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Increasing Crop Productivity; From the Prospects of New Community-Based Institutional Settings in Irrigation Management - A Case Study of Surkhrud Dobandi Canal, Nanagarhar, Afghanistan

Research Project Submitted to the Van Hall Larenstein University of Applied Sciences-Part of Wageningen in the Partial Fulfilment of the Requirements for the Degree of Master of Development, Specialization Rural Development and Food security

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ABSTRACT

In Afghanistan on-farm irrigation water is managed through informal community based irrigation system. Recently in January, 2011 process of formalization of community based irrigation management initiated in parts of Afghanistan including the Dobandi kanal, Surkhrod district, in eastern region. It was to build a formal setup of community based irrigation system.

The informal traditional irrigation system is no more effective in the maintenance and operation of irrigation system. It has limited the accessibility of irrigation water at field level. It is not effective through proper operation and maintenance of irrigation infrastructure to ensure equitable access of water to famers along the canal (up/mid/downstream)

In the study the formal setup of community based irrigation management system were studied and possible impact of formalization in the irrigation water accessibility through better operation and maintenances of irrigation structure and its ultimate impact on the crop productivity in the command area of IA.

While assessing it is observed that the formal institutional setup of IA answers the questions in the accessibility of irrigation water and potential of crop productivity at the farm level, which community based informal irrigation management was unable to solve. It is revealed that through IA setup the farmers have better access to irrigation water in their farms through better management of irrigation infrastructure maintenance and operations along the canal.

The setup of IA has overcome the basic constrains which traditional community based irrigation system was unable to solve in the current circumstances, particularly the operation and maintenance of irrigation infrastructure. With limited access of irrigation water, it has ultimately badly affected the farm crop productivity. But still IA setup has few shortcoming which based on the finding is substantial for the improvement of access of irrigation water to farmers at their farm gate**.**

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List of abbreviations

NSP	National Solidarity Program
CDC	Community Development Council
DDP	District Development Council
FAO	Food and Agriculture Organization
USAID	United States Agency for International Development
IA	Irrigation Association
WUA	Water User Association
WFP	World Food Program
NRVA	National Risk and Vulnerability Assessment
PERSMAIA	Procedures on the Establishment, Registration, Support and Modality of Activity of Irrigation Associations
MAIL	Ministry of Irrigation and Infrastructure Ministry of Agriculture, Irrigation and Livestock
MEW	Ministry of Energy and Water
WB	World Bank
AREU	Afghanistan Research and Evaluation Unit
ARTF	Afghanistan Rehabilitation Thrust Fund

Increasing Crop Productivity; From the Prospects of New Community Based Institutional Settings in Irrigation Management - A Case Study of Surkhrud Dobandi Canal, Nanagarhar, Afghanistan

CHAPTER ONE: BACKGROUND OF THE STUDY

1 Introduction

Afghanistan's current government policy is to empower local communities to manage and allocate resources at local community level. The goal of empowerment of local communities is to strengthen communities to manage development intervention effectively, involve them to prioritize their own need and plan allocation of resources. Through mega programs like National Solidarity Program (NSP) grass-root level of empowerment of local communities is undertaken. (A. Nagl et al., 2009). The local communities are formally organize at village, district and province level and are formulated into legal structure and operation. Under the mandate of NSP at village level community development councils (CDC) are developed and institutionalized. In hierarchy structure at district level District Development Council (DDC) and at provincial stage Provincial Development Councils (PDC) are developed.

The adaptation of community base development process was effective and encouraging in Afghanistan development scenario of Afghanistan National Development Strategy. Central government is weak to manage post-conflict rural development and food security interventions in Afghanistan context. It was not able to lead government-driven management system to manage local communities' needs and allocate resources effectively and monitor the on-going activities. It has limited capacity and capability to be an influential actor in the irrigation management system.

In Afghanistan, traditional community set-up is with strong coherent social interaction. The communities functions through informal existing customary rules and regulations. This is why mainly the irrigation canal of water distribution is managed locally through communities. It has estimated that Afghanistan has potential of 8.3 million hectares (10000m2 in one hectare) of arable land out which 5.3 million hectares is potential irrigable. Of which only 1.3 million hectares is currently irrigated. (ANDS, 2008). Currently Afghanistan has 3 million hectares of irrigated land and 3.5 million hectares of rain-fed area. On the other hand, only 1/3 of irrigated land is not planted. It is not planted as indeed it is not possible to irrigate it. Out of total irrigated land only 10 percent is irrigated using proper irrigation system the rest is irrigated using traditional irrigation manage systems through local communities, (FAO, 2003). The irrigated land has three times the productivity compare to rain fed agriculture land. The role of community in this sense is vital as Afghanistan is highly agriculture backed country. For the development of country it provides a sound ground to organize and institutionalize the existing traditional rules and regulation for better functioning of community irrigation system.

In traditional system, on-farm irrigation water is managed at village level by *Mirab*."In the research literature, the term "mirab system" is used extensively yet precise definitions are never given. Some studies (Lee, 2007) provide explanations about the traditional role of the mirab as a service provider and the arrangements for water allocation and maintenance work". *Mirabs* are water masters have the responsibilities of distributing water over farmers and handling the operation and maintenance of water infrastructure. Through *Mirab*, water is distributed according to local tradition and agreement between farmers. The management and distribution of irrigation water various from community to community and from region to region. the water is mostly commonly distributed looking the upstream downstream

farm, where upstream farms get priority to water access, and in some regions the water is also shared on timely bases, for example every farmer gets two hours of irrigation supply to their farm. Of course all this distribution depends on season and water availability. Water users maintain this water management system by agreed share financiers and organize labor according to tradition and long accepted norms based on customary law. Village elder customary handle water disputes and apply customary laws.

Mirab system passed over several changes through the course of history (Vincent Thomas and Mujeeb Ahmad, 2009). Traditional Mirab irrigation system lacks formal institutional and organizational set-up to efficiently respond to the needs of farmers. It is not well organize and well manage at community level to face new challenges in the operation and maintenance of irrigation system as well as the fulfilment of unprecedented food demand for the growing population (USAID, 2006). Canals passes through several villages, where there are different water uses as well as different crop cultivation and water management practices, upstream farmers does not consider the downstream water needs and traditionally the weak Mirab has very little control over these issues.

To cope with the aforementioned challenges, the government has taken initiatives to support the *Mir*ab system with newly established Irrigation Associations (IAs) and Water User Associations (WUA). Irrigation Association function along the secondary and tertiary canal, manage the maintenance and operation of canal and engaged in on-farm irrigation water management practices with farmers while Water User Association operate along the Main-canal (water source) and manage the maintenance and operation of canal and water among the water users at the Basin and Sub-Basin and canal level.

These community-based water associations (IA & WUAs) are also members of the Community Development Councils (CDCs) as well as part of the Cluster of Community Development Counsels (CDCs). CDCs are sub-national governance structure committees in Afghanistan comes through election process at village level. They are involved in community-driven development in different domains. While cluster CDCs are representation of CDCs at district level. From community prospective, these Associations are a transform structure of community based organization to replace the *Mirab* system for the better management of challenges in water distribution among water users and operation and maintenance of physical water infrastructure.

A number of *Mirabs* functioning along the river/irrigation channel are members of these Associations. They are organized based on the catchment area of the canal from the number of villages along the Main-canal, secondary and tertiary canal with legal identity, formal organizational structure capable to cope with changing demand.

Irrigation Associations (IA) is engaged with farmers through participatory management to take responsibilities of On-farm water management for equitable distribution at secondary and tertiary canal (on-farm) level. Operation and maintenance of irrigation channel remain their main responsibilities to improve crop productivity. They take holistic approach from the community prospective to manage better irrigation water and are organized to face challenges which *Mirab* system was not able to handle.

1.2 The Research Design

This section of the research enlighten the problem statement, briefly discuss the problem encourage in the on-farm irrigation management system in the Afghanistan, this section is key to research. Formulate the objective of the research and rise questions for the finding. It talks about justification of doing research in the specific above mentioned topic and importance of finding in Afghanistan context. Discuss the conceptual frame work to conceptualize the key concept use in the research. Finally the outline of the research is presented for the easy fallow up of reader.

