultural land[30] (million ha)		
		Arable land[31] (%)	Area equipped for irrigation[32] (%)
2003	8.690	51.78	40.56
2004	8.690	51.78	40.56
2005	9.390	55.38	37.54
2006	8.990	53.39	39.21
2007	9.140	54.16	38.57
2008	8.190	48.84	43.04
2009	7.850	46.5	44.9
2010	8.220	48.72	42.94
2011	8.530	48.72	42.94
2012	8.569	-	-
2013	9.230	-	-

[28] Materials collected from MoP

[29] World Bank Databank, http://data.worldbank.org/ , FAOSTAT, http://faostat3.fao.org/home/E

[30] Agricultural land refers to the share of land area that is arable, under permanent crops, and permanent pastures (WB)

[31] Arable land includes land under temporary crops (double-cropped areas are counted once), temporary meadows for mowing or for pasture, land under market or kitchen gardens, and land temporarily fallow (FAO).

[32] Note that a certain area is equipped to be irrigated does not mean that it has been irrigated in a specific year (FAO).

3.4.3 Sector's Labor Force

The Table herein below shows the number of people working in the agricultural sector. About 20% of workforce is employed in agriculture, indicating that the agriculture plays a major role in creating job opportunities[33].

Table 3.4.4 Trend of Total Labor Force and Employment in Agriculture[34]

Year	Total work force	Employed in agriculture		
			Male	Female
2006	6,557,200	1,948,500	1,150,100	798,400
2007	7,116,700	1,076,200	732,700	343,500
2008	7,606,100	1,781,600	1,056,500	725,100

Table 3.4.5 shows the trend of agricultural households.

Table 3.4.5 Agricultural Households Trend by District[35]

Governorate	2001	2009	2015
Dohuk	-	36,121	-
Nineveh	63,509	45,473	-
Erbil	-	38,886	-
Kirkuk	22,864	26,816	24,883
Slaymaniyyah	-	51,599	-
Diyala	42,385	41,704	24,223
Anbar	29,903	44,437	-
Baghdad	30,636	56,174	19,754
Babil	35,327	65,000	38,596
Karbala	16,715	19,873	13,960
Wasit	26,322	38,596	28,741
Salah ad-Din	39,980	72,001	-
Najaf	16,601	24,135	18,794
Qadisiyah	25,938	35,132	27,343
Muthanna	14,325	19,898	10,948
Dhi-Qar	33,841	25,661	21,839
Misan	17,812	20,173	18,107
Basrah	19,309	14,974	11,559
Total	435,467	676,653	258,747

3.4.4 Crop Production

Iraq's major crops production and area under cultivation after 2003 are shown in Table 3.4.6. Among the cereal crops, wheat is at the top, both in terms of production and acreage, followed by cultivation of barley. In vegetables production, tomato and potato are often quoted as the major crops[36].

[33] NDP 2013-2017, MoP, p.115 (ditto)

[34] ILO, http://www.ilo.org/global/statistics-and-databases/lang--en/index.htm

[35] Material collected from MoP. Missing data in 2015 are due to ISIL (Nineveh, Anbar, Salah ad-Din). The Kurdistan governorates are also excluded in 2015 (Dohuk, Sulaymaniyyah, Arbil).

[36] NDP 2013-2017, MoP, p. 116 (-ditto-)

Table 3.4.6 Production and Acreage of Major Crops[37]

	Wheat		Barley		Maize		Tomato		Potato	
Year	Production (ton)	Area (dunam)	Production (ton)	Area (dunam)	Production (ton)	Area (dunam)	Production (ton)	Area (dunam)	Production (ton)	Area (dunam)
2003	2,329,198	6,854,925	860,416	4,252,945	235,715	363,980	779,001	262,819	608,116	141,223
2004	1,832,138	6,159,223	805,445	3,829,236	415,971	739,761	988,160	266,224	629,959	154,745
2005	2,228,362	6,410,663	754,437	4,253,284	401,082	694,559	939,384	268,202	807,586	203,729
2006	2,286,311	6,054,103	919,307	4,103,966	399,038	630,725	1,042,216	263,284	794,514	179,980
2007	2,202,777	6,279,514	748,291	4,374,883	384,471	620,409	954,890	238,457	597,890	133,153
2008	1,254,975	5,741,162	403,999	5,395,037	287,955	490,290	802,386	210,574	348,773	132,034
2009	1,700,390	5,049,753	501,508	2,817,635	238,113	456,521	913,493	218,424	223,147	78,777
2010	2,748,840	5,543,880	1,137,169	4,026,674	266,699	467,833	1,013,177	212,780	204,597	52,067
2011	2,808,900	6,542,768	820,152	3,650,866	335,710	518,363	1,059,537	244,189	557,401	161,777
2012	3,062,311	6,914,498	831,990	2,849,531	503,389	605,815	768,375	235,794	586,081	173,966
2013	4,178,379	7,376,332	1,003,198	3,363,601	831,345	798,118	903,809	214,538	647,337	151,779
2014	5,055,111	8,528,043	1,277,796	4,632,262	289,288	378,061	770,564	139,281	402,302	106,966

The trend of food self-sufficiency in the major crops up to 2014 is shown in Table 3.4.7. Wheat, maize, tomatoes and potatoes show a relatively high self-sufficiency rate. Except for 2004, dates, a popular export commodity, has also achieved food self-sufficiency. On the other hand, rice has shown a consistent trend of low self-sufficiency. Even onion that once showed a high self-sufficiency has remained at a low level in recent years.

Table 3.4.7 Self-sufficiency of Major Crops[38]

Year	Wheat	Barley	Rice	Maize	Tomato	Potato	Onion	Dates
2001	24.9	100.0	8.0	100.0	95.7	96.9	99.7	100.4
2002	57.5	155.7	15.3	100.0	97.7	97.8	99.4	100.9
2003	50	124.8	6.0	110.4	51.3	91.8	84.7	116.8
2004	37.7	115.8	16.3	100.0	85.8	83.9	95.8	82.2
2005	42.8	107.1	20.7	82.7	79.6	82.4	90.0	159.1
2006	36.2	119.5	21.4	93.7	74.1	86.6	48.3	127.1
2007	38.9	104.2	22.2	97.7	56.5	77.7	73.7	165.8
2008	23.7	57.4	13.5	91.4	70.7	78.3	58.5	264.4
2009	29.6	71.5	9.4	89.8	62.0	76.1	39.0	164.6
2010	44.6	158.4	9.0	98.9	53.6	53.0	37.5	128.8
2011	45.4	122.4	14.4	99.4	81.6	89.4	62.9	128.7
2012	36.2	71.4	6.3	-	-	-	-	-
2013	54.1	90.0	11.8	-	-	-	-	-
2014	56.5	90.0	17.6	-	-	-	-	-

[37] Materials collected from MoP

[38] FAOSTAT, http://faostat3.fao.org/home/E
Food Outlook 2011 Nov, http://www.fao.org/docrep/014/al981e/al981e00.pdf
Food Outlook 2012 Nov, http://www.fao.org/docrep/016/al993e/al993e00.pdf
Food Outlook 2013 Nov, http://www.fao.org/docrep/019/i3473e/i3473e.pdf
Food Outlook 2014 Oct, http://www.fao.org/3/a-i4136e.pdf
Food Outlook 2015 Oct,
http://www.fao.org/fileadmin/user_upload/newsroom/docs/Food%20Outlook%20October%202015.pdf

Chapter 4 Other Donors Activities[39]

4.1 International Agencies

Table 4.1.1 shows the economic cooperation of international agencies

Table 4.1.1 Economic Cooperation of International Agencies

(Gross expenditure, Unit: million US$)

Year	1st		2nd		3rd		4th		5th		Japan	Total
2008	EU	38.01	IDA	12.28	UNDP	4.19	GFATM	3.17	UNICEF	2.13	3.94	63.72
2009	EU	57.31	IDA	31.93	Isl. Bank	8.66	UNDP	4.09	UNICEF	2.03	3.71	107.73
2010	IDA	59.76	EU	54.10	UNHCR	10.84	GFATM	10.39	UNICEF	2.95	5.61	143.65
2011	IDA	42.11	EU	13.00	GFATM	4.09	UNDP	3.01	UNICEF	2.44	3.68	68.68
2012	EU	91.58	IDA	59.10	UNDP	2.81	GFATM	2.62	UNICEF	2.52	3.74	162.37

Source: OECD/DAC

Notes: Ranking reflects the major international organizations

(1) FAO

FAO is currently implementing 10 projects[40] in Iraq. FAO has analyzed the agriculture sector as follows[41]. Iraq is basically an agricultural country with much arable land laid with irrigation facilities but dependent on rain-fed grain production and sheep keeping. Livestock is also important part of Iraqi agriculture (sheep, goats and cattle are the main animals), and meat, wool, milk, leather and fur are also utilized. However, due to many years of conflicts and social unrest, Iraqi agriculture is faced with many challenges. Low agricultural income coupled with less employment opportunity, had led to out flux of population to the cities, causing public service failures and urban poverty. Although agricultural sector is extremely important for the economy, Iraq is forced to opt for short term food imports, while recognizing importance of long term sustainable developments to meet the growing food demand.

To put the scenario into perspective, firstly, the irrigation projects are facing serious water shortage. Percolation and seepage are the main causes of water loss. Overgrazing is also cited as the other major culprit. Efforts like better pasture management are yet to be made in mitigating the impact of increased animal keeping. In addition, the impact of the riots[42] that happen in wheat cropping season is becoming a concern. Steps like force eviction and preventing farmers from accessing the land, will lead to medium-term food security problem. Due to the large number of IDPs and huge influx of people into the host communities, food security has worsened, and it is acute particularly in the Kurdish region.

The agriculture sector, a source of livelihood for most of the people, has also been analyzed as facing severe situation. The major constraints are: hindered land access due to riots, the occurrence of IDPs, hard-to-find and soaring agricultural inputs prices, damages to infrastructure (including land, agricultural machineries, and storage facilities), collapsed marketing system, decreased access to livestock feed and increased cost, decreased veterinary supplies and services.

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[39] See Annex 4, Donor Assisted Projects", to check main donor projects in Iraq

[40] FAO Office Web page（http://www.fao.org/iraq/programmes-and-projects/project-list/en/）

[41] ditto（http://www.fao.org/iraq/fao-in-iraq/iraq-at-a-glance/en/）

[42] No detail is mentioned(http://www.fao.org/iraq/fao-in-iraq/iraq-at-a-glance/en/). It seems to be ISIL activities from June 2014. Wheat cropping period is October.

To address these challenges, FAO has prioritized the following as major support[43]. (i) winter grain production (wheat), (ii) poultry production, (iii) vegetable production, (iv) small-scale horticulture, (v) small-scale livestock keeping, and (vi) food and agriculture sector cooperation.

(2) UNDP

The action plan of UNDP does not mention the analysis of the agricultural sector. However, the environment and land-related issues can be found in UNDP's analyses on Iraqi current situation[44]. In the context of poverty, the nation is vulnerable to environmentally negative impact of, necessity to adopt systemic measures to overcome climate change, trans-border water and environmental degradation, in particular shrinking agricultural production due to soil/land degradation. Regarding land access, about 1,730 km^2 is adversely affected by landmines and explosive remnants and thus making it difficult to develop new oil and gas fields and inhibiting farmers' access to the land.

In March 2014, UNDP and JICA had updated the agreements that strengthen the partnership in implementing economic development and improvement of the living conditions, including infrastructure development for irrigation.

(3) The World Bank

The World Bank, as part of economic reconstruction, had implemented "Emergency Community Infrastructure Rehabilitation Project" from 2004 to 2008. This had contributed greatly to the rehabilitation of irrigation and drainage facilities.

According to an interview with the World Bank Iraq office[45], WB's support to the agricultural sector is provided through grants (2004-2013) to MoWR to repair the canals in all of the governorates. Further, there is need to build the capacity on salinity damage management and maintenance of agricultural markets, in particular the capacity to manage irrigation water which is saline (3,000-4,000 ppm). In addition, it is necessary to improve project implementation coordination between MoWR and MoA.

(4) EU

For reconstructing the country, EU has been supporting since 2003 a wide range of cooperation such as public services provision (education, health, water, sanitation and infrastructure), facilitation of political / electoral process, refugees and IDP support, legislation, organization capacity building[46]. Out of such support, the proportion of the agricultural sector was about 7%[47]. On the other hand, the priority areas for 2011-2013 were (i) good governance and legislation, (ii) education that matches the demand of labor market, and (iii) water management and efficiency.

Description on support to agricultural sector is scattered in the 3rd description as mentioned

[43] ditto（http://www.fao.org/iraq/fao-in-iraq/en/）

[44] Iraq Country Programme Action Plan 2011-2014, UNDP, p.4-5
（http://www.iq.undp.org/content/dam/iraq/img/CPAP.pdf）

[45] Conference records of JICA Survey team with WB Iraq office (15th September 2015)

[46] Cooperation Between the European Union and Iraq, EU, p.17
(http://www.eeas.europa.eu/iraq/docs/2011_2013_jsp_nip_en.pdf)

[47] Its about 2% out of whole donor assistance

above i.e.- "Water management and efficiency[48]", of the program overview. According to the description, water resources of Iraq which is relying mainly on the intake from the Tigris and the Euphrates rivers, is in a state of crisis, due to devastation and years of dispute as well as receding water level resulting from improper management. About 64% of the water is used for agriculture, but about 50% of it is lost to percolation and evapotranspiration during conveyance, Lack of water has a significant impact on agricultural production, and Iraq has to rely on import of agricultural products. In addition to low agricultural productivity, reduction in soil fertility is becoming a problem due to inefficient irrigation technologies and high water salinity.

For such challenges EU has been focusing on (i) technical cooperation aiming to build the capacity of institutions responsible for water resources management (both central and local level, including the health authorities for prevention and control of water-borne infections), (ii) general education on water (responding to domestic educational inequality as well as transferring sectorial knowledge and technology). This support also complements with that of Italy.

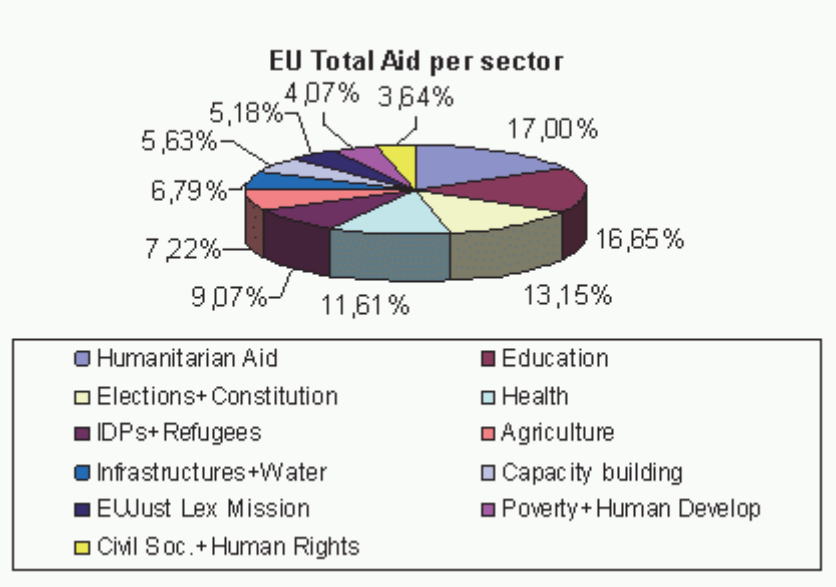

Fig. 4.1.1 EU's Sectorial Assistance for Iraq up until 2010[49]

4.2 Bi-lateral Cooperation

As shown in the table below, 3 countries, namely, US, Germany and Italy, are more active compared with others. In terms of disbursement to agriculture sector, the US and Italy are outstanding, as per the following comparison. Japanese bilateral cooperation is also described.

Table 4.2.1 Major Bi-lateral Cooperation (Agricultural sector in bracket) (million US$)[50]

	US	Germany	Italy
2005	9,762.42 (80.06)	2,013.92 (-)	953.94 (-)
2006	3,974.02 (94.82)	388.17 (-)	485.20 (-)

[48] Cooperation Between the European Union and Iraq, EU, p.37-38 (http://www.eeas.europa.eu/iraq/docs/2011_2013_jsp_nip_en.pdf)

[49] Overview on EU Assistance (http://eeas.europa.eu/delegations/iraq/eu_iraq/tech_financial_cooperation/overview/index_en.htm)

[50] OECD Statistics, http://stats.oecd.org/

	US	Germany	Italy
2007	4,050.87 (143.28)	2,095.39 (-)	480.92 (-)
2008	2,931.24 (59.29)	1,859.07 (-)	879.48 (2.16)
2009	2,134.96 (59.44)	35.94 (-)	166.99 (139.32)
2010	1,027.84 (41.34)	40.91 (-)	12.33 (-)
2011	1,262.27 (27.21)	32.22 (-)	10.18 (1.24)
2012	609.73 (20.00)	23.77 (-)	9.35 (-)
2013	554.22 (-)	23.55 (-)	6.78 (0.68)
2014	385.07 (-)	132.25 (-)	10.95 (1.84)
Total	26,692.64 (525.44)	6,645.19 (-)	3,016.13 (145.24)
Ratio	100%(0.2%)	100%(-)	100%(4.8%)

Source: OECD/DAC

(1) Japan

1) Outline

Japan revealed Grant Aid assistance equivalent to US$1.5 billion to Iraq at an international conference on Iraq's recovery in 2003. In addition, Yen Loan projects equivalent to up to US$3.5 billion was also promised for Iraq's mid-term recovery. US$1.7 billion and US$4.6 billion have been implemented for Grant Aid and Yen Loan, respectively. Technical cooperation projects are also consistently ongoing which results in training of more than 6,000 Iraqi since 2003. In addition, Iraqi public debt of US$6.7 billion was remitted in 2008.

Table 4.2.2 Japanese Assistance for Iraq

(Gross expenditure, Unit: million US$)

Year	Yen loan	Grant aid	Technical cooperation	Total
2009	16.79	3.11 (0.05)	8.22	28.12
2010	128.14	5.32 (2.76)	10.97	144.44
2011	353.91	5.81 (2.51)	10.74	370.46
2012	338.24	2.90 (0.21)	19.81	360.96
2013	676.01	8.76 (6.09)	15.68	700.46
Total	1,446.71	7,800.30 (149.33)	127.61	9,374.61

Source: OECD/DAC

Notes:
1. Donation through international agencies is, since 2006, appropriated for "Grant Aid" if recipient country is clear. Japan has extended donation through international agencies that is appropriated for Grant Aid in accordance with OECD/DAC instructions. Numbers in bracket mean donation through international agencies.
2. Amounts of Yen Loan and Grant Aid are the actually disbursed amount of money in the year. (Regarding Yen Loan, repayment from Iraq is deducted)
3. Total amount of Yen Loan can be minus due to fluctuation of foreign exchange rate.
4. Technical cooperation includes both JICA's and other authorities'

2) JICA's achievements

(a) Project for Spreading Water Users Associations for the Efficient Use of Irrigation Water

This technical cooperation project was built on the high achievements of the informally called

as "Karbala Project 2006-2008" (the official name is “Capacity Development for Agriculture & Rural development for Iraq”). It was implemented from 2012 to 2014 to promote establishment of WUAs. Project management, establishing WUAs and operation & management, irrigation and drainage facilities maintenance & management by WUAs, farm irrigation technology, and dissemination of water saving irrigation methods were the topics in the 6 programs and 8 courses. Trainings were provided for 17 pilot project sites to impart knowledge on water saving irrigation and WUAs regulations, to targeted MoWR, MoA, MoP and the local staff as well as farmers. As a result, WUAs have been established and approved in several of the pilot sites.

To achieve the overall goal, “Efficient irrigation water management by Water Users Associations (WUAs) is conducted in the pilot project site”, (i) WUAs have been established in the pilot site with efforts to en-root the activities, and (ii) completion of the improvement works with minimum one year operation were the measures taken.

In actual implementation, the WUAs faced with further challenges such as not being able to put into practice what have been learned and thus necessitating further trainings, in particular on WUAs management for the executive members.

Revision and consolidation WUA-related laws and regulations were also the challenges. Currently as a result of political decision, collection of water fees has been stopped. Moreover, participating in the WUAs is arbitrary. These have affected negatively the motivation for fair and equitable water resources distribution as well as WUA participation. Collection has to be resumed and make participation compulsory.

i) Period of Cooperation: (M / D) April 1 2012 –March 30 2015 (three years)

ii) Counterpart agencies: MoWR, Cooperative agencies: MoA, PMAC AI, Directorates of Water Resource of the 15 target governorates

iii) Content of cooperation: to improve the capacity of irrigation agriculture officials for the WUA dissemination.

iv) Project purpose: Relevant agencies on irrigated agriculture develop their capacity for irrigation water management by WUAs in the pilot project site.

v) Outputs: 1) Relevant agencies on irrigated agriculture develop their capacity for managing and monitoring projects for promoting efficient water management by WUAs
2) Relevant agencies on irrigated agriculture develop their capacity for facilitating the activities1 of WUAs and PMTs.
3) Relevant agencies on irrigated agriculture develop their capacity for extension of improved farming practices under irrigated conditions.

As a result of this project, the WUAs have started to implement the activity plan and PMT has started to disseminate irrigation practice as planned in some pilot project sites. In order to continue these activities, MoWR has established the Water Extension Unit in the Department of Water Resources of each governorate, monitoring and providing technical guidance to WUAs.

(b) Irrigation sector loan

Despite the fact that irrigation is indispensable for Iraqi agriculture, irrigating capacity has

continue to drop due to lack of materials and equipment as well as poor maintenance of the structures for irrigation and drainage. If it is left unattended the situation will further deteriorate.

Providing materials and equipment to rehabilitate the badly affected facilities will help to revitalize the functions. In addition, this will contribute to the national economy and social reconstruction in the end. For this an L / A was signed on January 25, 2008.

Since this was a sector loan, it was funded on the sub-projects basis (Provision and installation of irrigation and drainage pumps, rehabilitation and refurbishment of existing facilities by the provision of materials and equipment for maintenance) based on the Implementation plans (I/Ps) submitted by implementing agencies after signing of the L/A.

Specifically, it was implemented through the rehabilitation of following eight pumping stations. (See Fig. 4.2.1)

Wasit governorate: Badra Jassan district Al-Dobony 1, 2, 3, 4 (4 irrigation pumping stations) and Shakha district Shakha 8, 10, 13 (3 drainage pump station)

Dhi-Qar governorate: East Gharaf (1 drainage pump station)

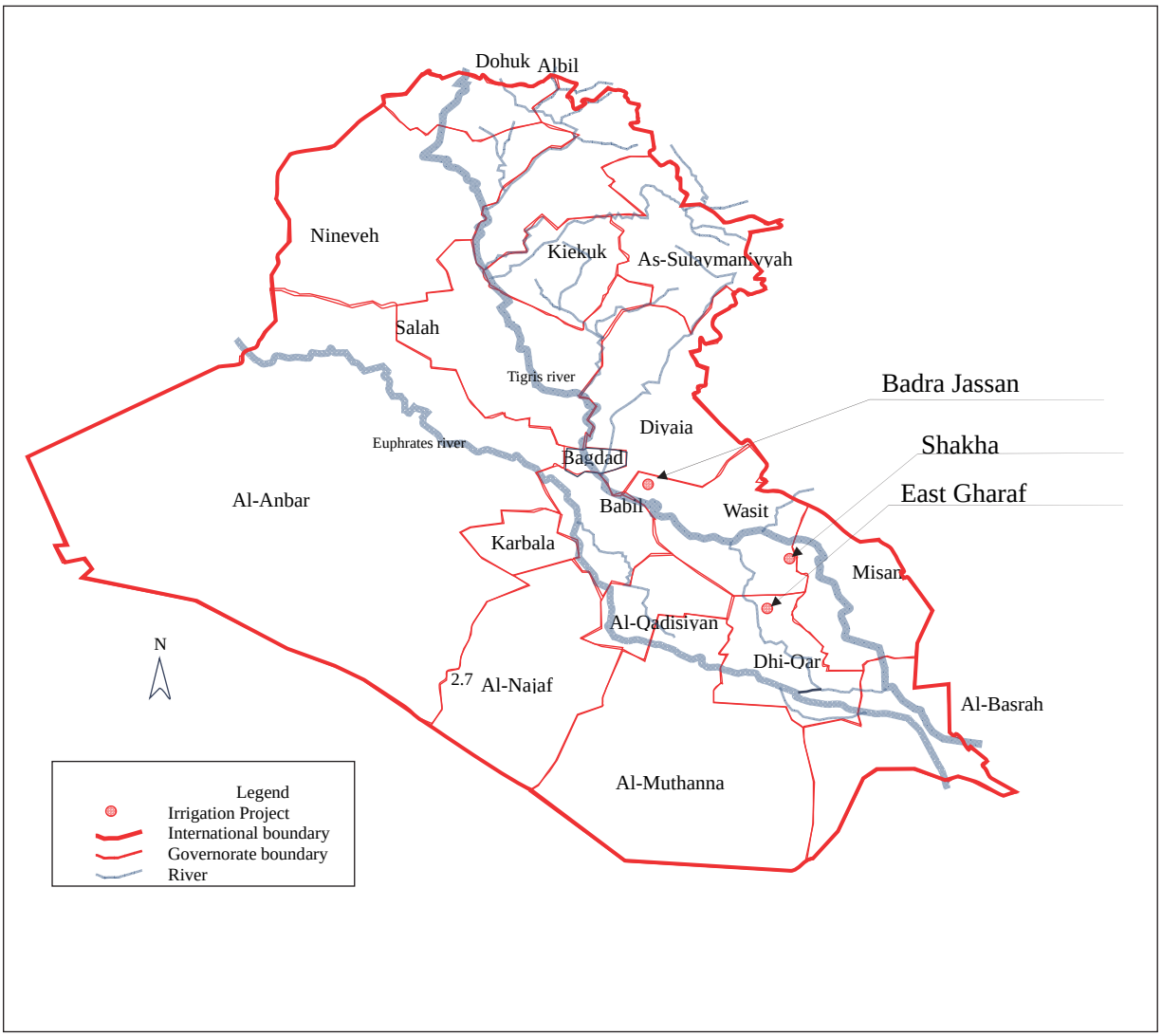

Fig. 4.2.1 Locations of Irrigation Sector Loan Projects (Completed)

2) US

USAID is the largest donor to Iraq (US is the largest bilateral donor), the bilateral cooperation in the agricultural sector amounts to US$525 million from 2005 to 2012. Although currently US is implementing 9 projects in Iraq[51], most of them are in the area of reconstruction, and only 1 project in the agricultural sector.

According to USAID analyses on Iraqi agricultural sector[52], lack of investment, isolation from the international economy and agricultural policies that fell short of expectation had considerably diminished the agricultural sector in the last 20 to 30 years. As a result, Iraq is dependent on imports of food. On the other hand, in order to meet the domestic demand as well as to escape from excessive dependence on imported goods, efforts just have been made to modernize agribusiness and market development. After the public sector and oil-related industries, agriculture is the 3rd major employing sector, contributing greatly to the economy. Recognizing the agriculture sector's large contribution to Iraqi economy, USAID is implementing agricultural revenue improvement project targeting the private sector.

(3) Italy

Since 2005, the Italian aid to Iraq is approximately US$3 billion, of which agricultural support amounts to US$150 million. From 2010 Italian cooperation has focus on i) cultural heritage, ii) health and education, iii) agriculture, iv) water supply management, v) small and medium-sized enterprises (private sector) and vi) organizational / political process.

Of the cooperation programs, agricultural sector is linked strongly with the NDP[53], and is recognized as one of the key areas. In order to modernize agriculture and to increase its contribution to GDP, emphasis is placed on mechanization and capacity building.

4.3 Partnership with Other Cooperating Partners

WB and UNDP have been playing a vital role in reconstruction through supporting rehabilitation of irrigation and drainage system. In recent years, emphasis is also placed on building the human capacity to tackle environmental issues such as rise in water salinity in irrigation water. The EU also concentrates its effort in building human capacity in water resources management, reduced irrigation water and deteriorated water quality (salinized soil), decline of soil fertility, institutional strengthening to improvement of irrigation technology. JICA has provided materials and equipments for rehabilitating and maintenance of irrigation and drainage pumps and irrigation canals through yen loan, besides conducting third country training on irrigated farmland and water management. However, better consorted efforts between and among the multi as well as bilateral cooperating with partners on building the capacity on monitoring and project development and implementation is expected.

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51 USAID Web (http://portfolio.usaid.gov/#)

52 ditto（https://www.usaid.gov/iraq/agriculture）

53 Cooperation Between the European Union and Iraq, EU, p.39-40
（http://www.eeas.europa.eu/iraq/docs/2011_2013_jsp_nip_en.pdf）

In addition, JICA's technical assistance project started in 2006 to establish and strengthen WUAs, which is an area where JICA has much experience. This is an area for further collaboration with other cooperating partners in building the institutional capacity in operation and maintenance of irrigation facilities.

Chapter 5 National Policies and Development Plans on Water Resources, Irrigation and Agriculture

5.1 Agriculture and Irrigation Sector in the National Development Plan

In the National development Plan 2013-2017, the industrial sector, appropriated with 38.2% of the planned investment, is given the top priority. This is due to the fact that the industry sector is regarded as the main budget generating sector and has the highest impact on capital accumulation. The second priority, accounting for the 28.6% of planned investment is placed on human and social development, including construction and service sector such as tourism. The agricultural sector, including water resources and irrigation, is placed at the third priority, receiving 13.4%. This budget is for to turn around the food security situation as well as to create jobs, banking on the high effect of rural development on poverty reduction. As described above, the water resources sector and the agricultural sector, including the irrigation, are important sectors in the NDP.

5.2 National Policies and Development Plans on Water Resources, Irrigation and Agriculture

5.2.1 National Development Plan 2013-2017[54]

The NDP 2013-2017 is the overarching supreme development plan for the nation. In the NDP, the goals for water resources sector, including agriculture and irrigation, is specified, and means for achieving them are also set.

(1) Vision and goals

The common vision for agricultural and water resources sector calls for "agriculture to meet the demands of the national food basket as well as to contribute to the rights to security and to sustain the diversified economic foundation". In order to realize such vision, strategic objectives and quantitative goals have been set as follows.

■Strategic objectives

- Improve agricultural sector’s contribution to GDP
- Improve food self-sufficiency ratio
- Ensure the necessary water resources

■Quantitative goals

In food production target, the most important item in agricultural production is wheat (winter), potatoes (summer) and dates and fruit development. The second priority is placed on the production of rice, tomatoes, onions, corn (white and yellow), legumes and clover (forage crops). For each of the crops, the baseline year is set as of 2009 (or 2011) to monitor annual productions quantitatively in achieving the targets towards the target end year of 2017

(2) Ways of achieving goals

NDP 2013-2017 describes various measures to achieve abovementioned strategic and quantitative goals. Main measures are below.

[54] NDP 2013-2017, MoP, p.127-137 (http://www.mop.gov.iq/mop/resources/IT/pdf/123.pdf)

(3) Consolidation of the major infrastructures and water allocation negotiations with neighboring countries

1) Increase in storage capacity with large-scale dam construction

In the light of the results of the strategic research on water and land resources, consolidation of large dam such as Bakhma dam, Mundwa dam, Taq Taq dam and Khazar-Comel dam shall be continued. In addition, construction and re-development of the Mosul dam will be started within planned five years of time (2013-2017 years) as rehabilitation project. After that the storage capacity will be increased to 22 billion m^3 in the long term.

2) Water source development by small-scale dam

Small dam will be constructed in the valley of Nineveh and Salah ad Din, Anbar, Muthanna, Najaf and Diyala governorate to secure about 150 to 200 million m^3 of storage capacity.

3) Consolidation of major waterways and drainage canals

Complete consolidation of the waterways in the Eastern Euphrates, Western Euphrates and Al-Gharaf drainage in East Tigris. The land improvement works will benefit about 1.27 million ha.

4) Negotiations with neighboring countries on water use of international rivers

As a result of large-scale irrigation development in neighboring countries such as Turkey and Syria, discharge of the Tigris and Euphrates rivers is expected to reduce greatly. This necessitated the implementation of a comprehensive water resources policy, including signing of treaties with neighboring countries. In this regard, it should be noted that currently there is no formal international agreement on water resources allocation between Iraq and the neighboring countries.

(4) Land improvement and water saving irrigation

To expand agricultural land and to increase agricultural productivity of various crops, it is necessary to implement land improvement (irrigation project) of un-implemented areas. As stipulated in the NDP 2013-2017, it is necessary to develop more than 2 million ha of irrigation project in the long term. The details for implementation and repair of existent irrigation projects are as; 1) sub-irrigation projects of 200,000 ha and 2) existent irrigation projects of 1.75 million ha in the Tigris and Euphrates river basin. So far, the total farmland developed, whether fully or partly, by agricultural development is 1.10 million ha (out of 1.75 million ha) in 2011. In addition, it is important to introduce state-of-the-art irrigation methods to counterbalance water shortage in the Tigris and Euphrates rivers due to large scale upstream irrigation developments in Turkey and Syria.

In each year 125,000 ha of irrigation project is being implemented during the ongoing period of NDP. In order to achieve the target of 625,000 ha by the end of such development plan (2017), project area in each of the governorate has been distributed through the governorate conferences. A new irrigation development project of 200,000 ha is included in the target. The total cost of such irrigation projects is about IQD 6.25 trillion for surface irrigation (based on reclamation cost of 2.5 million IQD/dunam) and about IQD 12.5 trillion for modern irrigation methods (5 million IQD/dunam).

Regarding modern irrigation technology, the plan is to implement 750,000 ha of sprinkler irrigation. At the same time, drip irrigation, installation of closed pipeline and pressurized pipeline and lining of open canals are also being promoted. Currently, the total length of the irrigation canals is about 47,000km, of which about 14,700km or 31% are being lined or pipelined. To maintain the irrigation and drainage network and more than 200 of pumping stations, the cost shall be added to the federal budget.

(5) Policy on capacity building, awareness creation and agricultural guidance

Together with implementing training programs, investment on audio-visual aids and printed material for agriculture guidance and education as well as modern agricultural technologies are necessary. Such approaches will contribute to local economies by absorbing the unskilled labors and thus, reducing unemployment. In addition, considering the fact that women play a large role in agriculture, it is necessary to improve cultural standard of local residents, including women. In addition, design, implementation, follow-up, operation & maintenance and management of water resources project will be implemented to develop the capacity of the human resources.

(6) Utilizing the research institutions

Study, research and field experiments on modern irrigation methods such as sprinkler and drip irrigation, and installation of closed pipeline to increase irrigation efficiency shall be conducted. Efforts are made in using drainage water for irrigation and in establishing WUAs. In Iraq attempts are also being made to utilize saline water for irrigation. Such efforts are carried out in al-Zubair and Safwan district in Basrah as well as in the highlands in Najaf desert, Karbala, and Jazeera area in Salah ad Din governorate. Such trials re-use the drainage water with high salt concentration in the main drainage canals by diluting it with fresh water. Furthermore, it is proposed to treat sewage water for agricultural and industrial use.

(7) Post-harvest handling

Keeping the viewpoint of regulations and classification, packing, packaging, transport and storage, improvement in agricultural marketing shall also be promoted. In addition, market data/information will be provided to increase transparency of agricultural marketing. Modern slaughter house, cold/freezer storage for various agricultural products as well as transport means shall also be promoted. Workshops on insurance against fire, theft and natural disasters, agricultural financial services, agricultural machinery repair and operation and maintenance will also be convened

(8) Promotion of agriculture investment by foreign and domestic private sector

Likewise as in promoting refrigeration facilities, foreign and domestic private sector investments shall be supported through establishing a complex agriculture entity utilizing the integrated crop and livestock production projects as well as economic and technical fund. In addition, besides developing the financing markets, purchase of part of the products to stabilize management after establishment of agriculture-related enterprises shall be promoted. While continuing to support agricultural inputs and production, protection of local production from imported goods shall be

considered, in particular, in realizing the competitiveness of local products during the NDP period.

(9) Continuation of the existing program and project

Implementation of the following programs and projects prior to formulation of the NDP 2013-2017 should also be continued, taking into consideration competitiveness and advantages of each region. However, the details of such are not verified.

- Increase wheat yield by 1t/dunam by utilizing modern irrigation technology
- Project to utilize agricultural waste and organic fertilizers to grow mushrooms and project to address agricultural pests
- Poultry project in Al-Usul
- To increase sprinkler irrigation area from 94,000 ha/year to the final target of 750,000ha
- To increase production of high yielding dates varieties using local cultural, etc.
- Potato development projects
- Buffalo breeding project
- Fish (aquaculture) protection project
- Promote rice cultivation and development of new high yielding varieties. establish weeding method
- Introduce wheat-legume crop rotation cultivation to improve soil fertility
- Introduce drought resistant varieties, promote grain production under rain-fed irrigation area
- Promote cotton production
- Promote tomato production
- Promote cyclic production of autumn and spring maize (white and yellow variety) to resist salinization and/or double cropping of wheat and maize (white variety)

5.2.2 Strategy on Water and Land Resources

Led by MoWR, strategic documents on water resources and land resources development (Strategy for Water & Land Resources in Iraq: SWLRI) has been formulated. The formulation process involved 14 pertinent ministries, making it a comprehensive strategy for water and land resources. SWLRI was spurred by the realization that there is a steady decreasing trend in meeting water demand till 2015 and prediction of critical shortage by early 2020[55].

In the SWLRI, basic elements, data and analytical tools necessary to come up with reforms that can avert such critical situation are provided. Strategy pertinent to water resources and irrigated agriculture is discussed below.

(1) Water resources strategy

The most important factor in securing the quality and quantity of water in the Tigris and Euphrates rivers is none other than securing the agreement with Turkey and Syria.

In SWRLI, discussions are made on two scenarios: 100% development in Turkey and Syria in the next 20 years will result in 24.5 % of flow decrease of that of 2015. 75% development in Turkey and Syria in the next 20 years will result in 20.9% of flow decrease of that of 2015. Iraqi Government assumes that they can secure water resources in the latter scenario.

Strategic discussions are also conducted on domestic water demand and supply. In the water supply strategy, allocation and operation methods for both the existing dam and those in pipeline are highlighted. In addition, balancing the 91.2% and 8.8% share of surface and groundwater, respectively, is becoming important, as well as management of water demand between the sectors. Since the

[55] SWLRI had premised predictions on a reduction of 24.5% water supply by 2035

discharge in the Tigris and Euphrates rivers greatly affects water salinity, negotiation with Turkey and Syria is unavoidable. Contaminated agricultural water, portable and industrial water must be separated from river water.

Comprehensive water resources management requires estimates on a national level of portable water, commercial and industrial water, agricultural water as well as water for environmental protection during drought. Table 5.2.1 shows the change in the available amount of water until 2035. Available water resources is the total of the inflow from the upstream countries, water in the tributary watersheds within the boundary and return flows of agriculture, portable supply and industrial use. The important point is that these figures which are decreasing over the time, do not accurately indicate the available water resources in Iraq. Rather they have been taken to indicate increase in water demand of the developments in Turkey and Syria. Available surface water in the next 20 years is estimated to decrease by 17.64 billion m^3, i.e. a decrease of 24.5%. Of which decrease in the water amount due to increase in water demand outside Iraq is 15.21 billion m^3. In addition, with the necessary agricultural drainage facilities installed, the amount of non-reusable water for irrigation is estimated to be 2.431 billion m^3, from the viewpoint of water quality conservation. This also seems to be a cause of decline in available water.

Reduction in available surface water is significantly dependent on the reduction in the water use in agricultural sector. This is founded on the fact that by reviewing cropping plan in the agro-climatic zones, reducing conveyance loss and reducing irrigation demand by increasing on-farm irrigation efficiency, necessary agricultural water amount will decrease to 15.359 billion m^3 (a reduction of 30.8% of that of 2015) by 2035.