1.2.1 Problem Statement:

Mirab system was not sufficiently capable to meet the new challenges to handle new technological requirement for the management and maintenance of irrigation system. To cope with the challenges, IAs came into being. Under the Associations, there is initial assessment shows suggested evidences that this new institution will ensure more accessibility of water to the farmers (USAID, 2006), yet this argument is not support by any ground research. The initial literature review reveals that availability and accessibility of irrigation water under *Mirab* system was limited, a large portion of arable land remains barren due to no available water at farm level. Ultimately the productivity at farm level suffered and had consequences for individual farmer's household food availability. This was mainly because of the lack of proper infrastructure maintenance and poor management practices (Thomas and Ahmad, 2009). In addition to improve irrigation services, the establishments of Associations also intend to extend the influence of the central government over local communities. Though the establishment of IAs does not totally means the abolishment of *Mirabs*, but *Mirabs* are supposed to be part of each Association. This raises many questions on how the *Mirabs* is fitted in the new organizational set up. There is also a need of research if any improvements are being observed at the farm level. For instance if the farmers have more access to water or better services compare to the *Mirab* system times, and also if the food productivity at individual famer's household has improved. Irrigated land area increased in Association command area, crop diversification because of availability/shortage of irrigation water, and crop failure due to improper management of irrigation water.

After the establishment of Irrigation Associations (IAs) very little research has been carried out to assess the IAs as if the irrigation services have been improved. This research intends to assess the organizational setup of newly established IAs as well as the improvements in the availability and accessibility of water at farm level, if any. The study will further assess if the famers have observed any improvement in their crop productivity.

The proposed site for this study is Surkhrud Dobandi Canal, located in Eastern Afghanistan in Nanagarhar province to study 3 established IAs along the canal in the district.

1.2.2 Research Objectives:

This study intends to optimise the effectiveness of the organizational set-up of newly established Irrigation Associations (IAs) to identify the effectiveness of Irrigation Associations in the Community-based water management to ensure that the initial objective of this change, improving crop productivity by the improvement of water accessibility is achieved on the Dobandi Surkhrod Canal.

1.2.3 Research Questions:

Main Research Question One:

How far the existing institutional set-up of Irrigation Association is successful?

Sub-research questions

1.1 Does the organizational set-up/structure of newly formed Irrigation Association is adapted to local condition?
1.2 What is the community perception of the institutional set-up of irrigation Association?
1.3 What is the community perception of the effect of about the evolution/formulization of Irrigation Associations?

Main Research Questions Two:

Does the new institutional set-up improve irrigation water accessibility for crop farmers in the Irrigation Association administrate area of the canal?

Sub-research questions:

2.1 What are the role and responsibilities of Irrigation Association in the distribution of irrigation water?
2.2 What are the responsibilities of Irrigation Associations in the operations and maintenance of current available irrigation structure?
2.3 Will the access of farmers' to irrigation water be improved?

Main Research Questions Three:

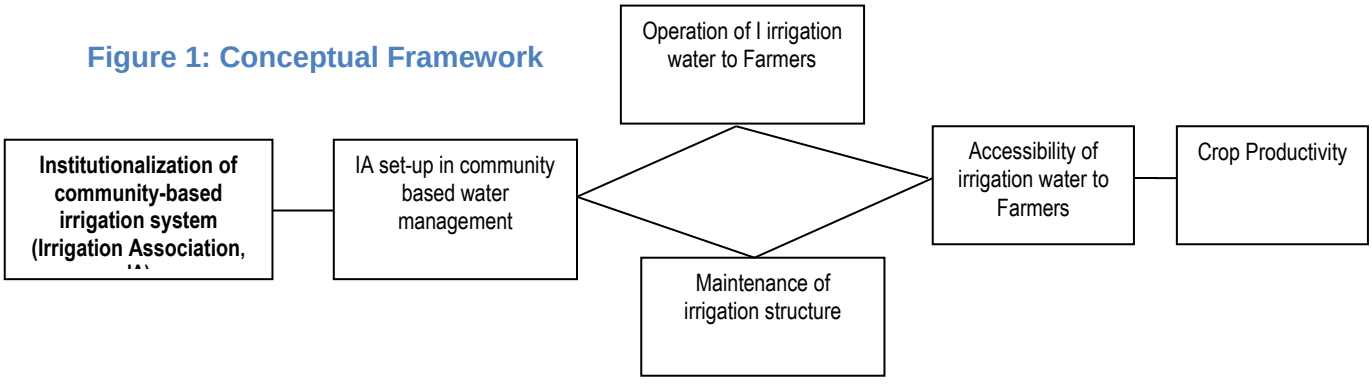
Will the productivity at farm level increased with newly established IAs?

Sub-questions:

3.1 Will the cropping pattern be changed because of access or shortage of irrigation water?
3.2 Will the successful crop production/failure increased?

From the main and sub-questions of the research a conceptual framework is developed. In the conceptual framework the fallow-up of the research objective is further pinpointed. Irrigation Association a formalized community-based organization, being studied structure/set-up of formalization, its impact on irrigation water accessibility through operation and maintenance of irrigation infrastructure, its effect on crop productivity in the target area.

Figure 1: Conceptual Framework



1.3 Justification of study:

The Ministry of Agriculture, Afghanistan in January 2011, established Irrigation Associations in different parts of the country with the financial support from the World Bank. The project is called On-Farm Water Management project. Very little research has been done to assess its effectiveness and community perception about its establishment. The finding of the research will help in understanding the perception of the community about this new institutional setting as well as the changes observed in the field. The study will also assess how to optimize formulizing of IAs that could be adapted to local condition for the effective operations and maintenance of irrigation infrastructure. It will help to develop polices and strategies about IA compatibility to local environment to increase the availability and accessibility of irrigation water to farmer for successful crop production. It is vital as Afghanistan fall in semi-arid climate zone and annual precipitation in Eastern region, Nangrahar is not enough for the successful harvesting of stapl crop wheat (USAID, 2008).

1.4 Research Outline

This study is classified into five main chapters. The chapter one cover the background information to the study, key components of the research designed; problem statement, research objective, the research main and their respective sub-questions are included in sequences. It further elaborates the justification of the study and its importance in current Afghanistan development scenario and the key concepts used in the research. In Chapter two Literature review elaborates the key concepts and terminologies evolved in the research. The Literature review revolves around main topics touched in research Objectives and Main questions are pinpointed in the search proposal conceptual framework; are community-base irrigation management organization in Afghanistan, its role in irrigation water accessibility to farmers through maintenance and operation of irrigation system and its effect on crop productivity. Chapter three, highlight the research methodology in details. Discuss Description of the study area, General Methodology, sampling procedures, sources and tools of primary and secondary data collection, data processing, limitations and assumption take place in research in details.

Chapter four presents the empirical finding of research and discussion based on the finding. The thesis report windup with chapter five, formulates the conclusion and recommendation.

2 CHAPTER TWO: LITERATURE REVIEW

This chapter present a concise overview of the earlier studied carried out in Afghanistan community-based irrigation management practices, and its adaptation to changes through course of history and its role in irrigated Agriculture in Afghan's food security, moreover discuss the concepts and role irrigation systems, accessibility to irrigation water, its impact on crop productivity; also reviewed the sampling method used in the research.

2.1 Sampling

There are many methods of data sampling each has its own characteristics, is specific in a technique of data collection and feasibility to applied in the field to find results. The simple random sampling method has feasibility and applicability to collect data from research population/subset of population from a large accessible population with similar characteristics within available time resources-frame. The most common method to proceed with simple random sampling is the Lottery method in which each member of accessible population has opportunity to selected randomly (Joseph 2009).

Simple random sampling method was selected to conduct field research. In a simple random sampling method each member of irrigated land farmer's population at watercourse has equal chances to be selected as a subject of study. It is representation of population and unbiased randomly selected for conclusion of results and was the main focus of research.

Research population in the field study has similar characteristics in, was a large collection of individual irrigates land farmers and was well-defined members of irrigation water recipients at tertiary canal watercourse.

The simple random sampling method was employed as it was not possible to collect data of all individual/test in the target population of farmers having irrigated land at watercourse. A sample of irrigated land farmers was selected randomly as subset of population and is representative of entire population from which it is drawn. it was done based on the availability of time and resources.

Case study is conducted to find in-depth information about a unit. Intensive analysis of an individual unit/case is conducted. It is most commonly use in social and life sciences. It more focus on descriptive and explanatory aspect, but still in case study methods can use quantitative data as an access to databases and other sources of objective information. (E.Stake, 1995)

2.2 Irrigation in Afghanistan

In the field site Surface irrigation was practiced. The site is included in the Indus river basin, one of the five river basins in Afghanistan. Indus river basin is contributing to surface irrigations in eastern part of Afghanistan. Surface irrigation contributes to more than 70 percent of Afghanistan crop production. At the river basin level irrigation water is managed through (a) formal irrigation system (b) Informal irrigation system. Formal irrigation system is introduced onward 2004. The formal irrigation system was developed in the form of Water User Association (WUAs) and Irrigation Associations (IAs). The WUA is developed and operate at the river basin, sub-basin and main canal level (water sources). WUA is comprised of five main stakeholders, (1) Irrigation Associations (2) Energy production users (3) Industry users (4) Domestic water use and (5) Environmental protection. At the start of 2011, IA was established at the on-farm / tertiary canal level water to promote and secure equitable water distribution among farmers,

operation and maintenance the physical irrigation infrastructure at tertiary canal. IA has literally linked with WUA and has membership in the executive committee of it (USAID, 2006).

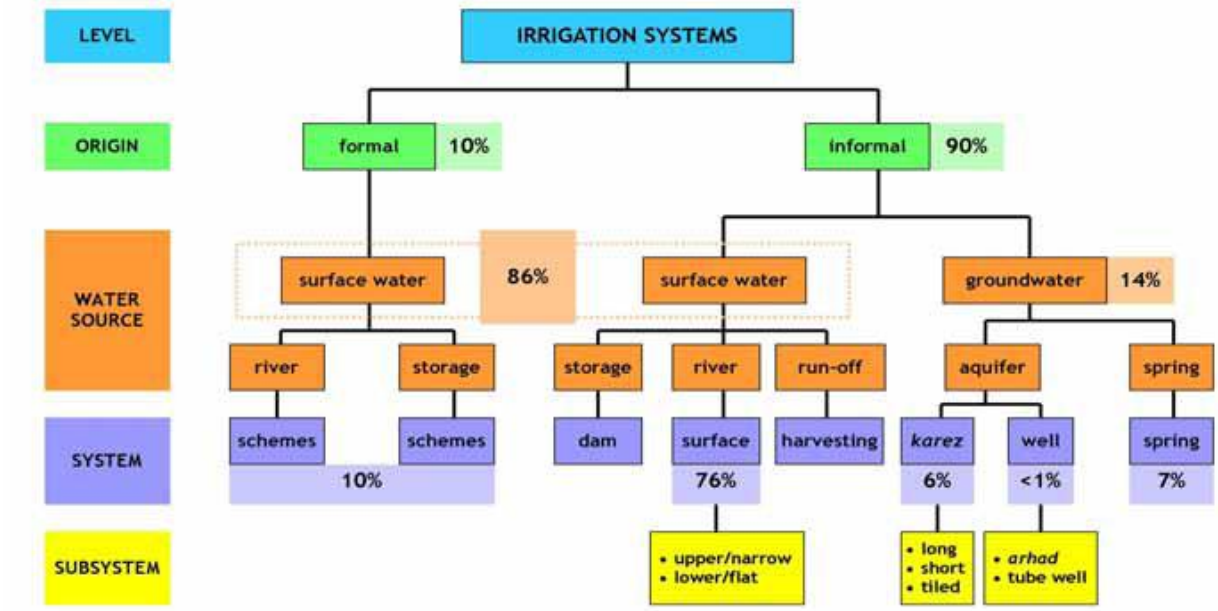
Informal or community-based irrigation system; it operate and maintain irrigation water through communities and function as an autonomous unit, with little or no intervention from the state. 99 percent of Afghanistan on-farm irrigation is managed through community based irrigation system. Its management is largely supply driven, sensibly it depend and varies with timing and duration of year and with access to amount of water System (Rout, 2008).

Irrigation channels, its diversion points are badly damaged in past conflict and require reconstruction and rehabilitation. The community management system is not effective to improve surface irrigations. (Rout, 2008)

Surface flow is peaked during late spring and summer follow the melting of snow. The snowfall occurred during winter in high elevation points in the November till January end. The snowfall calendar depends in different areas elevation.

Surface irrigation supply up to 86 percent of total irrigated land. During planting season from May to January the high demand for irrigated water in irrigated land increased as a result of less precipitation.

Figure 2: Irrigation systems in Afghanistan



Source: Afghanistan Research and Evaluation Unit (AREU)

Data in the figure revealed that 90 percent of irrigation water in Afghanistan is managed through informal system at the on-farm /tertiary canal application and 10 percent of it managed through formal irrigation system (in the form of only at big government schemes). Virtually by number 99 percent of all country irrigation system is managed through local community management systems.

The establishment of IAs in Afghanistan is in the introductory stage. Few are established in the parts of Afghanistan by the Ministry of Agriculture through project "On-farm water management Project". In Surkhod district only 3 IAs are established along the Dobandi canal. The rest of canals in the district are managed through informal irrigation management system. The data revealed in figure 2 is virtually applied in the surkhrod district.

2.3 Community-Based irrigation Management system in Afghanistan

In Afghanistan community irrigation management systems counts up to 90 percent of country's irrigated land. it is estimated that there are nearly 2,9000 community based irrigation systems in Afghanistan. Such system has being developed, managed, owned and operated through local communities accordance with accepted traditionally recognize norms and laws. It exists for generations. (Thomas & Ahmad, 2009).

It organizes labour, rise finances; uphold water sharing agreements, individual water rights through traditional norms based on customary law. Although customary laws different from community to community and even from watercourse to watercourse along the canal. But the principles of community-based irrigation water management is same at country wide (Lee, 2007), changes are accepted to cope with the water availability and accessibility.

According to Lee, The process to administrate irrigation water through customary laws is performed and enforced jointly through its stakeholders within community. It is a collective process of monitoring and self-policing of irrigation water along the canal.

The irrigated land owners with consultation and canal networking elect an individual among themselves called *Mirab* or water master as one of main stakeholders in the community irrigation water management, it act as a supervisor at primary canal water distribution and allocation. The number *of Mirabs* along the irrigation canal communities is based on the size of canal and irrigated land within canal. The *Kuk Bashi* (Assistants) to *Mirab* are selected further down the canal communities and are responsible at one or more tertiary canals at village on-farm management. This process depends on the size of canal, irrigated land and communities with in canal.

The second stakeholder is the irrigated land owner farmers. It acts as an important actor in the community water management at on-farm level, monitoring the performance of *Mirab* and has role in the selection of it. The third stakeholder is the community *Shura* or council who is comprised of community elders and influential people in the community who act as a catalyst in the irrigation management performance along the canal. The *Mirab* and *Shura* is the primary responsible of upholding Water Sharing Agreements among communities *(hashar ab).* According to Rout, 2009 report, the election process of *Mirab* through communities is not transparent any more. It is influenced by warlords. In cases they select a person of their choice and will.

Financially, the irrigated land owner at canal has to support the community management system. Traditionally payment is made in a single, annually to *Mirab* as a determined proportion amount of wheat (or cash equivalent to predetermined amount of wheat). The amount is mostly done on annual basis and traditionally at the end of solar year or per crop if multi-cropping is practised, however, some water master may accept payment equivalent to the sum of wheat. The specific amount of wheat/cash is given to respective community Mirab and it's Assistant for its services in water distribution and is fixed with the size of land. The amounts vary from community to community.

Maintenance of physical irrigation infrastructure is performed through community based agreed norms and traditional work-share system called *Hashar kar*. It is organized on need basis. In its organization all three main stakeholders of community irrigation managers take parts and consultation. The free labour quota/ share in the maintenance of irrigation infrastructure is connected with the land size of irrigators.

The construction is limited to off-take of primary canal. Off-take is constructed with mud, stones and sand bags. It mainly takes place on annual basis and siltation of canals take place based on requirement. According to Rout, 2008 report, the financing, organization, and technical support for the maintenance of irrigation infrastructure are limited and inadequate. Lee explained it as a lack of inter-community solidarity and ineffective government enforcement to support it.