As for groundwater use, the plan is to increase potable water and industrial use from 272 million m^3/year in 2015 to 400 million m^3/year in 2035, while agricultural use will significantly drop from 3.499 billion m^3 from / year to 1.882 billion m^3 / year in 2035.

Groundwater use for agriculture will also be continued in the area outside of government irrigation projects. However, like surface irrigation, the plan is to significantly reduce groundwater use. According to the plan, it is to decrease the total amount of groundwater use for portable water, industrial and agricultural use from the current 3,771 to 2,282 billion m^3/year until 2035.

Table 5.2.1 Water Balance (2015-2035), if Turkey, Syria, and Iran fully implemented Development Projects

AVAILABLE WATER [BCM/Year[56]]

	2015	2020	2025	2030	2035
Fresh Water from Riparian Countries	**43.696**	**38.482**	**34.592**	**31.870**	**28.487**
Euphrates	18.396	16.683	14.137	12.383	9.999
Tigris	15.919	12.905	11.588	10.703	9.822
Greater Zab	3.378	3.377	3.375	3.316	3.294
Lesser Zab	2.292	2.236	2.219	2.203	2.182
Diyala	3.710	3.281	3.273	3.266	3.189
Fresh Water Generated Inside Iraq	**21.919**	**21.919**	**21.919**	**21.919**	**21.919**
Euphrates Hadeetha dam – Qurna	1.123	1.123	1.123	1.123	1.123
Tigris	5.073	5.073	5.073	5.073	5.073
Greater Zab	7.462	7.462	7.462	7.462	7.462
Lesser Zab	4.551	4.551	4.551	4.551	4.551
Udhaim	0.956	0.956	0.956	0.956	0.956
Diyala	1.788	1.788	1.788	1.788	1.788
Tharthar[57]	0.967	0.967	0.967	0.967	0.967
Return flow to the Rivers	**6.507**	**5.359**	**4.568**	**4.193**	**4.076**
Total Available Surface Water	**72.122**	**65.761**	**61.080**	**57.983**	**54.482**
Sustainable Groundwater Withdrawals	5.243	5.243	5.243	5.243	5.243
Drainage Water	3.781	4.423	4.817	4.667	4.556
Total Available Water (FW+GW+DW)	**81.146**	**75.426**	**71.140**	**67.893**	**64.281**

FRESH SURFACE WATER CONSUMPTION [BCM/Year]

	2015	2020	2025	2030	2035
Municipal & Industrial	5.769	6.167	6.663	7.152	7.504
Agriculture[58]	46.090	40.089	36.294	33.378	32.187
Fish Farms and Livestock	0.329	0.329	0.329	0.329	0.329
Total Marshlands Consumption	5.388	7.037	6.554	6.395	5.825
Flow to the Gulf via the Shatt al Arab River	3.934	4.691	4.514	4.402	3.391
Evaporation from Rivers	0.959	0.959	0.959	0.959	0.959
Evaporation from reservoirs	9.653	6.488	5.766	5.368	4.287
Total Freshwater Consumption	**72.122**	**65.761**	**61.080**	**57.983**	**54.482**

GROUND WATER CONSUMPTION [BCM/Year]

	2015	2020	2025	2030	2035
Municipal & Industrial	0.272	0.304	0.337	0.369	0.400
Agriculture	**3.499**	**2.659**	**1.835**	**1.838**	**1.882**
From springs	0.099	0.089	0.095	0.097	0.103
From wells serving official Irrigation Projects	0.251	0.256	0.261	0.261	0.300
From wells serving areas outside official Irrigation Projects	3.149	2.314	1.479	1.479	1.479
Total Groundwater Consumption	**3.771**	**2.963**	**2.172**	**2.207**	**2.282**

DRAINAGE WATER RE-USE [BCM/Year]

	2015	2020	2025	2030	2035
Oil Sector	0.162	0.211	0.338	0.521	0.550
Hammar March (via MOD) + Shatt al Arab (via ETD)	3.306	3.899	4.166	3.834	3.693
Green Belts	0.313	0.313	0.313	0.313	0.313
Total Drainage Water Consumption	**3.781**	**4.423**	**4.817**	**4.667**	**4.556**

[56] The item “water generated inside Iraq” includes the exchange with Ground Water. The “water from return flow” includes both agriculture and M&I return flows. The Municipal & Industrial represents the gross consumption volume, assuming that 1.5 BCM of water needed for oil field re-injection is taken from the sea.

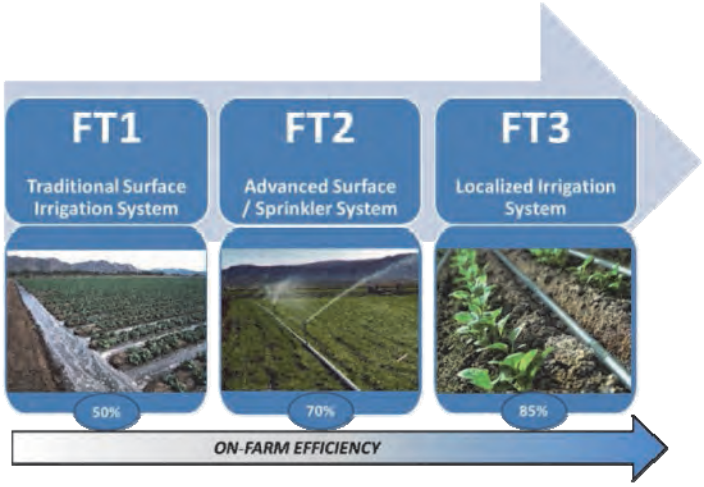
[57] The volume 0.967 BCM is the natural flow into Tharthar as computed in the GW study. All this volume will evaporate from the lake and it is accounted in the evaporation from reservoirs and therefore is not available for any use.

[58] Water requirements for agriculture include the reductions.

(2) Agriculture strategy

In SWLRI, based on the climate and crop suitability, the land is classified into 8 agro-climatic zones (ACZ1 ~ ACZ8). Under close cooperation between MoWR and MoA, specific combinations of cropping patterns have been determined for each of the zones out of the 34 strategic crops[59].

Furthermore, in the SWLRI, 3 different agronomic patterns (FT1 ~ FT3, see Fig. 5.2.1) with different cropping rate and irrigation efficiency are defined to enable step-by-step agricultural production improvement. These policies are viable approaches that can be realized in each of regions



	Cropping intensity	Overall irrigation efficiency
Current (FT0)	85%	35%
FT1	100%	43%
FT2 (2035)	115%	60%
FT3	130%	77%

Fig. 5.2.1 Agronomy Patterns for the 3 Different Irrigation Methods in SWLRI

SWLRI also described and prioritized in detail about capacity building of WUAs, agricultural mechanization and storage structure improvements, food processing and policy reform (land tenure legislation & laws) and interim zoning and classification for anti-urbanization.

As a result of the policy, SWLRI, while maintaining imports of major agricultural products such as wheat at the 2013 levels 20 years from now, aims to produce 47% of the food demand required to feed an anticipated double population.

SWLRI also assumes that, by 2035, it will be necessary to increase cropping ratio and irrigation efficiency from the current 85% and 35% to 115% and 60% for FT2 level[60]. Should the level of efficiency attained that of FT3, water requirement would decrease by 1.819 billion m^3/year, and there would be enough water to develop all of the 142 irrigation projects in Fig. 5.2.3. On the other hand, attaining only FT1 level would mean only 76.7% of 142 irrigation projects could be developed.

[59] Wheat, Barley, Broad bean, Rice, Maize (grain), Sorghum (grain), Onion, Kidney beans, Green gram, Groundnut, Cotton, Tobacco, Sunflower, Sesame, Cauliflower, Cabbage, Potato, Cucumber, Tomato, Eggplant, Sweet pepper, Okra, Water melon, Sugarcane, Persian clover, Alfalfa, Soya bean, Olive, Pomegranate, Grape, Date palm, Stone fruit trees, Citrus.

[60] 70% shown in FT2 in the Fig.5.2.1 means application efficiency(=on-farm efficiency). Irrigation efficiency 60% = applicationefficiency70%×application efficiency of concrete lining0.90×management efficiency0.95. Irrigation efficiency 77%(FT3)= applicationefficiency85%×application efficiency of closed pipe0.95×management efficiency0.95.

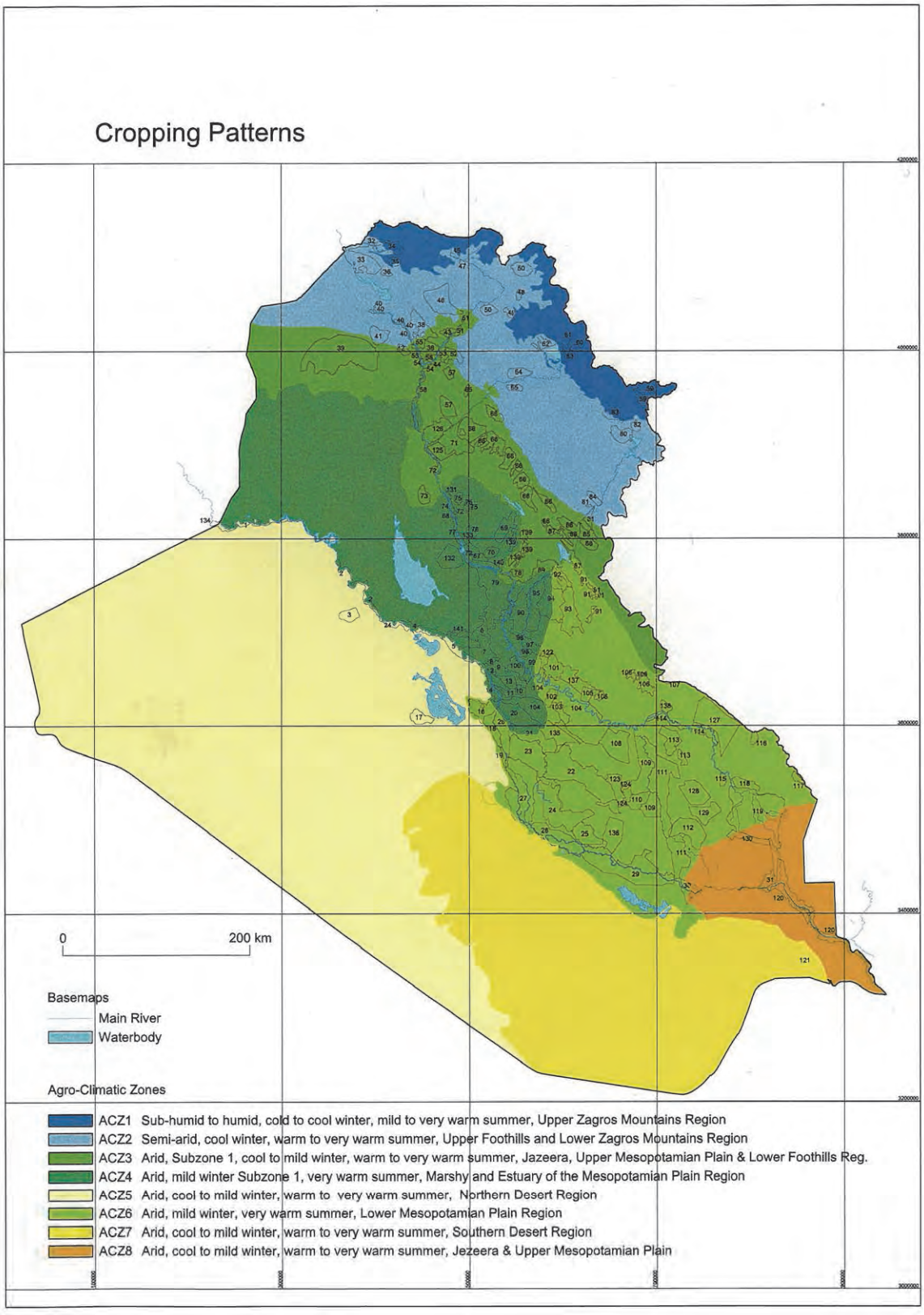


Fig. 5.2.2 Agro Climatic Zone

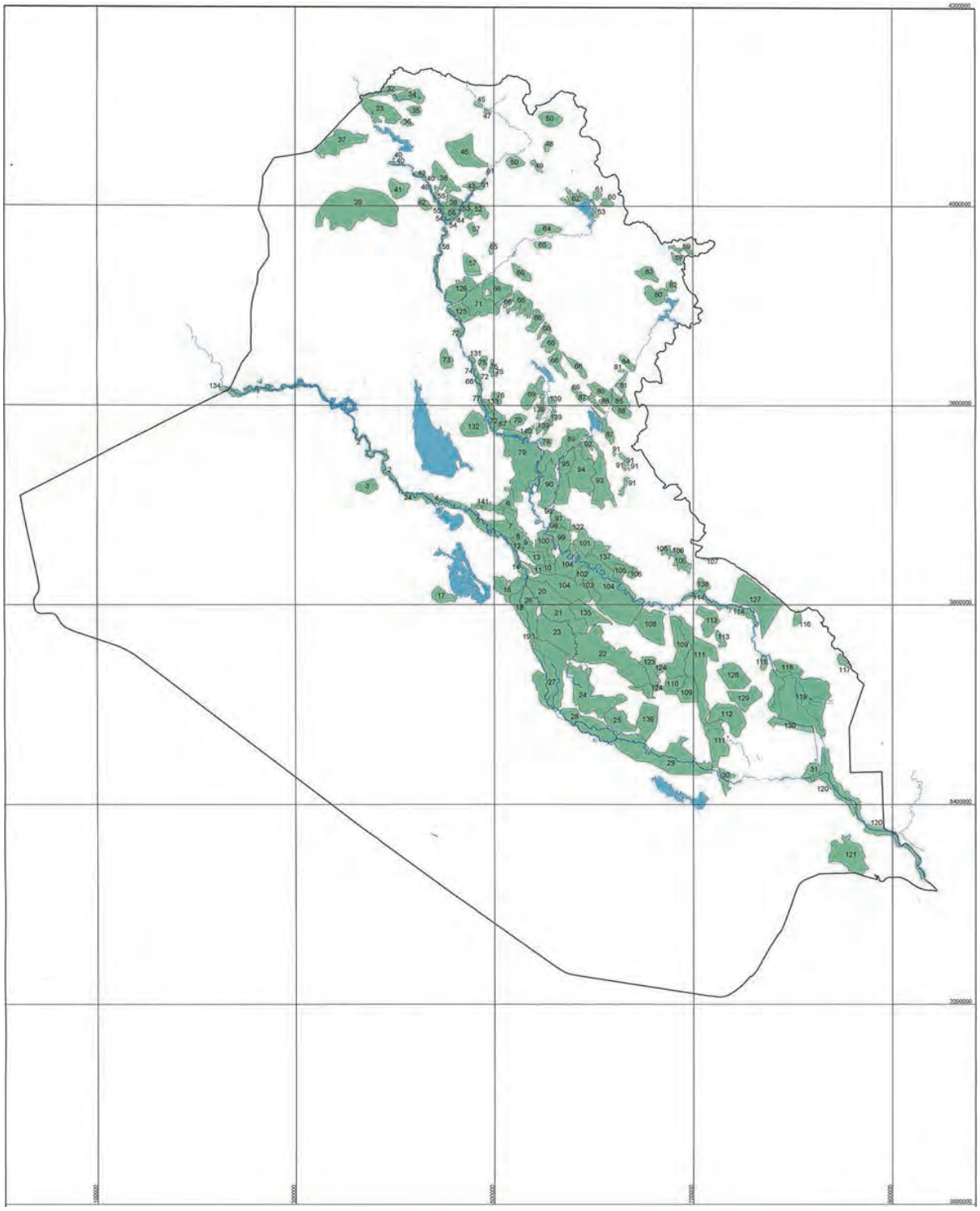


Fig. 5.2.3 Locations of the 142 Irrigation Projects

(3) Irrigation agriculture strategy

By 2035, as a result of development in Turkey and Syria, SWRLI assumes that water use will have to be decreased by 30.8%. As a strategy to counter the reduction in water resource and food security, it has been proposed to efficiently use water, increase cropping ratio to 115% from 85%, secure irrigated agricultural land of about 3.23 million ha, and to increase arable land by 17.1%. (It should be noted that water demand for irrigation in SWLRI can only be met 8 out of 10 years.)

In SWLRI irrigated farmlands in the existing and new sites are grouped into 142 projects. In addition, projects are jointly operated by MoA and MoWR, and the “Farm Water Management Unit" are proposed to handle a variety of issues such as drainage, salinization, land leveling and production.

5.2.3 Progress in Irrigation Development

Assessing the status of progress of irrigation development, based on the NDP, it can be said that the total irrigated farmland area developed by the project, both old and new, in the 142 sites is 1.37 million ha, which covers 42% of the total farmland in the 142 projects.

Irrigation development, with a target year of 2035 as described in SWRLI, has the following noteworthy points. The current situation and development plan (target year 2035) are summarized in Annex (Annex 5, "Present State of Irrigated Area in Iraq" and Annex 6, "Future State of Irrigated Area in Iraq") for reference.

1) To increase irrigation efficiency from the current 35% to 60%.
   The current irrigation efficiency without on-farm water saving facility is 35 %[61]. In the SWRLI, irrigation efficiency can be improved to 60% by 2035 by increasing application efficiency to 70%, conveyance efficiency of lined canal to 0.9 (90%) and operation efficiency to 0.95 (95%)[62].
2) The intention is to incorporate about 850,000 ha of land from outside of government projects, or 14.2% of the total irrigated area, in irrigation development.
3) To increase the current cropping ratio of 85% to 115%.

From the perspective of hardware, the current low irrigation efficiency can be attributed to high water leakage from the earth/unlined secondary and tertiary canals[63]. Unleveled plots are also cited as the reason. Basin irrigation[64], requiring large quantity of water, is the major cause of increased water consumption.

On the other hand, from the perspective of software, much water is lost through improper gate operation at intake structures. In some cases, automated gate operation, as hardware measure, has been planned but due to budgetary constraints installation has been delayed (e.g. Abu Bshoot irrigation project).

In addition, in the case of open channel, un-regulated individual pumping is also cited as one of the reasons. Water use plan is often not established in area with individual pumping. Moreover, the fact is that farmers practice individual pumping because there is no guarantee that water will flow in the canals throughout the irrigation period.

Besides, the conventional thinking that “water is free” also causes inefficient water use.

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61 SWLRI p.108
62 SWLRI p.50
63 Conveyance efficiency is below;
   1) earth/unlined canal=0.77 (Main canal: 0.94×Branch canal: 0.95×Distributary: 0.94×Water course: 0.92）(Design standard: MoWR)
   2) Concreted canal=0.90（SWLRI p. 50）
64 The term “flood irrigation”, used in the SWRLI report, is taken to be same as “basin irrigation”

Proper pricing of irrigation water has not been made[65]. Policy direction to stop collecting water fee by ISF also contributed to low efficiency.

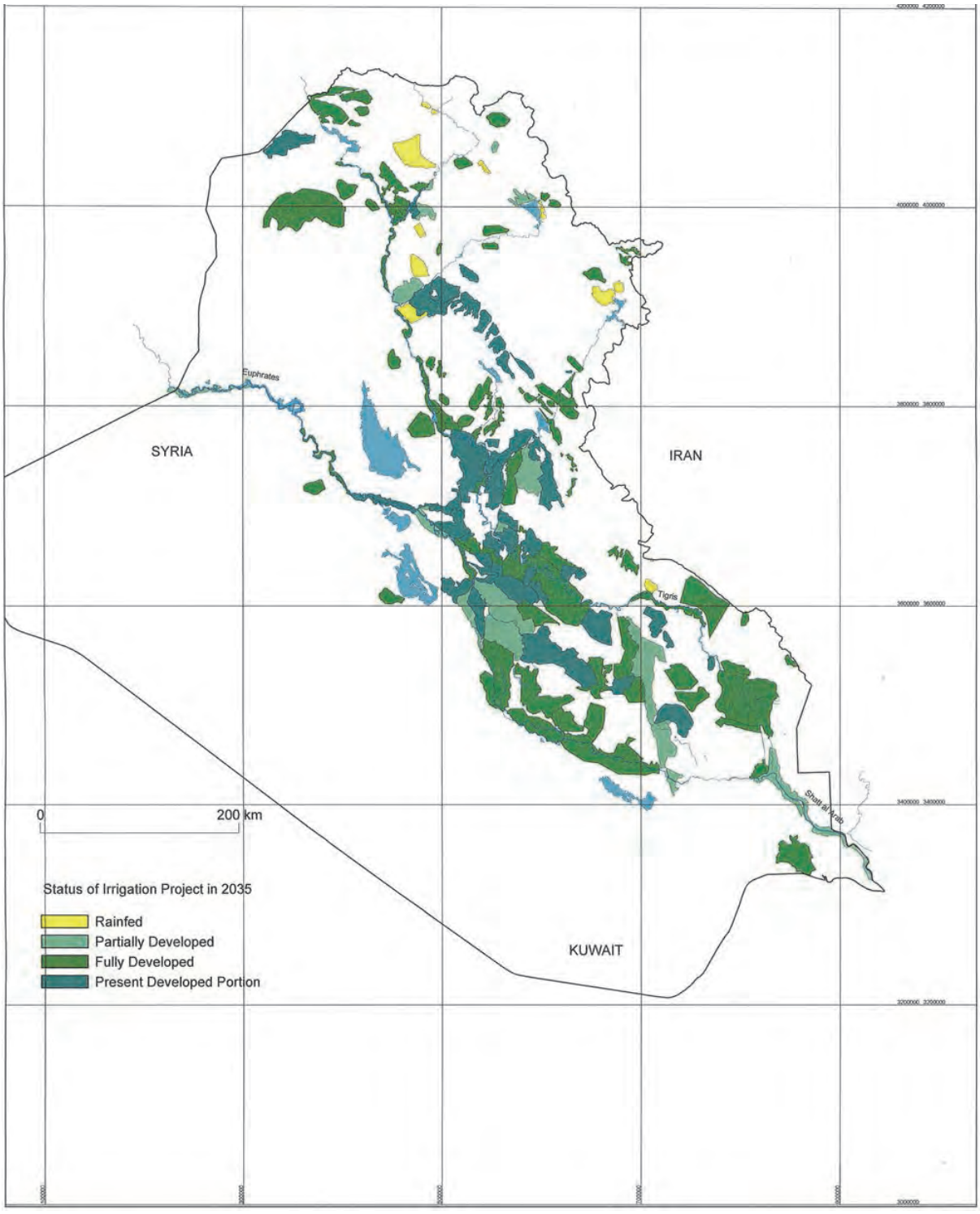


Fig. 5.2.4 Scale of New and Rehabilitation Irrigation Projects

[65] ISF is prescribed in Law 112 (1986), regulating farmers' extended responsibility for operation and maintenance of irrigation facilities. ISF is 3,000 IQD/ha (in the case of farmland with drainage facilities) and 2,000 IQD/ha (other), which is the most reasonable in the world. (WB Water Resource Assistance Strategy)

5.2.4 Promoting On-farm Water Saving Irrigation

MoWR constructs and operates water conveyance structures up to the field and those necessary for on-farm operation are under MoA. The current project to promote introduction of sprinkler irrigation (a subsidy project) started in 2010 for 6 years. 50% of the facility cost is funded by subsidies and the remaining 50% will be paid by farmers over a period of 10 years. MoA has planned to introduce the sprinkler system to a total of about 60,000 ha (Table 5.2.2). Due to budget cuts resulting from slump in crude oil prices, only about 20% of planned area has been completed. As a response, MoA intends to extend the project period. It should be noted that drip irrigation is not included in the promotion project (subsidy business)

Table 5.2.2 Sprinkler Promotion Project by MoA (Subsidy plan)

Governorate	400 pivot sprinkler (120 dunams)	150 pivot sprinkler (80 dunams)	400 pivot sprinkler (68 dunams)	150 pivot sprinkler Lindsey (120 dunams)	500 pivot sprinkler Lindsey (80 dunams)	420 Fixed sprinkler Atayatirm (42 dunams)	450 Fixed sprinkler Atayatirm (42 dunams)	250 Linear sprinkler Bauer (250-400 dunams)
Nineveh	60	20	70	30	80	100	84	200
Kirkuk	10	-	15	5	10	75	50	
Salah Ad-Din	82	40	100	40	150	50	90	
Anbar	78	40	80	40	120	50	70	
Baghdad	8	2	2	-	2	20	2	
Diyala	12	16	50	20	50	25	60	
Karbala	15	5	25	5	25	10	10	30
Najaf	15	2	-	-	5	10	10	
Babil	58	12	25	5	20	20	29	
Wasit	9	2	10	-	13	25	20	
Diwaniyah	5	2	5	2	5	10	2	
Dhi-Qar	5	2	8	-	7	10	2	
Misan	20	2	5	-	5	-	1	
Muthanna	18	5	5	3	8	15	10	20
Basrah	5	-	-	-	-	-	5	
Total	400	150	400	150	500	420	450*	250
	Center pivot (1600)					Fixed (870)		Linear (250)
Total: 2,720 units (≒61,000ha**)								

*) Total =445, sourced data =450

**) In estimating total area, liner system is taken to be 250 dunams. If liner system is taken to be 400 dunams, area will be70,000 ha

In promoting sprinkler irrigation, no priority areas have been set. As shown in the table above, MoA has prioritized sprinkler system for irrigating 120 dunams, 80 dunams, 68 dunams with center pivot, 42 dunams with fixed sprinklers and 250-400 dunams with large scale linear sprinkler to receive subsidy. This is cited as one of the challenges in introducing the sprinkler. As the area required for the installation promoted by the Government is often larger than the area owned by farmers, and hence it is difficult to adopt sprinkler system for small holders or farmers facing difficulties in expanding their land. On the flip side, the Government is only promoting sprinkler in larger farm. There are cases where power supply is not sufficient to operate the sprinklers. However, the most significant setback in introducing water-saving irrigation is the mindset of the conservative farmers and expensive cost.

5.3 Legal System of Water Resources, Irrigation and Agriculture

5.3.1 Main Laws of Water Resources and Irrigation Sector

The main laws are summarized as follows:

(1) National Water Council Law

Laws and regulations related to National Water Council (NWC) were adopted in February 2015. NWC is constituted by the Prime Minister (Chairman), Deputy Prime Minister, Ministry of Foreign Affairs, MoWR, MoA, MoP, Ministry of Power, Industrial Ministry, Ministry of public Works, the Ministry of the Environment, Ministry of Local Governments, the National Security Advisor, the ministers of the agriculture and water resources provincial office in the Kurdish district.

The National Water Council has two supreme committees, one for international water resources, and the other for domestic water resources. The former oversees international rivers and watersheds, implement groundwater strategies, negotiate with neighboring countries in matters pertaining to economic and technical aspects of international water resources, technical aspects related to the water rights, implement legal investigation, and participate in international conference and forum related to Iraq's rights.

The latter, in the areas related to the water and land resources, makes strategic proposals based on water allocation plan proposed by MoWR and policy direction of the federal Government in survey of effective use. It is also stipulated that the committee also proposes and makes decision on strategies on effective utilization of water resources, agriculture and environment. All along, since the latter functions are being performed by MoWR, there is a negative opinion on creating the committee.

However, besides MoWR, the nation as a whole has indicated domestically and internationally its resolution to address water problem. Iraqi next movement shall be paid attentions. In addition, the NWC organized academicians and experts, and has the ability to conduct study on water resources, agriculture and environment.

(2) WUA instructions

WUA instructions, translated literally from official Arabic title; "The instruction No.1 on implementing laws and regulation 2014 regarding water sharing among Water resource users." Based on a preceding Article 5 paragraph 3 c of the "Law No. 12 on the maintenance of the irrigation and drainage network 1995," it was enacted in April 2014 to define the establishment procedures as well as the rights and obligations of WUAs. However, the following points have been pointed out as areas for improvement (see also Annex 7: Related Laws and Regulations on Water Users Associations); 1) A group of 9 beneficiaries can establish a WUA. Participation of other farmers is arbitrary, creating an environment for free-riding that often results in WUAs failure. 2) merging with WUA in the vicinity is allowed but no provision is provided for union. (Currently this is allowed at the tertiary level (end level) and assumes that farmers taking water from the same pump will establish WUA. For a set up where beneficiaries share the same water source, there is a need for higher order of coalition of WUA whereby stricter adjustments can be implemented and full-time staff employed for that purpose).and, 3) With regard to costs, Article 12 just stipulates and describes as "to bear the costs of operation and maintenance of the transferred pump and to protect the facility". (no provisions for the expense of

land improvement, maintenance of facilities and fulltime staff of employment[66]). 4) The legal system is not premised on land improvement. MoWR, recognizing the above issues, has an intention to review the laws and regulations to have a more appropriate content[67].

(3) Water fee law

Bill relating to resuming water fee collection has been submitted to the Iraqi parliament in the second half of 2014. According to the bill, water fees are set at 5,000IQD/dunam for each cropping season. In cases where cropping is done twice, winter and summer, in a year, the fees will be 10,000IQD/dunam. In each Directorate of Water Resources, Water Resources Bureau has stationed staff to collect water fees. Fine is imposed on default and measure for repeated/continued defaults is also spelled out. Weak law enforceability remains a challenge.

5.3.2 Law of Agricultural Sector

The agricultural sector laws and instructions, enacted up until November 2015, are shown in Table 5.3.1.

Table 5.3.1 Laws and Instructions regarding the Agricultural Sector (As of Nov. 2015)

SN	Title of Law or Instructions	Law No.	Year
1	Law of Rangelands	2	1983
2	Law on Lease of Agrarian Reform Land to Companies and Individuals	35	1983
3	Law on Lease and Administration of Reclaimed Agricultural Land	79	1985
4	Law on Amending Agrarian Reform Law No. 117 of 1970	106	1985
5	Law on Amending Law No. (79) of 1985 on Lease and Administration of Reclaimed Agricultural Land	71	1986
6	Law on Re-regulating Agricultural Ownership of Reclamation Projects	42	1987
7	Beach Exploitation Law	59	1987
8	Law on Amending Law No. 79 of 1985 on Lease and Administration of Reclaimed Agricultural Land	88	1987
9	Law on Amending Law No. 79 of 1985 on Lease and Administration of Reclaimed Agricultural Land	32	1988
10	Law on Amending Beach Exploitation Law No. 59 of 1987	129	1988
11	Law on Amending Law No. 35 of 1983 on Lease of Agrarian Reform Land to Companies and Individuals	79	1989
12	Law on Amending Beach Exploitation Law No. 59 of 1987	7	1990
13	Law on First Amendment to Law No. 42 of 1987 on Re-regulating Agricultural Ownership in Reclamation Projects	43	2000
14	Instructions by Minister of Agriculture and Agrarian Reform on Allocation, Lease and Acquisition of Agrarian Reform Land under Law No. 115 of 1980	45	1981
15	Instructions by Minister of Agriculture and Agrarian Reform on Solving the Issue of Orchards	45	1981
16	Instructions by Minister of Agriculture and Agrarian Reform on Reclaimed Land for Livestock Projects	46	1981
17	Amendment No. 69 of 1973 to the Instructions Regarding Issues of Death of Persons to whom Land were Distributed, promulgated by the Supreme Agricultural Council (repealed)	68	1982
18	Instructions by Minister of Agriculture and Agrarian Reform on Amending Instructions No. (15) of 1970 on Distributing Agrarian Reform Orchards	76	1983
19	Instructions by Minister of Agriculture and Agrarian Reform on Lease of Agrarian Reform Land to Agricultural Companies and Individuals	77	1973
20	Instructions by Minister of Agriculture and Agrarian Reform on Implementation of provisions No. 178 of 1984 of the Revolution Leadership Council	88	1984
21	Instructions No. 28 of 1971 by Minister of Agriculture and Agrarian Reform on Amending Mugharasa Rights	90	1984
22	Instructions by Minister of Agriculture and Agrarian Reform on Lease and Administration of Reclaimed Land	102	1985
23	Instructions by Minister of Agriculture and Agrarian Reform on Solving the Issue of orchards Left	103	1985

[66] The authority has a separate provision on water fee collection, but is not implemented.

[67] Action Plan to revise WUA laws and regulations has been prepared by the project “Project for Spreading Water Users Associations for the Efficient Use of Irrigation Water”. In the plan, analysis of the challenges in trial implementation and sourcing references from other similar countries had been implemented in the early stage.

SN	Title of Law or Instructions	Law No.	Year
	Uncultivated with no Valid Reason for two Years		
24	Instructions by Minister of Agriculture and Agrarian Reform on Amending Instructions No. 100 of 1985 Regarding Fish Farms	104	1986
25	Instructions by Minister of Agriculture and Agrarian Reform on Amending Instructions No. 102 of 1985 Regarding Lease of Reclaimed Land	106	1986
26	Instructions by Minister of Agriculture and Agrarian Reform on Amending Instructions No. 100 of 1985 Regarding Fish Farms	108	1986
27	Instructions by Minister of Agriculture and Agrarian Reform on Amending Instructions No. 88 of 1984	100	1986
28	Instructions by Minister of Agriculture and Agrarian Reform on Amending Instructions on Distributing Agrarian Reform Orchards No. 15 of 1970	111	1986
29	Instructions by Minister of Agriculture and Agrarian Reform on Amending Instructions on Lease and Administration of Reclaimed Land	112	1986
30	Instructions by Minister of Agriculture and Irrigation on Termination of Contracts of Ministry of Agriculture Staff Members who were Leasing Areas of Agrarian Reform Land and but wished to remain in their Job	114	1987
31	Instructions by Minister of Irrigation on Implementation of Beach Exploitation Law No. 59 of 1987	115	1987
32	Instructions on Regulating Irrigation in Rangelands	117	1987
33	Instructions by Minister of Agriculture on Re-regulating Ownership in Reclamation Projects	116	1987
34	Instructions by Minister of Agriculture on Amending Instructions on Distributing Agrarian Reform Orchards	118	1988
35	Instructions by Minister of Agriculture and Irrigation on Solving the Issue of Abandoned Agricultural Land	9	1988
36	Instructions by Minister of Agriculture and Irrigation on Amending Instructions No. 4 of 1988	10	1988
37	Instructions by Minister of Agriculture and Irrigation on Amending Instructions No. 4 of 1988	4	1989
38	Instructions by Minister of Agriculture and Irrigation: Empowerment to Cultivate Trees in Land within Mayoralty of Baghdad's Borders	10	1992
39	Instructions by Minister of Agriculture on Collecting Rent of Agricultural Land	3	1997
40	Fourth Amendment to Instructions No. 69 of 1973of the Supreme Agricultural Council on Issues of Persons to whom Agrarian Reform Land were Distributed	3	2000
41	Removal of Violations Committed in State-owned Property under Resolution No. 156 of 2001 of the Revolution Leadership Council	15	2002
42	Agricultural Quarantine Law	76	2012
43	Animal Health Law	32	2013
44	Registration, Accreditation and Conservation of Agricultural Species	15	2013
45	Seeds and Seed Tubers Law	50	2012
46	Registration and Approval of Insecticides	47	2012
47	Law on Regulating Trading in Agricultural Materials	46	2012

5.3.3 Subsidy for Farmers

MoA is implementing two subsidy systems, purchase of the major cereals and input support for agricultural production. Input subsidies for agricultural production include purchasing cost for seed, fertilizer, greenhouse nylon sheet, pesticides, agricultural machinery (harvester, tractor, etc.). The subsidy rate and retailing price for the farmers are shown in Table 5.3.2.

Table 5.3.2 Input Subsidy for Agricultural Production (2015)

Items	Subsidy rate	retailing price for the farmers [IQD]
Wheat seeds	80%	24,000-32,000/ton *depending on seed rank
Barley seeds	80%	20,000/ton
Rice seeds	37%	62,500-70,000/ton *depending on seed rank
Maize seeds	50%	-
Agricultural machinery	30-50%	Depending on machinery
Fertilizer	50%	Depending on fertilizer type
Pesticide	35-100%	Depending on type
Greenhouse nylon	50%	-

As a subsidy for purchasing agricultural outputs, the main cereals (wheat, rice, barley, maize) are bought at a subsided rate, as shown in Table 5.3.3. Purchase price by state shall be determined yearly taking into account the international price as well as the production costs. The subsidized rate is decided by the Government every year, taking into consideration production cost and international prices.

Table 5.3.3 Subsidy for Agricultural Production (2014)

Target crop	Subsidized price [IQD]
Wheat	792,000/ton
Barley	572,000/ton
Rice	700,000-900,000/ton
Maize	400,000/ton

5.4 Administrative Structure of MoWR and MoA at Central and Directorate Level

5.4.1 MoWR

The structure of MoWR is shown in Fig. 5.4.1. In MoWR, 6 permanent commissions overseeing management and maintenance of irrigation and drainage projects, groundwater use, 6 departments for general planning and follow-up, administrative, financial and legal matters, and dredging and river drainage, 3 centers in charge of water resources management and facility design, including the Kurdish region, and 3 general corporations responsible for development of dams and implementation of irrigation projects.

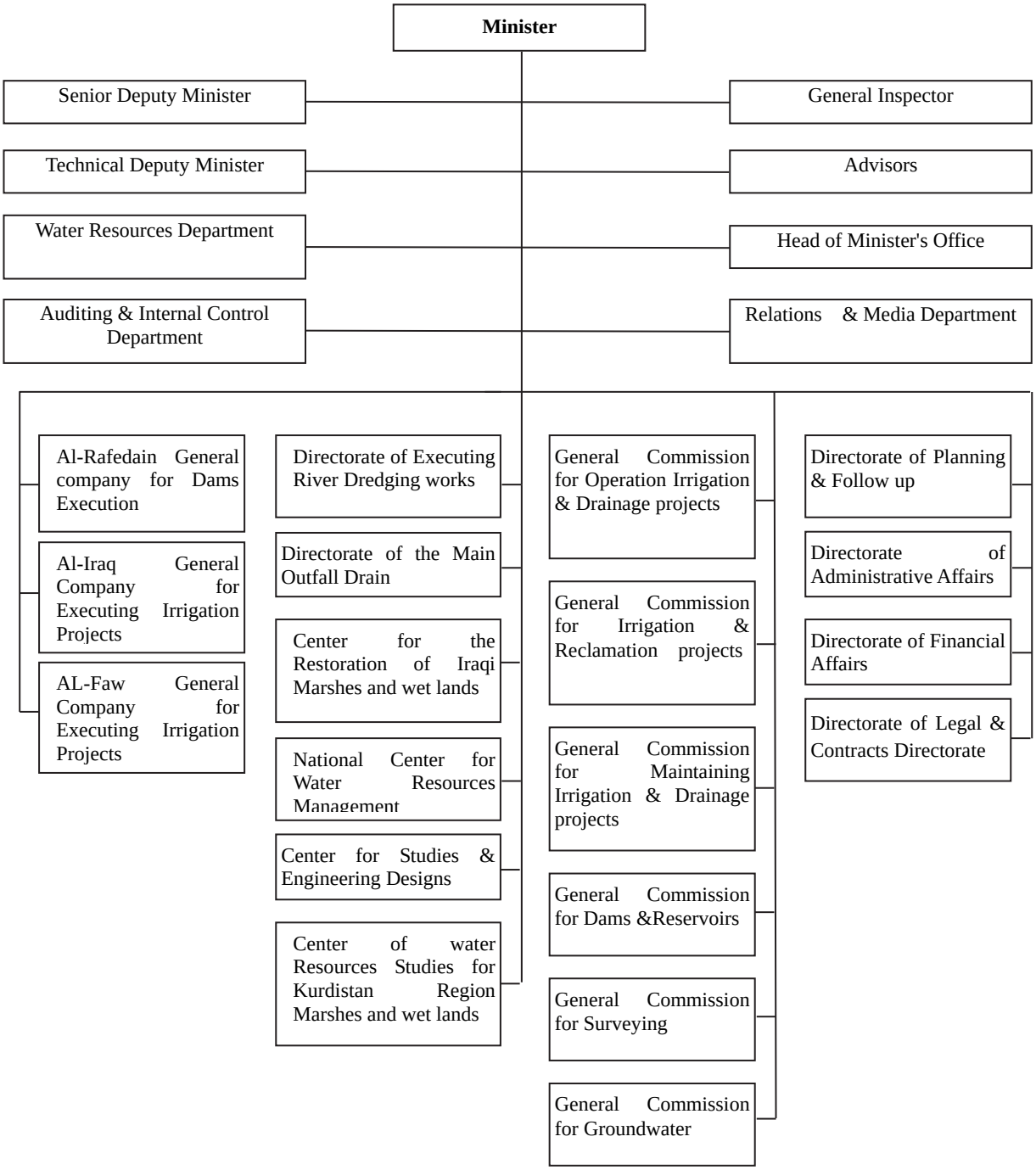


Fig. 5.4.1 MoWR (Central Government)

Each governorate has Directorate of Water Resources[68]. The structure of the one in Dhi-Qar is shown in Fig. 5.4.2 as a sample. There are sections for planning, design, implementation, accounting, legal matters, and a section for WUAs. In addition, Unit local office has been established to oversee matters at the district level. It should be noted that MoWR plans to establish Water Extension Unit for the purposes of monitoring, giving technical instructions and implementing field exercises to WUA in

[68] Some governorates have more than 1 Directorate of Water Resources.

each governorate.