Operations of irrigation canal depend on customary rules and regulation based on water sharing agreement develops through communities. *Mirab* and *Shura* are the primary responsible for upholding Water Sharing Agreements along the canal and on-farm level water allocation and distribution. The amount of water and period of sharing rotation depends on developed agreed customary rules. Different terminology is used for the amount of water sharing and rotation system and it vary from watershed to watershed. The principal behind all these terminologies are same. To allocated water in proportion to land owners. The amount of water and period of rotation is based on the size of land within each watershed. Each land owner has access to irrigation right known as water right for X hours within X days, where the day is counted in 24 hours in most cases. Landowner's water right is measured through traditional units of measurements. Various traditional measuring unit of land's water right is used and is different from region to regions. These traditional units measure the landowner's water right is predetermine and pre-recognised among communities like *Juftgaw* (A pair of Yoken oxen) is a pre-determine unit of measuring land's water right (one juftgaw is equivalent to 120 jerb or 24 hac of land) a or *Pau* (equivalent .44 kg) a local recognized and standard unit of wheat for per *Jerb*(0.5 hac) land cultivation. Based on these traditional measuring units each canal and land owner is entitled to certain amount of time and rotation duration of water allocation within 24 hours. Depend on the measurement of these traditional units each canal irrigating specific amount of land in a community (the size of land is measured through above mentioned traditional units) is entitlement of certain amount of water with in specific time of rotation of irrigation water between communties. These traditional water allocation and measuring units per size of land is applied within primary, secondary, head/tail and on-farm water users. This amount and period of water rotation is hold through communities by customary laws called *hashar ab* (water sharing agreements)

Table 1: Percentage of water right for the Punj Buluk canals according to different Water Sharing Agreements *(hashar ab*) with the Marwa canal

Canal name	*Juft-faw*	% of water allocated	hours of water on 7/3 turn (nobat)	hours of water on 6/3 turn (nobat)	Hours of water on 5/5 turn (nobat)
Pusht-i-Zarghan (or Shaflan)	170	40.5 %	29 hrs 15 min	38 hrs 45 min	48 hrs 30 min
Atishan	120	28.5%	20 hrs 30 min	27hrs 30 min	34 hrs 15 min
Fushkan	40	9.5%	6 hrs 45min	9hrs 15 min	11 hrs 30 min
Kambarag	90	21.5%	15 hrs 30min	20 hrs 30 min	25 hrs 45 min
Total	420	100%	72 hrs	96 hrs	120 hrs

Source: Afghanistan Research and Evaluation Unit (AREU)

Atishan is the primary Canal of Rari Rod River in the Herat province, Afghanistan. It suffered from severe community-based water sharing agreements (*hashar ab*) disputes. Atishan canal is one of the five primary canals of lower Hari Rod river, these five canals of lower Hari Rod is named as Punj Buluk. The Atishan canal operates through water sharing agreements (*hashar ab*) with its five adjacent canals of Punj Buluk. Under the water sharing agreement Atishan canal was entitled to 28.5 % of Punj Buluk's water. The Punj Buluk has water sharing agreement with upstream Marwal canals block, of which Marwa is the most important. Under the Water-sharing Agreement between Punj Buluk and Marwa, water rotation is based on 5 days for Punj Buluk and 5 days for Marwa within 10 days rotation period. But this customary agreement has broken down by the upstream Marwa water users. The 5/5 Water Sharing Agreement is not honoured anymore, in 2006 the Water Sharing Agreement was operated as 7/3 in the favour of Marwa canals. under the 7/3 rotaion Atishan receives 20 hrs 30 min in each 10 days and under 5/5 rotation it received more than one and half days of water as illustrated in Table 1.

Table 2: Water rights of the Athishan canal communities (the secondary canal)

Settlement Name (head to tail)	Jaftgaw entitlement	Percentage of canal water
Gawashk	6	5 percent
Postin	6	5 percent
Turan	12	10 percent

Aliabad	14	11.67 percent
Qala0i-Nawak	4	3.33 percent
Qala-i-Hajji Jahangir Khan	2	3.33 percent
Tunia	2	1.66 percent
Khalish	20	16.67 percent
Ali Afghan	14	11.67 percent
Jinda Khan	20	16.67 percent
Total	120	100

Source: Afghanistan Research and Evaluation Unit (AREU)

In Athishan canal, *Mirab* with consultation of *Shura* decides the number of minutes and hours to each landowner applying the same water distribution procedures and units (as illustrated in Table 2). The entitlement to each landowner depends on the amount of water allocated from Marwa canal. Moreover, It is hard for *Mirab* and *Shura* to predict the amount of water to be received in each rotation during water scarce period, to calculate the water right of each landowner within Athishan canal communities. It ultimately affects the accessibility of farmers to irrigation water.

In such a scenario, it is not able to provide irrigation water to the communities depends on it for irrigation. It was not always the same case, in the past it the Atishan canal community did intensive summer cropping, now it main relay on winter cropping of wheat and barley. One of the main reasons of not able to irrigate its watercourse is the break-down of water sharing agreements between Atishan and Marwa canal, the latter lies on the upstream of Hari Rod river.(Rout, 2008), criticized the performance of community-based irrigation system that during the low flowing period of the year, (May-November) water is limited to primary canal close to river and secondary and tertiary canal water access is limited.

Lee, criticized further the operation, maintenances and accountability of stakeholders in traditional water management. The maintenances of off-take is done through mud wall mostly annually and ad hoc and is not effective in water allocation and distribution. Distribution problem because of poor maintenance of channel and off-takes remains. Cross-flooding destroys the canal banks and required intensive labour to repair and landowner labour-quato is not sufficient to repair. Unlined canal takes much more time than it's required to reach to the downstream and a big portion of water loss take place**.** Rout, also reinforce the criticism and said the durability of structure is limited and is not able to control the peak flow. According to Wegerich, 2009 report, the system has high level of inequity in maintenance labour qauto-share and water allocation. Head Enders receives more water and are required to contribute less in the maintenance of canal and it is often the tail enders who has to clean until end up of canal and receives less water.

He further criticized the operation of irrigation water between primary-secondary canals, upstream and downstream communities, water masters and land owners. Rotation period agreements are dated back to many decades and are not upholding in communities and are unclear. The customary agreement has broken down and communities not respect them anymore and raised disputes among communities. In communities irrigation management along the canal the water- sharing agreements are broken down. Water distribution is not restricted to specific time. Disputes raised in rotation and period of rotation. In most cases the upper water

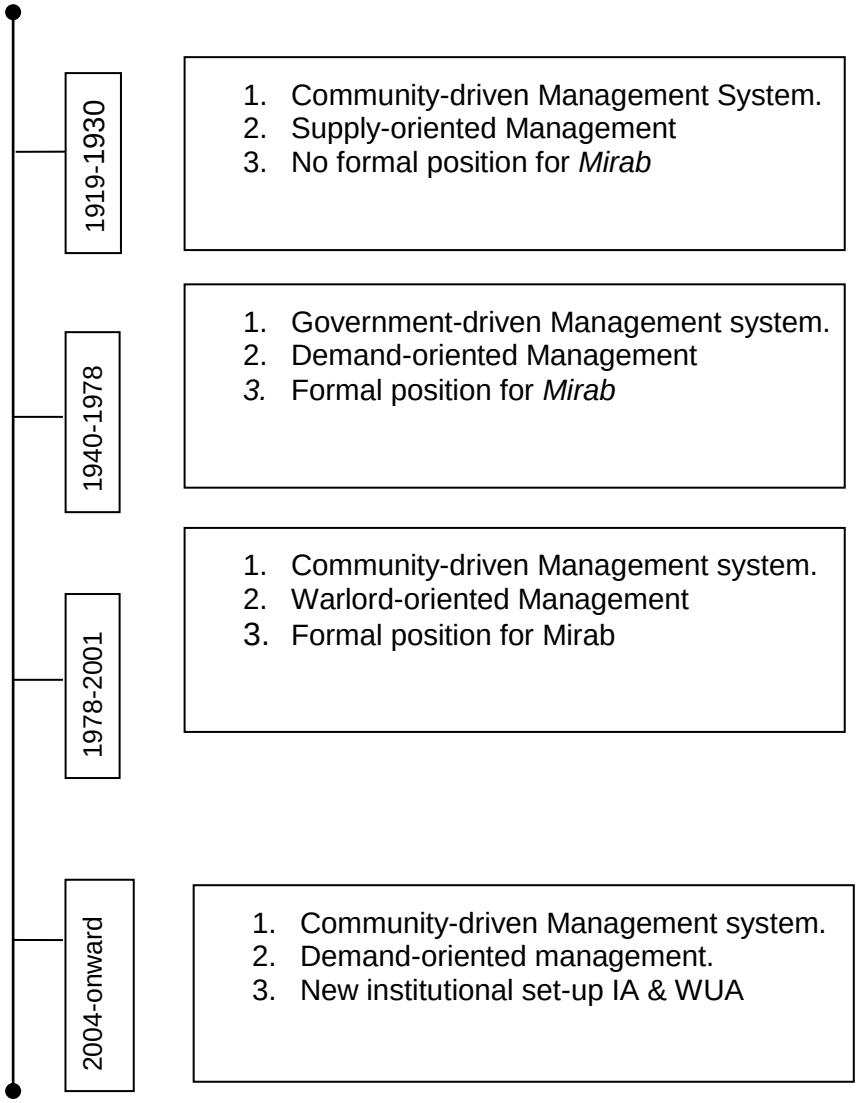
users not respect the turn and duration down streamers. They use water on their fee will and reduce the turn duration of down streamers along canals.

According to Rout, *Mirab* being an important stakeholder, many cases of taking bribe in order to take additional water and cases of turn blind eye on water stealing come to surface. a proper system of accountability for *Mirab* is not in placed because of weak inter-community solidarity and ineffective government enforcement.

2.4 Adaptation of Community-Based Irrigation Management system in Afghanistan through course of History

The traditionally community-based irrigation management systems in Afghanistan passed through several phases through course of history. It underwent through many social and physical changes for better adoption to the test of time (Thomas and Ahmad, 2009).

Figure 3 : History of irrigation water management in Jangaroq canal, Afghanistan



Author, present the Jangaroq canal in Baghlan , Afghanistan as a case, which went through major social and structure change through course of history (Figure. 3). During the period of 1919-1930 the management characteristics of Jangaroq canal was supply-oriented. In this phase of development water was in excess and the demand of water of land owners were met by the excess amount of water at plot level. There was not need to define water right as well as no need for a particular position to manage water. An informal organization under community elders was sufficient to mange. There was not a specific position for *Mirab* during this phase. The maintenance of canal was limited and it was organized through community at ad hoc basis. At large it was solely community- driven management.

With the settlement of new immigrants from the south and increased in the command area of the canal, a second phase of development took place. During this phase Government initiated necessary regulations to meet the increasing demand of water. These regulations were largely based on the cropping pattern to keep interest of the Government for its overall production strategy and to ensure water distribution in the canal command area especially the downstream water users. It was somehow government-driven managements system. A formal position for *Mirab* was placed in this era. *Mirab* was selected through communities under the supervision of Agriculture department. The *Mirab* act as a watch dog of Agriculture Department; it ensured the water distribution among farmers and oversees the Government regulation defined along the canal. It was called the **Golden Period of *Mirab***. It would be more accurate to call this period Jointly-management system as water users select *Mirab* under the supervision of Agriculture department. Water rights was defined during this period and imposed. Water was distributed in canal with proportion of water right of each and individual farmer. *Mirab* was selected through communities. Communities provided and defined collective maintenance, Labour for maintenances were contributed through communities through fair principles. Labour was control and mobilized through communities with the support of *Mirab* for canal maintenance. Water right of farmers was control and implement through communities among water users without external intervention of Government.

The third phase developed at the war with Soviet Union. The war triggers major changes in the system. The local government became weak and ineffective to reinforce and supervised the system. Was no more effective to supervise the *Mirab* and regulate the cropping pattern especially in the canal upper part. It has no more effective control over rival communities and groups, results with disintegration of the system. It was not a surprise that with the collapse of the state vacuum left was filled with new power-holders. These new power holders were local commander and warlords. They use water for their own benefit and influences among rivalries in water management. During this phase the system was managed at community level, traditional customary law and rules exists for collective maintenances, water allocation and water rights of farmers at the canal. A formal position for *Mirab* selection exists within communities along the canal and selection take place though communities. In this new system *Mirab* has limited control over key factors such has regulation of water demands and water rights of farmers at the upstream and lower canal. Active supervision from the local government was vanished of the *Mirab*.

Onward 2004; the community irrigation management system although had been passed through several drastic social and structure changes, still have the characteristics of a community-driven management system. It is still demand oriented to answer the excessive demand of water among water users and distribution between head/tail farmers. New development intervention was taken, it is decided to supervise the system as once it did by the Department of Agriculture and to made it compatible with changing environment. But one strong element of the system

was missing; it was a capable local government with capacity to actively participate in the community irrigation management system.

It was suggested to build on the already existing foundation of local community based institutions. Provide it formal structure with formal identity and support to improve the collective water management practices and governance. Lee argues that*" it is vital to build on existing community structure"* he further argued that there is no justification to abandon a framework who survived through generation. He urged that it is impossible to reproduce the *Golden Age* of the system during 70,s as one of the important element of the system an authoritarian and strong government capable of providing support as credible managing actor is missing.

A new model of the set-up is put together with collective diagnoses of the system. It is Irrigation Association (IA) and Water User Association (WUA). Since the model is on participatory process, put the farmers on driver's seat and promotes farmer role in decision-making process and a possible way for formulation. (Lee, 2006), Lee argues that collective/integrated water management approach should be adopted, it should be development of institutional set-up, technical and physical water infrastructure development, thus water accessibility to head/tail farmers and crop productivity can be increased.

2.5 Role of Irrigated Agriculture in Afghan's Food security

Afghanistan is one among the world most food unsecure country. The physical availability and productivity of food throughout the year and country's zones is limited. According to World Food Program (WFP, 2008) report, still one third of the population, approximately 7.3 million live under transitory and chronic food insecurity. (NRVA, 2007) .In 1970's 3.6 million hectares of irrigated cultivated land is reduced to 1.3 million hectares of land. In the past physical infrastructure and institutional structures were badly damaged including the structure of irrigation system. It needs holistic approach to rehabilitate to improve the performance and reliability of irrigation system through building institutional and infrastructure arrangement. Irrigated land per unit production is quite low to meet the food requirement of its population. One of the main causes of low production is the destruction of irrigation physical infrastructure and community irrigation management system that limited access of farmers to water. (Rout, 2008)

On the other hand, Afghanistan has 3.5 million hectares of irrigated land, out of it one third of it is possible to cultivate. It is due to lack of existing proper management of irrigation water, poor infrastructure. It limits the water supply to farmers. (FAO, 2003)

According to FAO 2001-02 annual survey reports, the conducted survey found that 4 % of farmers were not able to cultivate irrigated crop at all in their irrigated land, 58% were able to cultivate portion of their irrigated land, 9% farmers were not able to cultivate crop at all in their irrigated land (table.3).

Table 3: Distribution of Agriculture land according to actual use in 2001-2002, Percentage of Afghanistan Agro-ecological zones and regions irrigated land not cultivated by farmers at all, partially cultivated, cultivate all its land and unknown.

Villages with irrigation						
Extend of irrigated land actually planted in villages in 2001-2002						
		Partially planted				
	No irrigated land	Less than	More than	All	Unknown	Total

	planted	one half	one half	planted		
Total	3.9%	58.1%	28.8%	8.9%	0.2%	100.00%

Source: FAO, 2001-2002 Afghanistan report.

The report further described, the Eastern region which is taken as zone while calculating the agriculture irrigated land being planted partially, all planted and unknown. It was found that 56 % of its irrigated land is partially planted and 43.4 % is all planted which is the highest ratio of all planted irrigated land in the in the Afghanistan eight regions. When asked about the reason not to cultivate the irrigated land, 2/3 blames the lack of sufficient water at the farm level.

Wheat is the staple crop in Afghanistan. According to FAO survey report during 2001-2002 an estimated annual 2.1 million hectares of wheat arable land was planted (not necessary harvested). Out of total planted area 1,242,425 million metric tons were irrigated (table 4).

Table 4: Difference between cultivated and harvested area of wheat in 2001-2002

	Planted and harvested of irrigated wheat areas, in hectares, 2001-02		
	Planted in hectares	Harvested in hectares	Difference in planted and harvested in hectares
Total	1,242,425	1,196,126	4,6299

Source: FAO, 2001-2002 Afghanistan report.

Refer to table 4 calculations, Out of total 1,242, 425 irrigated land 1,196,126 was harvested (totally or partially), while 46,300 hectares of land totally failed. One of the main reasons explained by the farmers for the crop failure is the scarcity of on-farm water.

2.6 Improvement of Accessibility to Irrigation Water through IA

Compare to community irrigation management system, which run as an autonomous unit. The IA has a well development procedure for its establishment and registration. Its activities are well defined within the framework developed by the Ministry of Agriculture, Irrigation and Livestock (Procedures on the Establishment, Registration, Support and Modality of Activity of Irrigation Associations PERSMAIA, 2011). In the PERSMAIA, IAs are defined its tasks and responsibilities. Tasks assign to IAs, which causes to limit the access of irrigation water to farmers. Within responsibilities which are assign to IA is control of illegal use of irrigation water along the canal, removal of illegal obstacles along the canal, control of illegal activates which effect on the quality and quantity of irrigation water. Supervise and control water discharges for equitable distribution along the canal. Removal of blockage along the canal which limit the access of water rights to farmers. In case of blockage/limit the access of water rights to farmers along the canal, it consults to Water User Associations (function along the water sources) or relative government body for the demand of its water right. it has a literally linked with WUA.