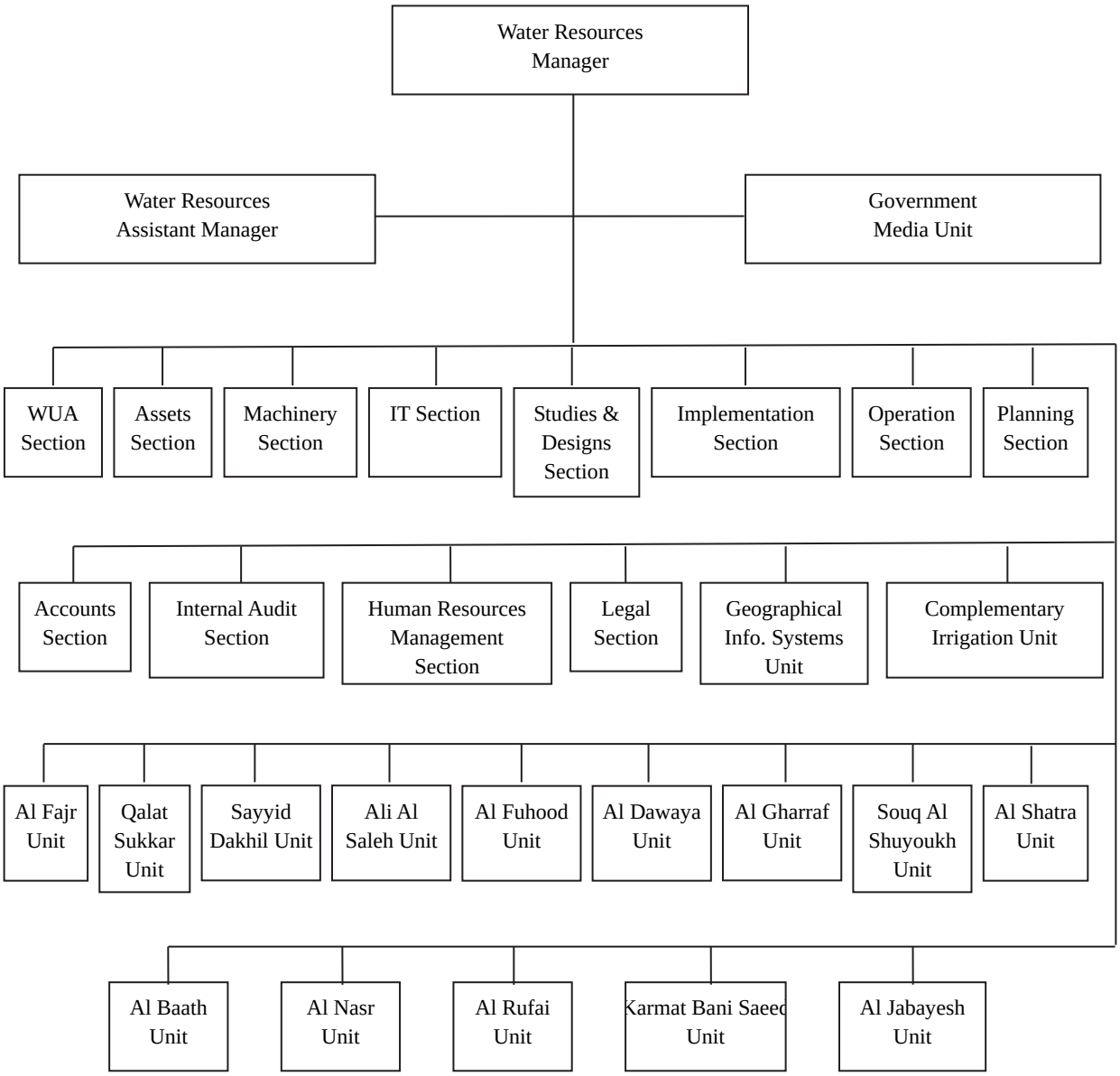


Fig. 5.4.2 MoWR (Directorate level)

Table 5.4.1 shows the number of staff of each departments of MoWR. Of MoWR's 19,323 staff, 7,890 (about 40% and the largest) belong to General Commission for Operation Irrigation & Drainage projects. The second largest is General Commission for Maintaining Irrigation & Drainage projects, occupying 3,255 staff. From the viewpoint of academic background, 5,792 staff graduated from university science courses (about 30%), followed by other staff (including some staff who did not even graduate form elementary schools), staff graduated from elementary schools, and those who graduated from university humanities courses.

Table 5.4.1 Number of Staff of MoWR

Departments	Staff No.	Departments	Staff No.
Ministry headquarter	756	AL-Faw General Company for Executing Irrigation Projects	389
General inspection	99	Al-Iraq General Company for Executing Irrigation Projects	336
General Commission for Irrigation & Reclamation projects	1,008	Center of water Resources Studies for Northern Region	88
State commission for dams & reservoir	1,747	Center for Studies & Engineering Designs	603
General Commission for Surveying	242	National Center for Water Resources Management	194
General Commission for Operation Irrigation & Drainage projects	7,890	Center for the Restoration of Iraqi Marshes and wet lands	198
General Commission for Groundwater	1,291	Directorate of Executing River Dredging works	677
General Commission for Maintaining Irrigation & Drainage projects	3,255	Directorate of the Main Outfall Drain	273
Al-Rafedain General company for Dams Execution	277	TOTAL	19,323

Table 5.4.2 shows budget allocation within MoWR. Up until 2011-2014, the total amount had fluctuated between IQD 800 billion and IQD 1,100 billion. It, however, drastically fall to IQD 300 billion in 2015 due to decline in oil price. In descending order, State commission for dams & reservoir, General Commission for Irrigation & Reclamation project, General Commission for Operation Irrigation & Drainage projects have large allocation. Investment into infrastructure like dams and irrigation projects occupy large amount of budget. All ministerial budgets are divided into investment budget and operation budget. The latter covers personnel/staff expenses, pension, office and vehicle maintenance costs, etc. In 2009 and 2010, 75% of the budget was allocated for the operation budget and 25% for investment budget. Operation budget was 70% in 2011 and 2012, but declined to 60% in 2013, still accounting for a large proportion of the budget.

Table 5.4.2 Investment Budget in MoWR (billion IQD)

Departments	2011	2012	2013	2014	2015	Average
General Commission for Irrigation & Reclamation projects	130.3	101.0	326.0	206.1	80.0	168.68
State commission for dams & reservoir	660.0	360.0	320.0	56.1	67.3	292.66
General Commission for Operation Irrigation & Drainage projects	71.5	104.0	135.0	182.9	68.0	112.28
General Commission for Maintaining Irrigation & Drainage projects	50.0	65.0	122.0	59.0	12.8	61.76
General Commission for Groundwater	40.0	42.5	56.5	53.9	10.0	40.58
General Commission for Surveying	1.5	1.4	1.5	2.0	5.0	2.28
Directorate of Executing River Dredging works	25.0	27.0	37.1	40.4	10.0	27.9
Directorate of the Main Outfall Drain	15.0	17.0	19.7	18.4	10.0	16.02
National Center for Water Resources Management	36.0	9.4	10.0	3.9	5.0	12.86
Center for Studies & Engineering Designs	18.5	16.0	19.5	14.0	10.0	15.6
Center for the Restoration of Iraqi Marshes and wet lands	35.0	27.0	25.0	27.2	10.0	24.84
Ministry head quarter	73.5	88.2	25.9	136.1	11.2	66.98
Center of water Resources Studies for Kurdistan Region	0.2	1.5	2.1	0.2	0.8	0.96
Total	1156.5	860	1100.3	800.2	300.1	843.42

5.4.2 Structure and Administration in Water Resources Management

MoWR has established a Water Resources Management Center to control dams and regulate

water intake at intake structures under the Water Control Center. Further, monitoring water quality is being conducted by experiment section (Laboratory Department), while planning section (Planning Department) manages budget and human resource development.

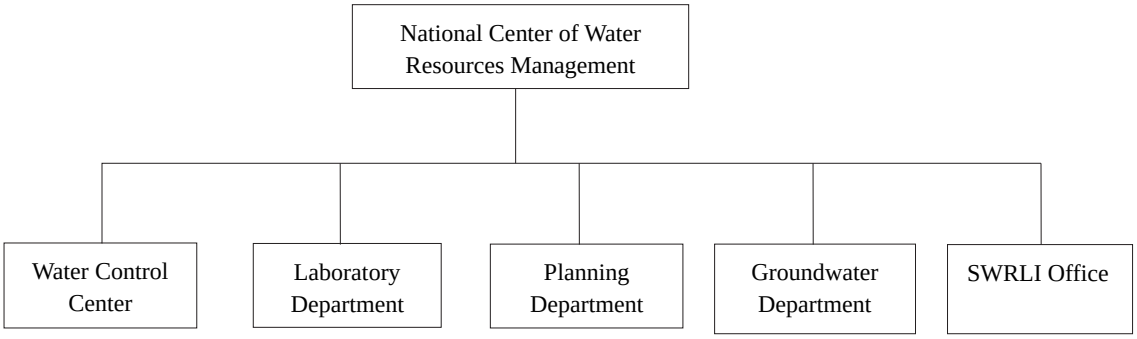


Fig. 5.4.3 Structure of Water Resource Management Center

Project wise monthly water requirement is estimated by the Directorate of Water Resources of each governorate based on irrigation area, unit water demand and environmental discharge. These data are used to control and regulate dam discharge and intake structures. Environmental discharge is indexed on the basis of required discharge in rivers, water in wetland and salinity control. Flow regulation is carried out on a daily basis. However, unit water demand is different between the north and the south. The estimated value for upland irrigation is 5,000 dunam/m^3/sec (0.8 lit/s/ha) and 2,000 dunam/$m^{3/}$sec (2 lit/s/ha) for rice cultivation. As explained later, due to the calculation method, blanket application of these estimates often results in inefficient water use in many of the projects. Unit water demand for each irrigation project has to be calculated based on the detail assessment of the cropping plan.

Currently, water regulation is being operated and monitored at 14 intake weirs and 104 checkpoints. The major ones are the 2 dams in the Tigris river basin, 2 wetlands (lake), 18 river checkpoints, 1 dam in the Euphrates river basin, 2 wetlands (lake) and 16 river checkpoint (see Annex 8, "Water Control and Monitoring Points").

Dam as well as intake gate operation are electrified. With the exception of some gates, maintenance is good (as per interview conducted at water control center). The water control sector, in carrying out water supply to the 142 irrigation projects, is intending to increase the current 104 checkpoints to 180.

In addition, the Ministry of Science and Technology is planning to link up 15 hydrometric stations (Fig. 5.4.4, currently 7 hydrometric stations under tele-communication) via satellite to automate information flow required to control rivers, dam water level and flow rate (see Annex 9, "Schematic Diagram for Main Control Structures"). The design has been completed with donor support. However, the estimated equipment installation cost of US$ 8-9 million is yet to be budgeted. Together with the installation it is necessary to formulate the operational rules and provisions of these structures.

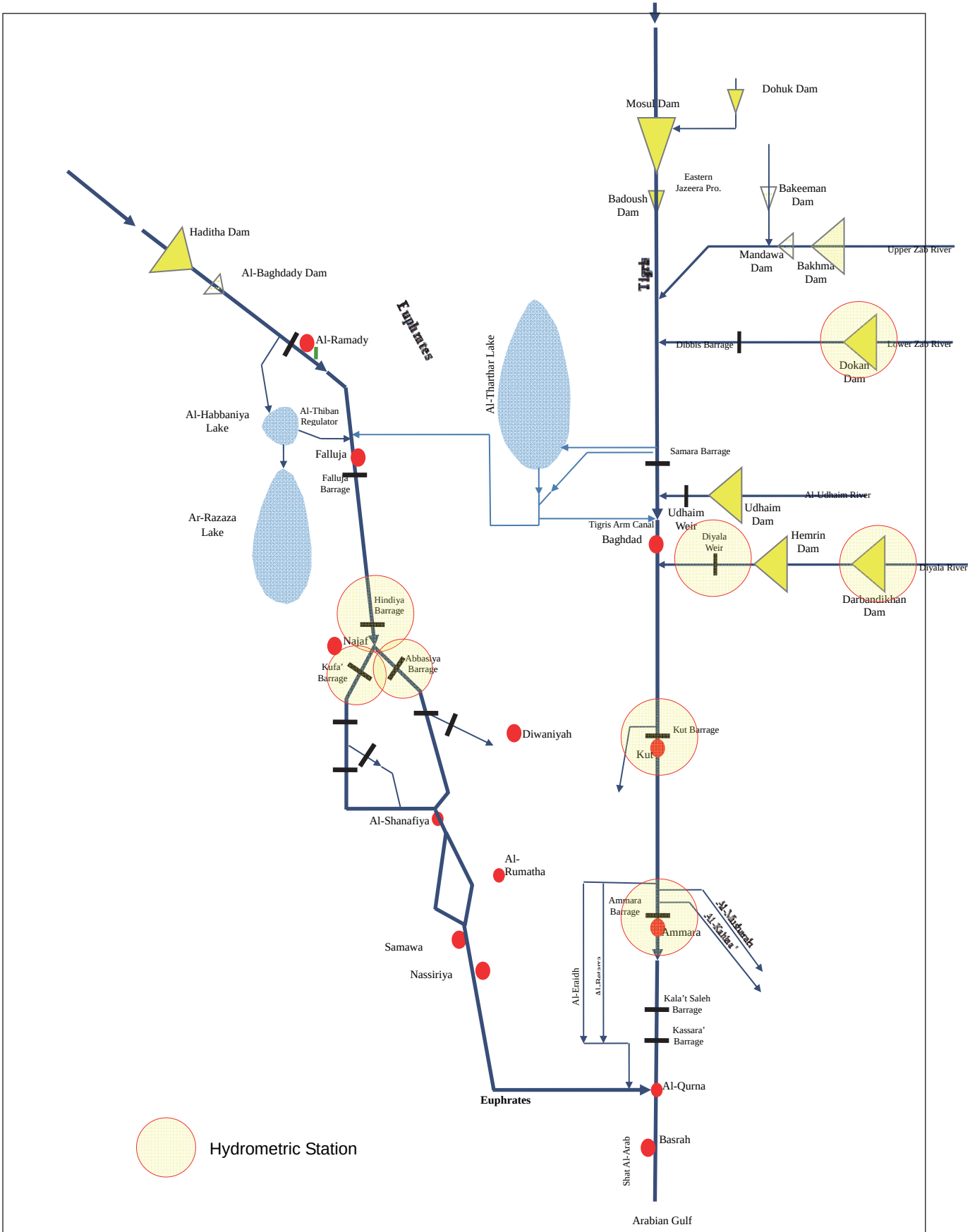


Fig. 5.4.4 Location of Proposed Automated Discharge Observation network (check points)

5.4.3 Structure of MoA

The structure of MoA is shown in Fig. 5.4.5. The ministry is comprised of 9 technical departments and 2 state companies responsible for overseeing irrigation technology and seed certification. The Directorate of Agriculture (technical sector) is placed under the technical permanent secretary. Directorate of Agriculture (for administrative, financial, legal sector, etc.) and central departments for internal auditing and monitoring, finance, clerical, legal matters come under the administrative permanent secretary. It is to be noted that the water saving irrigation methods at field level is implemented by Planning & Follow-up Department, Agricultural Research Department, Agricultural Extension & Training Dept, and Sanharib Company for Irrigation Technique.

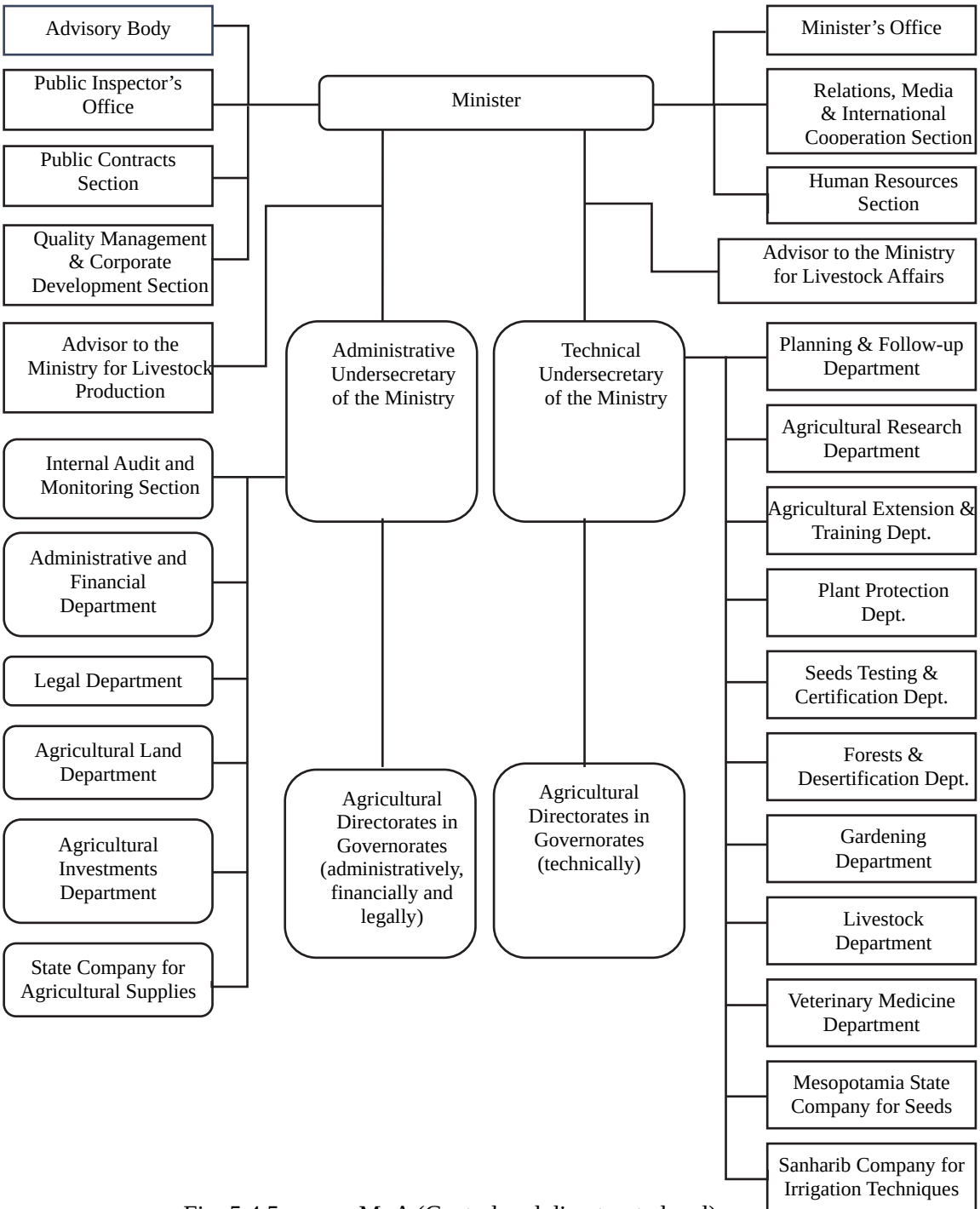


Fig. 5.4.5 MoA (Central and directorate level)

Table 5.4.3 describes the number of staff of each department of MoA. Approximately 25,000 staff belong to MoA. The department which has the largest number of staff is General Company for Agricultural Supplies (2,483), followed by Veterinary Department (2,358), and Zarah Diyala Directorate (2,107). 10,285 staffs are graduated from university science courses (42%), followed by graduates from elementary schools (3,485), graduates from high schools (3,389), and those who graduated from university humanities courses (2,676). Budget allocation within MoA is not obtained.

Table 5.4.3 Number of Staff of MoA (2014)

Department	Total	Department	Total
The ministry center	1,364	Directorate of Agriculture Karbala	830
Coaching Circle agricultural cooperation	852	Directorate of Agriculture Najaf	587
Agricultural Land Department	149	Directorate of Agriculture Baghdad / Rasafa	535
Agricultural Research Service	1,006	Directorate of Agriculture Baghdad / Karkh	450
Department examination and certification of seeds	360	Directorate of Agriculture and Wasit	894
The Department of Plant Protection	480	Directorate of Agriculture Basrah	943
Forestry and desertification circle	589	Agriculture Department of Dhi-Qar	764
General Company for Agricultural Supplies	2,483	Directorate of Agriculture Misan	666
Veterinary Department	2,358	Directorate of Agriculture Muthanna	275
Horticulture Department	1,155	Agriculture Department of Nineveh	-
Between public Mesopotamia Seed Company	1,090	Directorate of Agriculture Salah ad-Din	-
Livestock Department	726	Directorate of Agriculture Kirkuk	589
Sennacherib company Tguenat modern irrigation	444	Directorate of Agriculture Qadisiyah	863
Directorate of Agriculture Babylon	1,183	Directorate of Agriculture Anbar	1,004
Zarah Diyala Directorate	2,107	Total	24,746

Chapter 6 Obstacles and Analysis for Water Resources, Agriculture and Irrigation Policy

The Government of Iraq forecasts that the country will face difficulties to secure water resources by 2020 in terms of quality and quantity due to shortage of water resources. Therefore, the Government appeals the necessity for reforming the current system of domestic water resources allocation and its use, and regards it important to make some agreements about water resources allocation between riparian states and neighboring countries. (Water and Agricultural Current Situation in Iraq)

In Iraq, reform of agricultural system, efficient agricultural production and allocation of irrigation water through improvement of farmers' farming techniques are essential for realizing more yields with less water. Therefore, the Government needs to execute its policies such as improvement of access to financial systems for innovation and development of subsidy systems to facilitate market-oriented agriculture. On the other hand, the cost effectiveness of agricultural development is low in Iraq, and only the areas with enough water resources and high soil fertility have potentials for increase in agricultural production. In this context, the Government prioritizes to make measures in its food policy for the improvement of public health and poverty reduction rather than improvement of agricultural productivity, and try to develop economic opportunities in rural areas and to prevent famers from moving into urban areas. Securing and maintaining agricultural production through efficient water use are indispensable for activation of rural economies, while reduction in water resources will affect agricultural production.

The Government promotes wheat and barley production, and to do so, it focuses on strengthening irrigation and agricultural techniques and emphasizes the importance of agricultural extension services. The draft plans are proposed according to agricultural strategy for each of 8 Agro Climatic Zones (ACZ). ACZ is classified depending on the characteristics of water resources, land resources and climate. In the draft plans of each zone, the target crops are selected considering temperature, the amount of rainfall and water resources. The plan also includes, 1) cropping plans taking into consideration multiple cropping and 2) feed production plans for preventing land devastation and cropping plans for desertification prevention. In addition, as the criteria of crop selection, it considers i) whether the crop is market-oriented or not, ii) whether it is cash crop (staple crops, vegetables, fruits, feed crops) or not. Category of crops (main crops, vegetables, fruits, and feed crops) will also be considered in selection of crops.

The selected crops includes wheat and barley, 3 kinds of legumes, 10 vegetables crops, 3 industrial products, 4 oil crops, 5 feed crops and 6 fruits crops. These crops are recommended to cultivate in green house during winter seasons in order to save irrigation water and produce high value added products. In addition, the following points shall be considered for promoting natural resources (water and land) conservation.

1). Agricultural production increase, Effective use of natural resources, Ecosystem conservation
2). Effective use of water resources, agricultural materials (such as fertilizers and pesticides), and human resources
3). Conservation of biodiversity

In order to take into account the view points of natural resources consideration and to improve agricultural production, it is essential to maintain the soil fertility, implement rotation production, provide appropriate fertilizers and prevent diseases and pest damages.

6.1 Water Resources and Irrigation

NDP estimates that the water inflow from Tigris and Euphrates river into Iraq will decrease by 30.8 % and 47.1 % respectively before and after upstream countries' irrigation development[69]. As for the water quality, the TDS will change from 250 ppm to 375 ppm in Tigris river, and from 457 ppm to 1250-1350 ppm in Euphrates river, and it is caused by less river water flow. As a result, such salinity levels are inappropriate for farming and it negatively affects the cropping plan.

SWLRI recommends three technical measures mentioned herein below in order to solve the lack of water resources.

1). Reduction of water consumption: increase the utilization efficiency, implement appropriate maintenance, make water allocation network, improve the irrigation efficiency, improve cropping plans and irrigation systems, introduce drought-resistant crops and improve awareness of users through establishment of farmers' organizations
2). Securing current available water resources: reduce water evaporation from lakes or rivers, secure water resources and ground water through establishing small-scale reservoirs in desert regions of western Iraq
3). Development of new water resources: develop ground water and artificial recharge

1) Reduction of water consumption: In order to reduce water consumption, improvement of off-farm and on-farm irrigation systems is required. Regarding the off-farm systems, currently water leakages are being reduced through concreting main line and pipelining second line. As far as the pipelining is concerned, there are two methods, namely gravity and pressure types. Gravity type method reduces water leakages from water pipes and decreases water evaporation. The pressure type is suitable for water saving irrigation systems which require water pressure (such as sprinkler and drip irrigation) and it also shows the same advantages as of the gravity type mentioned above. When farmers introduce water saving irrigation systems such as sprinkler, the governmental subsidy system supports 50 % of its expenses, but the rest of 50% should be paid by the farmers in 10 years. Therefore, if farmers are doubtful whether they can increase production and develop new markets, it is difficult for them to introduce such irrigation systems. The fall in the crude oil price recent years has also inflected a negative impact on the continuation of the subsidy system. Establishment of famers' organization is essential for supplying irrigation water to irrigation areas, so this measure can be practical for agricultural development in Iraq.

2) Securing current available water resources: For example, the Tharthar lake loses approximately 3.9 billion m^3 from 2,700 km^2 of total reservoir water due to its evaporation if assuming that the evaporation from water surface amounts for 1.45 million m^3/year/km^2[70]. While there are still

[69] NDP does not mention exact years.
[70] Water Resources and Conflict in the Middle east, ROUTLEDGE, Tayler and Trancis Group, 1994

arguments both for and against reduction of evaporation, it might be better that the reservoir water is continuously discharged from the lake into Tigris and Euphrates rivers so that it can be a measure for flooding prevention. Establishment of small-scale reservoirs in desert regions of western Iraq is one of methods for water harvest, and such measure is often taken in neighboring countries.

3) Development of new water resources: Specific measures for new water resource development and artificial recharge will be considered in accordance with the results of ground water investigation by Iraqi Government.

6.2 Agriculture

(1) Agricultural land use

According to NDP 2013-2017, much land is left unused due to resigning of land ownerships and inefficiency of small scale famers. In particular, salinity of irrigation water, soil salinization by rising ground water, and excess irrigation has become serious issues. Therefore, about 70 % of the total agricultural areas requires effective drainage systems to mitigate the soil salinization. At the same time, at least 2 million ha of new lands is also required for agricultural production in Iraq.

In addition, in some irrigation projects to south of Bagdad, the percentage of $CaCO_3$ in soil has reached approximately 25-35%, which means the soil lacks necessary nutrition for growing plants. As for soil gypsum, the content amounts to 20 %, which results in impairment of nutrition absorption, imbalance of calcium and magnesium, and soils crack. The soil fertility is also deteriorated due to lack of the organic matter in it (less than 0.5%)[71]

(2) Productivity

The agricultural productivity is still at low level. This issue is caused by several reasons, yet the main causes are lack of agricultural equipments, fertilizers, improved varieties and insect prevention. In addition, many famers seem not to apply modern agricultural techniques. The graph below describes cereal productivity in Iraq and neighboring countries. It clearly shows that the productivity in Iraq is lower than other countries[72]. Therefore, it is necessary to disseminate more information about farming methods and improve their farming methods. At the same time, measures against problems of lacks of farming techniques, electricity, fuel and agricultural inputs such as fertilizers and pesticides should be addressed by taking some measures to increase agricultural production.

[71] Water and Agricultural Current Situation of Iraq
[72] NDP 2013-2017, MoP, p.118 (ditto)

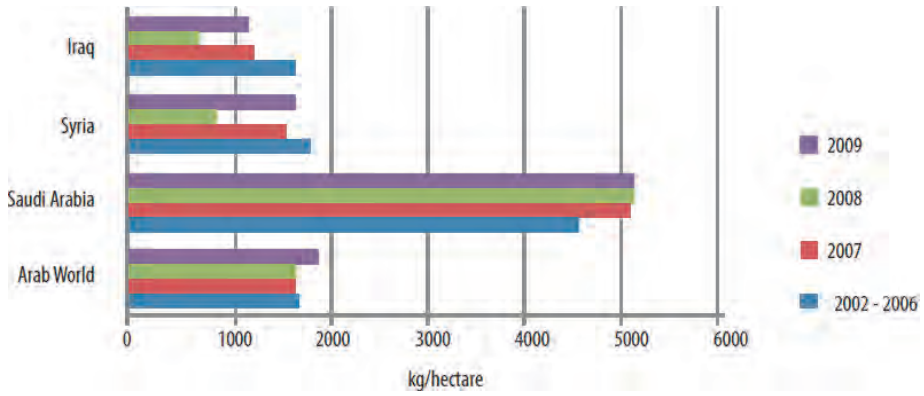


Fig. 6.2.1 Comparison of Cereal Productivity between Iraq and Neighboring Countries

(3) Capacity of human resources[73]

Skills and the capacity of human resources are low, and famers lack knowledge and information about new and innovative farming methods. In addition, farmers do not have the capacity to manage irrigation facilities and lack in awareness on necessity to participate in facility management and on limited water resources. Modern irrigation techniques such as sprinkler and drip irrigation, which improve the irrigation efficiency, are less utilized in Iraq.

This is because farmers cannot apply modern agricultural techniques since they do not have enough funds and are lacking in entrepreneurships. Most of famers have little knowledge about farming systems focusing on economic efficiency planned by the Government. In particular, they do not have access to the information about agricultural markets i.e. quality and prices of agricultural products. Therefore, there are urgent needs for MoA to change education system so that farmers can adjust themselves to new technology and to impart agricultural guidance to farmers.[74]

(4) Private investment[75]

The Government aims at promoting private agricultural investment while there are limited investments in the agricultural sector, particularly in agricultural land development and water resources (reservoirs) development. This might be caused by the influence of ISIL, causing instability. In order to facilitate agricultural mechanization and increase agricultural production, it is necessary to increase domestic and foreign investment.

(5) Public Subsidy System

In Iraq, there is a large amount of subsidy, and the cost accounts for about 9 % of its GDP (2014). The breakdown of the 9% are; food (1.8%), electricity (3.4%), and fuel (3.6%). As for the agricultural sector, the main food subsidy is called Public Distribution System (PDS)[76].

More than 7 millions of households use this system. In this system, food and agricultural products are registered and listed in ration cards and most of population receives this card. The lists covers wheat（9kg/card/person/month）, rice（3kg）, sugar（2kg）, vegetable oils （1litter）and milks

[73] NDP 2013-2017, MoP, p.126-127 (ditto)
[74] NDP 2013-2017, MoP, p.134(ditto)
[75] NDP 2013-2017, MoP, p.126 (ditto)
[76] IMF Iraq selected issues (July 14, 2015) Food subsidies: Public distribution system (PDS)

(3packs; 450grams each）. The public company called General Company for Trade in Grains has responsibilities for providing foods and agricultural products to recipients. The Government purchases products from famers at administrative prices and sell them at subsidized price using the ration card.

The administrative price is decided by MoA and the Government based on cost estimation by Ministry of Trade (MoT). The imported amount is the difference between the necessity amount for PDS and the domestic production amount. In PDS, the subsidized foods and agricultural products are stored and kept in silo and warehouse.

Food subsidies (PDS) accounts for 1.8% of GDP in 2014. The amount of the subsidies is the balance amount between the revenue of the Government and the cost for purchasing foods from farmers (or importing foods). Therefore, the amount of the subsidies depends on (a) the selling price to consumers (b) the purchase price from famers (c) the imported prices As mentioned above, the cost of PDS allocated in the national budget was IQD 4.8 trillion (1.8% of GDP) in 2014. While the social security system also provide some supports for widows and martyrs other than the food subsidies, the cost for the food subsidies (PDS) accounts for 60% of the total cost for the social security system.

The subsidies for wheat account for more than 60% of the food subsidies (PDS). The subsidy for rice shows the second largest amount in the food subsidies. All other products, sugar, vegetable oil and dairy products, listed in the ration card, are imported and sold at a very low price. In the case of wheat, the purchase price from farmers is almost double than the imported price in order to stimulate famers' motivation for their production. In the case of rice, there are two varieties. One sets a higher purchase price than the imported price due to its quality, and the other sets a slightly lower price than the imported price because of low quality.

On average, the local administrative selling price of wheat, rice etc. is less than 0.5% of the purchase price. Distribution amount of flour with subsidy is said to be more than consumption in a typical household (according to some estimations, distribution is 9 kg and actual consumption is 6-7 kg). the surplus, reportedly, is sold at black markets.

The administrative cost for PDS is relatively low. The cost was 697 billion IQD in 2014, equivalent to approximately 13% of the total PDS cost. The cost for transportation and labor costs is more than 60% of the total administrative cost.

6.3 Environment (Salt damage)

As for environmental issues, salinization in river water is worsening particularly in the central and southern parts of Iraq. When the volume of river water decreases, the salinity of irrigation water increases and it exacerbates the degree of soil salinization. It is essential to consider how to improve current farming methods.

The table 6.3.1 compares mean yields of wheat, barley, maize, cotton and sunflower in areas affected by salinity with attainable yields on non-saline soil. The production in areas affected by salinity is 40-65 % lower in comparison to those in non-saline soil. The evident main cause of low productivity is the soil salinity. And salinity is caused by the conventional irrigation methods using excess water. Lacks of irrigation technologies to prevent salinization is also a factor for low production

Table 8. Mean yields (t/ha) of wheat, barley, maize, cotton, and sunflower in areas affected by salinity and attainable yields on non-saline soil.

Crops	Yield on saline land* (t/ha)	Attainable yields on non-saline soils† (t/ha)	Approximate yield reduction (%)
Wheat	1.2 –3.0	4–5	55
Barley	1.0 –2.8	3–4	50
Maize	1.0 –2.8	4-6	65
Cotton	2.0 –2.4	4–5	50
Sunflower	1.0–2.0	2–3	40

*Project survey data 2012.
† Ministry of Agriculture estimates of attainable yields on non-saline land under good management.

Table 6.3.1 Comparison of Saline Soil and Unit Crop Production

On the other hand, some farmers in southern Iraq earn over 50% of their income from livestock farming, while producing salinity tolerant forage crops. In order to increase agricultural production and profit, according to interviews, an option is to utilize more fertilizer than the usual[77]. However, when the irrigation water has the high content of salinity, it exacerbates the soil salinization in the root zone and thus is not a sustainable system. Therefore, it is necessary for farmers in areas affected by salinity to produce salinity-tolerance products and stably earn their income through its production.

Introduction of salinity-tolerance crops is effective when soil salinity happens. In order to develop the market using these farming methods, it is essential to cooperate with not only local communities but also private companies. When crop density is high, it reduces water evaporation from soil surface, and inhibits soil salinization. In order to introduce such kind of measure, the conventional farming methods should be reformed. In addition to modernization of the irrigation system, some measures, which do not require high expenses, should be planned and applied to the system. For instance, the strategy of water management in the field should be planned, and the measure for reducing soil salinization and the management for irrigation projects should be strengthened. At the same time, it is necessary to make the guideline for effective use of water resources.

6.4 Water Resources Management by WUA

The survey in southern Iraq (mainly Basrah) includes support for WUA from MoWR and MoA, establishment of WUA, WUA's water management, field survey of farming and sales. Workshops have also been implemented and distilled the issues related to establishment and activities of WUAs.

[77] Managing Salinity in Iraq's Agriculture, ICARDA

6.4.1 The Actual Conditions of Water Resources Management by WUA

The major points of the field survey are described below.

- The utmost important activities of WUA is the maintenance of watering facilities introduced in land improvement projects. Therefore, in case of no irrigation projects, there will be no WUA activities in general. It was confirmed that most of WUAs that were visited this time were periodically holding conferences and making decisions on water-related issues. (see Table 6.4.1) Many WUAs stated that these conferences are active. This proves the utmost impact of establishment of WUAs. It should be noted that some WUAs lack in periodical conference, recording of meetings and proper organizational management. Thus capacity development of WUA executives through trainings is needed.
- Although Piet Ghzayel WUA has collected fee from some WUA members to clean tertiary canals, most WUA do not implement such activities since MoWR are responsible for maintenance of canals. Introduction of rotation system for fair water distribution and discouraging upstream farmers from excessively pumping water shall be considered to rationalize water resources management by WUA.

Table 6.4.1 WUA Activities

WUA name	Benefitted area (dunams)	No. of members/farmers	Frequency of conference	Issues discussed	Other activities	Problems
al-Zaidiya WUA	1,540	82 /82	Twice a week	Water distribution, agriculture as a whole	・ water distribution among members (rotation)	Lack of water (only 80% in winter and 20% in summer can be watered)
Piet Ghzayel WUA	2,500	29/61	3 times a month	Water distribution, canal cleaning, agriculture as a whole including fertilizer	・ water distribution among members (rotation) ・Gate manipulation, cooperating with Directorate of Water Resources ・ Canal cleaning by hiring workers	No lack of water to date
Al-Manthori WUA	436	56/200	An executive committee a month	Salinity, water flow, and agriculture as a whole including fertilizer	-	Water quality （TDS: 7000ppm）
Al-Okaily WUA	4,000	179/179	Once a month	Water distribution and so on	・ water distribution among members (rotation) ・tolling of water fee	Lack of water
Al-Jadeed WUA	350	31/150	An executive committee a week	Agriculture as a whole	・ Management of conference records	Water quality （TDS: 7000ppm）
WUA on Block No. 2 / Abo Bshoot Irrigation Project	1788	35/35	Twice a month	Measure for issue related to water amount	“Project for Spreading Water Users Associations for the Efficient Use of Irrigation Water” Pilot Project: Remote Gate	Old pumps in the whole area(6,000 ha) Establishment of (union of)WUA covering the whole area

- Al-Manthori WUA directly intakes water from the nearby river by pumps, so there is no necessity to share water facilities and therefore, merits of establishment of WUA are limited. Advantages of establishment of WUA should be explained to farmers, while aiming at cooperative maintenance of irrigation facilities.
- Actual WUA activities are different from each other. This is because no guidelines and manuals stipulating WUA activities and how to monitor its activities were formulated.
- Water saving irrigation methods at field level that MoA are responsible for are furrow irrigation with laser leveling, sprinkler irrigation, drip irrigation. Distribution canals MoWR is responsible for are open lining, gravity pipeline, and pressurized closed pipeline. It is confirmed that MoA prepared subsidy for the following 4 sprinkler systems. Some farmers stated that unit crop has almost doubled after introduction of center pivot, from 600~700kg/dunams to 1,180kg/dunams. Satisfaction rate of farmers who introduced drip irrigation is high, proving effects of introduction of water saving irrigation. Regarding WUAs that were visited in this Survey, land leveling is not proper, therefore laser leveling, introduction of small on-farm canals and furrow irrigation shall be effective in water saving.