According to FAO survey report, 2001-2002 (table 5) conducted country's eight agro-ecological zones and eight regions; high marks go to the insufficient accessibility to irrigation water. Community irrigation system is inter- community and has a specific sphere of influence and

control within community of which it developed. It has limited intra-communities influence and control. Its access is limited along the canal. It acts like **well's frog**. It has limited/no access to the sources of water along the canal. Results are the unequal distribution of water along the canal communities (Wegerich, 2009). Wegerich refer to famous Afghan proverb fit on the current allocation and access of water along the canal" ***better to be servant in the upstream than a king in the down stream area***". According to Lee, 2009; two important infrastructures were developed under the Kunduz River Basin Program. But access was still a problem until it had to negotiate with the upstream water users. in this case, IA seems quite efficient, as it is build along the canal, include all communities, upstream, midstream and downstream.

Table 5: Villages reporting various irrigation constrains in 2001-2202

	No irrigation in the village	Insufficient irrigation water	Silting of canals	Losses of water	Damaged infrastructure	Poor water management	Salinity	Other irrigation constraints	Total villages reporting
Total	35	409	172	158	202	107	18	13	493

Source: FAO, 2001-2002 Afghanistan report.

The second round goes to the damaged irrigation infrastructure and poor maintenance. According to Lee, 2009 report; community irrigation system has limited capacity and capability to recover of irrigation infrastructure. It is done on ad hoc basis. While the IA, being a legal identity is register with state. It has right to apply for government loan/grants for the maintenance of infrastructure. Moreover, it has access to donor agencies for grants as in PERSMA it is defined as a responsible legal entity having personal rights. It can proclaim its rights and can be reclaimed. More or less it is framed as a private organization can make business in water sector and has access to privatization benefit, being currently the policy of Afghan government to support private sector in overall. Silting and salinity results of Poor maintenance of canal effect the conveyance capacity of the canal. According to Lee, 2009; conveyance capacity is the key factor in the water availability at farm gate and demand and it is often threaten by siltation.

The third round goes to poor water management. According to Wegerich, main reason of poor community irrigation management is the dysfunctional structure of community elected body in water management. Mirab as one of the main stakeholder in community based management and supervisor of the system is not elected through fair means. Its selection is not more fair and democratic; the large land holding farmers and lords has more influence in its selection rather than poor farmers and sharecroppers. Moreover, Mirab is selected from downstream communities to ensure water access until end of the canal, which would than result in equitable distribution along the canal. It is some how selected from upstream communities. It not takes in consideration the allocation of water along the down stream farmers.

He further elaborated, that prior to rehabilitation channels and intakes it is necessary the communities agreed on future sharing of water and maintenance task. This can danger furthers the water distribution and maintenance. It might threaten the collective work along the canal and increase maintenance inequality.

But still in IA,s set up these issues are not addressed, the selection of its executive committee members along the canal are not specified to be selected in the part of canal. Moreover, the voting power of irrigation water users is not specified in the Procedures of IA establishment (PERSMAIA, 2011). Water rights of individual farmer and community need to be defined, but in current circumstances it is not possible as there is no water gauging and measuring system along the intakes of canals. Water availability also varies through season and development of such a transparent system need a high transparency cost. There exist not a carrot and stick approach and mechanism to enforce the decision taken by government and from IA to community water users/farmers.

The advantage of IAs is explored, the IAs have well literally linkage structure with water source. It has hierarchy model of down-up, it liberally linked with the federation of IAs of a specific region working for the rights of water users; furthermore, they are literally linked with Water users Associations (WUA) and is member of it. In this procedure they are linked with the accounted department of Government.

2.7 Improvement of crop productivity through Irrigation water

It is concluded from the 2001-2002 country survey beside other agriculture inputs (seeds, labour, machinery) the largely contributor to irrigated land left unplanted is the lack of access to irrigation water (table 6).

Table 6: Farmers with some Irrigated land left uncultivated during 2001-2002, Reasons for not cultivating

Why some irrigated land was left uncultivated (% of all affected farms)										
	% Farms affected	**Total affected**	**Lack of water**	**Lack of seed**	**Lack of labour**	**Lack of animal power**	**Fallow**	**Farmer absent**	**Soil salinity**	**Unexplained**
TOTAL	49.0%	100.0 %	**86.7 %**	29.2 %	6.1%	0.6%	0.5%	0.1%	0.3%	3.6%

Note: first column percentage relative to all farms. Other columns: percentage relative to all farms leaving some land uncultivated. More than one reason may be mentioned by the same farmer, thus rows don't add up to 100.

Source: FAO, 2001-2002 Afghanistan report.

The data further revealed that maximum duration of limited access to irrigation water is in summer. Ultimately effect the summer crop (may-oct) production. 362 villages are reported as has limited access to irrigation water accessibility (table 7)

Table 7: Village reporting insufficiently of Irrigation during 2001-2002 by period in which insufficiency exists

Period of irrigation insufficiently					
	Autumn			**Total villages**	Total villages in

	/winter	Spring	Summer	reporting	sample
Total	165	231	**362**	450	516

Source: FAO, 2001-2002 Afghanistan report.

The limited accessibility of irrigation water compel farmer to change their cropping pattern. According to FAO report (table 8).

Table 8: On-farm access to irrigation water effect on cropping pattern in Afghanistan 2001-2002

Irrigated land cropped 2001-2002 (hec)		
Total	**One crop**	**Two crops**
1,731,784	1,292,025	439,759

Source: FAO, 2001-2002 Afghanistan report.

3 CHPATER THREE: RESERCH METHODOLOGY

In this chapter of the research project presented the research procedure and tools used to acquire the required data and information on the research main and sub- questions to proceed further for finding of the study. It includes a general description of the study area and irrigation water management practices exist. It further discusses General methodology, sampling procedures, and data source, research tools used to collect primary and secondary data. Fallowed by briefly mentioning the limitation and assumption of the research and conclude by discussing data analysis tools.

The research design is empirical; cover both qualitative and quantitative data to acquire information both in depth and breath. A case study approach was deployed with structure and semi-structure questionnaire. The duration is the research is three months, started in June with the disk study for proposal development, practical work start in the 10th of July and wind-up at the 20th of August, followed by the submission of report in the month of September.

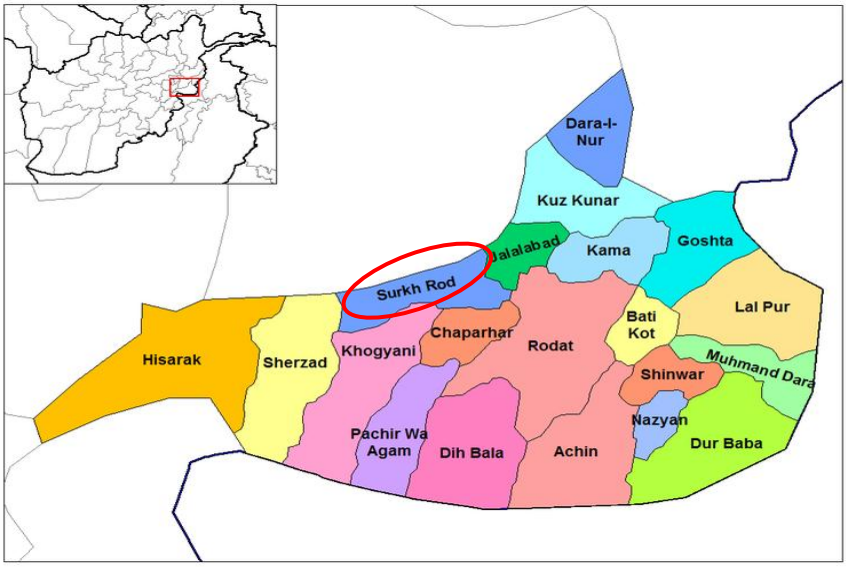
3.1 Description of the Study Area

The research study is conducted in the Surkhrud District, Dobandi Canal. It is part of Eastern-Afghanistan region Nanagrahar province. Geologically the areas lying at an altitude 580 m above the sea level and temperature fluctuate between +3 to +41 Centigrade.

The research site is in semi-arid zone. It receives precipitation of average 171mm annually and climate is dry and hot (USAID, 2008) most of the precipitation it receives during winter season and early spring. Summer dry season started from May to August with occasional rainfall but largely the summer is day within mentioned months. It has winter and early spring rain fall with no snow fall in the Surkhrud district. Snow fall takes place in the Adjacent districts Mountains at high elevation especially in the Spen Ghir Mountain. The winter precipitation is harvest in the parts of the district with access or limited access to irrigation water for crop production. . A small portion of the country's east receives south eastern monsoons precipitation during summer and climate is sub tropical but it has no access to these precipitation during summer.