Table 6.4.2 Farmers' Burden in accordance with Sprinkler Type

Sprinkler type	Area covered	Farmers' burden
Center pivot	120 dunams	Approx. US$30,000 (divided payment for 10 years)
Center pivot	80 dunams	Approx. US$27,000 (divided payment for 10 years)
Center pivot	68 dunams	Approx. US$25,000 (divided payment for 10 years)
Fix solid	42 dunams	N.A

※ Farmers' burden means subtracted prices after MoA's subsidy (50%). If the original price is US$60,000, farmers' burden will be US$30,000.

- The biggest obstacles to introduction and promotion of water saving irrigation proved to be farmers' conservative mindset and cost. Administrative side tends to state that farmers' mindset is more problematic because they can be financed through national agricultural bank without interest. On the other hand, farmers are prone to emphasize high introduction cost rather than their conservative mindset. Furthermore, when it comes to introduction of sprinkler, issued like land areas owned by farmers and supply of electricity are also pointed out. In short, only 4 kinds of sprinkler are subsidized, and necessary areas for them are basically broader than farmers' owned lands. Consequently, farmers who are having difficulties in expanding their land cannot introduce sprinkler. In some cases, sprinklers will not function as capacity of electricity supply is not enough.
- An issue common in irrigation agriculture in central and southern Iraq is not only shortage of water flow, but low water quality due to increasing salinity. The degree of water quality is different even in Basrah. Decline in water quality is remarkable especially in southern part of Basrah.

6.4.2 Consideration on Water Saving Irrigation Project Based on Farmers Economic Survey

Regarding water saving irrigation project cost, profitability of projects is evaluated based on results of farmers economic survey in Basrah and Dhi-Qar. The following are the outlines of the survey.

(1) Background, purpose and outline of the survey

Farmers survey was not fully implemented, and Iraqi governmental officers do not accurately grasp farmers economic situation. In considering Iraq's future water resource management and irrigation agriculture, it is necessary to survey farmers' economic situation and hence, this survey was implemented. Members of Piet Ghzayel WUA in Basrah and Al-Zaidiya WUA in Dhi-Qar were targeted and interviewed in this survey and 35 farmers (100%) and 70 farmers (85%, out of 82 farmers) answered, respectively.

The questionnaire consists of i) demographic information (e.g. sex, family member), ii) income (e.g. yield, price), iii) outgoing (e.g. fertilizer cost, machinery cost).

2) Results of Farm Survey

The results of the survey are shown in table 6.4.4 and 6.4.5. Members of Piet Ghzayel WUA have land holding of 61 dunams (approx. 15 ha) on average. On the other hand, Members of Al-Zaidiya WUA have land holding of 25.2 dunams (approx. 6 ha) on average. Both WUAs' members earn a large percentage of income from wheat.

Average annual profit of Piet Ghzayel WUA members is about IQD 17,021,000, and that of Al-Zaidiya WUA is approximately IQD 2,763,000. Profit per ha of the latter is about 40% of the former WUA. This is because Piet Ghzayel WUA's yield of wheat is 800kg/dunam (approx. 575kg/dunam in Dhi-Qar) and its unit price of wheat is 790IQD/kg (525IQD/kg in Dhi-Qar[78]). Difference in irrigation water amount is likely to result in amount of yield. Further, the latter sells their products at a market price, not at subsidized price.

3) Introduction cost for water saving irrigation facility

a) Annual cost for introduction of water saving irrigation facility

Water saving irrigation facilities whose prices are apparent from MoA's materials are sprinklers for 68dunam, 80dunam, 120dunam, and introduction costs for them are IQD 60,000,000, IQD 64,000,000, IQD 70,000,000, respectively. Thanks to the subsidy system, farmers pay a half amount of money in 10 years. After introduction of facilities, they have to pay electricity and maintenance fee as well[79]. Consequently, IQD 7,860,000 shall annually be paid for sprinkler for 68 dunam, IQD 8,720,000 for 80 dunam, and IQD 11,000,000 for 120 dunam.

b) Economic analysis on introduction of water saving irrigation facility

Whether farmers can afford to pay for the cost of introduction of water saving irrigation

78 According to PMT in Dhi Qar, farmers sell their products at market price so that they can immediately earn money

79 Irrigation amount: 600mm, fuel cost: 30IQD/ m^3, O & M is 3% of original introduction fee

facilities will be described. Afterward, the abovementioned 3 kinds of sprinklers shall be analyzed because they are subsidized and promoted by MoA[80].

As a result of economic analysis of relationships between farmers' annual profit and cost of introduction of water saving irrigation facilities, members of Piet Ghzayel WUA who have 68-120dunam will pay 28-40% of their expected annual profit every year for the water saving irrigation facilities. Regarding Al-Zaidiya WUA, members will have to pay 45-57% of their expected annual profit (see Table 6.4.3)

Table 6.4.3 Owned (or rental) Area, Annual Profit, Economic Burden

Piet Ghzayel WUA		
Owned (or rental) area,	Expected annual profit	Estimated economic burden ratio
68 dunam (17ha)	Approx. 19,687,000 IQD	Approx. 40%
80 dunam (20ha)	Approx. 24,178,000 IQD	Approx. 36%
120 dunam (30ha)	Approx. 39,146,000 IQD	Approx. 28%
Al-Zaidiya WUA		
Owned (or rental) area,	Expected annual profit	Estimated economic burden ratio
68 dunam (17ha)	Approx. 13,820,000IQD	Approx. 57%
80 dunam (20ha)	Approx. 16,217,000IQD	Approx. 54%
120 dunam (30ha)	Approx. 24,208,000IQD	Approx. 45%

c) Consideration based on the results

Regarding Piet Ghzayel WUA, ratio of economic burden out of annual profit shall be 28-40%. As they tend to have large lands (approx. 15ha on average), introduction of water saving irrigation facilities will be possible if they are sufficiently aware of importance of water saving. Al-Zaidiya WUA, however, has smaller lands (about 6ha on average), resulting in high ratio of economic burden. It seems that high burden discourages them from introducing water saving irrigation. It should be noted that it is almost impossible for farmers to introduce water saving irrigation facilities without subsidy system as it pays 50% of introduction cost.

The larger area farmers have, the more profit farmers will earn. Introduction of water saving irrigation can be commenced from high profit farmers (top 25% of Piet Ghzayel WUA[81]), while the Government disseminates farming techniques at the same time. This will prove high profitability, which will encourage other farmers to introduce water saving irrigation.

A cause of low profit of Al-Zaidiya WUA is current shortage of irrigation water. Securing necessary water amount along with increases in WUA members will result in improvement of unit crop, which will make introduction of water saving irrigation feasible.

When it comes to water saving irrigation scenario in the whole Iraq, Basrah and Dhi-Qar are located in the southern part of Iraq where agricultural productivity is low due to salinity of soils and river water. Productivity of wheat in the 4 governorates in southern Iraq (Basrah, Dhi-Qar, Misan, and Muthanna) is 16.5% lower than other parts[82]. It seems that more farmers with sufficient income to introduce the facilities are in central and northern regions, and dissemination of water saving

80 Calculation of farmers' annual profit is based on the governmental purchase prices, not on interviewed prices

81 WUA members having more than 20ha (8 out of 35 farmers)

82 Material from MoP. A document issued by WB, " Iraq: Country Water Resource Assistance Strategy: Addressing Major Threats to People's Livelihoods", 2006, also mention low productivity of southern part.

irrigation can be quicker. These farmers, however, do not necessarily regard water shortage a serious issue and thus, their low awareness in water saving irrigation can delay dissemination of water saving irrigation facilities.

The results of the farmers economic survey are summarized below.

a) Basrah: Piet Ghzayel WUA

Table 6.4.4 Summary of Survey (Piet Ghzayel WUA)

	Question	N	Mean	Min	Max	Std.Dev
	No. of co-workers	35	3.5	1.0	7.0	1.2
	No. of Kinds of products	35	1.26	1	3	0.51
	Owned and rent area (dunam)	35	61.23	30.0	175.0	34.58
Income	Income from other than farming (IQD)	35	0	0	0	0
	Income from wheat (IQD)	35	36,227,142.86	15,800,000.0	118,500,000.0	21,043,349.32
	Income from barley (IQD)	4	5,625,000.0	1,000,000.0	15,000,000.0	64,98,397.24[83]
	Total income (IQD)	35	36,955,714.29	17,800,000.0	118,500,000.0	22,011,864.35
Outgoing	Seed cost (IQD)	35	2,184,285.71	800,000.0	7,200,000.0	1,477,814.93
	Fertilizer cost (IQD)	35	3,163,476.19	1,550,000	9,041,666.67	1,786,408.63
	Pesticide cost (IQD)	35	15,052.02	7,375.0	43,020.83	8,499.85
	Machinery cost (IQD)	35	4,644,761.9	1,450,000.0	9,775,000.0	2,294,080.8
	Transportation cost (IQD)	35	2,185,714.29	0	5,000,000.0	1,581,537.39
	Personnel cost (IQD)	35	3,970,000.0	0	10,000,000.0	3,516,645.29
	Total outgoing (IQD)	35	19,934,718.69	7,266,937.5	46,059,687.5	9,511,751.24
	Profit (IQD)	35	17,020,995.6	-607,375.0	72,440,312.5	14,920,614.16

Farmers have on average 61dunams (15 ha), and earn most of income from wheat production. Cost of fertilizer, agricultural machineries (e.g. tractor, combine, and pump etc.), and personnel cost are large. Last year's average annual profit was approximately 17,021,000 IQD.

b) Dhi-Qar: Al-Zaidiya (Gharaf) WUA

Table 6.4.5 Summary of Survey (Al-Zaidiya WUA)

	Question	N	Mean	Min	Max	Std.Dev
	No. of co-workers	70	4.79	2.0	9.0	1.68
	No. of Kinds of products	70	2.76	2.0	4.0	0.5
	Owned and rent area (dunam)	70	25.24	6.0	110.0	22.31
Income	Income from other than farming (IQD)	70	0	0	0	0
	Income from wheat (IQD)	70	3,526,357.14	630,000.0	12,600,000.0	2,886,932.44
	Income from barley (IQD)	70	1,067,678.57	315,000.0	5,512,500.0	1,019,296.46
	Income from cucumber (IQD)	45	3,800,000.0	1,500,000.0	9,000,000.0	1,934,730.43
	Total income (IQD)	70	7,036,892.86	1,260,000.0	26,325,000.0	5,293,593.52
Outg oing	Seed cost (IQD)	70	1,147,114.29	90,500.0	3,615,000.0	828,926.25
	Fertilizer cost (IQD)	70	722,469.05	195,833.33	3,133,333.33	605969.04
	Pesticide cost (IQD)	67	61,746.27	15,000.0	240,000.0	51682.99

[83] Excessive value due to small sample

	Question	N	Mean	Min	Max	Std.Dev
	Machinery cost (IQD)	65	526,100.0	278,000.0	1,630,000.0	296,388.97
	Transportation cost (IQD)	70	534,921.43	81,000.0	2,025,000.0	409,752.82
	Personnel cost (IQD)	70	912,490.89	0	9,534,567.0	1,191,404.81
	Total outgoing (IQD)	70	4,273,458.76	708,333.33	17,136,500.0	3,005,487.42
	Profit (IQD)	70	2,763,434.1	-6,734,567.0	16,589,500.0	2,991,126.4

Farmers have on average 25.2dunams (6 ha) of land, and all of them earn large income from wheat production. Large outlays of seed, fertilizer, and personnel cost are observed. Last year's average annual profit was approximately 2,763,000 IQD.

6.4.3 PMT Activities

Pilot project sites were established in each directorate in the technical cooperation project, called "Project for Spreading Water Users Associations for the Efficient Use of Irrigation Water". And PMT were also organized by minister's order to implement these pilot projects. Each PMT consists of 6 staff of Directorate of Water Resources and 4 of Directorate of Agriculture. Although staff(s) of Directorate of Water Resources must be included, others are from various departments, meaning that suitable staff for a certain and specific role is assigned. For example, staff(s) of Directorate of Agriculture who is familiar with production shall be in charge of that function. During the above technical cooperation project, a variety of activities (including measuring, soil and water quality survey, designing of facilities, and implementation of construction etc. [84]) had been implemented in order to establishment of WUA and improvement of irrigation facilities. While the above project finished in 2015, PMT is maintaining their activities and the number of them increases (see 3.3.4). PMT members accompanied the Survey Team's field survey. They have achieved trust from farmers.

As evident from the fact that the number of established WUAs is different governorate to governorate, PMT activities also vary. Some PMTs are limited their activities due to ISIL, the others cannot be active because they do not understand what is supposed to do.

6.4.4 Problem Analysis Workshop

Table 6.4.6 shows schedule of problem analysis workshops about water resources management by WUA. In the workshops inviting officers of the central government and PMTs, participants positively exchanged their views. Additionally, they recognized roles of WUA and importance of establishment of WUA. Japanese side depicted 4 points (see below) which are quite important to continue the establishment of WUA at the final session.

Table 6.4.6 Schedule of Workshops

Fate and venue	Contents	Participants
8th December, 2015 MoWR (Reclamation office)	Stakeholders analysis and problem analysis with PMT members	About 40 participants (about 3 participants from each governorate)

[84] Some PMT achieved improvement of irrigation facilities, others could not because of short budget from ministry due to decline of oil price.

Fate and venue	Contents	Participants
9th and 10th December, 2015 MoWR (Reclamation office)	Stakeholders analysis and problem analysis with central governmental officers	MoWR (11 participants: day 1, 17participants: day 2) MoA (1: day 1, 1: day 2) MoP (4, day 1, 4: day 2) PMAC (1, day 2)

Attachment 1 shows results of stakeholders analysis. Attachment 2 shows an outline of problem analysis with central governmental officers. Attachment 3 depicts 2 outlines of problem analysis with PMT members. Here, outlines of problem analyses will be described.

In the problem analyses, the classification “Water (& Soil) Management is poor at the field level” was selected as the core problem, based on results of stakeholders analyses and interactions with participants. The core problem has following 5 direct causes.

(i) Farmers don't know how to deal with problems (Farmers depend on the old idea when they use land & water).
(ii) Conflict & dispute among farmers for water use. And some farmers get more water
(iii) Modern irrigation method (Drip & sprinkler) is not used
(iv) Each farmer has individual crop planning
(v) Infrastructure is poor

Cause (i) is due to lacks in trainings on dissemination, guideline, and policy. Cause (ii), is due to insufficient promotion of WUA and capacity development of WUA. Cause (iii) is due to expensive cost (including MoA’s subsidy, expensive electricity, and frequent black-out), a lack of farmers’ knowledge on agriculture, and stopping of collection of water fee. As regards to cause (iv), the coordination between MoWR and MoA is not fully done is pointed out. At last, cause (v) exists because of lacks in contractors’ capacity, understanding of farmers about projects, and budget.

Participants of the workshop were divided into two groups and selected different core problems in the problem analysis with PMT members, namely, “Water management by farmers is poor (core problem 1)” and “Water Saving Technologies are not accepted by farmers (core problem 2)”. These core problems mean almost the same thing as the one central governmental officers reached to.

The core problem 1 has the following 3 direct causes.

(i) Farmers are using old methods in irrigation.
(ii) The WUA is not active
(iii) Coordinate between farmers and Government is weak.

Regarding (i), similar to the analysis with central governmental officers, a cause is that farmers cannot afford to buy expensive modern system. Cause (ii) is because effects of trainings are not reflected. Furthermore, empowerment of WUA is also required. Cause (iii) is due to inadequate level of communication between farmers and the Government, the law, and untrusted governmental

policies.

Regarding the core problem 2 the following 2 direct causes are suggested.

(i) Farmers are stuck on typical/traditional methods of irrigation.
(ii) It is difficult to use modern irrigation system for small size lands.

Cause (i) is due to lack of farmers' knowledge due to insufficient dissemination and trainings. Securing budget, establishing ministries' support system, and correction of insufficient training contents are necessary. The direct cause of (ii) is expensive facilities and subsidy system.

6.4.5 Issues to be Intensively Tackled

Based on the above mentioned results of problem analyses, Table 6.4.7 shows the major points that have to be intensively considered.

Table 6.4.7 Issues to be Intensively Tackled

Items	Details
Capacity development such as dissemination and trainings	Trainings for trainers, instruction on formulation of dissemination guidelines, trainings on "communication with farmers", and trainings on WUA reinforcement
Policy and strategy	Decision on policies on purposes and roles of WUA, idea on future WUA, law amendment, evaluation and monitoring of established WUA, and decision making on water fee –related law.
Water saving irrigation methods	Dissemination of water saving irrigation methods, further trainings (related to abovementioned dissemination and training), assistance for formulation of policies and strategies for promotion of water saving irrigation methods (related to abovementioned policy and strategy)
Formulation of cultivation planning	Formulation of cultivation planning in which MoWR and MoA cooperate.

Further capacity development of Iraqi Governmental staff is necessary to evaluate and monitor WUAs and reinforce them through dissemination and training programs. Formulation of manuals and guidelines is also important. These will let Iraqi governmental staff recognize the suitability of WUA system for Iraq, which will lead to development of sustainable WUA model.

Attachment 1

Stakeholder Analysis

1. List of stakeholders

By central officials	By PMTs
MoE/ Parliament/ citizen/ MoA/ Leader committee/ MoWR/ MoP/ PMTs/ Local government/ Farmers (People on site/ Group of educated farmers)/ Agriculture directorate/ WUAs/ Inhabitants of the irrigated areas/ Donors/ Third country (Turkey, Jordan, Egypt)/ JICA/ Implementation company	Farmers/ Farmers at the upstream/ Farmers at the tail/ Power Farmers (farmers that make impact on decision)/ Head of tribe/ President of WUA/ WUAs/ PMT/ Ministry of agriculture/ Ministry of water resources/ Ministry of planning/ PMAC AI/ Ministry of environment/ Local government/ Directorate of Agriculture/ Directorate of Water resources/ Local councils/ Local committee of water / agriculture/ Agricultural bank/ Implementation company/ JICA

2. Weakness and strength analysis

By central officials

	Basic information	Weakness/Problems	Strength/Potential
Farmers	• Reducing the No. of farmers that cultivate crops • Using traditional methods of irrigation and growing crops • Limited agriculture equipment due to high price • Lack of knowledge and awareness on modern agriculture and water saving • Limited subsidy for farmers (e.g. fertilizer, high productive seeds)	• Marketing the price of marketing is low • More water and land salinity problems • Lack of awareness in water extension • Farmers are depending on government for support • There are a lot of canals needed to be reclaimed • There are a lot of canals needed to be lining • Farmers are not thinking about shortage water, but only benefit • Farmers do not know the benefit of WUA • Farmers do not know the benefit of modern irrigation • Farmers should have more awareness • Due to Iraqi climate, we face arid and semi-arid area • Farmers cannot afford the price of the irrigation systems • The amount of rain have been decreased	• The big farmers can produce crops more • Human resource • The government pay high prices for the products because it is preferable • The government supports the farmers by giving some equipment
Local government	• Agricultural plan (Summer & Winter) and the availability of water • Available of data base about the irrigated areas and farmers • Education centers	• Weak communication between local government and central government • The local councils don't implement the laws of planning procedure • No water extension unit • Limited budget from central government • There is weakness of local government through implementing law and solving problems • Shortage or lack in rainfall • Lack of paved roads and it effect marketing • Shortage availability of reserving silos for agricultural products • Insufficient energy (electricity) • Water salinity • Some irrigation facilities getting older and the lack of project completion • Diseases of animals and plants by insects, bacteria, etc.	• Enough staff capacity to complete land reclamation • Availability for large area of land ready for cultivation • Possibility to communicate with farmers • Some farmers are from local government • Local government supports farmers

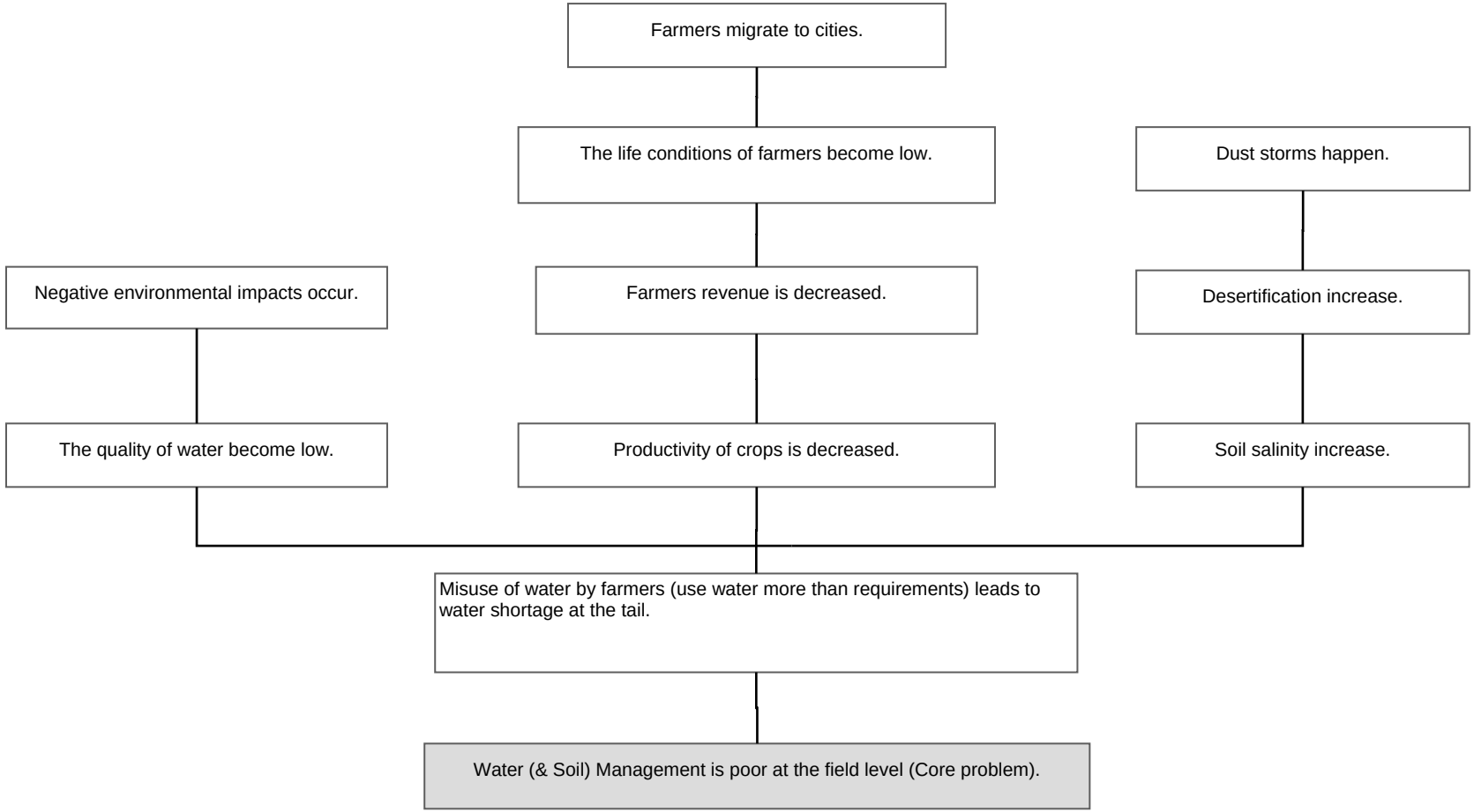
	Basic information	Weakness/Problems	Strength/Potential
Central Government	• Conducting strategy studies like SWLRI. • Amending laws and defining the powers/authority	• Shortage of water causes by the riparian countries (construction of dams). • There is shortage of expert especially in technical matters. • Lack of engineer in designing modern irrigation system. • There is no technical officials in top leaders of ministries. • There is no real desire to implement the projects effectively • There is attempts to get benefit from the projects for farmers for illegal purpose. • Lack of financial support or lack of funding. • Lack of completion of land reclamation. • Lack of modern equipment in implementation of projects. • Lack of expert companies with high capability for doing their job on time. • Low usage of modern irrigation technique. • There is no decision in government side for the use of modern irrigation method (banning the use of traditional method) • Lack of governmental support projects that use modern technique of irrigation and facilitate the process for farmers to accept modern irrigation system. • No justice in water distribution • There is no policy for water extension. • There is no obligation from farmers for implementing the agriculture plan • No monitoring from central government to local government. • Lack of new study to decide the priorities for implementation.	• Availability of good and efficient staff to implement the projects from ministries. • Government support for the project and coordinate with targeted parties. • ME (written by one design engineer of MoWR)

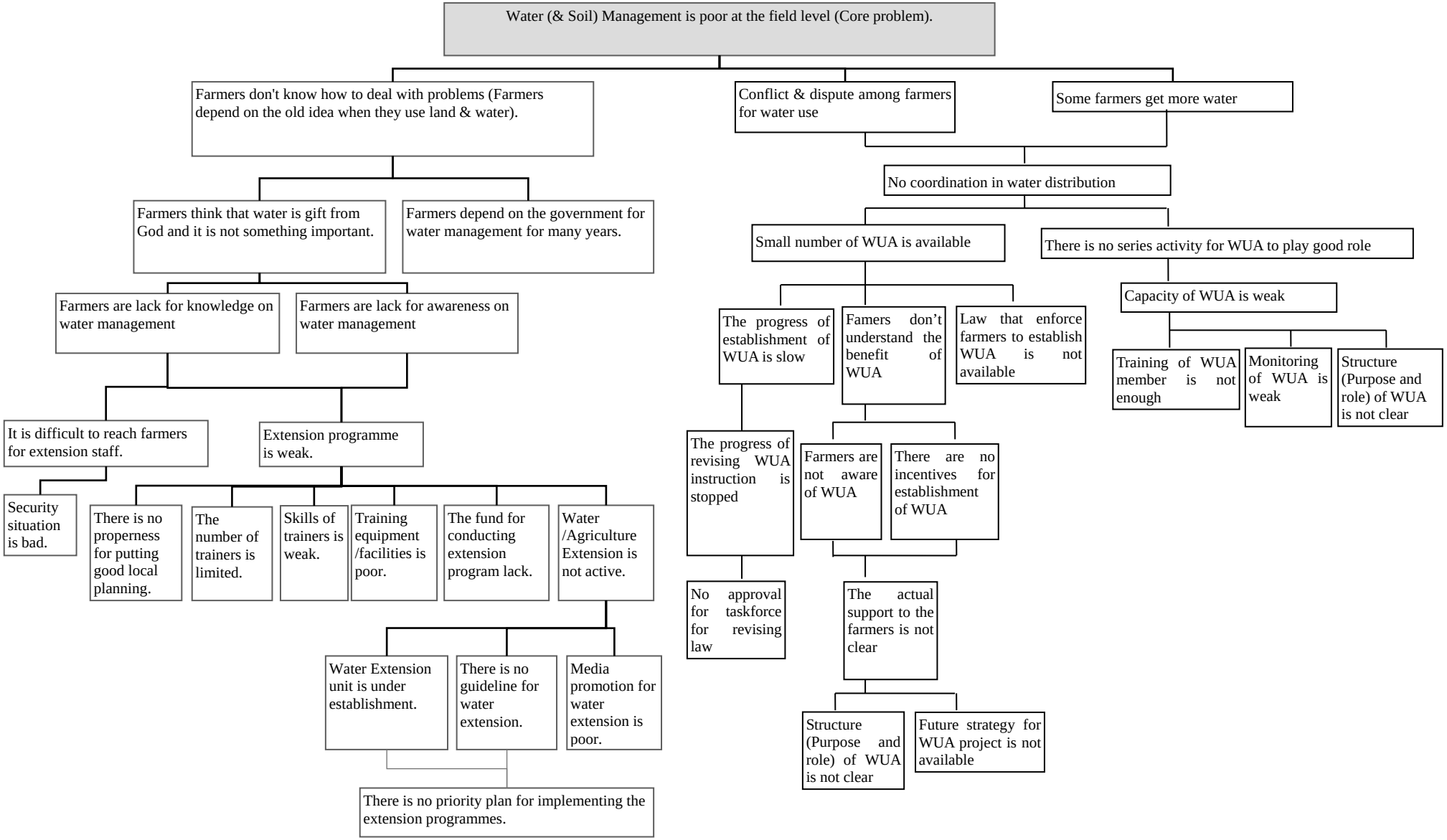
By PMT

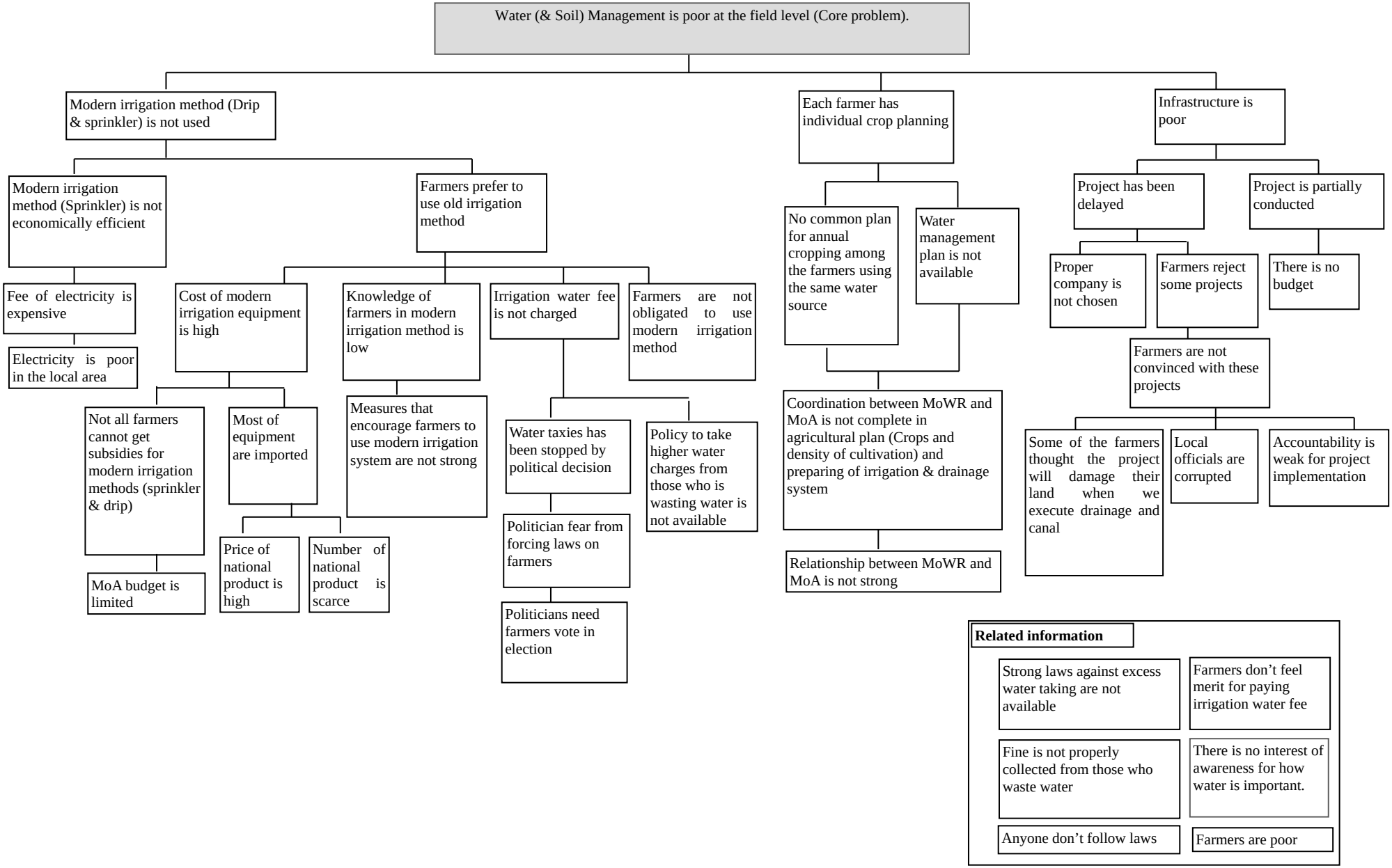
	Basic information	Weakness/Problems	Strength/Potential
Farmers	N/A (They only concentrated on weakness and strength)	• Economic situation for the farmers and social condition • (Old) type of irrigation method in the area • Situation of water irrigation network • Negative influence about illegal water taking • Weak support policy for farmers • Not paying fee for O&M • Difficult to convince farmers about special crops (that need less water) • Lack of awareness about the project • They are not satisfied with projects • Immigration to city and farmers leave his land • Change of type of land (agriculture → residence) • Soil type • Agricultural incentive is weak • The availability of irrigation and drainage network system • Culture level of farmers • Lack of awareness about WUA • Accepting new ideas from farmers	• President of WUA • Increase in financial situation of farmers • Social relationship of farmers • Water provision • Number of powerfuls in the projects • Crops cultivated in the area of normal type of soil

	Basic information	Weakness/Problems	Strength/Potential
Local government	• Management authority (Leader of the local area) • Attend to decision of WUA • Control the security situation • Follow up • Coordination between directorate • Approval of the result of election reduce the objection	• Interfere to the allocation of the project (Affect to the selection of the project) • Weak coordination between governorate and councils • Negative effect by subsidizing only biased beneficiary • Without any contribution to remove illegal water taking • Tribes (family) relation • Routine of bureaucratic for the performance • Without understanding about idea of WUA • Without contribution and help to create the law related to water fee • Without help to prevent fragmentation and converting agricultural land to residential	• Impose decision against engineering design • Affect water share • Solve the conflicts and disputes • Solve problems • Contribute of publishing the idea of WUAs • Facilitate the difficulties and arrange the work among directorates • Encourage farmers • Financial support to the project • Technical support to farmers (Guide farmers)
PMT	• Team including the members from MoWR and MoA. • Meeting is being held with PMT between MoWR and MoA. • Meeting is being held with head of MoWR and MoA in directorate. • Meeting with farmers. • Conducting specialized seminar.	• Shortage of financial allocation. • Delay in establishing laws for WUAs. • Shortage of water for irrigation. • Bad security situation. • Farmers don’t respond. • It is not easy to convince farmers to join WUA • It is necessary to find out a solution for water shortage. • There are people who is members of powerful (influential) family in the pilot project.	• PMT has efficient ability. • There is harmony between PMT members (MoWR & MoA). • PMT members have improved ability to spread WUA by the benefit of training. • Support from local government to PMT.

Attachment 2

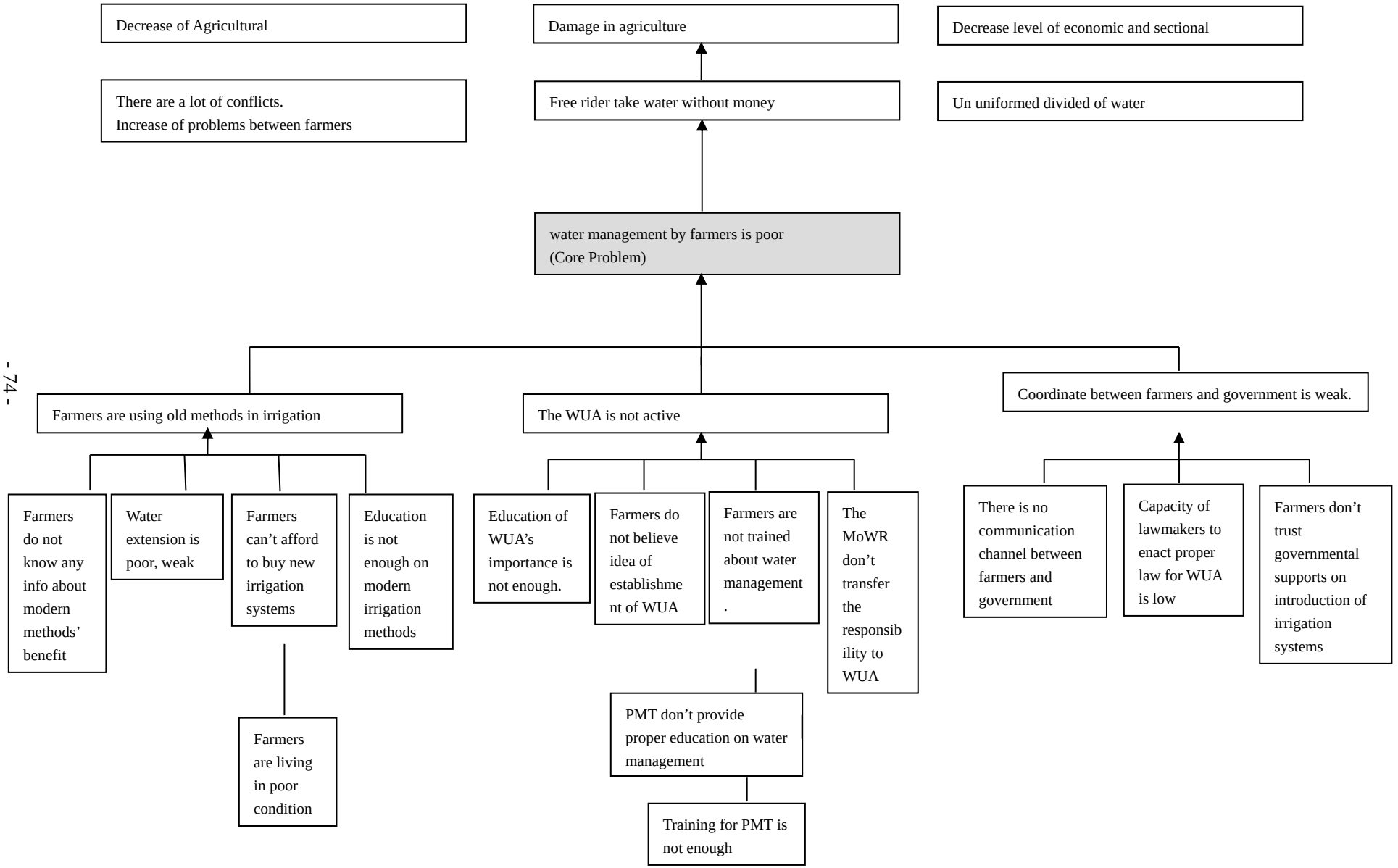



Water (& Soil) Management is poor at the field level (Core problem).
Farmers don't know how to deal with problems (Farmers depend on the old idea when they use land & water).
Conflict & dispute among farmers for water use
Some farmers get more water
Farmers think that water is gift from God and it is not something important.
Farmers depend on the government for water management for many years.
No coordination in water distribution
Farmers are lack for knowledge on water management
Farmers are lack for awareness on water management
Small number of WUA is available
There is no series activity for WUA to play good role
Capacity of WUA is weak
The progress of establishment of WUA is slow
Famers don't understand the benefit of WUA
Law that enforce farmers to establish WUA is not available
Training of WUA member is not enough
Monitoring of WUA is weak
Structure (Purpose and role) of WUA is not clear
It is difficult to reach farmers for extension staff.
Extension programme is weak.
The progress of revising WUA instruction is stopped
Farmers are not aware of WUA
There are no incentives for establishment of WUA
Security situation is bad.
There is no properness for putting good local planning.
The number of trainers is limited.
Skills of trainers is weak.
Training equipment /facilities is poor.
The fund for conducting extension program lack.
Water /Agriculture Extension is not active.
No approval for taskforce for revising law
The actual support to the farmers is not clear
Water Extension unit is under establishment.
There is no guideline for water extension.
Media promotion for water extension is poor.
Structure (Purpose and role) of WUA is not clear
Future strategy for WUA project is not available
There is no priority plan for implementing the extension programmes.

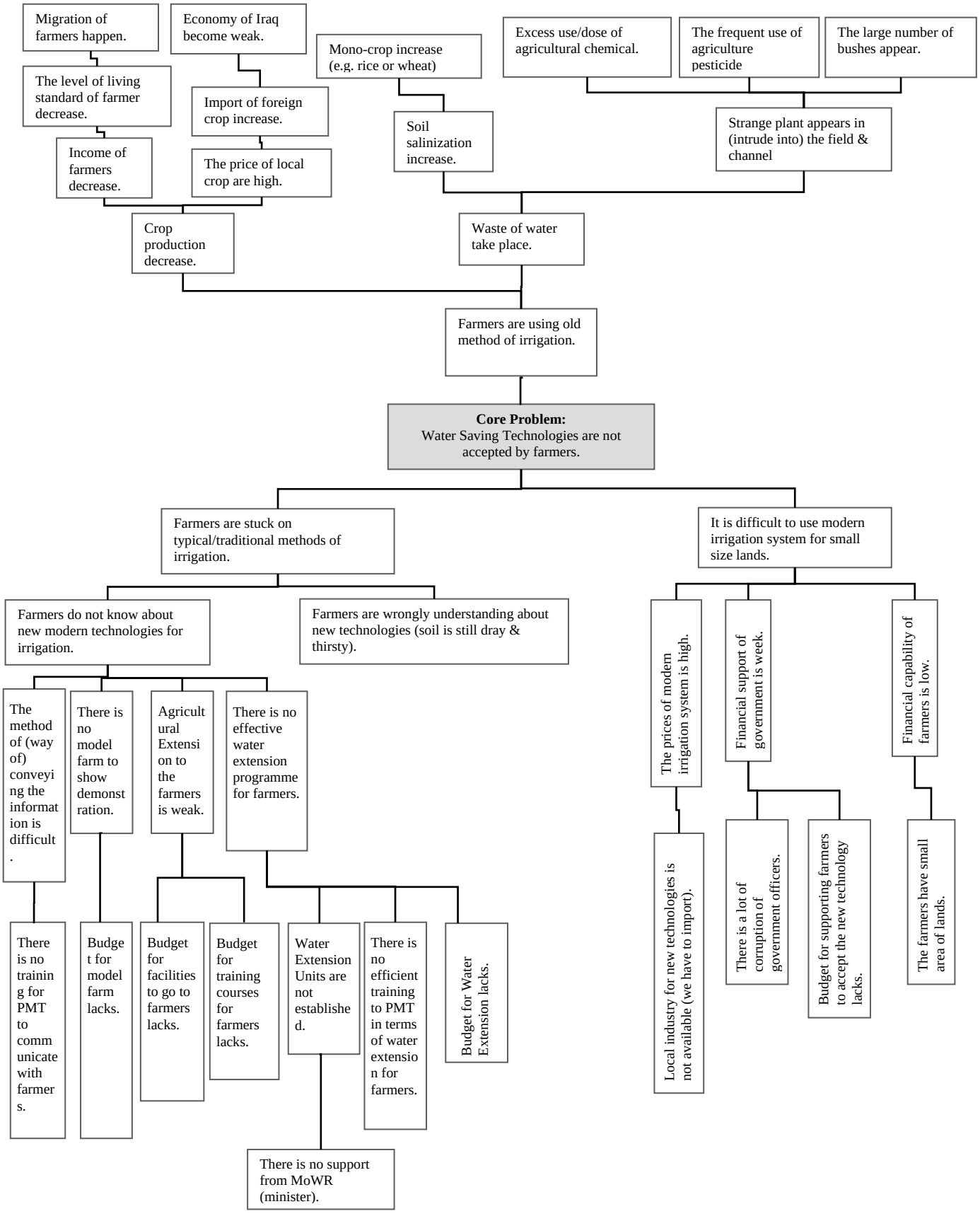

Water (& Soil) Management is poor at the field level (Core problem).
Modern irrigation method (Drip & sprinkler) is not used
Each farmer has individual crop planning
Infrastructure is poor
Modern irrigation method (Sprinkler) is not economically efficient
Farmers prefer to use old irrigation method
No common plan for annual cropping among the farmers using the same water source
Water management plan is not available
Project has been delayed
Project is partially conducted
Fee of electricity is expensive
Cost of modern irrigation equipment is high
Knowledge of farmers in modern irrigation method is low
Irrigation water fee is not charged
Farmers are not obligated to use modern irrigation method
Proper company is not chosen
Farmers reject some projects
There is no budget
Electricity is poor in the local area
Not all farmers cannot get subsidies for modern irrigation methods (sprinkler & drip)
Most of equipment are imported
Measures that encourage farmers to use modern irrigation system are not strong
Water taxies has been stopped by political decision
Policy to take higher water charges from those who is wasting water is not available
Farmers are not convinced with these projects
Coordination between MoWR and MoA is not complete in agricultural plan (Crops and density of cultivation) and preparing of irrigation & drainage system
Some of the farmers thought the project will damage their land when we execute drainage and canal
Local officials are corrupted
Accountability is weak for project implementation
MoA budget is limited
Price of national product is high
Number of national product is scarce
Politician fear from forcing laws on farmers
Politicians need farmers vote in election
Relationship between MoWR and MoA is not strong
Related information
Strong laws against excess water taking are not available
Farmers don’t feel merit for paying irrigation water fee
Fine is not properly collected from those who waste water
There is no interest of awareness for how water is important.
Anyone don’t follow laws
Farmers are poor

Problem Tree by PMT(Tree 1)

Attachment 3



Problem Tree by PMT(Tree 2)



Chapter 7 Recommendations and Points for Consideration

7.1 Assistance in accordance with Iraq's Current Situation

7.1.1 Policy and Institution

As shown in the Chapter 6, the most important issue in water resource and irrigation is to reduce water consumption. Improvement of efficiency of irrigated water use and agricultural productivity will lead to positive impacts in the field of irrigation agriculture in Iraq. Therefore, lining of irrigation canal, development of drainage canal, and promotion and implementation of water saving at field level should be continuously implemented. On the other hand, as improvement of irrigation efficiency as planned in the SWRLI nationwide will need long term time period because it includes farmers' economic burden, development of available water resource also should be considered. Although there are pros and cons about development of dams and lakes, measures for implementation of construction are necessary since neighboring countries are likely to accelerate their water use. As salinity of shallow ground water does not fit for agricultural use, development of deep ground water is suggested but for the agricultural use of it is difficult from the viewpoint of cost effectiveness. Deep ground water shall be used for tap water.

Both increases in yield of irrigation products and development of unused agricultural lands (inclusion of new agricultural lands of 2 million ha) are necessary in terms of food security. Land sterility also results in low productivity. Transforming to labor intensive agriculture from old methods, through spreading of information related to farming such as introduction of fertilizer and improved varieties of seeds, shall be considered. Currently, only a few modern agricultural technologies are adopted due to low level of awareness including business management and poverty of farmers. Efficient use of irrigation water, improvement of farming techniques at field level and transformation into market-oriented agriculture are needed which are mainly handled by MoWR and MoA.

7.1.2 Modern Agriculture

(1) Market-oriented agriculture

In Iraq, advancement of private companies to agricultural sector is limited not only because of small amount of profit due to weak international competitiveness, but because of old agricultural technologies and international standard of agricultural products. Furthermore, Iraq's domestic system of agri-products processing industry and value-chain is unclear, and knowledge dissemination system is underdeveloped. Unstable system of trade prices, delay in operational market information system, and troubles in import and export also result in the limited advancement of private companies. Given these factors, development of agricultural sector so as to become an intensive and profitable system, so transformation into the market-oriented agriculture is necessary.

As Iraqi Government states that drastic reform of subsidy system on purchase price of strategic products and support for agricultural input are needed, reform of market system, reduction of inappropriate water use, solution of agriculture of low investment and low productivity are indispensable for it. Furthermore, assistances for public and private investment and safety net for fragile farmers are also essential to deal with it.

The Government will take measures to improve farmers' profit through development of agricultural infrastructure and market information system, reduction of marketing cost, and redress the

gap between producer's price and consumer's price. Famers are required to reduce governmental expenses through water saving irrigation, effective water schedule, and stopping mono agriculture.

SWRLI shows the following strategies.

1) Promotion of mechanized agriculture
2) Use of organic fertilizer
3) Dissemination of micro-irrigation method
4) Post-harvest processing, construction of cold insulation unit
5) Introduction of producing and processing technology that utilize information technology system
6) Dissemination of modern food processing technology
7) Creation of value-chain including production, distribution, sales, and maintenance of facility, from the viewpoint of technology and logistics
8) Development of distribution system including domestic and international trade

(2) Development of new market for horticultural crop (establishment of value-chain)

It is required to reduce production cost through development of production and post-harvest processing, cold insulation units, and export of horticultural crops in the given situation that horticultural crops of neighboring countries are flowing into Iraq at low prices. Although strategic products including horticultural crops have been selected, Iraq's international competitiveness is weak due to dependence on import of agricultural input, resulting in production of expensive agricultural products. It is pointed that this is a disadvantageous point of Iraq's value-chain. The price of fertilizer is approximately US$1.0/kg, and this should be lessened to US$0.5/kg[85]. As domestic production of fertilizer is necessary, fertilizer factory in Basrah should be re-constructed. A measure is needed to improve unit productivity by means of intensive agriculture like input of fertilizer, so that irrigated areas would be efficiently utilized and amount of irrigation water would decrease.

It is suggested to adjust timing of shipment of root crops such as onions and potatoes by using cold insulating units. Additionally, making efficient distribution is also plausible as it is pointed out that existence of several distributing systems like broker system raise prices of agricultural products.

Introduction of producing and processing technology that utilizes information technology system is also suggested. Fields that are suitable for introduction of IT system are irrigation water management, dissemination and improvement of farming techniques, and improvement of access to market information on distribution of agricultural products. The main users of agricultural ICT[86] will be producers, WUA, farmers associations such as agricultural cooperatives.

The followings are examples of utilization of agricultural ICT. Trainings for extension workers in Japan and the third country about farming, water saving irrigation, and reduction of damages caused by salinity shall be implemented.

Censor network: improvement of meteorological observation network, field censor (highly

[85] Approximately US$0.2/kg in U.S., where they produce fertilizer by themselves
[86] Information and Communication Technology

value-added management of cultivation), remote control of irrigation facilities (prevention of damages caused by flood), system of agricultural land asset management (registration, production records), electronic information services (dissemination of techniques, improvement of market prices).

Farming: Fertilizer management, improvement of land productivity through mechanized agriculture, trainings for farmers by agricultural extension workers, bulletin system of outbreak of pest, informing agricultural information through radio.

Micro-finance: Management of financing and repayment through mobile phones

Distribution of agricultural products: Distribution of marketing information regarding agricultural products (e.g. price) at governorate level, categorization of agricultural products based on class, modernization of distribution by means of rationalization of broker system.

(3) Preservation of (agricultural) land

Segmentation of agricultural land under the current land ownership system can disturb improvement of agricultural development and productivity. There are owners, lease holders, and land tenure. Some parts are public lands which are categorized into unused lands and lands developed by individual farmers and registered cooperatives. The public lands occupy 67% of total land in 2001. Out of that, 32% is managed by private sector. Such privately managed lands are distributed by MoA, and there are 933 cooperatives and 220,000 cooperative members.

Although reform of agricultural lands has been continued since 1958, land registration system does not appropriately function (e.g. lands are segmented after inheritance), due to lack of reliable information about land ownership and governmental policy on land ownership. Consequently, conflicts over land ownership and deletion of registration records happen, and especially landless peasants' rights can be violated. A main cause is that the Government stopped implementation of improvement of land ownership systems.

Out of causes for inefficient irrigation, one related to land ownership systems is, as mentioned, a lack of incentive for investment in irrigation and field facilities due to segmentation of lands. These issues can be solved partly by mechanization of agriculture through sharing of agricultural lands, reduction of introduction cost through making construction of facilities efficient, improvement of cost effectiveness of the construction of facilities, and enlightenment of farmers about importance of farmers' cooperatives for fair distribution of water.

7.1.3 Irrigation Facility

The amount of irrigation water supply is daily controlled based on expected amount of necessary water reported from each directorate. The calculation of expected amount of necessary water, however, is fixed i.e. $1m^3$/sec for 5,000 dunam (1,250 ha: grain), 2,000 dunam (500 ha: rice). So, the annual water amount can be reduced by calculating it in accordance with cultivation periods.

Regarding this, the flow of Euphrates river increases by 20% due to water discharge from paddy fields in Samawa in October and November, and there is no need for irrigation downstream in this period. Cultivation plan should be reviewed and a plan for efficient use of river flow is required.

MoA is promoting sprinklers of center pivot type for water saving irrigation. A planning standard in Shatt al-Arab Irrigation Project, however, recommends smaller sprinklers for cultivation of wheat, beans, sorghum, and sesame, and it plans for drip irrigation for vegetables. Although MoWR promotes pressurized pipelines, it is suggested for them to plan water canals at field level in such a way that assume transition from land leveling to flood irrigation, flood irrigation to sprinkler, and sprinkler to drip irrigation.

Regarding measures against salinity, a design taking construction and maintenance cost into consideration is necessary. For example, reduction of water use by water saving irrigation and appropriate burial of pipes through proper soil survey are effective against salinity.

7.1.4 Cost Analysis of Current Projects

Information on social and economic factors shall be gathered and analyzed. Economic impact and burden in the irrigation sector shall be described.

Cost analysis in related to irrigation projects which is described in SWRLI is below.

1) Reclamation of current irrigation project: US$12.475 billion is capitalized, and it is US$9,010 per ha (in total 5,474,000 dunam (1,368,500 ha), Northern area 58,000 dunam(14,500 ha), southern area 4,996,000 dunam (1,249,000 ha))
2) New projects: US$33.068 billion is capitalized, and it is US$17,760 per ha (in total 7,446,400 dunam (1,861,600 ha), Northern and central area 5,577,100 dunam（1,394,300 ha), southern area 1,716,800 dunam (429,200 ha))

Regarding rehabilitation cost of existent irrigation projects and development cost of new projects, benefit from projects will highly affect project impacts. Detailed explanation and farmers' understanding about farmers' economic burden including maintenance cost are essential factors. This is because the Iraqi Government and farmers shall pay for water saving irrigation projects (see 6.4.2, "Consideration on Water Saving Irrigation Project Based on Farmers Economic Survey").

7.2 Framework of Suggested Project

7.2.1 Irrigation Development Plan

Irrigation efficiency should be improved to 0.90[87] from 0.77 (earth canal) by concrete lining of supply water canals. As shown in the chapter 3 and table 3.3.1, development rate of concrete lining of water supply canals (main and branch canals) in irrigation projects is in the range of 20～24%. Development rate of pipelined water supply canals is about 2% at tertiary level. The purposes of such developments are to reduce leakage and vaporization from canals, and further rehabilitation is

[87] Water canals without lining =0.77 (Main canal: 0.94×Branch canal: 0.95×Distributary: 0.94×Water course: 0.92), water canals with concrete lining =0.90: SWRLI

required. Rehabilitation consists of civil engineering and concrete construction, so technically they are not so difficult. Securing budget, however, is problematic due to decline in oil price. MoWR is being introducing self-propelling concrete lining machines and adopted reasonable methods, while securing quality.

Of all arable land, unused land is not so small This is because of collapsed ownership, segmentation of farm lands, saline soils, and poverty of small scale farmers. Iraqi Government states that inclusion of at least new agricultural land of 2 million ha is needed. Such new irrigation project including agricultural land development is categorized into Reclamation Sub-project, and IQD 843.4 billion is capitalized between 2011 and 2015. There are, however, opinions to prioritize rehabilitations of existent irrigation projects because amendment of the laws related to land ownership on agricultural land is delayed due to expensive cost involvement.

Taking into consideration efficient use of budget, assistance in new developments and rehabilitations of irrigation projects will be plausible in terms of securing of water resources.

7.2.2 Development of Water Resources

NDP lists securing water amount through water storage and constructions of small dams as development goals. It also states that Bakhma dam, Mundwa dam, Taq Taq dam, and Khazar-Comel dam will be continuously developed. Further, there is a plan to repair Mosul dam which has leakage from the foundation. Regarding constructions of small dams, constructions of such dams of 116 million m^3 in total capacity are ongoing in Anbar, Kirkuk, Diyala, and Wasit governorates in order to facilitate the water supply, stockbreeding, and migration to desert areas. Besides, 150-200 million m^3 water shall be secured by constructions of small dams in Nineveh, Salah ad Din, Anbar, Muthanna, Najaf, and Diyala governorates.

Dam constructions in Turkey and Syria will influence water amount in Iraq, which is a serious issue for Iraqi Government and hence, development of Tigris river system (excluding Kurdish areas) is expected. Technical cooperation projects can support it.

7.2.3 Modern Irrigation Facility

MoA is promoting sprinklers of center pivot type for water saving irrigation. A planning standard in Shatt al-Arab Irrigation Project, however, recommends smaller sprinklers for cultivation of wheat, beans, sorghum, and sesame, and it plans drip irrigation for vegetables. Although MoWR promotes pressurized pipelines, it is suggested for them to plan water canals at field level that assume transition from land leveling to flood irrigation, flood irrigation to sprinkler, and sprinkler to drip irrigation.

Dissemination of sprinkler and drip irrigation is emergent issue to secure water resources. Sprinkler has been introduced in 99,000ha and it is planned to extend to 750,000 ha. While target areas are not selected, MoA has a plan to install center-pivoted sprinklers for120 dunams, 80 dunams, 68 dunams and fixed sprinkler for 42 dunams, and linier sprinkler for 250-400dunams of land. Such systems are too large and expensive for farmers owning less land. This is an obstacle against promotion of sprinkler. On the other hand, a planning standard in Shatt al-Arab Irrigation Project recommends smaller sprinklers for cultivation of wheat, beans, sorghum, and sesame. These small

sprinklers are 15m across and mobile. They are straightly lined on-farm and suitable for small farmlands possessed by many farmers. As they are made in Middle-East countries, it is possible to procure in accordance with various types of farming in Iraq. Besides vegetables, improved emitters with reduced salt clogging for dates and fruit trees are also produced. Trainings in Jordan, Turkey, and Egypt on accumulated experiences, facility design, and maintenance will improve the capacity of government officials, which will result in a base of enriched human resources that disseminate and teach water saving irrigation and farming to farmers.

7.2.4 Operation and Maintenance

As to maintenance of irrigation facilities, malfunction of facilities is observed due to lacks of equipment for drainage, maintenance of drainage canals in a whole irrigation and drainage canals,. Although MoWR has installed and maintained the supply system, it is suggested that beneficiaries should be responsible for maintenance of supply system up to the secondary canals, including cost burden.

Regarding pump stations, some pump stations intake water from Tigris and Euphrates rivers to supply water to large irrigation projects, and others intake from main and branch canals for relatively small projects. Suggestion is that MoWR will be responsible for large pump stations and beneficiaries need to bear responsibility for daily maintenance.

Iraqi Government proposed that WUA should maintain these irrigation facilities. Hence, establishment and capacity development of WUA is essential[88].

7.2.5 Project Goal and Prioritization

To make the fullest use of the limited budget it is necessary to prioritize implementation guided by the NDP goals. Irrigation development can be divided into new development of irrigation facilities, rehabilitation of existent facilities and establishment and reinforcement of WUA. The most important issue is related to gradual reduction of available water amount in Iraq. So, reduction of water used for irrigation is required as it uses 64% of available water. As discussed above, reduction of irrigation water can be realized through reduction of irrigation water through establishment of WUA and improvement of conveyance efficiency. Introduction of water saving irrigation is generally effective for the former. Decision on project scale and implementation schedule through analysis of water saving effects and evaluation of cost-effectiveness is necessary to disseminate water saving irrigation facilities and prioritize rehabilitation of existent water canals. Incentives for farmers, such as increases in yields and income, are indispensable because they will have economic burdens for dissemination of water saving irrigation facilities. Support for dissemination of agricultural technology and improvement of market access should be further promoted.

Another issue is to secure agricultural lands from the viewpoint of food security. Formulation of comprehensive development plan is needed not just to secure budget for fertilizers to improve soil

[88] WUA has just been established and its role in maintenance is not fixed. In districts with no WUA, MoWR is responsible for other than tertiary level. In districts with WUA, MoWR is in charge of main and branch canal in upper stream, and WUA is responsible for supply water canals after gates and tertiary canals. Both are responsible for gates to control water flow.

fertility for new irrigation projects, but also to settle the migrating farmers. For achieving all of such goals, it is necessary to study the cost-effect carefully.

7.2.6 Establishment and Dissemination of WUA

Having agreements with Turkey and Syria on quality and quantity of Tigris and Euphrates rivers is the most important to secure water resources. Turkey is, however, reluctant to reach an agreement because of Iraq's insufficient efforts for efficient water use. 64% of water resources are used for irrigation in Iraq. Establishment and dissemination of WUA will be feasible and effective measures. It will internally and externally show Iraqi resolutions and efforts for efficient water use.

WUA activities are generally confined to water distribution, operation of facilities, maintenance, and administration. Their effects on rational and effective water management are limited because effective water use on-farm is delayed and irrigation water is used more than necessary for basin irrigation. Given the current conditions whereby farmers are used to pumping water according to individual cropping pattern without coordinated use, fair distribution of water through rotation system will be effective. Water saving methods have been introduced on a limited scale and its impact on the whole scheme is minimal.

WUA will enable rotation system and cooperative maintenance of canals, contributing to rationalization of water use. Insufficient capacities in existing WUAs are i) conflict resolution among WUA members, ii) maintenance (technical knowledge), and iii) appropriate water distribution on-farm. Obstacles to development and capacity building of WUA are i) ambiguous purposes, roles, and vision of WUA (governmental order is insufficient), ii) lacks in monitoring and evaluation of WUA activities, and iii) delay in implementation of irrigation projects due to financial difficulties. Challenges needed to be tackled are to immediately formulate guidelines and strategic documents on WUA activities, train agricultural experts, and reach agreements on establishment of WUA and introduction of water saving irrigation methods with farmers.

7.2.7 Comprehensive Water Management Plan

Southern Iraq has already fallen short of irrigation water. As excessive water withdrawal in northern and central part of Iraq will further deteriorate the situation, water flow data must be collected from MoWR and Iraq's actual regional water use should be surveyed. Annex 11 shows records of water intake in Abu Bshoot pilot project and Nahar Saad Project. In Abu Bshoot pilot project, beneficiary area is 6,000ha and water intake is 6 m^3/sec. There is no excessive water intake. Also in the downstream Nahar Saad project, irrigation area increased to 15,000ha (2014/2015) from 5,000ha (2008/2009), while water intake just increased to 7.2 m^3/sec from 6 m^3/sec. Thus, the required amount in the south is not met, resulting in low agricultural production. Besides trainings on water intake from the canals and on-farm water saving, it is necessary to collect data and analyze the national requirements to produce a water distribution plan for each of the projects. While in so doing, explain to the low-income farmers in the southern Iraq about the situation they are facing and the way forward of it.

7.3 Points of Consideration

(1) Authorities overseeing irrigation development

The functions of planning, design and installation of off-farm facilities in the rivers, canals and branch canals feeding the fields are under the jurisdiction of MoWR, while that of on-farm facilities falls under MoA. It must be kept in mind that increase in irrigation efficiency can only be achieved when efforts are made in reducing conveyance loss, cooperating with improvement of on-farm application, but the 2 central ministries do not coordinate themselves. Since farmers bear the costs of installing water saving facilities and it will take some time for the installation to be completed. Some forms of grace period must be considered to disseminate water saving irrigation facilities all over the project sites. It is therefore necessary for the two ministries to cooperate in promoting water saving irrigation at both on and off-farm level in JICA assistance.

(2) Gender consideration

In Iraq, wheat and barley cultivation have been mechanized to some extent. Vegetable growing is mainly done by women and it is necessary to lessen the work load of women. In developing agriculture and irrigation projects, it is proposed that basic survey on farmers shall be carried out and the results needed to be reflected in planning, as gender initiatives.

(3) Hardware and software linkage

When considering efficient water use, the conveyance efficiency, application efficiency and management efficiency become the targets. Although conveyance efficiency and application efficiency can be improved by off-farm as well as on-farm hardware approach mentioned above, management efficiency can only be improved by software approach. Therefore, in efficient water use, cooperation and linkages between hardware and software approaches are important.

(4) Target areas and trainings

As mentioned in the above, field activities for Japanese experts are limited to four southern governorates. Since the trip tenure was short to perform direct support and OJT in the field, it is necessary to consider travel time to and from accommodation place as well as exhibition effect in selecting the project sites. In concretizing the project outside the four governorates, there will not be enough time for project management and supervision, technical guidance, and training activities due to the short stay. In order to cope with this, training in Japan and in a third country is proposed. The third country training can be conducted in Jordan, Turkey and Egypt but must pay attention to the following points.

- Assign an Iraqi official to oversee training progress throughout the project period, and to evaluate the performance at any time.
- Select sites of similar size, management conditions, and technical level such as water conveyance and water saving technology.

The information of candidate contractors for third country training is as below.

1) NCARE in Jordan (National Center for Agricultural Research and Extension)

NCARE has received many trainees from Iraq in implementing "Karbala Project" and “Project for Spreading Water Users Associations for the Efficient Use of Irrigation Water”, and possesses extensive training experiences.

2) DSI in Turkey (General Directorate of State Hydraulic Work)

DSI has received trainees in “Project for Spreading Water Users Associations for the Efficient Use of Irrigation Water” and provided quality trainings. Also DSI has played a central role in the WUA policy in Turkey and therefore it is a place to source information on the WUA policy.

3) CDIAS in Egypt (Central Department for Irrigation Advisory Service)

Egypt was selected as a training destination of “farmer training” in “Project for Spreading Water Users Associations for the Efficient Use of Irrigation Water”. Because it was a "farmer training", rather than lectures, it was basically only field visit. In implementing the training, JICA has relied on the human resources of CDIAS, who were the counterpart of the JICA project in Egypt. Egyptian agricultural ecology and irrigation facilities have a lot in common with that of Iraq, and would serve as helpful examples. Institution similar to CDIAS has been proposed in SWLRI, and would be a resource for information related to WUA policies.

Annexes

Annex 1 Canal Length and Lining Progress

Irrigation Canal Length (2 June., 2015)

	District	Main canal (km)			Branch canal (km)			Secondary canal (km)			Distributary canal (km)			Total length (km)
		Lined	Earth	Others	Lined	Earth	Others	Lined	Earth	Others	Lined	Earth	Others	
1	Nīnawā	153	0	0	58	0	182	5	0	0	716	0	0	1,114
2	Telafes	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Keskuk	37	83	14	171	79	22	283	175	1,424	226	435	2,457	5,406
4	Altuz	82	0	0	95	3	0	134	3	0	430	0	0	748
5	Salah-Aideer	68	50	0	47	305	23	34	0	33	0	140	91	791
6	Ishaqi	31	10	0	101	33	0	591	40	18	1,035	266	229	2,354
7	Deyala	204	623	0	200	255	0	337	42	0	1,573	751	0	3,985
8	Baghdad	116	18	0	127	138	0	177	226	0	310	451	0	1,563
9	Mabein al-nahreen	168	128	0	212	601	0	641	144	0	0	140	0	2,034
10	Wasit	234	1,632	0	614	1,632	0	0	2,500	0	1,151	1,138	370	9,271
11	Maisan	33	691	0	52	643	24	8	110	18	0	0	144	1,723
12	Bassah	0	1,395	0	0	939	0	0	0	0	0	0	0	2,334
13	Faloja	45	97	0	60	51	0	0	0	0	187	0	118	588
14	Anbar	75	6	12	64	0	3	0	0	0	279	7	13	459
15	Babil	115	539	0	57	512	0	0	1	0	1,063	591	0	2,879
16	Musaib	0	50	0	0	91	0	0	55	0	0	933	0	1,129
17	Karbala	60	16	0	102	33	0	76	6	0	78	0	0	371
18	Najaf	25	442	0	9	368	0	49	219	0	0	0	0	1,112
19	Muthavia	57	167	0	54	215	0	8	72	0	0	0	0	573
20	Pewania	263	324	0	256	486	0	10	0	0	812	477	0	2,628
21	Dhi-Qar	61	1,364	0	53	2,915	0	0	2,424	0	0	1,935	0	8,752
22	Basrah	145	94	0	0	0	0	0	0	0	0	0	0	240
Total		1,972	7,729	26	2,332	9,330	254	2,353	6,018	1,493	7,860	7,264	3,422	50,053

Total length (km) (Ratio of canal category)	9,727 (19%)			11,916 (24%)			9,864 (20%)			18,546 (37%)			50,053 (100%)
% of rehabilitation	20%	79%	1%	20%	78%	2%	24%	61%	15%	42%	39%	18%	

Source: MoWR

Annex 2 142 Irrigation Projects

Irrigation Projects Areas and Water Demand

All area in 1,000 dunam

ID	PROJECT NAME	GOVERNORATE	SOURCE	RANKING	Total Area MoWR	Developed till 2013	To Be Developed in the Plan	Final Development	Net area	% DEV	TOTAL DEMAND	total dem/ k don	Max Monthly Demand	Max discharge (lit/sec)
					1	**2**	**3**	(4)= (2)+(3)			**5**		**6**	**7**
1	Small farms to hadeetha dam	Anbar	Euphrates	71	59	4	47.3	51.3	45.0	87%	130.3	2895.556	21.5	8.29
2	Small farms from the hadeetha dam up to the boundary of the Ramadi project	Anbar	Euphrates	81	47	1	46	47	41.2	100%	132.5	3213.83	21	8.10
3	Small farms at springs in the Anbar	Anbar	GW-springs	GW	1		1	1	0.9	100%	2.9	3306	0.5	0.19
4	Ramadi-habaniyah	Anbar	Euphrates	73	135	111	20.4	131.4	115.3	97%	326.8	2835.251	52.1	20.10
5	Faluja-amreah	Anbar/Baghdad	Euphrates	75	56		50.4	50.4	44.2	90%	134	3030.952	21.6	8.33
6	Saqlawiya	Anbar/Baghdad	Euphrates	D	140	140	0	140	122.8	100%	367.7	2994.129	60	23.15
7	Abu ghraib	Anbar/Baghdad	Euphrates	D	206	206	0	206	180.7	100%	576.8	3192	93	35.88
8	Radhwaniyah	Baghdad	Euphrates	D	28	28	0	28	24.6	100%	81	3297.857	13	5.02
9	Yousifia	Baghdad/Wasit	Euphrates	45	125	57	68	125	109.6	100%	360	3283.2	57.8	22.30
10	Latifia	Baghdad/Babil	Euphrates	37	108	88	20	108	94.7	100%	304.8	3217.333	48.8	18.83
11	Iskandariyah	Baghdad/Babil	Euphrates	42	51	44	0	44	38.6	86%	122.3	3168.682	19.5	7.52
12	Faluja al-muahada	Anbar/Baghdad/Babil	Euphrates	62	54		54	54	47.4	100%	152.2	3213.111	24.4	9.41
13	Small farms from the boundary of the anbar muhafadha	Babil	Euphrates	72	25		15	15	13.2	60%	42.4	3222.4	6.8	2.62
14	Jarf al sakhr & ruwaiyah	Anbar/Baghdad/Babil/ Karbala	Euphrates	69	38		38	38	33.3	100%	107.8	3234	17.2	6.64
15	Greater musaiyab	Babil	Euphrates	D	310	310	0	310	271.9	100%	836.1	3074.69	132.5	51.12
16	Husainaia	Babil/Karbala	Euphrates	41	101	80	21	101	88.6	100%	251.9	2843.228	36.9	14.24
17	Small farms; at spring irrigated in karbala	Anbar/Karbala	GW-springs	GW	10	10	0	10	8.8	100%	29.7	3385.8	4.9	1.89
18	Bani-hasan	Babil/Karbala/Najaf	Euphrates	52	145	43	81.6	124.6	109.3	86%	304.7	2787.785	44.3	17.09
19	Small farms from the Hindiyah barrage	Babil/Karbala/Najaf	Euphrates	64	4		3.6	3.6	3.2	90%	8.7	2755	1.3	0.50
20	Iskandariyah-mehaweel & gadwel al-nasiriya	Babil	Euphrates	74	182	11	153.3	164.3	144.1	90%	432.7	3002.301	68.7	26.50
21	Hilla-hashimiyah	Babil	Euphrates	70	240		204	204	178.9	85%	531.2	2968.471	84.2	32.48
22	Huriyah-daghara	Babil/Diwaniyah	Euphrates	12	635	207	428	635	557.0	100%	1,702.50	3056.457	243.1	93.79
23	Hilla-diwaniyah	Babil/Diwaniyah/Najaf	Euphrates	55	282		273.8	273.8	240.2	97%	643.6	2679.708	100	38.58
24	Diwaniyah-shaifiyah	Diwaniyah/Muthanna	Euphrates	19	380		380	380	333.3	100%	1,031.90	3095.7	157.7	60.84

ID	PROJECT NAME	GOVERNORATE	SOURCE	RANKING	Total Area MoWR	Developed till 2013	To Be Developed in the Plan	Final Development	Net area	% DEV	TOTAL DEMAND	total dem/ k don	Max Monthly Demand	Max discharge (lit/sec)
25	Rumaitha	Muthanna	Euphrates	40	144	30	114	144	126.3	100%	426.6	3377.25	58.4	22.53
26	Hilla-kifil	Babil/Karbala/Najaf	Euphrates	D	173	173	0	173	151.8	100%	411.5	2711.618	59.7	23.03
27	Kifil-shnafiyah	Babil/Diwaniyah/Najaf	Euphrates	58	494	50	444	494	433.3	100%	1,338.00	3087.692	192.4	74.23
28	Muthanna	Muthanna	Euphrates	27	41	32	9	41	36.0	100%	123	3420	18.7	7.21
29	Shnafiyah-nasiriya	Diwaniyah/Dhi-Qar/Muthanna	Euphrates	43	260		260	260	228.1	100%	790.8	3467.354	118.9	45.87
30	Suq al shoyokh	Dhi-Qar	Euphrates	65	75		22.5	22.5	19.7	30%	72	3648	10.4	4.01
31	Small farms in the euphrates river mouth	Basrah	Tigris	53	35		35	35	30.7	100%	93.1	3032.4	16.2	6.25
32	Zakho	Dohuk	GW-wells	60	15		15	15	13.2	100%	17.3	1314.8	4	1.54
33	Small farms from the boundary up to mosul dam	Dohuk/Nineveh	Tigris	63	11		11	11	9.6	100%	14.6	1513.091	3.2	1.23
34	Small farms at springs in the dohuk	Dohuk	GW-springs	GW	4		4	4	3.5	100%	5.7	1624.5	1.4	0.54
35	Small farms at wells in the	Dohuk	GW-wells	GW	1		1	1	0.9	100%	1.4	1596	0.4	0.15
36	Dohuk	Dohuk	Tigris	D	2	2	0	2	1.8	100%	2.6	1482	0.6	0.23
37	North jazeera	Nineveh	Tigris	D	264	264	0	264	231.6	100%	477.6	2062.364	98.8	38.12
38	East jazeera	Nineveh	Tigris	26	215	12	203	215	188.6	100%	403	2136.837	90.3	34.84
39	South jazeera	Nineveh	Tigris	8	344		344	344	301.8	100%	670.3	2221.343	118.6	45.76
40	Small farms up to greater zab river	Nineveh	Tigris	33	46		46	46	40.4	100%	86.1	2133.783	19.3	7.45
41	Small farms at springs in the ninawa	Nineveh	GW-springs	GW	2		2	2	1.8	100%	3.6	2052	0.8	0.31
42	Small farms at wells in the ninawa	Nineveh	GW-wells	GW	1		1	1	0.9	100%	2	2280	0.4	0.15
43	Small farms at springs in the ninawa	Nineveh	GW-springs	GW	3		3	3	2.6	100%	5.3	2014	1	0.39
44	Small farms at wells in the ninawa	Nineveh	GW-wells	GW	4		4	4	3.5	100%	7.4	2109	1.4	0.54
45	Balandah	Dohuk	Greater Zab *	83	1		rainfed		0.0					0.00
46	Khazir-gomel	Nineveh	Khazir *	61	148		rainfed		0.0					0.00
47	Bela-rizan	Dohuk/Nineveh	Greater Zab *	80	1		rainfed		0.0					0.00
48	Diyana-balikiyan	Erbil	Greater Zab	87	6		0.9	0.9	0.8	15%	1.5	**1900**	0.4	0.15
49	Harir	Erbil	Greater Zab *	78	25		rainfed		0.0					0.00
50	Small farms at springs in the erbil	Nineveh/Erbil	GW-springs	GW	1		1	1	0.9	100%	1.7	1938	0.4	0.15
51	Markaz	Nineveh/Erbil	Greater Zab	39	14		5.6	5.6	4.9	40%	10.2	**2076.4**	1.9	0.73
52	Shemamuk	Erbil	Greater Zab	30	60		54	54	47.4	90%	101.4	2140.667	18.8	7.25
53	Eski-kalak	Nineveh/Erbil	Greater Zab	D	42	42	0	42	36.8	100%	81.4	2209.429	14.5	5.59
54	Kashaf	Nineveh/Erbil	Greater Zab	14	12		12	12	10.5	100%	25.3	2403.5	4.6	1.77
55	Sallamiyah	Nineveh	Tigris	D	9	9	0	9	7.9	100%	17.2	2178.667	3.2	1.23