Part of the district have access to irrigation water, intensive agriculture practices take place. it receives the irrigation water through Indus river basin. On-farm Flood irrigation is practiced in Behsood distinct. Underground water is mainly used for drinking purpose not for irrigation. It has limited access to electricity to operate under ground and tube-well. Major cropping pattern in the mention area is wheat-rice and wheat/rice-fodder crop. It only practiced in the part of the district with good access to irrigation water during summer. The second type of crop rotation is the wheat/vegetables/legumes/cotton (vegetables and legumes with low water requirement). It practiced in the part of district along the canal with limited access to irrigation water during summer. Wheat is the staple crop of Afghanistan and is some how compulsory part of crop rotation of both rotation. Third type is mono-cropping and plant only wheat in winter and left fallow land during summer in case of extreme irrigation water scarcity. Wheat is the major food crop cultivated while rice, cotton, vegetable and legumes are cash crops.

Traditional/Community based Irrigation water management is largely practiced in the district's canal. Operation and maintenance of physical irrigation infrastructure is managed through traditional norms and customary laws. One of the leading actors of the traditional community management system is *Mirab or* water master. Except in the part of the district along the Dobandi canal recently in January 2011 a formal system of Irrigation Associations (IAs) is introduce along the traditional system to improve water management along the canal. Most of irrigation infrastructure is destroyed during the past conflict and is poorly maintained.



Source: http://en.wikipedia.org/wiki/File:Nangarhar_districts.png

3.2 General Methodology

Case study approach

In the first phase of research during proposal development an intensive desk study was conducted to know about establishment of Irrigation Association (IA) in Afghanistan. Different parameters of irrigation Association was studied in desk study as well as focused on the impact of association on accessibility of irrigation water and crop productivity.

In the second phase empirical data was collected in the field, a case study approach was adopted to find in-depth information on the required parameters of association through semi-structure questionnaires and supported by survey. In case study focus group discussion, interview with key informants conducted. Further in case study official documents like water law, documents developed on the procedures, rules and regulation on IA, Irrigation Association By-law and World Bank (WB) proposal developed on IA implementation was studied.

A baseline survey conducted by World Bank On-Farm Water Management Project in the research site was analyzed through research parameters and cross-checked the finding.

3.3 Sampling procedure

On the Dobandi canal three Irrigation Schemes were selected with estimated each1000 farming house hold receives irrigation water from each scheme. Each operate and maintain with newly build Irrigation Association. During Field study each Irrigation Scheme was studied separately. In each Irrigation Scheme 6 farmers were selected randomly for interview, total in three schemes 18 farmers were selected. Out of these 6 farmers in each individual scheme they are further categorized; 2 farmers were selected from up-stream, 2 from Mid-stream and the rest 2 were interview from Down-stream. The criteria of selection were farmers received irrigation water from same Scheme. Moreover, 3 IA's members were selected per Scheme, total in three Irrigation Schemes 9 Irrigation Association's members were selected.

Furthermore, the Technical Advisor to Deputy Ministry of Irrigation and Infrastructure Ministry of Agriculture, Irrigation and Livestock (MAIL) was interview to receive information on the technical aspect of Irrigation Associations. The Director of Water User Associations (WUA) Ministry of Energy and Water (MEW) was interviewed to find information about the linkage and cooperation between Water User Associations and Irrigation Associations. World Bank On-farm Water Management Project is currently engaged in the building of IA in the different parts of Afghanistan. Project director was interviewed with respective personal at the Centre Kabul and in the field during the case study.

Table 9: Category, Number of Respondent, Research Tool and Strategy

Category of Respondent	Number of Respondent	Research Tool and Strategy
Irrigation Association Members	3/ Per Irrigation Scheme	Interview for Case Study/Survey
Up-stream farmers	2/ Per Irrigation Scheme	Interview for Case Study/Survey
Mid-Stream farmers	2/ Per Irrigation Scheme	Interview for Case Study/Survey
Down-Stream farmers	2/ Per Irrigation Scheme	Interview for Case Study/Survey
World Bank (WB) On-Farm Water Management personal in Kabul	3	Interview for Case Study
World Bank (WB) On-Farm Water Management personal in field	3	Interview for Case Study
Technical Advisor to Deputy Ministry of Irrigation and Infrastructure Ministry of Agriculture, Irrigation and Livestock (MAIL)	1	Interview for Case Study

. The Director of Water User Associations (WUA) Ministry of Energy and Water (MEW)	1	Interview for Case Study

Research Questions versus Respondent

Farmer and Irrigation Association members address questions 1.2, 1.3, 3.1,3.2 officials and implementing partners address questions1.1 ,2.2 , 2.3, 3.1, 3.2 and questions 1.1, 1.3 , 2.1, 2.2, 2.3, is asked both officials and IA's members for cross-checking and verification of information.

Primary Data Source

(Qualitative and quantitative) collected during the field visit to the study site (fig-3 appendix). In order to make sure the data relevant to institutional set-up of IA, accessibility to water through operation and maintenance of system and its impact on crop productivity is collected to answered the research question, to achieve the research objectives. The target group is divided into three categories to get relevant data (a) Irrigation Association committee members (b) Water Management Departments & Partner Agencies (c) Target area farmers.

3.4 Research Tools

The research has used the fallowing tools to collect relevant data:

- **Interviews:**

A semi-structured interview questionnaire will be designed to collect qualitative and quantitative data from the field. In order to get in-depth information about the performance of IA structure, irrigation water availability and accessibility to farmers in the association administrate area and their effect on productivity in the target area.

- **Observations:**

The existing picture of IAs in the field will be observed. Observation mainly will be on physical evidence like the existing of IA's office, their work plan, registration of record.

- **Literature review:**

A comprehensive literature review is done. Literature review is based on research work assessed IA performance in Afghanistan as well as the region developing countries. Since the foundation of IAs is new in Afghanistan and limited field research is done to assess its performance. It is important in literature review to include the IAs literature from region developing counties having same characteristics to Afghanistan to watch a precise picture of IAs performance in Afghanistan. The region countries with IA set-up and has resemblance geological, social and climatic characteristic to Afghanistan; fall in semi-arid arid zones condition and face irrigation water scarcity challenges.

3.5 Data Collection

Data used in the research report is based on the primary and secondary data retrieved during the research process.

3.5.1 Secondary Data Collection

Secondary data is collected while doing desk study for the triangulation of the process. Secondary data is collected during studying the research articles mainly developed by Afghanistan Research and Evaluation Unit (AREU) conducted in different parts of Afghanistan. These articles critically analyzed the pros and cons of community-based irrigation management systems. Furthermore, the secondary data is collected from unpublished project baselines, proposals, and reports developed through national and international NGO and International donor agencies engaged in the On-farm water management process.

3.5.2 Primary Data collection

A case study and project baseline survey was deployed as a source of primary data collection. For case study a structure and semi-structure questionnaire was conducted for interview and group discussion to answer per-developed research main and sub-question. Interviews were conducted with the guidance of field on-Farm Water Management community mobilize to facilitate to identify the target group in the Association administrate area.

Before conducting interviews in the field, it was discussed and pre-tested with the Irrigation Association development project personal to identify the gaps within questionnaire and relevance for amendment**.**

Case Study

A: individual Interviews

Individual interviews took place with individual farmers within the Irrigation Association administrating area about their perception of IA and performance. It include further the implementing partner World Band (WB) on-farm water Management personals. Its stakeholders Ministry of Agriculture, irrigation and livestock (MAIL), and Ministry of Energy and Water (MEW) are covered. Moreover, the development and monitoring of community-based irrigation Association as presented earlier in table 9.

The interview with farmers organized at community guesthouse *(Hujara*) while visit the research site and interviews with officials took place at their respective offices. The duration of interview was varied and depends on the required knowledge and interest of the responded.

B: Group Discussion:

Group discussion was organized with the on-farm water management Project personal at the regional office Nangrahar province and IAs members. In the group discussion regional office project head, agronomist, community mobilize, and irrigation scheme designer participated. The discussion was held at on-farm water management regional office.

Survey

A baseline survey was conducted by On-farm Water Management Project on the research site to collect preliminary data to assess key outcome indicators. the survey include information about the community perception about the capability of IA operation and maintenances , Major crop cultivated in the target area and their cropping intensity, Water and land management and access to Government support. Data in the baseline survey was analyzed and extracted for finding. The data in the survey was cross-check with the information collected during case study for confirmation.

3.6 Data Analysis:

The data collected during individual interviews and focus group discussion of key informants and baseline survey were summarize and presented into descriptive and objective form and presented in graphical, tabular and pictorial form. Data was analyzed accordingly to find answer to the research sub-question in the results and to discussion lead to objectives. Based on the results' conclusion and discussion recommendations were presented to contribute to improvement of Irrigation Associations (IAs) being an effective Community-based water management body to improve crop productivity by the improvement of water accessibility in the command area.