ID	PROJECT NAME	GOVERNORATE	SOURCE	RANKING	Total Area MoWR	Developed till 2013	To Be Developed in the Plan	Final Development	Net area	% DEV	TOTAL DEMAND	total dem/k don	Max Monthly Demand	Max discharge (lit/sec)
56	Small farms at wells in the ninawa	Nineveh	GW-wells	GW	1		1	1	0.9	100%	1.9	2166	0.4	0.15
57	Makhmur	Erbil/Kirkuk	Greater Zab *	54	140		rainfed		0.0					0.00
58	Small farms at well in the ninawa	Nineveh/Salah-ad-din	GW-wells	GW	42		42	42	36.8	100%	107.6	2920.571	19.2	7.41
59	Penjween	Sulaymaniyah	Lesser Zab	85	10		10	10	8.8	100%	16.3	1858.2	4.2	1.62
60	Small farms at siprins in the sulaymaniyah	Sulaymaniyah	GW-springs	GW	2		2	2	1.8	100%	3.6	2052	0.9	0.35
61	Sangasar	Sulaymaniyah	Lesser Zab	25	2		2	2	1.8	100%	3.8	2166	0.9	0.35
62	Raniya-sarujawa	Erbil/Sulaymaniyah	Lesser Zab	82	48	10	0	10	8.8	21%	15.7	**1789.8**	3.4	1.31
63	Sarsiyan	Sulaymaniyah	Lesser Zab *	79	1		rainfed		0.0					0.00
64	Small farms at springs in the erbil	Erbil	GW-springs	GW	1		1	1	0.9	100%	1.8	2052	0.4	0.15
65	Small farms at wells in the kirkuk muhafadha	Erbil/Kirkuk	GW-wells	GW	1		1	1	0.9	100%	1.9	2166	0.4	0.15
66	Kirkuk	Kirkuk/Salah-ad-din/Diyala	Lesser Zab	D	662	662	0	662	580.7	100%	1,298.40	2235.915	224.7	86.69
67	Resasy-tereshiyah	Salah-ad-din	Tigris	76	60		60	60	52.6	100%	135.9	2582.1	23.5	9.07
68	Al boajeel	Salah-ad-din	Tigris	D	6	6	0	6	5.3	100%	16.2	3078	2.8	1.08
69	Small farms at springs in the salah ad din	Salah-ad-din	GW-springs	GW	20		20	20	17.5	100%	47.2	2690.4	8.3	3.20
70	Small farms at wells in the salah ad din	Salah-ad-din	GW-wells	GW	16		16	16	14.0	100%	37.6	2679	6.5	2.51
71	Haweeja	Kirkuk	Lesser Zab	23	192	100	92	192	168.4	100%	398.7	2367.281	68.4	26.39
72	Small farms from lesser zab river up to udhaim	Salah-ad-din	Tigris	56	102	0	102	102	89.5	100%	240.9	2692.412	41.6	16.05
73	Small farms at wells in the salah ad din	Salah-ad-din	GW-wells	GW	7		7	7	6.1	100%	15.2	2475.429	2.5	0.96
74	Al-khalij, al aali	Salah-ad-din	Tigris	D	18	18	0	18	15.8	100%	47	2976.667	8.1	3.13
75	Upper naifah	Salah-ad-din	Tigris	48	59		59	59	51.8	100%	150.3	2904.102	25.8	9.95
76	Dour	Salah-ad-din	Tigris	D	8	8	0	8	7.0	100%	20.4	2907	3.5	1.35
77	Al-aoja & dujail	Salah-ad-din	Tigris	D	24	24	0	24	21.1	100%	63.4	3011.5	10.9	4.21
78	Al-nai	Salah-ad-din/Diyala	Tigris	D	33	33	0	33	28.9	100%	69.5	2400.909	11.2	4.32
79	Ishaqi	Salah-ad-din/Baghdad	Tigris	D	317	317	0	317	278.1	100%	753.7	2710.467	127.6	49.23
80	Shahrazoor	Sulaymaniyah	Diyala *	84	74		rainfed		0.0					0.00
81	Kalar	Sulaymaniyah	Diyala	57	12	4	0	4	3.5	33%	8.6	**2451**	1.9	0.73
82	Kaolas	Sulaymaniyah	Diyala *	86	17		rainfed		0.0			#DIV/0!		0.00
83	Small farms at springs in the sulaymaniyah	Sulaymaniyah	GW-springs	GW	1		1	1	0.9	100%	1.6	1824	0.4	0.15
84	Shekh-langar	Sulaymaniyah	Diyala	67	1		1	1	0.9	100%	2.1	2394	0.5	0.19

ID	PROJECT NAME	GOVERNORATE	SOURCE	RANKING	Total Area MoWR	Developed till 2013	To Be Developed in the Plan	Final Development	Net area	% DEV	TOTAL DEMAND	total dem/ k don	Max Monthly Demand	Max discharge (lit/sec)
85	Balajo-khanaqeen-wind	Sulaymaniyah/Diyala	Diyala	68	89		89	89	78.1	100%	167.1	2140.382	29.9	11.54
86	Qara teppe	Diyala	Diyala	17	62		62	62	54.4	100%	117.2	2154.968	20	7.72
87	Jalawlaa & al-sa'diyah	Diyala	Diyala	18	24		24	24	21.1	100%	47.7	2265.75	8	3.09
88	Small farms at wells in the diyala	Diyala	GW-wells	GW	4		4	4	3.5	100%	7.6	2166	1.3	0.50
89	Upper khalis	Salah-ad-din/Diyala	Diyala	D	216	216	0	216	189.5	100%	467.1	2465.25	74.9	28.90
90	Lower khalis	Diyala/Baghdad	Tigris	D	230	230	0	230	201.8	100%	587.7	2912.948	98.8	38.12
91	Mandeli	Diyala	Diyala	13	29	3	26	29	25.4	100%	64.9	2551.241	10.1	3.90
92	Haruniyay+ combined head reach (sudour)+ muqdadiyah	Diyala	Diyala	D	93	85	8	93	81.6	100%	188.1	2305.742	28.7	11.07
93	Ruz	Diyala	Diyala	D	230	230	0	230	201.8	100%	541.7	2684.948	82.6	31.87
94	Mahrut	Diyala	Diyala	38	190	10	100	110	96.5	58%	283.1	2933.945	48.1	18.56
95	Khoraisan (sareah) + tel asmar	Diyala/Baghdad	Diyala	31	93.4		93.4	93.4	81.9	100%	238.8	2914.69	40.3	15.55
96	Small farms in the low course of diyala river	Baghdad	Diyala	47	3		3	3	2.6	100%	7.4	2812	1.2	0.46
97	9th april project (nehrawan) " previously 7th of april project"	Baghdad	Diyala	D	78	78	0	78	68.4	100%	227.1	3319.154	37.4	14.43
98	Small farms on left bank of the diyala	Baghdad	Tigris	51	17	0	12.8	12.8	11.2	75%	37.1	3304.219	6	2.31
99	Wihda (nehrawan)	Baghdad/Wasit	Tigris	D	85	85	0	85	74.6	100%	251.5	3373.059	40.8	15.74
100	Hour-rijab	Baghdad/Wasit	Tigris	D	95	95	0	95	83.3	100%	275.9	3310.8	44.4	17.13
101	Suwairah (hafria)	Diyala/Baghdad/Wasit	Tigris	D	148	148	0	148	129.8	100%	398.9	3072.608	59.3	22.88
102	Qusaiba	Wasit/Babil	Tigris	D	55	55	0	55	48.2	100%	141.1	2924.618	20.5	7.91
103	Shihaimiyah	Wasit/Babil	Tigris	D	72	72	0	72	63.2	100%	185.7	2940.25	25.9	9.99
104	Middle tigris	Baghdad/Wasit/Babil/ Diwaniyah	Tigris	35	528.2		528.2	528.2	463.3	100%	1,442.50	3113.309	196.6	75.85
105	Daboni (al-jut farms)	Wasit	Tigris	D	68	68	0	68	59.6	100%	196.5	3294.265	27	10.42
106	Badra-jassan	Wasit	Tigris	21	75	47	28	75	65.8	100%	198.3	3014.16	30.3	11.69
107	Karmashiyah	Wasit	Eastern Tributaries	77	1		1	1	0.9	100%	2.6	2964	0.4	0.15
108	Dalmaj	Wasit	Tigris	D	296	296	0	296	259.6	100%	848.9	3269.412	114.5	44.17
109	West gharaf	Wasit/Dhi-Qar	Tigris	15	337	60	277	337	295.6	100%	999.3	3380.421	138.6	53.47
110	Al-mghashe "previously 17th july"	Dhi-Qar	Tigris	D	56	56	0	56	49.1	100%	167.2	3403.714	23.2	8.95
111	East gharaf	Wasit/Dhi-Qar	Tigris	24	475	55	400.7	455.7	399.7	96%	1,367.50	3421.001	193	74.46
112	Dawaiyah "previously 30th july"	Misan/Dhi-Qar	Tigris	11	183	123	60	183	160.5	100%	567.9	3537.738	79.9	30.83
113	Dujailah	Wasit	Tigris	D	186	186	0	186	163.2	100%	556.4	3410.194	81.7	31.52
114	Kut-butaira	Wasit/ Misan	Tigris	20	133	16	117	133	116.7	100%	393.3	3371.143	60.1	23.19
115	Abu-bshoot	Misan	Tigris	D	29	29	0	29	25.4	100%	88.7	3486.828	12.9	4.98

ID	PROJECT NAME	GOVERNORATE	SOURCE	RANKING	Total Area MoWR	Developed till 2013	To Be Developed in the Plan	Final Development	Net area	% DEV	TOTAL DEMAND	total dem/ k don	Max Monthly Demand	Max discharge (lit/sec)
116	Taib	Misan	Eastern Tributaries	2	1		1	1	0.9	100%	2.8	3192	0.4	0.15
117	Duwairij	Misan	Eastern Tributaries	1	3		3	3	2.6	100%	7.2	2736	1.1	0.42
118	Nahar-saad	Misan	Tigris	D	75	75	0	75	65.8	100%	215.7	3278.64	31.1	12.00
119	Amara	Misan	Tigris	7	400		400	400	350.9	100%	1,118.40	3187.44	159.3	61.46
120	Shatt al-arab & swaib	Basrah	Tigris	66	290	20	130	150	131.6	52%	404.8	3076.48	70.3	27.12
121	Zubair (irrigated from wells)	Basrah	GW-wells	GW	35		35	35	30.7	100%	99.5	3240.857	18.4	7.10
122	Modern village 1 and 2	Baghdad	Tigris	50	60		60	60	52.6	100%	156.1	2965.9	23.3	8.99
123	Basroukiya	Diwaniyah/Muthanna	Tigris	10	94		94	94	82.5	100%	273.9	3321.766	38.4	14.81
124	Mdalel, mrezeja and fao	Wasit/Diwaniyah/Dhi-Qar	Tigris	9	12		12	12	10.5	100%	35.3	3353.5	4.9	1.89
125	Abbasi	Kirkuk/Salah-ad-din	Tigris *	34	60		rainfed		0.0					0.00
126	Sader	Erbil/Kirkuk/Salah-ad-din	Tigris	28	150		20	20	17.5	13%	44	**2508**	7.6	2.93
127	Ali gharbi and ali sharqi	Misan	Tigris	3	137		137	137	120.2	100%	403.4	3356.759	62.7	24.19
128	Boghaylat	Misan/Dhi-Qar	Tigris	6	30		30	30	26.3	100%	93.4	3549.2	13.2	5.09
129	Jazeera (island) sayed ahmad	Misan/Dhi-Qar	Tigris	5	40		40	40	35.1	100%	123.3	3514.05	17.4	6.71
130	Southern ez river	Misan	Tigris	4	17		17	17	14.9	100%	45	3017.647	7.7	2.97
131	Khozaimiya	Salah-ad-din	Tigris	29	5		2	2	1.8	40%	4.9	2793	0.8	0.31
132	Jazeera western samarra	Salah-ad-din	Tigris	49	89		89	89	78.1	100%	220.9	2829.506	37.5	14.47
133	Upper resasy	Salah-ad-din	Tigris	44	18		18	18	15.8	100%	45.8	2900.667	7.8	3.01
134	Southern haseeba al baghouz	Anbar	Euphrates *	59	4		rainfed		0.0					0.00
135	Expanding hilla hashimiyah	Babil/Diwaniyah	Euphrates	46	150		150	150	131.6	100%	361.8	2749.68	50.5	19.48
136	Extension sewaer	Muthanna	Euphrates	16	43		43	43	37.7	100%	129.3	3427.953	18.8	7.25
137	Extension Middle Tigris-Suwaira	Wasit	Tigris	36	**137**		**137**	**137**	120.2	100%	374.1	3112.949	51	19.68
138	Al Gharbia	Wasit	Tigris *	32	40		rainfed		0.0					0.00
139	Kirkuk Phase 3	Salah-ad-din/Diyala	Udhaim	22	160		160	160	140.4	100%	313.8	2235.825	54.3	
140	Dhalouia	Salah-ad-din/Diyala/	Tigris	22	32		32	32	28.1	100%	62.8	2237.25	10.9	
141	Farms in the north of Saqlawiya	Anbar	Euphrates		26		26	26	22.8	100%	68.3	2994.692	11.2	
142	Is'haqi farms from Balad up to the confluence with Tigris arm	Salah-ad-din/Baghdad	Tigris		62		62	62	54.4	100%	147.4	2710.258	25	
TOTAL					14042.6	5474	7446.5	12920.5						

Source: MoWR

Annex 3 Present Status of WUA

Sr No.	Name of WUA	Irrigation Project (142 projects)	Name of Village(s) the water users belong	District	Governorate	GPS coordinate	No. of members of WUA	No. of total farmer	Date of Establishment	Area (hectare)	Pilot Project or Not	Status of Facilities Improvement (Stage (Design or Construction) & progress %)	Nature of improvement (e.g., remote gate, closed pipe, etc.)	Remarks (Main crop, Farmers willingness, etc.)
1	WUA on Al-Rushdiya River			Al – Hur Sub-District	Karbala	X : 403025 Y : 3614401	81	81	April – 13 - 2014	652	Pilot Project Site	Construction 100 %	Closed Pipes System	Onion , Wheat , Vegetable
2	WUA on Bany Hassan River			Al – Khayrat Sub-District	Karbala	X : 432020 Y : 3586605	215	228	April – 13 - 2014	557	Pilot Project Site	Design 100 %	Closed Pipes System	Vegetable , Wheat , Barley
3	WUA on DC 17,15 Canal			Al – Hur Sub-District	Karbala	X : 401439 Y : 3625193	53	53	March – 11 - 2015	709		—	—	Wheat , Barley , yellow corn
4	WUA on AS-13 Canal			Abo Ghraib District	Baghdad		139		May – 7 - 2014	1000	Pilot Project Site	Design 100 %	Closed Pipes System	
5	WUA on (WC42 / CC) Canal			Al – Kadhimiya District	Baghdad		20		November – 30 - 2014	950		—	—	
6	WUA on (WC42 / 3) Canal			Al – Kadhimiya District	Baghdad		32		November – 30 - 2014	1250		—	—	
7	WUA on (WC42 / 2) Canal			Al – Kadhimiya District	Baghdad		25		November – 30 - 2014	700		—	—	
8	WUA on (WC42 / 4) Canal			Al – Kadhimiya District	Baghdad		31		November – 30 - 2014	350		—	—	
9	WUA on Mohammad Al – Abbas Branch Canal / 9 Nissan Main Canal			Nahrawan	Baghdad		11		April – 26 - 2015	110		—	—	
10	WUa of Village 8 / 3B Branch Canal/ 9 Nissan Main Canal			Nahrawan	Baghdad		12		April – 26 - 2015	105		—	—	
11	WUA on 8 Branch Canal / Right 9 Nissan Main Canal			Nahrawan	Baghdad		12		April – 26 - 2015	1430		—	—	
12	WUA on 7 Branch Canal / Right 9 Nissan Main Canal			Nahrawan	Baghdad		12		April – 26 - 2015	417		—	—	

Sr No.	Name of WUA	Irrigation Project (142 projects)	Name of Village(s) the water users belong	District	Governorate	GPS coordinate	No. of members of WUA	No. of total farmer	Date of Establishment	Area (hectare)	Pilot Project or Not	Status of Facilities Improvement (Stage (Design or Construction) & progress %)	Nature of improvement (e.g., remote gate, closed pipe, etc.)	Remarks (Main crop, Farmers willingness, etc.)
13	WUA on 6 Branch Canal / Right 9 Nissan Main Canal			Nahrawan	Baghdad		12		April – 26 - 2015	557		—	—	
14	WUA on 3A Branch Canal / Right 9 Nissan Main Canal			Nahrawan	Baghdad		15		April – 26 - 2015	145		—	—	
15	WUA on 5 Branch Canal / Right 9 Nissan Main Canal			Nahrawan	Baghdad		13		April – 26 - 2015	545		—	—	
16	WUA on 2 Branch Canal / Right 9 Nissan Main Canal			Nahrawan	Baghdad		14		April – 26 - 2015	120		—	—	
17	WUA on 2 Branch Canal / Left 9 Nissan Main Canal			Nahrawan	Baghdad		13		April – 26 - 2015	164		—	—	
18	WUA on Al-Ghawas Canal	Hilla - Kefel Reclamation Project	2 village (Al-Musafer & Zghair Al-Anun)	Hilla – Kefel Project / Abo Gharak Sub-District	Babil	The Head Regulator of Al-khawas X ; 439782 Y ; 3603961	147	364	May – 7 - 2014	294	Pilot Project Site	Cancelled	—	Wheat , Barley , Yellow Corn , Alfalfa , Jet , vegetable , Gardening
19	WUA on Line 5 -121	Kirkuk Irrigation Project	Khubaz Kabira	Kirkuk – Riyadh / Kirkuk Irrigation Project	Kerkuk	N:22 2.04 - E: 44 3 3.29	27		May – 18 - 2014	345		—	—	Note : Since the position of the Project is unsecured and out of the control the project is not carried out.
20	WUA on Line 4 - 121	Kirkuk Irrigation Project	Khubaz Saghira	Kirkuk – Riyadh /Kirkuk Irrigation Project	Kerkuk	N:35 22 24.68- E:44 5 0.40	22		May – 18 - 2014	339	Pilot Project Site	Construction 100 %	Basins	
21	WUA on Line 2 - 115	Kirkuk Irrigation Project	Aguia	Kirkuk Irrigation Project	Kerkuk	N:35 25 36.93 - E:43 53 53.66	14		May – 18 - 2014	181		—	—	
22	WUA on Canal 1 - 121	Kirkuk Irrigation Project	Marrata Saghira	Kirkuk Irrigation Project	Kerkuk	N:35 24 17.75 - E: 44 5 41.25	15		May – 18 - 2014	120		—	—	
23	WUA on Line 101	Kirkuk Irrigation Project	Alsadda	Kirkuk Irrigation Project	Kerkuk	N:35 25 19.25 - E: 44 5 39.66	17		May – 18 - 2014	180		—	—	

Sr No.	Name of WUA	Irrigation Project (142 projects)	Name of Village(s) the water users belong	District	Governorate	GPS coordinate	No. of members of WUA	No. of total farmer	Date of Establishment	Area (hectare)	Pilot Project or Not	Status of Facilities Improvement (Stage (Design or Construction) & progress %)	Nature of improvement (e.g., remote gate, closed pipe, etc.)	Remarks (Main crop, Farmers willingness, etc.)
24	WUA on Line 102	Kirkuk Irrigation Project	Mansurria	Kirkuk Irrigation Project	Kerkuk	N: 35 25 27.82- E: 44 4 48.95	15		May – 18 - 2014	163		—	—	
25	WUA on Line 2 - 104	Kirkuk Irrigation Project	Bryma	Kirkuk Irrigation Project	Kerkuk	N:35 25 55.00 - E:44 2 1.93	15		May – 18 - 2014	179		—	—	
26	WUA on Line 106	Kirkuk Irrigation Project	Atshana	Kirkuk Irrigation Project	Kerkuk	N:35 26 2.38 - E:44 1 46.10	11		May – 18 - 2014	111		—	—	
27	WUA on Line 128	Kirkuk Irrigation Project	Jamalia	Kirkuk Irrigation Project	Kerkuk	N:35 24 35.14 - E: 43 34 40.O5	14		May – 18 - 2014	153		—	—	
28	WUA on Al - Zarariya canal	Kirkuk Irrigation Project	Zararia	Al – Zab Sub-District	Kerkuk	N:35 20.517 - E: 43 34.034	12		May – 18 - 2014	412		—	—	
29	WUA on Al – Numesa Canal	Kirkuk Irrigation Project	Namisa	Al – Zab Sub-District	Kerkuk	N35 18>488 - E:43 32.593	148		May – 18 - 2014	173		—	—	
30	WUA on The Fourth Pipe	Kirkuk Irrigation Project	Khadmia	Al – Hawega District	Kerkuk	N:35 23.441- E:43 44.256	11		May – 18 - 2014	57		—	—	
31	WUA on Al – Mahooz Pipe	Kirkuk Irrigation Project	Muahaz	Al – Hawega District	Kerkuk	N:35 29.809 - E:43 50.191	15		May – 18 - 2014	68		—	—	
32	WUA on The outlet of The First Pipe Canal 6	Kirkuk Irrigation Project	Abassi	Al – Abbasi Sub-District	Kerkuk	N:35 17.970- E:43 37>898	9		May – 18 - 2014	82		—	—	
33	WUA on Canal 121 Al-Salihiya	Kirkuk Irrigation Project	Salihiya	Al- Salihiya Sub-District	Kerkuk	N:35 19 19,15 - E:44 O 28.31	11		May – 18 - 2014	83		—	—	
34	WUa in Al - Dijeal			Al – Dijeal District	Ishaqi		178		June – 1 - 2014	930	Pilot Project Site	Construction 90 %	Basins	
35	WUA on 17 L Canal		Al-Mujedad	Al – Khalus District	Diyala	N : 3752265 E : 464854	50	140	June – 1 - 2014	1000	Pilot Project Site	Construction 100 %	Rehabilitation	
36	WUA on K8B2 Canal		Al-Jedeeda	Al – Khalus District	Diyala	N : 3731811 E : 447000	47	158	June – 18 - 2015	2150		—	—	

Sr No.	Name of WUA	Irrigation Project (142 projects)	Name of Village(s) the water users belong	District	Governorate	GPS coordinate	No. of members of WUA	No. of total farmer	Date of Establishment	Area (hectare)	Pilot Project or Not	Status of Facilities Improvement (Stage (Design or Construction) & progress %)	Nature of improvement (e.g., remote gate, closed pipe, etc.)	Remarks (Main crop, Farmers willingness, etc.)
37	Dijlah Al – Ghair WUA			Dijla – Sammara / Dijlah Sub-District	Salah Al-din		148		June – 1 - 2014	777	Pilot Project Site	Design 100 %	Closed Pipes System	
38	WUA in Al – Shehemiya			Al – Shehemiya Sub-District	Wasit	X : 498258 Y :3623063	28	100	June – 1 - 2014	336		—	—	Wheat , Barley , yellow corn , Vegetable .
39	WUA on Al – sawada Canal			Al – Kut District	Wasit	X :574500 Y :559850	52	42	June – 29 - 2014	1451		—	—	Wheat , Barley , yellow corn , Vegetable .
40	WUA on Canal Al - Zahraa 7 / Right			Al – Ahrar Sub-District	Wasit	X :45.70808 Y :32.39237	42	19	March – 3 - 2015	421	Pilot Project Site	Construction 39 %	Closed Pipes System	Wheat , Barley , yellow corn , Vegetable .
41	WUA on Canal 6 / Kunh			Al – Ahrar Sub-District	Wasit	X :45.70808 Y :32.39237	19	38	March – 3 - 2015	244				Wheat , Barley , yellow corn , Vegetable .
42	WUA on Canal Al - Zahraa 7 / Left			Al – Ahrar Sub-District	Wasit	X :45.70808 Y 32.39237	38	920	March – 3 - 2015	389				Wheat , Barley , yellow corn , Vegetable .
43	WUA on Al-Hussainniya Project			Al – Ahrar Sub-District	Wasit	X :558244 Y :3592744	59	99	August – 6 - 2015	244		—	—	Wheat , Barley , yellow corn , Vegetable .
44	WUA on Canal 7 / Aldujaila Project			Wasit Sub-District	Wasit	X :601483 Y :3591559	47	69	August – 17 - 2015	3153		—	—	Wheat , Barley , yellow corn , Vegetable .
45	WUA on Canal 13 / Aldujaila Project			Wasit Sub-District	Wasit	X :609864 Y :3589320	41		August – 26 - 2015	2358		—	—	Wheat , Barley , yellow corn , Vegetable .
46	WUA on MH Canal	Rabeaa Project	Tel-Smeer	Rabeaa District	Nineveh	X : 42.134499 Y : 36.758301	57	57	November - 25 - 2014	633	Pilot Project Site	Construction 100 %	Rehabilitation	Wheat , Barley , Potato

Sr No.	Name of WUA	Irrigation Project (142 projects)	Name of Village(s) the water users belong	District	Governorate	GPS coordinate	No. of members of WUA	No. of total farmer	Date of Establishment	Area (hectare)	Pilot Project or Not	Status of Facilities Improvement (Stage (Design or Construction) & progress %)	Nature of improvement (e.g., remote gate, closed pipe, etc.)	Remarks (Main crop, Farmers willingness, etc.)
47	Al – Hor river WUA			Al – Mahmodia District	Mabain Al Nahrain		18		July – 3 - 2014	25		—	—	
48	Alobaid WUA			Al – Mahmodia District	Mabain Al Nahrain		45		July – 3 - 2014	69		—	—	
49	Alzubar WUA			Al – Mahmodia District	Mabain Al Nahrain		23		July – 3 - 2014	29		—	—	
50	WUA on YG - 00 canal			Al – Mahmodia District	Mabain Al Nahrain		21		November – 24 - 2014	60		—	—	
51	WUA on TH - 05 - 07 canal			Al – Rasheed Sub-District	Mabain Al Nahrain		30		November - - 2014	88		—	—	
52	WUA on pump station Line – PS - 02			Al – Mahmodia District	Mabain Al Nahrain		34		January – 25 - 2015	414	Pilot Project Site	Design 100 %	Closed Pipes System	
53	WUA on river of Abbas Ali Al-khikry			Al – Mahmodia District	Mabain Al Nahrain		48		March / 24 / 2015	250				
54	WUA on Alderand River		Imam Al-Sadiq	Al – Mdayna District	Basrah	N : 729334 E : 3424733	9	200	August – 19 - 2014	437				Wheat & Barley
55	Al – Nasr Irrigation Project WUA		Saleh River	Al – Mdayna District	Basrah	N : 708342 E : 3425719	9		August – 19 - 2014	375				Wheat & Barley & Summer And Winter Vegetable Crops
56	Al – Ghumage WUA		Al-Sharash	Al – Qurna District	Basrah	N : 734091 E : 3429097	20	300	August – 19 - 2014	2500				Palm Groves & Wheat & Barley & Summer And Winter Vegetable Crops

Sr No.	Name of WUA	Irrigation Project (142 projects)	Name of Village(s) the water users belong	District	Governorate	GPS coordinate	No. of members of WUA	No. of total farmer	Date of Establishment	Area (hectare)	Pilot Project or Not	Status of Facilities Improvement (Stage (Design or Construction) & progress %)	Nature of improvement (e.g., remote gate, closed pipe, etc.)	Remarks (Main crop, Farmers willingness, etc.)
57	Al- Abrar WUA		Hor Al-Saad	Al – Qurna District	Basrah	N : 731701 E : 3433966	15	1100	October – 27 - 2014	875				Wheat & Barley & Summer And Winter Vegetable Crops
58	Al – Okaily WUA		Bani Skean	Al – Nashwa Sub-District	Basrah	N : 731130 E : 3413767	12	179	October – 27 - 2014	250				Wheat & Barley & Summer And Winter Vegetable Crops
59	Bait khzail WUA		bait khzail	Al – Thaghar Sub-District	Basrah	N : 731776 E : 3464003	29	61	October – 27 - 2014	250	Pilot Project Site	Design 100 %	Closed Pipes System	Wheat & Barley & Maize
60	Al – Manthori River WUA		Al-Masihab	Al – Hartha Sub-District	Basrah	N : 755167 E : 3394358	56	56	May – 6 - 2015	109		—	—	Summer And Winter Vegetable Crops
61	Abo Turfaa WUA		abu milh	Al – Hartha Sub-District	Basrah	N : 759285 E : 3390530	17	25	May – 6 - 2015	625		—	—	Summer And Winter Vegetable Crops
62	Al – Jadeed River WUA		Al-Jazeera River	Shat Al – Arab District	Basrah	N : 765676 E : 3389474	31	150	May – 6 - 2015	46		—	—	Palm Groves & Sidr & Summer And Winter Vegetable Crops
63	Al- Rashayed WUA			Jbala Sub-District	Musaib		29		August – 26 - 2014	320		—	—	
64	Al- Braje WUA			Jbala Sub-District	Musaib		54		November – 11 - 2014	417		—	—	
65	WUA on the River of Sons of Abdulaziz alnasr			Jbala Sub-District	Musaib		12		December - 22 - 2014	247		—	—	

Sr No.	Name of WUA	Irrigation Project (142 projects)	Name of Village(s) the water users belong	District	Governorate	GPS coordinate	No. of members of WUA	No. of total farmer	Date of Establishment	Area (hectare)	Pilot Project or Not	Status of Facilities Improvement (Stage (Design or Construction) & progress %)	Nature of improvement (e.g., remote gate, closed pipe, etc.)	Remarks (Main crop, Farmers willingness, etc.)
66	WUA on the second branch canal (1- 0 - 2C)		Al-Abbassiya	Al-Abbassiya Sub-District	Najaf	X : 442970 Y : 3552236	12	120	October – 28 - 2014	200	Pilot Project Site	Construction 100 %	Remont Control System	Farmers have the desire to activate the work in the WUA due to the current conditions of scarcity of water
67	WUA on Block No. 2 / Abu Bshot Irrigation Project			Kumait Sub-District	Misan		35		December – 7 - 2014	447	Pilot Project Site	Design 100 %	Remont Control System	
68	WUA on Al – Shatheria River			Said Ahmed Al – Rifaie Sub-District	Misan		60		December – 7 - 2014	1250		—	—	
69	WUA on the Aksha		Al-Aksha village	Al- Najmi Sub-District	Muthanna	X : 502177 Y : 3503364	93	93	November – 12 - 2014	675	Pilot Project Site	Design 100 %	Closed Pipes System	
70	WUN on Al – Zaidiya River	Al- Gharaf Project	AL-Hussain Village	Al – Gharaf Sub-District	Dhi-Qar	X : 60713800 Y : 34554660	82 2,813	82	December – 23 - 2014	1540 38,285	Pilot Project Site	Design 100 %	Closed Pipes System	Wheat & Barley

Annex 4 Donor Assisted Projects

Donor country	Project	Title	Governorate	Implementer	Committed (US$)	Project Progress
Canada	OP/27738	Humanitarian assistance-WFP	Nationwide	WFP	17,304,578	
Italy	IRQ/050972	Tractor rehabilitation	DHI -QAR	CHN HOLLAND	4,082,153	100.00
Italy	IRQ/050973	Training course to setup and develop a national farming chain	Nationwide	IAMB/CIHEAM	446,485	100.00
Italy	IRQ/050974	Professional training plan for operators in the agricultural field in DHI-QAR Governorate and setup of a center to support local agriculture	DHI -QAR	University of Florence department for agricultural and forest engineering	2,551,345	100.00
Italy	IRQ/050976	Training course for managers and experts in agricultural sector	Nationwide	IAMB/CIHEAM	765,404	100.00
Italy	IRQ/051018	Multi sector emergency initiative in the field of agriculture, water, health and education	DHI-QAR	ITALY	9,035,404	100.00
Japan	OP/10216	Trilateral technical cooperation for Iraq in ICAROA (Agriculture researcher)		To be specified	166,944	
Japan	OP/10241	Food Assistance for Iraq	Nationwide	WFP	11,475,410	
Japan	OP/10278	Project for providing wells in AL BUSAYYA, AL MUTHANA	MUTHANA	To be specified	218,800	
Japan	OP/10248	IREP – Government of Japan (MUTHANA)	MUTHANA	UNDP	320,367	100.00
Japan loan	IRQ/051319	Irrigation sector Loan project (IQ-P2)	WASIT, DHI-QAR	JICA; Government of Iraq	142,528,089	63.00
SWEDEN	OP/10365	Selective food programs, water and sanitation health care	Nationwide	CARITAS-S	177,333	
SWEDEN	OP/10376	Selective food programs, water and sanitation health care	Nationwide	CARITAS-S	88,667	
SWEDEN	OP/10381	Protection, Medical, Assistance, food, shelter etc	Nationwide	ICRC	399,005	
SWEDEN	OP/10384	Health, Food, Nonfood etc.	Nationwide	IFRC	6,650	
SWEDEN	OP/10389	Protection, Medical Assistance, food, shelter etc.	Nationwide	ICRC	798,000	
SWEDEN	OP/10391	Health, Food, Nonfood etc.	Nationwide	IFRC	317,205	
SWEDEN	OP/10394	Health, Food, Nonfood etc.	Nationwide	IFRC	126,882	
SWEDEN	OP/10395	Selective food programs, water and sanitation health care	Nationwide	CARITAS-S	266,419	100.00
UND.ITF	IRQ/051267	IRAQ Agricultural Growth and employment support program (I-AGES)	Nationwide	FAO	5,000,000	90.00
UND.ITF	IRQ/051289	Developing Iraqi Agricultural and Agro-industrial data, information systems and analytical capacities	Nationwide	UNIDO, FAO	1,340,000	100.00
UND.ITF	IRQ/051290	Technology Acquisition to Re-start and generate economic Transformation (TARGET)	ANBAR	UNIDO	2,979,000	96.00
UND.ITF	IRQ/051298	Rehabilitation of MOUSL Dairy plant	NINAWA	UNIDO	2,700,000	100.00
UND.ITF	OP/10576	Support to school Feeding, Development of Safety Nets and Food Security	NINAWA, DIYALA, ANBAR, BAGHDAD, KARBALH, WASIT, SALAH AL DIN, DHI-QAR, MISAN, BASRAH	WFP	9,194,839	100.0
UND.ITF	OP//10722	Strengthening immunization services in Iraq (Phase II)	Nationwide	UNICEF, WHO	4,081,500	100.00
UND.ITF	OP/10724	Rebuilding food safety and food processing industry capacity in Iraq	Nationwide	WHO, UNIDO, FAO	6,506,112	100.00
UND.ITF	OP/10736	Restoration and modernization of fish production in Iraq	DIYALA, BAGHDAD, BABIL, KERBLAH, WASIT, SALAH AL DIN	FAO	7,312,177	99.00

Donor country	Project	Title	Governorate	Implementer	Committed (US$)	Project Progress
UND.ITF	OP/10737	Rehabilitation and development of the national seed industry in Iraq	Nationwide	FAO	5,383,460	96.00
UND.ITF	OP/10756	Community livelihoods and micro-industry support project in rural and urban areas of north Iraq	SULAYMANIYAH, ERBIL	UNIDO	1,933,759	100.00
UND.ITF	OP/2259	Capacity building in water institution of Iraq	Nationwide	UNESCO	3,275,550	
UND.ITF	OP/27747	Job creation through collage and micro industries promotion in al QADISIA	DIWANYAH	UNIDO	5,871,891	100.00
UND.ITF	OP/27806	Rehabilitation of the data palm sector in Iraq	BAGHDAD, BABIL, KERBLAH, NAJAF, DIWANIYAH, MUTHANA, DHI-QAR, MISAN, BASRAH	UNDEO, FAO	8,011,117	96.90
UND.ITF	OP/50635	Towards sustainable development of inland fisheries in Iraq	NINAWA, DIYALA, ANBAR, SALAH AL DIN	FAO	3,000,007	83.20
UND.ITF	OP/60637	Enhancing the Iraqi institutions capacity in analyzing and reporting food security and vulnerability in Iraq project	Nationwide	WFP	1,151,317	100.00
UND.ITF	OP/50914	Rehabilitation and development of the national vegetable seeds industry in Iraq	BAGHDAD, BABIL, KERBLAH	FAO	2,828,263	95.00
UND.ITF	OP/50915	Strengthening the capacity of the Iraqi veterinary services for control of zoonotic and transboundary animal diseases	Nationwide	FAO	5,748,000	100.00
UND.ITF	OP/50919	Improvement of water supply and irrigation provision through the rehabilitation of ABUSABKHA Pumping station	DIWANIYAH	FAO	1,502,490	100.00
UND.ITF	OP/766	Improvement of drainage conditions in Major agricultural areas	BABIL	FAO	5,126,600	
UND.ITF	OP/768	Improvement of water supply and irrigation provision through the rehabilitation of Pumping station	DIYALA, ANBAR, KERBLAH, WASIT	FAO	25,158,544	100.00
UND.ITF	OP/773	Pilot project for the rehabilitation of dairy sector in Iraq	DIWANIYAH, MISAN, BASRAH	UNIDO	4,419,514	100.00
UND.ITF	OP/794	Restoration of veterinary services in Iraq	Nationwide	FAO	8,758,955	100.00
UND.ITF	OP/795	Restoration and development of essential livestock services in Iraq	BAGHDAD	FAO	8,545,727	
UND.ITF	OP/798	Assessment emergency, maintenance and rehabilitation of community irrigation schemes and restoration of water supply rural areas	Nationwide	FAO	16,958,942	100.00
UNDP,TTF (Funded By EU)	OP/2633	Iraq Reconstruction and Employment program (IREP) II	DAHUK, SULAYMANIYAH, ERBIL	UNDP	443,063	
United Kingdom	OP/27830	Provision of general food basket to the Iraqi population upgrading logistics and communications capacity	Nationwide	WFP	62,264,151	

Source: MoP

Annex 5 Present State of Irrigated Area in Iraq

PRESENT STATE OF AGRICULTURE

	Million Hectares	Million Dunams	%
Total Area of Iraq	43.700	174.800	100.0%
Total Area Suitable for Agriculture	7.000	28.000	16.0%
Total area ready for cultivation by 2015	**5.985**	**23.938**	**100.0%**
Irrigated	**3.810**	**15.238**	**63.7%**
By surface water INSIDE official Irrigation Projects	2.534	10.135	42.3%
By surface water OUTSIDE official Irrigation Projects	0.850	3.400	14.2%
By springs INSIDE official Irrigation Projects	0.007	0.029	0.1%
By ground water INSIDE official Irrigation Projects	0.020	0.081	0.3%
By ground water OUTSIDE official Irrigation Projects	0.398	1.593	6.7%
Rain fed	**2.175**	**8.700**	**36.3%**
Presently Irrigated Areas	**3.810**	**15.238**	**100.0%**
Developed or Partially Developed Irrigation Projects	**1.369**	**5.474**	**35.9%**
Underdeveloped Land Currently Cultivated	**2.441**	**9.764**	**64.1%**
Areas receiving water through gravity Irrigation	2.081	8.325	54.6%
Areas receiving water through pumping	1.193	4.773	31.3%
Areas receiving water from Ground Water	0.350	1.703	11.2%
Total Amount of Water for Irrigation [BCM]		**49.919**	
From Surface Water [BCM]		46.420	
From springs [BCM]		0.099	
From the Ground Water [BCM]		3.400	
Overall Irrigation Efficiency		**35%**	
Overall Cropping Intensity in the Irrigated Land		**85%**	

Source: MoWR

Annex 6 Future State of Irrigated Area in Iraq

FUTURE STATE OF AGRICULTURE

	Million Hectares	**Million Dunams**	**%**
Total Area of Iraq	43.700	174.800	100.0%
Total Area Suitable for Agriculture	7.000	28.000	16.0%
Total area ready for cultivation by 2035	**5.397**	**21.586**	**100.0%**
Irrigated (if 100% of the area were to be developed)	**3.397**	**13.586**	**62.9%**
By surface water INSIDE official Irrigation Projects	3.191	12.748	59.1%
By surface water OUTSIDE official Irrigation Projects	0.000	0.000	0.0%
By springs INSIDE officials Irrigation Projects	0.011	0.045	0.2%
By ground water INSIDE officials Irrigation Projects	0.032	0.127	0.6%
By ground water OUTSIDE officials Irrigation Projects	0.167	0.666	3.1%
Rain fed	**2.000**	**8.000**	**37.0%**
Area proposed for Irrigation by this Strategy	**3.230**	**12.920**	**94.6%**
To be rehabilitated	1.369	5.474	42.4%
To be reclaimed (based on available water)	1.862	7.446	57.6%
Areas receiving water through gravity Irrigation	3.187	12.748	98.7%
Areas receiving water from Ground Water	0.043	0.172	1.3%
Total Amount of Water for Irrigation [BCM/Y]		**34.560**	
Surface Water [BCM/Y]		32.678	
Springs INSIDE official Irrigation Projects [BCM/Y]		0.103	
Ground Water INSIDE official Irrigation Projects [BCM/Y]		0.300	
Ground Water OUTSIDE official Irrigation Projects [BCM/Y]		1.479	
Overall Irrigation Efficiency		**60%**	
Overall Cropping Intensity in the Irrigated Land		**115%**	

Source: MoWR

Annex 7 Related Laws and Regulations on Water Users Associations

Government of Iraq has legitimized related laws and regulations on water users associations as follows:

- Instructions No. (1) for the year 2014 on associations of users of the shared water source
  The Instruction No. (1) was legislated according to Article 3, c, e, Section 5 of Law No. (12) on maintenance of irrigation and drainage network (1995), that provides operation and maintenance of irrigation and drainage network. The Instruction is called "WUA Instructions". Water Instructions and Law No. (12) provide following instructions on WUA's roles and activities.

Guideline (Internal system) on WUA registration and contract exchanged between WUA and MoWR have been prepared apart from the WUA Instructions. Contract prescribes a few obligations on WUA and MoWR.

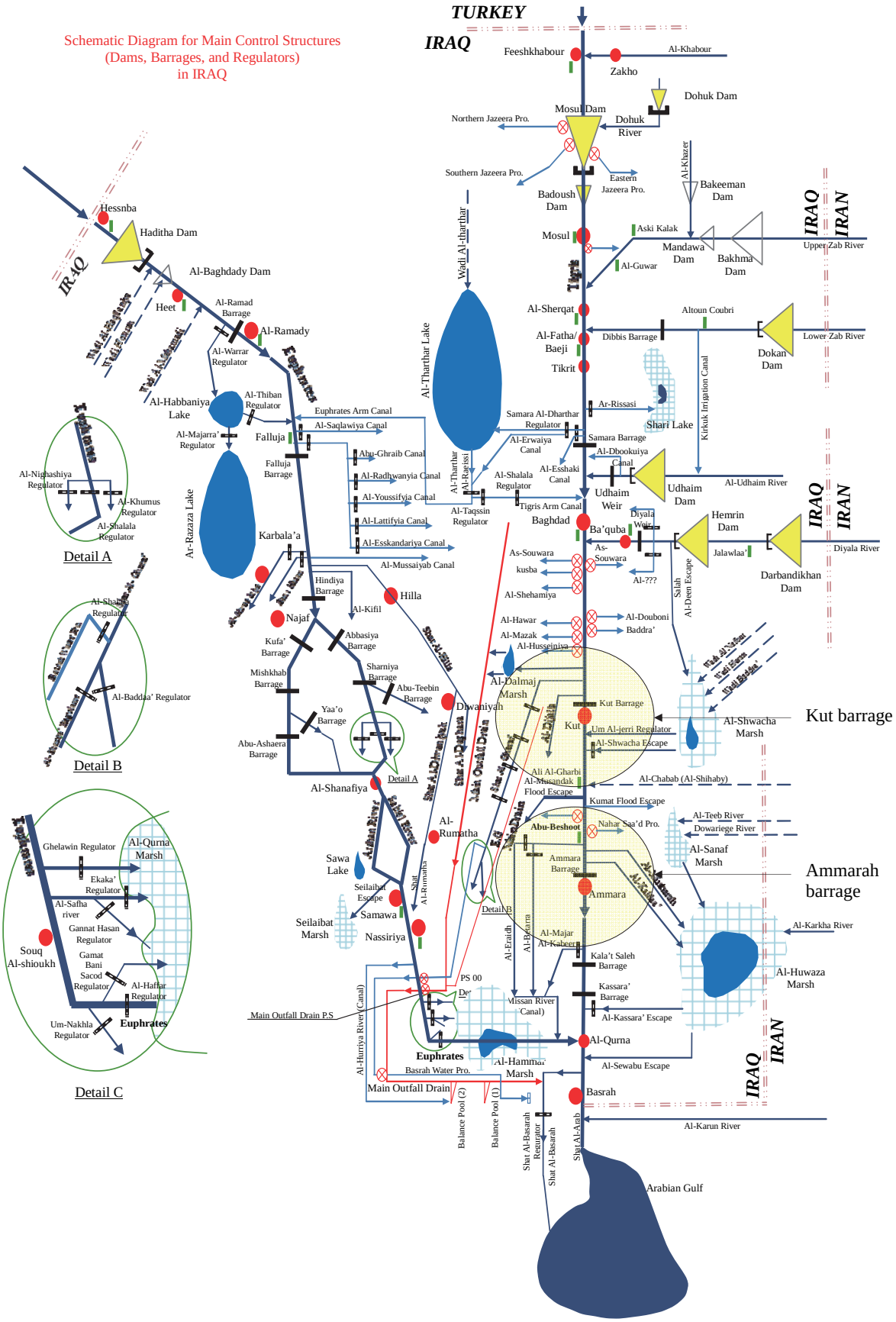
WUA Instructions	
Article 6: Right of WUA member	The member of the association has the right to: • Obtaining water on the basis of operation program and distribution system. • Participate the association work management, discuss the committees' job and make suggestions. • Elect or candidature for the association administrative authority and the committees. • Benefit of the aids provided by the association, the Government, etc.
Article 7: Duties of WUA member	The member must: • Apply the rules of the association internal system and execute all the decisions issued. • Seriously participate in the association activities in accordance of the fundamentals and behaviors put for the work. • Protect the association properties, maintain and correctly use them, and inform about any damage may take place.
Article 12: Activities of WUA	The association will afford the cost of operating, maintaining and guarding the delivered pump station.
Law No. 12	
Article 5 (1) Government obligations	1. The General Authority for irrigation projects operation (hereinafter named as "the Authority"), and the irrigation departments in the Governorates shall be responsible for the following rivers, streams, and drains as well as their facilities: a- Natural rivers b- Drains, river mouths and evaporation pans c- Streams, main drains and their facilities specified by the design maps, as well as their pumping stations d- Main, secondary, and supplying streams; secondary, collecting, and field drains; as well as their facilities and pumping stations 2. Modified (cancelled)
Article 5 (3) Roles of WUA	3. Modified a- Water supervisors are employed by water users association to supervise streams' water distribution according to the number specified by projects water resources departments. Their salaries are paid by water users of each administrative unit or project. Their nomination, selection, salary payment, duties, and all related matters and contracts are decided by instructions from the Minister of Water Resources. b- Persons mentioned in (a) are not subject to services, contracts, and labor laws. c- Users of a common water source must create an association for management, operation, and maintenance of the common water source. d- Objectives of the association mentioned in (c) of this Article are: 1. Rationalize water use and reduce wastes Ensure water distribution fairness between users 2. Contribute to solving disputes between users 3. Conserve and maintain irrigation and drainage projects facilities e- Minister of Water Resources issues instructions to control creation, management, operation, and all related matters of the associations mentioned in (c).

Rehabilitation contract for the management, operation and maintenance of irrigation project In the following Articles, the first party and second party mean the Director General of the General Authority for the operation of irrigation and drainage projects and President of the Association, respectively.	
Obligations of MoWR	First : the first party's obligations : • Delivery of the common water source facilities in good condition for the second party under Minutes receipt of a fundamentalist after confirming his rehabilitation in the management, operation and maintenance and perpetuation of the common water source facilities and costs while achieving the first party a number of employees for the purpose mentioned • Training members of the Association on the work of the management, operation and maintenance and perpetuation of the common water source facilities and administrative and accounting and business for the association to enable it to perform its tasks and achieve their goals • Rehabilitation and development of irrigation project area of work of the Association , according to the possibilities available • Facilitate the task of the second party by appealing to the relevant authorities in obtaining fuel oils and electrical power necessary to do so
Obligations of WUA	Second : the second party's obligations: • Receipt of the common water source facilities in good condition from the first party in accordance with paragraph (1) of Article (first) above • Maintain a common water source, including ducts, pipes and other facilities related to the source of water in the scope of work of the association • First party adhere to the guidance in the management of the irrigation project, operation and maintenance of its facilities built for the whole association work space and maintain it from damage and tampering and theft • Commitment prepared by the first party distribution system for the main feeder channel common source of water that is fairly allocate water between members of the association by association • Assigned to one or more members from among its members to be present in the work of association site for the duration of operation of the , according to the distribution of water table • Provide squatters on water quotas or acquired unlawfully or cultivation area bigger than planned, or any offense punishable by law to irrigation specialist engineer to take appropriate action against them in accordance with the legislation in force • Bear all the legal consequences for people working under his supervision • Other obligations set forth in the maintenance of irrigation and drainage networks Law No. (12) of 1995, as amended, and in the instructions associations of users of the common water source (1) for the year 2014

Annex 8 Water Control and Monitoring Points

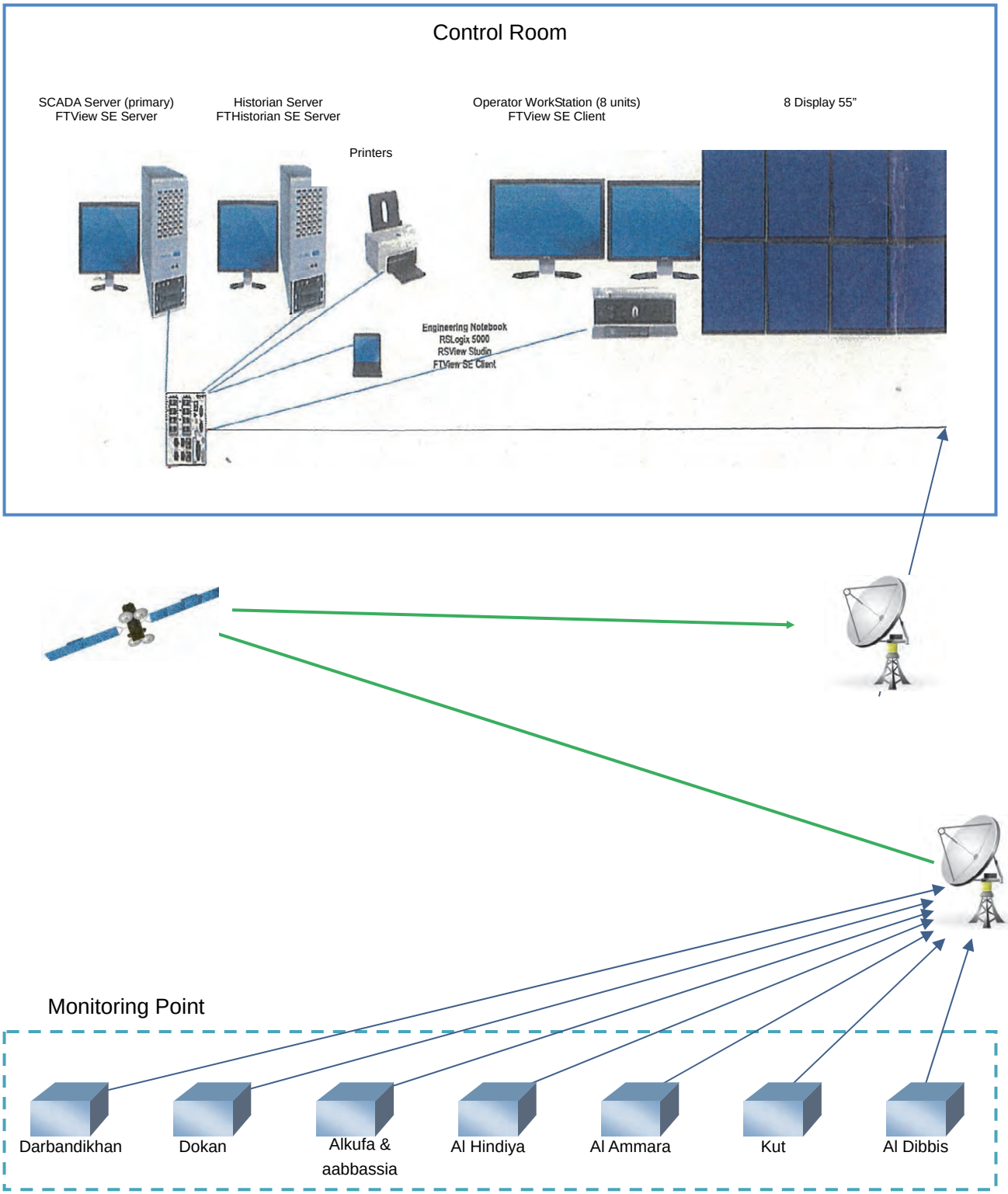
Tigris river		Euphrates river	
Station		Hadithadaw	
Mosul dam		Habania lake	
Dokan dam		Razaza lake	
Tharthar lake			
Udhaim			
Darbandikhan			
Himreen			
Zakho/ Khabor	Aljazera/ Mos	Hussaiba	Musaib
Fishkhabo	Kerkuk	Heet	Al-Kifil
Mosul city	Risasy	Upstream Warar regulator	Al-Hussainia
Upstream Zab	Ishaqi	Al rumady Baraq (Upstream)	Bany-Hassan
Upstream Askikalqa	Samara Canal	Al rumady Baraq (Downstream)	
Shirkat	Upstream diversion	Tharthar (Upstream)	
Alton-kupry	Al-Uraidh	Tharthar (Downstream)	
Downstream Dibbis	Al-Butairah	Tharthar diversion (Upstream)	
Baigy	Al-Musharah	Tharthar diversion (Downstream)	
Tikreet	Al-Kehlaa	Dhiban regulator (Upstream)	
Downstream Samara	Al-Majar Al kabeer	United canal (Downstream)	
Upstream Samara regulator		Alfaloga Barrage (Upstream)	
Downstream Samara regulator		Alfaloga Barrage (Downstream)	
Thanthar canal/ Diake Downstream		Downstream Head regulator	
Bagidacl		Upstream Daghara	
Swaira near bridge, Wasit		Bershawig/ Shat al-hila	
Downstream Dharapl		Hindia (upstream)	
Upstream Kut		Hindia (downstream)	
Downstream Kut		Kufa (upstream)	
Ali Algharby		Kufa (downstream)	
Upstream Amarar regulator		Upstream Al-Abasia	
Downstream Amarar regulator		Al-Shanafia	
Amarar		Simawa	
Qalat Salih		Nasiria	

Source: Water Control Center, National Center of Water Resource Management, MoWR



Schematic Diagram for Main Control Structures (Dams, Barrages, and Regulators)

Annex 9 Proposed Diagram of the Water Control System



Source: Revised information of the Water Control Center, National Center of Water Resource Management, MoWR

Annex 10 Potential Study on the Storage Water in the Tharthar Lake

For development of available water resources, it is necessary to reduce losses due to water evaporation from the open reservoirs surfaces and streams of water as well to restrict the water depletion. In this context, it was proposed to increase the Euphrates river flow with releasing storage water in the Tharthar lake, and the lake storage capacity would be utilized for the flood purpose. Several research reports indicates that it was not so recommendable to use slightly saline water in the Tharthar lake which contained 1,000 ppm TDS for irrigation purpose. Following are reported to utilize the Tharthar lake water: [89]。

The Tharthar lake is located at 65 km north-west of the Bagdad city and has both flood control and storage capacity for the water use. The lake has total storage capacity of 85 billion m^3 with its surface area of 2,700 km^2 (length of 100 km with 40 km wide). For a storage purpose, the channel of Tharthar- Euphrates was achieved with 37.5 km long with the flow capacity of 500 m^3/sec in 1976 and Tharthar-Tigris channel with 23.5 km long with the flow capacity of 600 m^3/sec in 1988. The Tharthar depression made possible the accumulation of water by escaping Samara-Tharthar canal for diversion of the flood of the Tigris water. First water from the Tigris river was diverted to Tharthar depression in 1957. Water diversion to the lake for twenty years caused high accumulation of saline water, e.g., 2,000 ppm in 1980, thus water use of the lake raised questions for the sustainability for the use of irrigation. The evaporation from the water surface, lixiviation from the ground and seepage of saline groundwater appeared as reasons of the salinity accumulation. Salinity of water that entered from the Samara barrage in the Tigris river indicated the presence of about 450 ppm at maximum and 200 ppm at minimum. The salinity of the lake was about 1,000 ppm in 2005due to inflow of low salinity water from the Samara barrage. While the salinity in Fallujah which is located at upstream of outflow points of the Tharthar-Euphrates channel was observed at 830 ppm, and water salinity at Ramadi which is located 45 km upstream of outflow points of the Tharthar- Euphrates channel was 600 ppm. In this fact, the high increase in the salinity along the Euphrates river was caused due to inflow of the Tharthar lake water and its sur

Figure indicates that TDS has been stable at around 1,000 ppm since the middle of 1990s.

It is expected to use the storage water of the Tharthar lake for the irrigation purpose when evaporation that causes high salinity water would be minimized. In this regard, it is proposed to limitedly utilize the lake capacity for the flood control purpose.

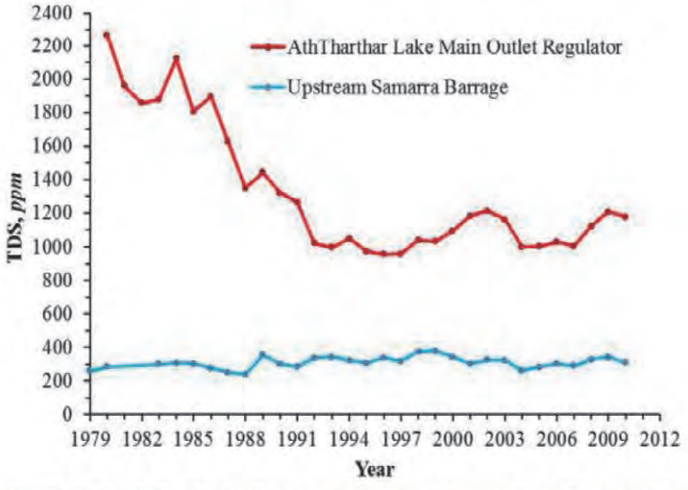


Figure 19: Total dissolved solids concentrations at Samarra Barrage and at the outlet of the Tharthar Lake (CEB, 2011).

[89] SWLRI page 53.

Annex 11 Irrigation Water Capacity at Proposed Project Sites

Followings are river and diversion discharge for the proposed irrigation sites.

1. Site location of the proposed irrigation projects

Water availability at the proposed 4 sites under the irrigation sector loan project was studied with discharge data of recent 6 years.

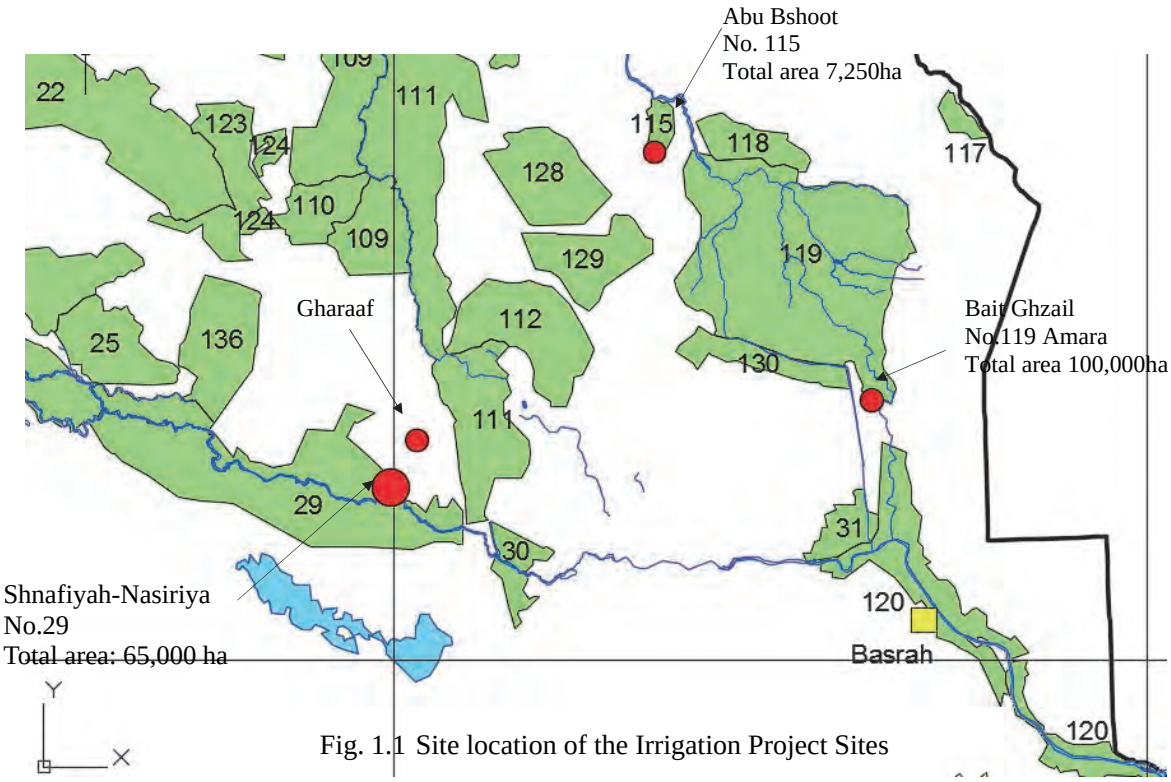


Fig. 1.1 Site location of the Irrigation Project Sites

2. Shanafiyah – Nasiriya Sub-project (Dhi-Qar): 2,500 ha

(1) River discharge

River discharge data are observed at Samawa station. River discharge downstream of the Samawa is not available because of tide phenomenon of the Arabian Sea.

Table 2.1 Monthly Mean Discharge (Samawa Station)

(Unit: m^3/sec)

Station	Month / Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (billion m^3/year)
Samawa	2009-2010	39	39	45	47	58	55	104	67	72	122	106	118	2.29
	2010-2011	135	77	67	46	84	37	53	38	41	82	63	74	2.09
	2011-2012	77	53	69	68	91	65	87	57	73	141	80	122	2.58
	2012-2013	101	100	107	116	85	83	79	86	88	204	125	136	3.45
	2013-2014	165	150	84	109	81	103	77	88	120	225	145	134	3.90
	2014-2015	152	79	80	68	70	57	71	30	32	41	38	39	1.99
Average		112	83	75	76	78	67	79	61	71	136	93	104	2.72

Source: Water Control Center, National Center of Water Resource Management, MoWR

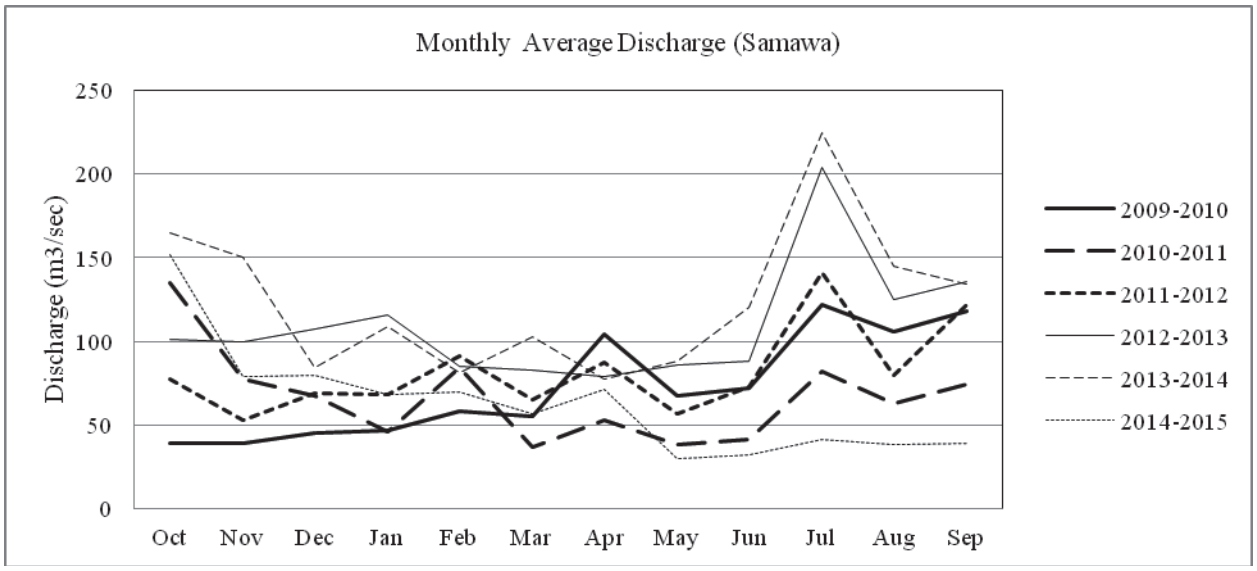


Fig. 2.1 Monthly Mean Discharge (Samawa Station)

(2) Water Requirement

River discharge at the Samawa station in the Euphrates river is observed in the range of 75 to 78 m^3/sec (5-year probability: 45 to 58 m^3/sec) in the period of wheat and barley cultivation for three months from December to February.

As indicated in Fig. 1.1, irrigation area at the downstream of the Samawa is estimated at 92,500 ha, comprising of 29-Shnafiyah-nasiriya, 30- Suq al shoyokh, 31- Small farms in the Euphrates river mouth, and water requirement is estimated at 56.1 m^3/sec. Water requirement of 45.9 m^3/sec at 29-Shnafiyah-Nasiriya is supplied with 5-year probability. Table 2.2 shows detailed information of each irrigation area.

Table 2.2 Outlines of Irrigation Area downstream of Samawa

	Irrigation Project	Directorate	River	Irrigation area (ha)	Water requirement (m^3/sec)
29	Shnafiyah-nasiriya	Diwaniyah/Dhi-Qar/ Muthanna	Euphrates	65,000	45.87
30	Suq al shoyokh	Dhi-Qar	Euphrates	18,750	4.01
31	Small farms in the Euphrates river mouth	Basrah	Tigris	8,750	6.25
				92,500	56.13

3. WUA Sub Project

Table 3.1 WUA Sub Project

	3.1	3.2	3.3	3.4	3.5
	Basrah	Mabain Al-Nahrain	Misan	Dhi-Qar	Karbala
WUA	Bait Ghzail	Sheshbar (Line PS - 02)	Abu Bshoot	Gharaaf	Khayrat
	Piet Ghzayel WUA	(Abbas Ali Al-Khikry)		al-Zaidiya WUA	
WUA members	17	82	35	81	148
Water system	Closed pipe	Closed pipe	Remote system	Closed pipe	Closed pipe
Irrigation area (ha)	250	664	447	385	311.5
Water requirement(m^3/sec)	0.18	0.46	0.31	0.27	0.22

Note: Water requirement is estimated with irrigation area ×0.7 (lit/ha)

(1) Abu Bshoot pilot project

Irrigation area of the Abu Bshoot pilot project is 7,250 ha in the Project list prepared by MoWR (while it is 5,750 ha according to the Abu-Bshoot project office). Irrigation water is directly diverted from the Tigris river. River discharge data at the diversion point is as follows:

Table 3.2 Monthly Mean Discharge (Abu-Bshoot project station)

(Unit: m^3/sec)

Station	Month / Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (billion m^3/year)
Abu-Bshoot	2009-2010	6.4	6.0	6.0	6.1	6.0	6.9	6.0	5.1	3.1	5.2	5.0	5.6	0.18
	2010-2011	6.0	6.8	6.0	6.6	6.3	6.0	6.3	4.6	3.0	5.1	5.3	4.8	0.18
	2011-2012	5.9	6.9	6.2	6.9	7.4	6.9	5.9	4.4	2.7	4.8	4.6	4.4	0.18
	2012-2013	5.8	6.0	6.6	6.0	6.3	6.0	5.4	4.2	2.6	4.4	4.3	4.2	0.16
	2013-2014	5.0	5.0	6.8	6.4	6.4	5.5	4.3	3.3	2.0	4.0	4.2	4.2	0.15
	2014-2015	5.2	5.4	6.7	6.2	6.9	5.2	4.2	3.1	2.1	4.2	4.2	4.2	0.15
Average		5.7	6.0	6.4	6.4	6.6	6.1	5.4	4.1	2.6	4.6	4.6	4.6	0.17

Source: Abu-Bshoot project office

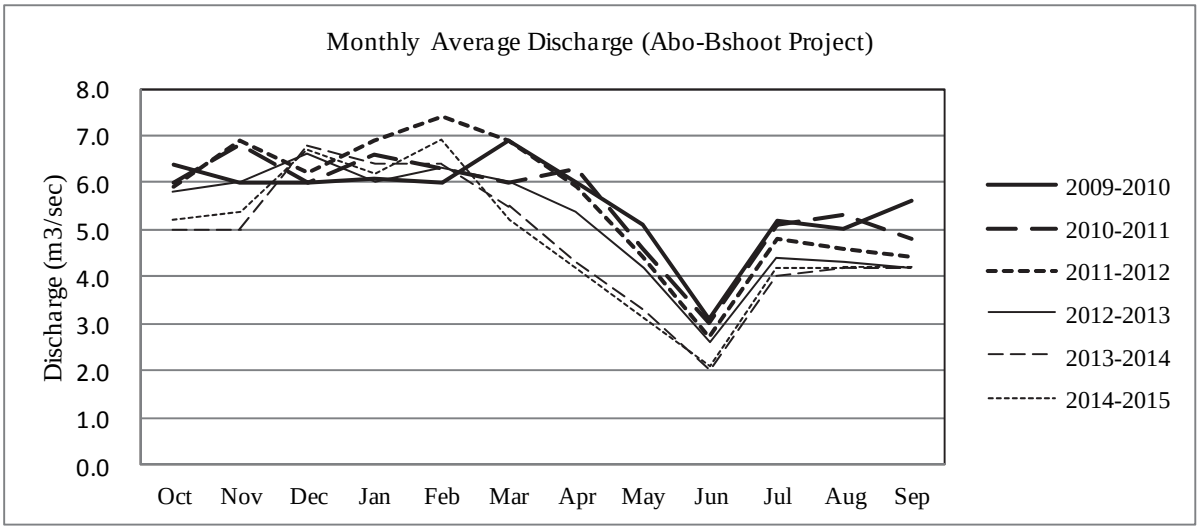


Fig. 3.1 Monthly Mean Discharge (Abu-Bshoot project station)

Water requirement is estimated at 5.7 - 6.6 m^3/sec in the winter from October to February. Total intake water volume is 62.9million m^3/crop and it is equivalent to 1,094 mm/crop, it is therefore considered water supply meets requirement for the cropping of the whole irrigation area. The intake water discharge is reduced to 4.1 m^3/sec in May to 4.1 m^3/sec in June comparing to those of 6.1 to 5.4 m^3/sec sowing period in March to April during the summer cropping season from March to July. Cropping area is not exactly surveyed, but it is roughly estimated at about 50 % corresponding to the actual intake discharge in the period. Table 3.2 shows monthly mean discharge observed at Kut. Since river discharge is constant though the year, sufficient irrigation water is supplied to the whole irrigation area in the Abu-Bshoot project.

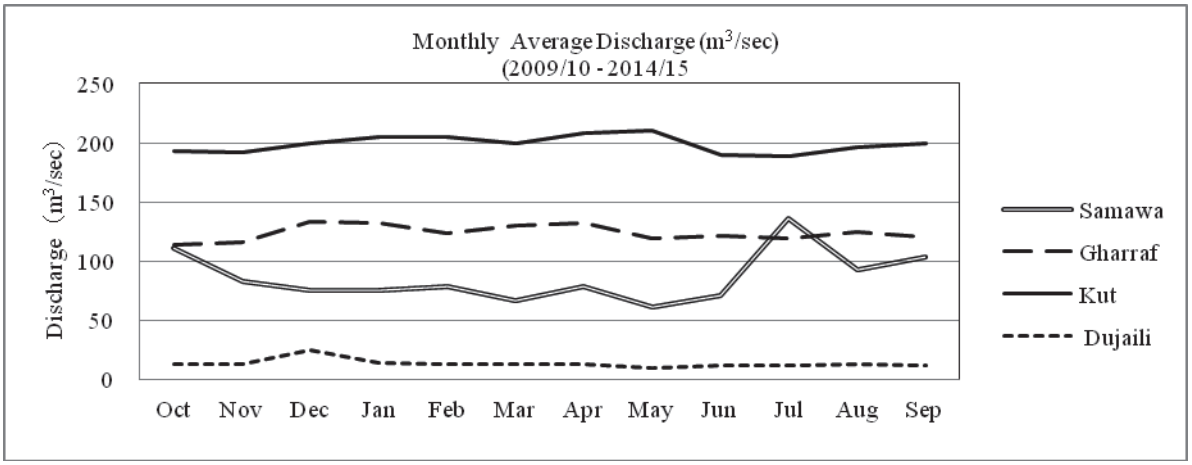


Fig. 3.2 Monthly Mean Discharge (Samawa, Gharraf, Kut, Dujaili Stations)

(2) Bait Ghzail pilot project

Irrigation water is directly diverted from the Tigris river to Bait Ghzail pilot project area. Fig. 3.4 indicates river discharge at Qalat Salih barrage located at immediately downstream of the Bait Ghzail pilot project area. Irrigation area is 87,725 ha downstream of Amarah barrage (119: Amarah) and water requirement is 61.46 m^3/sec as shown in the Project list (MoWR). As no exact river discharge data is observed near the Bait Ghzail pilot project, discharge at the Bait Ghzail pilot project is assumed at 50 % of that released water from the Amarah barrage and accordingly irrigation area and discharge are calculated at 87,725 ha and 30.73 m^3/sec, respectively. River discharge is given by the balance of that observed at upstream of the Amarah barrage minus diversion discharge to the Musharah and Kahla area and Qalat Salih discharge.

Table 3.3 shows discharge between the Amarah and Qalat Salih barrages. Constant flow of 40 m^3/sec is enough to irrigate the Bait Ghzail pilot project and adjoining projects that require 30.73 m^3/sec according to the recent 10 years data.

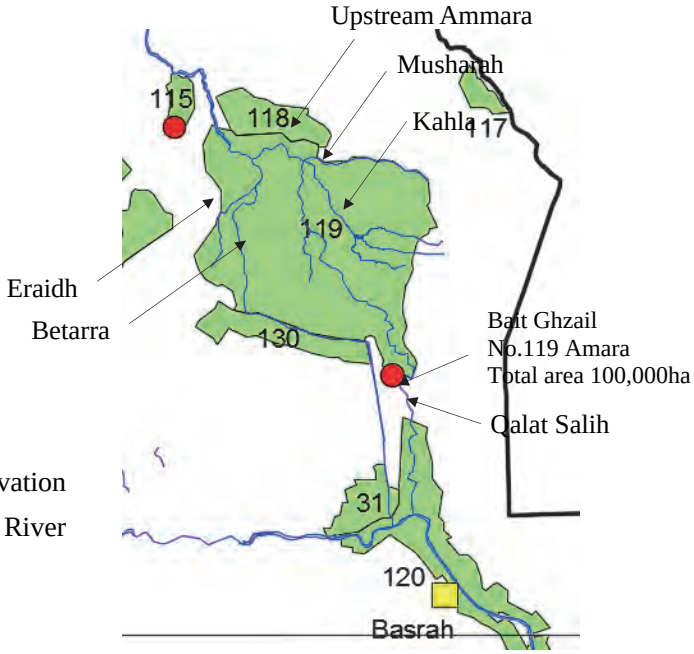


Fig. 3.3 Location of Hydrological Observation Station downstream of the Tigris River

Table 3.3 Monthly Mean Discharge (Downstream of Amarah Barrage)

(Unit: m^3/sec)

	Month / Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (billion m^3/year)
Balance	2005-2006	79	92	73	84	113	73	116	94	107	91	75	82	2.83
Bait	2006-2007	73	87	101	110	86	79	96	103	80	86	84	75	2.79
Ghzail	2007-2008	76	64	78	77	67	72	75	60	56	56	50	51	2.06
	2008-2009	47	47	55	49	52	63	90	58	66	55	42	40	1.74
	2009-2010	37	44	50	44	51	42	42	49	56	52	51	53	1.5
	2010-2011	47	51	56	57	54	37	39	38	33	34	37	53	1.41
	2011-2012	55	50	50	54	60	53	50	60	48	59	61	54	1.72
	2012-2013	62	57	74	64	75	95	58	58	45	47	55	73	2.00
	2013-2014	61	75	60	79	58	74	79	78	61	63	60	56	2.11
	2014-2015	48	44	59	61	49	46	66	63	55	42	38	46	1.62
平均		59	61	66	68	67	63	71	66	61	59	55	58	1.98

Source: Water Control Center, National Center of Water Resource Management, MoWR

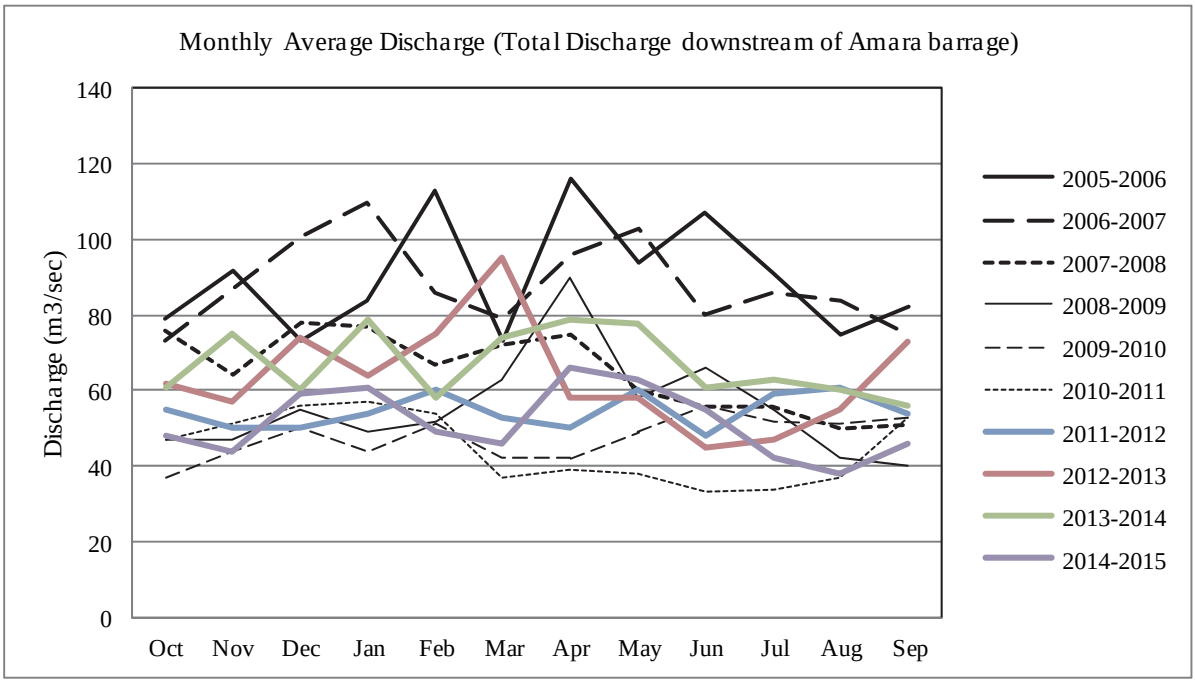


Fig. 3.4 Monthly Mean Discharge (Downstream of Amarah Barrage)

(3) Gharaf pilot project (al-Zaidiya WUA)

Water source of the Gharaf pilot project is the lateral canal of the Shat-al Gharaf canal originated from Nut barrage. The discharge data of the Shat-al Gharaf canal is shown below. Monthly mean discharge of the Shat-al Gharaf canal is stable at about 120-130 m^3/sec.

Total irrigation area of the Shat-Al Gharaf canal command area is 262,750 ha and discharge is 167.71 m^3/sec (Irrigation project list, MoWR). It is noted that Shat-al Gharaf canal supplies 70 % of the total irrigation area.

Table 3.4 Monthly Mean Discharge (Gharaf Station)

(Unit: m^3/sec)

Station	Month / Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (billion m^3/year)
Gharaf	2009-2010	98	103	110	105	128	123	111	78	93	114	120	115	3.41
	2010-2011	113	115	120	122	129	91	132	129	132	114	120	105	3.73
	2011-2012	106	105	127	139	131	134	133	131	129	138	141	131	4.06
	2012-2013	124	132	146	151	146	164	146	122	136	129	147	136	4.41
	2013-2014	120	137	133	143	104	151	119	110	110	125	116	108	3.89
	2014-2015	122	107	164	132	102	115	152	144	132	96	102	125	3.93
Average		114	117	133	132	123	130	132	119	122	119	124	120	3.9

Source: Water Control Center, National Center of Water Resource Management, MoWR

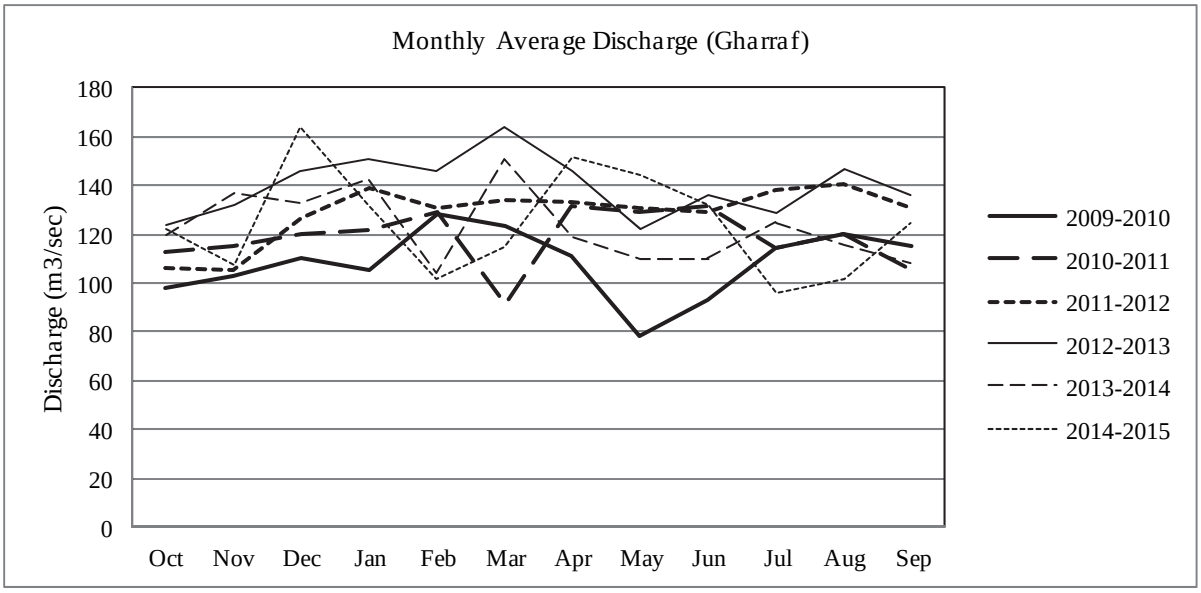


Fig. 3.5 Monthly Mean Discharge (Gharaf Station)

Table 3.5 Irrigation Area, Discharge of Irrigation Project

	Irrigation Project	Directorate	River	Irrigation Area (ha)	Water Requirement (m^3/sec)
109	West Gharaf	Wasit/Dhi-Qar	Tigris	84,250	53.47
110	Al-mghashe "previously 17th July"	Dhi-Qar	Tigris	14,000	8.95
111	East gharaf	Wasit/Dhi-Qar	Tigris	118,750	74.46
112	Dawaiyah "previously 30th July"	Misan/Dhi-Qar	Tigris	45,750	30.83
				262,750	167.71

Source: Irrigation Project List (MoWR)

4. Water Requirement of Other Project Areas

(1) Nahar saad (Misan) Rehabilitation Sub-project

Diversion discharge to Nahar saad rehabilitation sub-project, one of the proposed projects under the irrigation sector loan project is indicated in Table 4.1. Similar to the case of the Abu-Bshoot project, cropping time is scheduled at the same period for the Nahar Saad project area.

Table 4.1 Monthly Mean Discharge (Nahar Saad Project)

(Unit: m^3/sec)

Station	Month / Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (billion m^3/year)
Nahar saad	2008-2009	3.9	6.0	6.0	6.2	5.8	5.8	3.8	3.2	2.0	4.0	4.0	3.4	0.14
	2009-2010	4.0	5.8	6.0	6.4	6.0	5.8	3.8	3.4	2.1	4.0	4.1	3.4	0.14
	2010-2011	4.0	6.0	6.6	6.4	6.4	6.0	3.6	3.2	2.0	3.8	4.0	3.6	0.15
	2011-2012	4.2	6.4	6.8	6.6	6.6	6.4	3.6	3.4	2.2	4.0	4.0	3.8	0.15
	2012-2013	4.0	6.4	6.8	6.8	6.6	6.4	3.8	4.4	1.8	4.4	4.0	4.2	0.16
	2013-2014	4.0	6.4	7.2	7.2	6.4	6.4	4.0	3.9	1.6	4.3	4.0	4.0	0.16
	2014-2015	6.4	6.4	7.2	7.2	7.2	6.4	4.3	3.2	3.2	4.3	4.3	4.3	0.17
Average		4.4	6.2	6.7	6.7	6.4	6.2	3.8	3.5	2.1	4.1	4.1	3.8	0.15

Source: Nahar Saad Project office

Note: Irrigation area has been expanding by year in the Nahar Saad project

Table 4.2 Irrigation Area in the Nahar Saad Project

Year	Irrigation Area (ha)
2008-2009	5,125
2009-2010	6,250
2010-2011	6,250
2011-2012	8,000
2012-2013	9,250
2013-2014	13,750
2014-2015	15,000

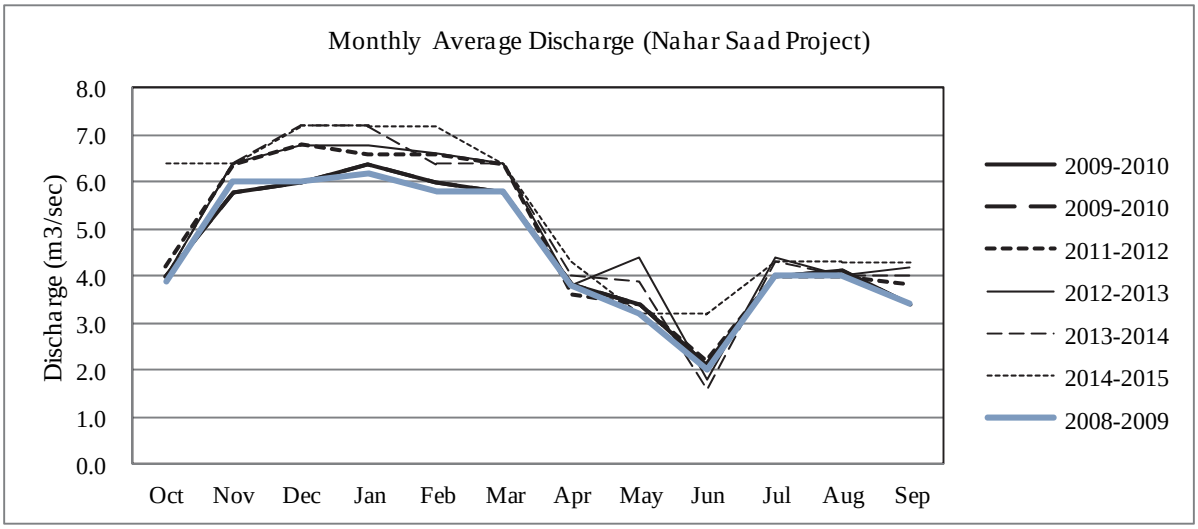


Fig. 4.1 Monthly Mean Discharge (Nahar Saad Project)

(2) River Discharge at Shatt al Arab River

Minimum 50 m^3/sec of the river discharge shall be secured to prevent salinity intrusion to the Shatt al Arab river (Basrah). Since there is no hydrological station along the Shatt al Arab and downstream of the Euphrates rivers due to tide, discharge data observed at Qalat Salih barrage is shown in Table 4.3.

Table 4.3 and Fig. 4.2 indicate that around 50 m^3/sec of the river discharge of the Tigris river has been flowing down to the Shatt al Arab river after 2009/10.

Table 4.3 Monthly Mean Discharge (Qalat Salih Station)

(Unit: m^3/sec)

Station	Month / Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (billionm^3/year)
Qalat Salih	2005-2006	16	19	15	18	48	19	45	23	36	24	17	21	0.79
	2006-2007	15	18	38	47	20	26	55	53	29	26	28	18	0.98
	2007-2008	14	12	25	25	21	20	20	12	11	11	10	11	0.50
	2008-2009	10	9	11	10	15	21	43	38	25	24	28	30	0.69
	2009-2010	51	36	43	53	58	54	60	57	46	50	48	49	1.59
	2010-2011	47	41	44	49	60	50	46	54	49	50	52	68	1.60
	2011-2012	70	41	38	49	57	54	52	64	60	58	56	51	1.71
	2012-2013	46	42	71	68	76	77	71	81	60	60	63	78	2.08
	2013-2014	60	69	59	78	77	66	74	72	56	54	51	49	2.01
	2014-2015	49	41	45	43	44	44	51	50	48	44	36	45	1.42
Average		38	15	22	25	26	22	41	32	25	21	21	20	0.81

Source: Water Control Center, National Center of Water Resource Management, MoWR

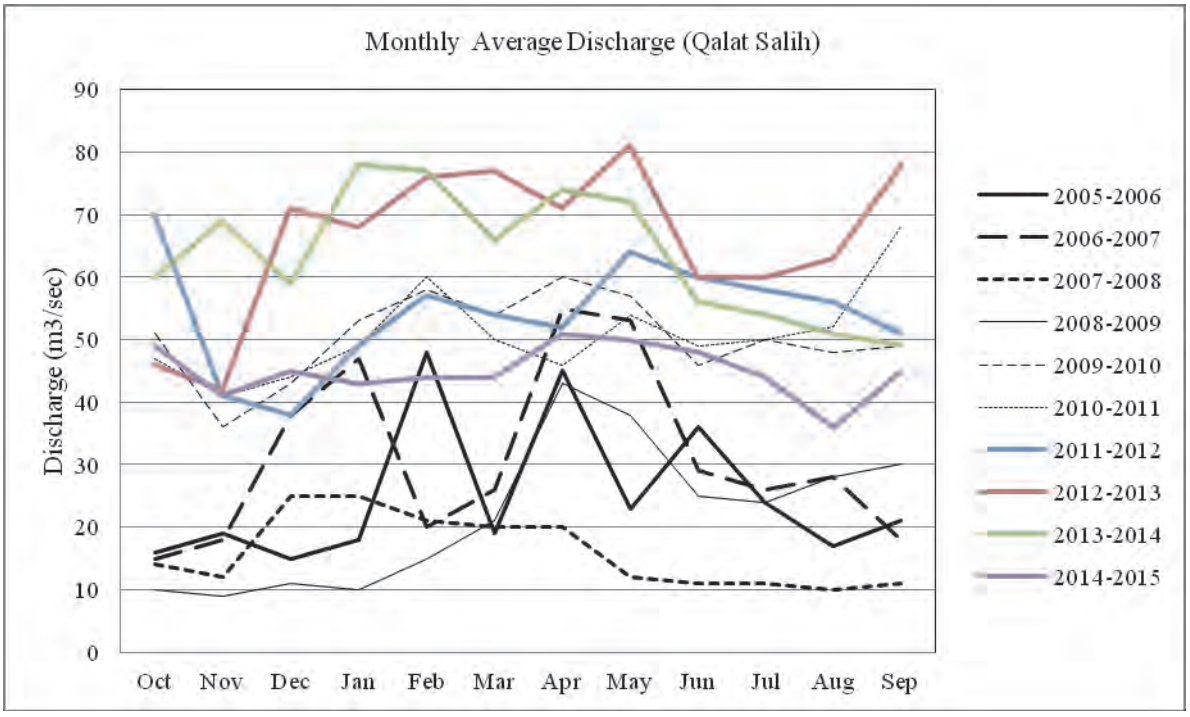


Fig. 4.2 Monthly Mean Discharge (Qalat Salih Station)

(3) Downstream of the Amarah Barrage

In the Tigris river downstream area, several irrigation projects are located downstream of the Amarah barrage as enumerated below:

1)	No. 115	Abu-Bshoot	6,350 ha	4.98 m^3/sec
2)	No. 118	Nahar-saad	16,450 ha	12.00 m^3/sec
3)	No. 119	Amarah	87,725 ha	61.46 m^3/sec
4)	No. 130	Southern ez river	3,725 ha	2.97 m^3/sec
Total			114,250 ha	81.41 m^3/sec

Fig. 4.3 indicates diversion water discharge from the Amarah barrage. Discharge of approximately

60 m^3/sec is diverted excluding water discharge of about 20 m^3/sec to the downstream area of the barrage. Fig. 4.3 indicates that water shortage from the Amarah barrage had occurred 3 times in 11 years during the period of 1999/2000 to 2009/10. Flow discharge decreased to about 40～50 m^3/sec in December to February in the consecutive agricultural years of 2000/01 and 2001/02. The occurrence was twice in 11 years, and it met 80% probability[90], but such a drought caused damages to the livelihood of the farmers.

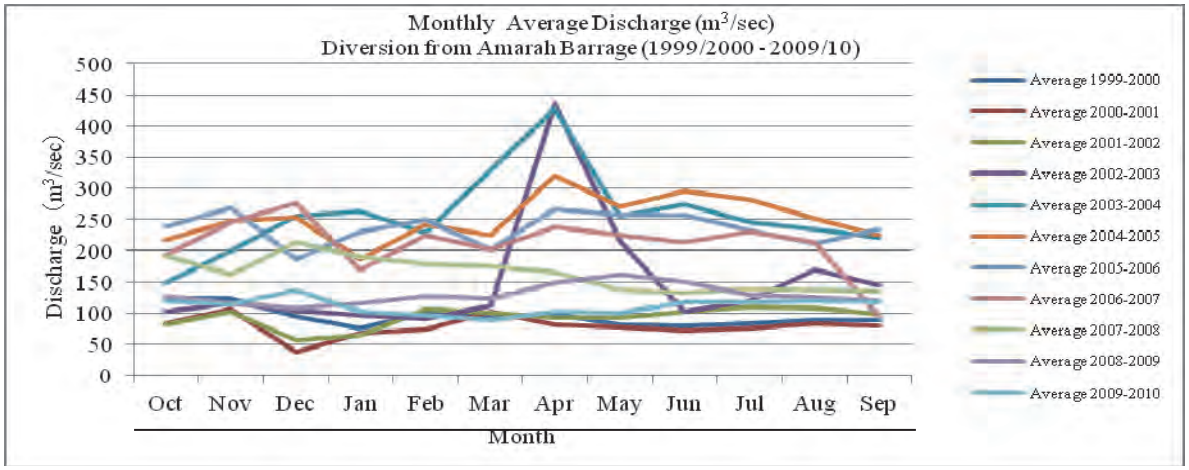


Fig. 4.3 Monthly Mean Diversion Discharge at Amarah Barrage

(4) Intake Discharge at Other Project Sites

Table 4.4 indicates the diversion discharge to the Eraidh and Betarra canals upstream of the Amarah barrage. It is remarkable that discharge has been largely fluctuated from month to month and year to year. Unclear diversion schedule and cropping calendar might be the reasons of this fluctuation.

Table 4.4 Monthly Mean Diversion Discharge (Eraidh Canal)

(Unit: m^3/sec)

Station	Month / Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (billionm^3/year)
Eraidh	2005-2006	11	14	10	14	13	11	12	10	10	10	9	11	0.35
Uraidh	2006-2007	8	9	14	12	11	11	11	10	8	9	8	7	0.31
	2007-2008	7	6	11	10	8	9	8	6	6	7	6	6	0.24
	2008-2009	5	6	9	6	7	13	29	12	6	4	5	5	0.28
	2009-2010	4	6	10	7	8	7	7	7	7	7	7	7	0.22
	2010-2011	7	10	9	13	17	7	8	8	5	6	6	9	0.27
	2011-2012	10	8	8	13	17	14	13	15	10	11	13	16	0.39
	2012-2013	15	14	21	18	18	30	20	16	11	13	15	20	0.55
	2013-2014	15	22	17	27	21	20	26	22	12	13	13	11	0.57
	2014-2015	10	10	19	16	12	12	20	21	17	10	8	13	0.44
Average		9	9	11	11	10	11	15	10	8	8	7	7	0.30

Source: Water Control Center, National Center of Water Resource Management, MoWR

[90] Irrigation project is justified with 80% probability of water supply in SWLRI report. (p.113)

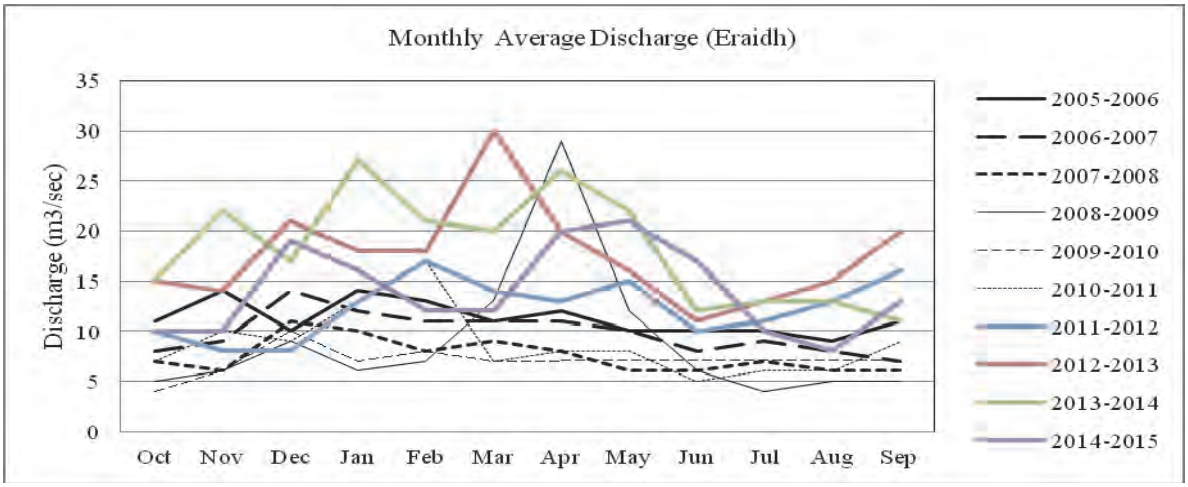


Fig. 4.4 Monthly Mean Diversion Discharge (Eraidh Canal)

Table 4.5 Monthly Mean Diversion Discharge (Betarra Canal)

(単位: m^3/sec)

Station	Month / Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (billionm^3/year)
Betarra	2005-2006	39	43	33	34	46	34	50	38	46	43	35	36	1.25
	2006-2007	34	41	38	39	41	36	43	45	41	45	43	39	1.27
	2007-2008	40	32	33	33	30	35	39	31	29	28	27	26	1.01
	2008-2009	23	21	25	23	26	28	33	24	29	31	21	20	0.8
	2009-2010	18	22	26	22	21	19	21	22	21	17	20	21	0.66
	2010-2011	16	15	19	21	21	13	13	16	12	13	14	20	0.51
	2011-2012	23	18	19	22	24	20	19	26	21	24	27	21	0.69
	2012-2013	22	18	28	27	32	37	23	30	18	17	20	30	0.79
	2013-2014	28	37	29	40	28	32	43	45	35	34	31	28	1.08
	2014-2015	21	17	22	25	18	16	24	22	16	13	12	14	0.58
Average		26	26	27	29	29	27	31	30	27	27	25	26	0.86

Source: Water Control Center, National Center of Water Resource Management, MoWR

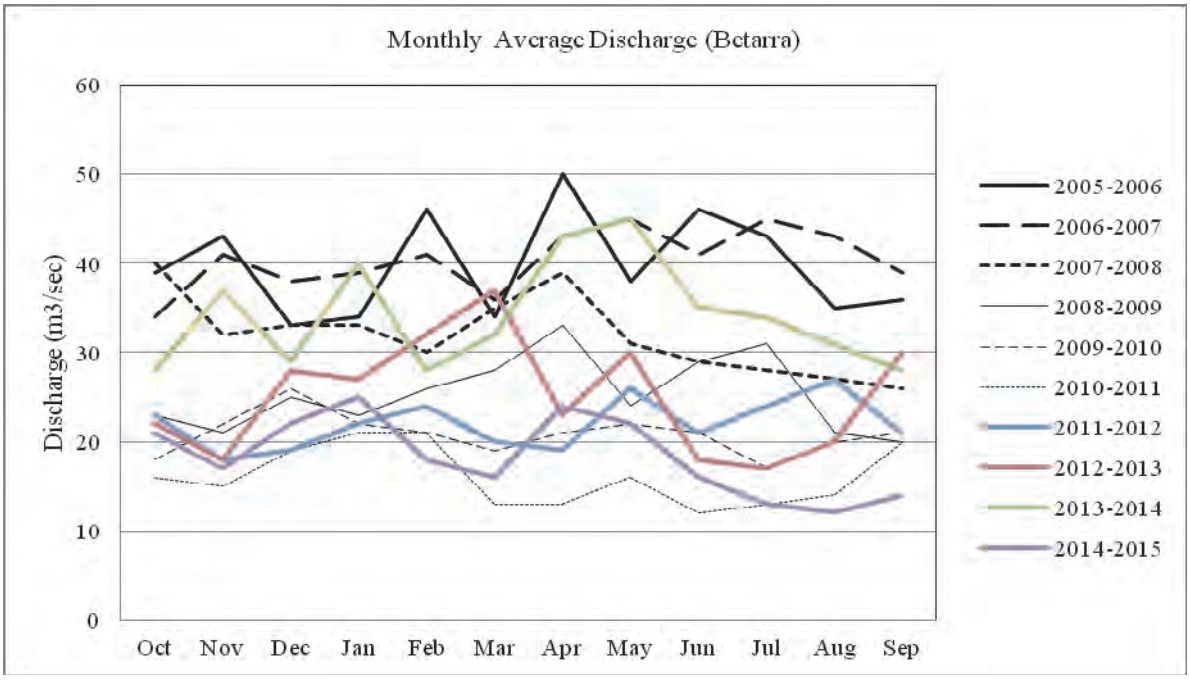


Fig. 4.5 Monthly Mean Diversion Discharge (Betarra Canal)

Table 4.6 Monthly Mean Discharge (Samawa Station)

(Unit: m^3/sec)

Station	Month / Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total (Billion m^3/year)
Kut	2009-2010	180	162	200	163	168	158	176	166	160	174	180	174	5.42
	2010-2011	167	169	168	171	196	153	176	207	167	156	182	206	5.56
	2011-2012	204	182	175	197	194	182	195	228	215	224	221	194	6.34
	2012-2013	203	206	244	229	276	307	236	218	219	224	241	262	7.52
	2013-2014	218	266	207	271	230	235	270	247	195	201	198	187	7.16
	2014-2015	184	169	206	198	165	165	198	197	184	156	153	176	5.66
Average		193	192	200	205	205	200	209	211	190	189	196	200	6.28

Source: Water Control Center, National Center of Water Resource Management, MoWR

Fig. 4.6 indicates monthly average discharge for 6 years from 2009/10 to 2014/15 as observed at Kut station. River discharge of the Tigris river has been maintained at 150 m^3/sec or more at the Kut barrage. River flow of 50 m^3/sec has been kept through the year to prevent salinity intrusion at Basrah. Intake discharge of 4.98 m^3/sec has been constantly pumped up for the Abu Bshoot pilot project.

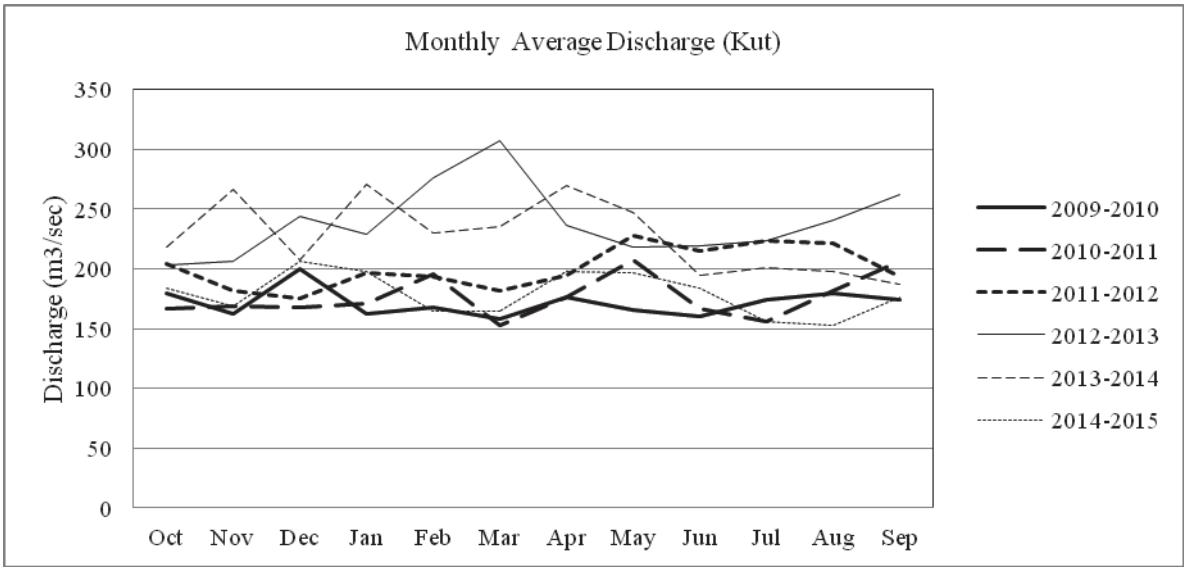


Fig. 4.6 Monthly Mean Diversion Discharge (Kut Station)

Annex 12 On-farm Facilities (Water saving irrigation)

(1) Outline of on-farm facilities

Several kinds of water saving irrigation devices have been being introduced in Iraq such as center pivot, linear sprinkler, fixed/ movable sprinkler, micro sprinkler and drip irrigation. In addition, land leveling, and furrow irrigation are also effective methods to realize water saving at on-farm level. Regarding water supply devices at off-farm level, and pipelined structures are also effective method to minimize water loss. Meanwhile, target crop selection (grain, vegetable, fruit tree, fodder, etc.) and cropping pattern are also essential factors for a devise selection because crop water requirement and rotation system are variable due to sun shine duration, .temperature, evapotranspiration.

It is noted water saving method shall be selected by adopting stepwise approach to make it effective. High technology method beyond farmers" skill such as sprinkler and drip irrigation system with pressurized pipeline might oppositely increase the irrigation loss. It is essential to introduce water saving method suitable for local water quality (salinity level), especially in the southern area of Iraq, and other high technology method in the center to northern areas of Iraq blessed with water resource and marketability.

(2) Water saving method

It is preferable to select water saving method in conformity with the effectiveness of respective water saving method with cost-benefit impact, e.g., basin, furrow, sprinkler and drip irrigation methods.

Basin (flood) irrigation ⇨

Furrow irrigation ⇨

Mini sprinkler ⇩

Drip irrigation ⇦

Large scale sprinkler (Center pivot/ linear type) ⇦

Micro sprinkler

Water saving methods possess following characteristics in general:

- Irrigation efficiency of the basin irrigation is smaller than other methods. (Undulated surface requires much water to keep whole land surface wet.)

- Water requirement of furrow irrigation is not so high comparing to the basin irrigation, on contrary to this it needs detailed furrow design in terms of furrow slope, seepage loss, etc.
- Sprinkler irrigation has a great advantage for the undulated farmland, but overspreading water to outside of the root zone is not effectively used for cropping, and susceptible to wind effects.
- Water saving irrigation is broadly composed of sprinkler and drip irrigation. Saline and calcareous content may clog emitter and drip tube, thus these materials shall be fluently dissolved with dilute chemicals. In addition saline content is susceptible to accumulate around root zone.

Two types of the sprinkler systems have been installed by the farmers near the Bagdad city with Government subsidy system.

- Center pivot system — 30 ha coverage with 325 m arm radiant. Four farmers installed total 5 center pivot systems.
- Movable sprinkler — 199 sets of movable sprinklers have been installed with distance interval of 10 m long. Total farmland of 1,250 ha is sprinkled with 199 sets of movable sprinklers.

(3) Water saving irrigation in the Basrah District

Drip irrigation system has been first introduced by the individual farmers in 1972. But saving effect was not so high due to saline accumulation in the drip tube and emitter when river water had high saline concentration (or TDS: Total Dissolved Solids), large evaporation from soil surface and high air temperature in and around the Basrah district. For these reasons, low skilled farmers had reverted to the previous basin, flood and furrow irrigation methods. Also, MoWR officials reported closed pipeline system might not attain high irrigation efficiency at on-farm level. It is necessary to add various measures for sprinkler system against saline concentration and wind effect:

1) Leaching effect by sprinkler to prevent salinity accumulation.
2) Lower elevated sprinkler nozzle to prevent irrigation water scatters.

Following photographs are the Abda-Doukkala Upper Scheme Irrigation Project (Japanese loan project in Morocco) River water is pumped up and conveyed to the farmland by pipeline system. Gate opening is due scheduled under the Government control to properly distribute the irrigation water to the farmland, so beneficiaries are strictly restricted to control the gate opening. Drip irrigation method has been also verified by the Government research institute. Pressurized system using elevated regulation tank has been applied to the drip irrigation system in the project.

Main irrigation canal
Abda-Doukkala Irrigation Project (Morocco)

Watering schedule by the Government officials

Attachments

Attachment 1　List of Visitors (alphabetical order)

Affiliation	Name	Position
MoWR	Ahmed Lilo Kareem	Assistant DG of operation project
	Ali Muhammed Jawad	MoWR National center
	Ali Taha Ahmed	Senior engineer
	Anwar Abd Al Amir	MoWR Extension water
	Asaad	Minister office
	Asia Rasheed Jawad	D.G. Finance
	Ayad Hameed Abbas	Head of environmental study department
	Bushra Ghanim Ahmed	Senior Engineer, Head chief of planning dep.
	Entissar Muzher Suhail	Center of study of engineering design
	Ghani Razzaq	DG reclamation
	Hamid Hussein Alwan	Manager of media
	Hasan M. AlSAFFAR	Deputy of DG of water resource management
	Hatem Hameed	Head of water control section
	Huda Ismaeel Khlil	Senior chief engineer
	Intisar Ali Mohammed	Assistant D.G
	Jafer K. Alwan	Chief engineer
	Jawad Kadim Badr	D.G. Legal
	Kifah Sadiq	MoWR Reclamation
	Mahdi Saleh Hussain	Head of grants – loans dep.
	Mazen Qaes Dawood	Senior engineer: operation and management
	Mohammed A Kadhim	MoWR
	MunadhiL F. AL-Mahdawi	Director general of water resource management
	Murad Mohammed	MoWR
	Nada Mohamed Shaker	MoWR Water extension section
	Nidhal Sabri Ahmed	MoWR Reclamation
	Raad FadhiL Amen	Training department manager
	Raheem E. Zamil	Senior chief engineer
	Salwa Abd Moslim	Senior chief engineer
	Serwan Abbas Hassan	Senior engineer
	Suhad Jassim	MoWR Planning
	Suhad Jassim Obeed	MoWR Planning
MoA	Ahmed Abdulhamza	Deputy of manager of plant
	Ahmed Nadhir	Engineer / Planning and follow-up department
	Ahmed Shaker Ahmed	Member in project of modern irrigation system
	Ali Jabber Abdul Hassan	-
	Ali Mousin Samari	-
	Ali-A-Ali	Production department; Assistant of chief department
	Firas Abd alumeer	Ministry of Agriculture
	Hussain Ali	Minister's adviser
	Mohameed Ghasib	Ministry of Agriculture
	Shawkat S. Jameel	Director of Agromet Center
MoP	Anwar Jamil Buni	Director General of international cooperation
	Aseel Aelel	Water resource engineer
	Aseel Awadh Abdul Haneed	Senior programmer
	Hamid Ali Abdulla	Head of follow-up division
	Mamdouh Nasser Moumdouh	Civil engineer
	Marwa Mahmood (Hiknet)	Ministry of Planning
	Maysoon Abd-Hjoud	Ministry of Planning
	Mohammed Jawad kadhim	Ministry of Planning
	Rana Saadi	Civil statistics
	Tareq Irhayyim Saad	Agricultural engineer
PMAC AI	Aun Abdullah	Senior expert
	Hssein Ali Jabir Al Wasiti	Acting director of the Agriculture Initiative
	Sadeq N. Jawad	Director water & agri. office
JICA Iraq	Ayuko Takahashi	Programme specialist
	Hayashi Hiroyuki	Senior reps
	Kumiko Uchida	Senior reps

Attachment 2 Field Survey Schedule

First Field Survey

Date		Destination	Purpose
2015/9/7 Mon			Departure from Tokyo
2015/9/8 Tue	AM		Arrival at Baghdad
	PM	JICA Iraq Office Conference Room	Explanation and discussion on the Inception Report and the Mission
2015/9/9 Wed	AM	Ministry of Water Resources (MoWR)	Explanation and discussion on the Inception Report. Information gathering
	PM	Ministry of Agriculture (MoA)	Explanation and discussion on the Inception Report. Information gathering.
2015/9/10 Thu	AM	JAAI seminar on Water Security and Food Security in Iraq	Meeting with local experts on the issues
	PM	PMAC Agricultural Initiative (PMAC AI)	Explanation and discussion on the Inception Report. Information gathering.
2015/9/11 Fri			Organizing of collected data.
2015/9/12 Sat			Organizing of collected data.
2015/9/13 Sun	AM	Ministry of Planning (MoP)	Explanation and discussion on the Inception Report. Information gathering.
	PM	MoWR Reclamation	Discussion on sectoral issues with related sections of the institute. Information gathering.
2015/9/14 Mon	AM	No movement	
	PM	Lunch meeting with Mr. Jafer, Mr. Raheem, @ Babylon Centre	
2015/9/15 Tue	AM	Ministry of Agriculture	Discussion on sectoral issues with related sections of the institute. Information gathering.
	PM	PMAC Agricultural Initiative (PMAC AI)	Explanation and discussion on the Inception Report. Information gathering.
		World Bank	Discussion on sectoral issues with related sections of the institute. Information gathering.
2015/9/16 Wed	AM	MoWR Reclamation	Discussion on sectoral issues with related sections of the institute. Information gathering.
	PM	Ministry of Environment	Explanation and discussion on the Inception Report. Information gathering
2015/9/17 Thu	AM	JICA	Reporting of progress.
	PM		Departure from Baghdad
2015/9/18 Fri			Arrival at Tokyo

Second Field Survey (1)

Date		Destination	Purpose
2015/10/5			Departure from Tokyo
2015/10/6 Tue			Arrival at Basrah
2015/10/7 Wed	AM	Dhi-Qar	Field visit & Farmer interview at Dhi-Qar WUA sub-project (Nasiriyah and Al- Zaidiya WUAs)
	PM	Dhi-Qar	Trial run of Questionnaire survey
2015/10/8 Thu	AM	Basrah	Field visit & Farmer interview at Basrah WUA sub-project (Piet Ghzayel WUA)
	PM	Basrah	Trial run of Questionnaire survey

Date		Destination	Purpose
2015/10/9 Fri		Basrah International Hotel	Workshop with governorate level PMT members
2015/10/10 Sat	AM	Al-Harth district	Field visit of candidate site of WUA sub-project (Al-Manthori WUA, Al-Harth sub-project)
	PM	Near Basrah	Field visit of drip irrigation site (Zubair)
2015/10/11 Sun		Basrah International Hotel	Workshop with central government officers
2015/10/12 Mon	AM	Al-Nashwa district	Field visit of candidate site of WUA sub-project (Al-Okaily WUA)
	PM	Shatt al-Arab district	Field visit of candidate site of WUA sub-project (Al-Jadeed WUA)
2015/10/13 Tue			Move to Baghdad
2015/10/14 Wed		JICA Iraq office	Meeting
2015/10/15 Thu			Departure from Baghdad
2015/10/16 Fri			Arrival at Tokyo

Second Field Survey (2)

Date		Destination	Purpose
2015/11/6 Fri	AM		Departure from Tokyo
	PM		Arrival at BIAP
2015/11/7 Sat	AM		
	PM	JICA Iraq Office Conference Room	Explanation of progress, discussion on the project formation.
2015/11/8 Sun	AM	Ministry of Planning (MoP)	Explanation of progress, discussion on the project formation, and information gathering.
	PM	Ministry of Agriculture (MoA) Karada	Explanation of progress, discussion on the project formation, and information gathering.
2015/11/9 Mon	AM	Ministry of Water Resources Head Quarter (MoWR HQ)	Explanation of progress, discussion on the project formation, and information gathering.
	PM	PMAC Agricultural Initiative (PMAC AI)	Explanation of progress, discussion on the project formation, and information gathering.
2015/11/10 Tue	AM	Ministry of Planning (MoP)	Discussion on the project formation, and information gathering.
	PM	Ministry of Agriculture (MoA) Karada (cancelled)	Discussion on the project formation, and information gathering.
2015/11/11 Wed	AM	Ministry of Agriculture (MoA) Karada	Discussion on the project formation, and information gathering.
	PM	Ministry of Planning (MoP)	Discussion on the project formation, and information gathering.
2015/11/12 Thu	AM	MoWR Reclamation (towards north of the highway)	Discussion on the project formation, and information gathering.
	PM	MoWR Reclamation (continued)	
2015/11/13 Fri			Departure from Baghdad
2015/11/14 Sat			Arrival at Tokyo

Third Field Survey

Date		Destination	Purpose
2015/12/4 Fri			Departure from Tokyo
2015/12/5 Sat		JICA Iraq Office Conference Room	Arrival at Baghdad Explanation of progress, discussion on the project formulation.
2015/12/6 Sun	AM	Ministry of Water Resources Head Quarter (MoWR HQ)	Explanation of progress, discussion on the project formulation, and information gathering.
	PM	Ministry of Planning (MoP)	Explanation of progress, discussion on the project formulation, and information gathering.
2015/12/7 Mon	AM	MoWR Reclamation (towards north of the highway)	Explanation of progress, discussion on the project formulation, and information gathering.
	PM	Ministry of Agriculture (MoA) Karada	Explanation of progress, discussion on the project formulation, and information gathering.
2015/12/8 Tue	AM	MoWR Reclamation (PMT Workshop)	PMT Workshop
	PM	(Continued)	
2015/12/9 Wed	AM	MoWR Reclamation (PCM Workshop)	PCM Workshop
	PM	(Continued)	
2015/12/10 Thu	AM	MoWR Reclamation (PCM Workshop)	PCM Workshop
	PM	(Continued)	
2015/12/11 Fri			
2015/12/12 Sat			
2015/12/13 Sun	AM	Ministry of Agriculture (MoA) Karada	Discussion on the project formulation, and information gathering.
	PM	(Continued)	
2015/12/14 Mon			Departure from Baghdad
2015/12/15 Tue			Arrival at Tokyo

Fourth Field Survey

Date		Destination	Purpose
2015/1/22 Fri			Departure from Tokyo
2015/1/23 Sat		JICA Iraq Office Conference Room	Arrival at Basrah Discussion on the survey.
2015/1/24 Sun	AM	Misan	Field visit & Farmer interview at Abu Bshoot WUA
	PM	(Continued)	
2015/1/25 Mon	AM	Basrah	Field visit & Farmer interview at Al-Okaily WUA
	PM	(Continued)	
2015/1/26 Tue	AM	Amman	Move to Amman
	PM	JICA Amman Office Conference Room	Discussion on the survey
2015/1/27 Wed	AM	Jordan valley	Field visit to drip irrigation project
	PM	(Continued)	
2015/1/28 Thu	AM	Hotel Conference room (PDM Workshop)	PDM Workshop (1st day)
	PM	(Continued)	
2015/1/29 Fri	AM	Hotel Conference room (PDM Workshop)	PDM Workshop (2nd day)
	PM	(Continued)	
2015/1/30 Sat		Bagdad	Move to Bagdad
2015/1/31 Sun	AM	Ministry of Water Resource (MoWR)	Workshop on WUA project at MoWR
	PM	(Continued)	
2015/2/1 Mon	AM	Ministry of Agriculture (MoA)	Courtesy call to minister of MoA
	PM	-	-
2015/2/2 Tue	AM	JICA Iraq Office Conference Room	Discussion on the survey
	PM	Dubai	Move to Dubai
2015/2/3 Wed			Arrival at Tokyo