3.7 Limitations and Assumptions

- Because of small size of baseline survey statistical test is not deployed. Data is organized into descriptive from to quantitatively summarize data findings.
- Irrigation Associations (IAs) are establishes since the start of current year 2001 and 28 IAs are established through-out country in different Irrigation Schemes. Thus the objective data on the performance and its effectiveness in the accessibility to irrigation water to farmers through better operation and maintenance of irrigation system management to increase crop productivity is limited.
- Current year is counted as a dry year and the eastern-part of Afghanistan received less precipitation compare to normal years. Because of dry year farmer in the research site was seasonally shifted to other livelihoods. Results it create hurdles in the accessibility to farmers in the target area.
- The research area was located in the outskirt of the city and has limitation in finding regulation transportation and has security risks.

4 CHAPTER FOUR: RESULTS AND DSICUSSIONS

This chapter summarized the results of conducted interviewers, group discussion with Irrigation Association (IA) members, IA administration areas farmers, implementing partner personal (On-farm water management project) and IA's stakeholders (Deputy Ministry of Irrigation and infrastructure of the Ministry of Agriculture, Livestock and Irrigation, (MAIL) and Water User Associations (WUA) Directorate of the Ministry of Energy and Water (MEW) and supported by survey. The results are formulated accordance with research questions raised and discussed to contribute to the objective of research. This chapter presents the results of building an institutional set-up of IAs in community-Based Irrigation Water Management, characterized it in community willingness about the building/formalization and discussed its environment to cope with. Its effectiveness in irrigation water accessibility through operation and maintenance of irrigation infrastructure and is impact on crop productivity in the IA established area.

Irrigation Associations (IAs) are established in the Surkhrud district, Dobandi Scheme. The average irrigated land under the command of IA in Dobandi canal is estimated 6000 jerb(1 jerb=0.5 hec) with average 3000 of families depend on it.

4.1 Institutional Setup of IA in Community-Based Irrigation system

According to respondents, the institutional set-up of community-based Irrigation Association (IAs) is build of executive committee. The executive committee is made up of there members (a) Chairman, (b) Vice-chairman and (c) treasures. The procedure of selection of executive committee is through election process. In its election process the irrigated land owners along the canal participated and members of committee are selected with common consensus. The process to be a member of executive committee is volunteer, any farmer with irrigated land and acceptable to community is elected. Irrigated land owners farmers among community was selected as a member of committee with majority consensus. In process of selection members of IAs communities along the canal (up/mid/down stream farmers) participated. It has membership in Water User Association (function along water source). In the executive committee of IA the

Mirab (selected in traditional water management practices) or Water Master also participated and part of the process of IAs member's selection and in cases it was selected as a member of executive committee of IAs by farmers.

The duration to be members of committee is not fixed and responded that the selection or dismissing of current committee is based on their effectiveness in duties

While interviewing, an IA's farmers described the establishment of IA committee as *"association was established through consensus of local community elders and farmers. it was described that association executive committee which is comprise of Chairman, Vice Chairman, Treasurers and supporting members were build up through election process in which at least 75% of water user took part"*.

The set-up of IAs is simple and flat. It is not so big and complicated. The structure assists it to have better communication with farmers. Task and responsibilities are well assigned within established structure are cleared and defined. It build on what exist, the procedure of selecting IA Committee through farmers already executed in communities in the form of similar selecting *Mirab*. Neither it neither opposes nor challenges the existing traditional system. The structure is literally linked with Water source organization and it increased the communication All three IA established with well coordination between farmers and the project Area Team.

During discussion, the question raised, where two system a traditional *Mirab* system and current IA performing somehow same duties in the irrigation water management can operate parallel. One of the communities elder described the Mirab system an ineffective in the operation and maintenance of irrigation system, partly because of Mirab a single person and a single person is not capable to administrate the entire scheme. While IA composed of a committee and it is more feasible to well administrate the irrigation water among water users. from the study of the Procedure of Establishment, Registration, Support and Modality of Activity of Irrigations and interview with Kabul-based and Area team staff of IA implementation project it was elaborate that the establishment of IA is not to abolish the Mirab system but is a supporting tool to the *Mirab* system to further strengthen its operations. In long term based on the change in community perception and adoption of IA it can replace the *Mirab* system.

4.1.1 Viability

Irrigation Associations (IAs) are established with the financial assistant of Afghanistan Rehabilitation Thrust Fund-ARTF/ the World Bank. The fund is channelled through Ministry of Finance Afghanistan Government for the project implementation. The project has three years implementation plan to implement its prescribed activities for strengthen on-farm water management at tertiary channel level. The project has three main components (A) On-Farm Water Management. It has three sub-components; one of its sub-components is (a) Establishment of Irrigation Association for the irrigation water management through better operation and maintenance.

Although the Project has prescribed procedure for IAs financial viability, according to prescribed procedure the Association has to open a joint bank account. Every farmers in the association administrate receive irrigation water from the scheme has to submit an agree amount of money periodically based on the size of land in the joint account for IA operation and maintenance functions. In the procedure for the establishment of IA, It has been declared as in independent identity and can take loans from the Government and other Donor agencies for investment and can do private investment in Agriculture inputs. But neither in the Afghanistan Rehabilitant Fund-ARTF/ The World Bank project implementation plan nor Government has any specific procedure for allocation loans to these newly established association for their economic viability. For the elected Association executive committee members salaries or any other financial incentives are not presented. It puts the viability of association under threat.

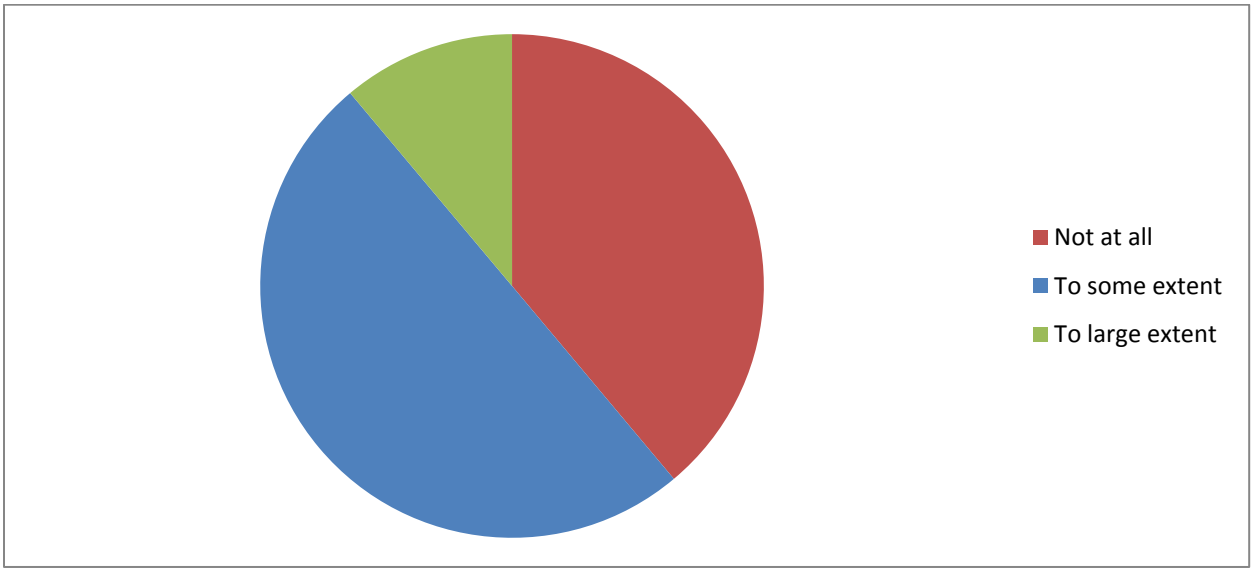
One association executive member, Akhter Mohammad, explained his view as

"The process of membership of IA is voluntarily, with no financial reward. The members of executive committees are award no specific amount of salary from the implementing partner currently engaged in the development of IA .This put the viability of association under question.". He further described that the executive committee member farmers are mostly poor and has no substantial source of income. During off-season they work in the off-farm activities. Being a member of committee is somehow full-time job and they have to allocate their specific time in IA organizing functions and activities"

4.1.2 Community Perception of Irrigation Association Formalization

Currently an estimated 90% Afghanistan irrigation water management is executed through traditional water managers called *Mirab*. Irrigation water manages through *Mirab* function as an autonomous unit without any external support. When asked farmers perception about the satisfaction ratio of *Mirab* system, a big portion of them were not satisfied at all. A portion of them were satisfied to some extent. Because of historical roots of the system as it survives through generation. It is also because of IAs are in transition period. The large extend satisfied were the head users in the canal (figure 4).

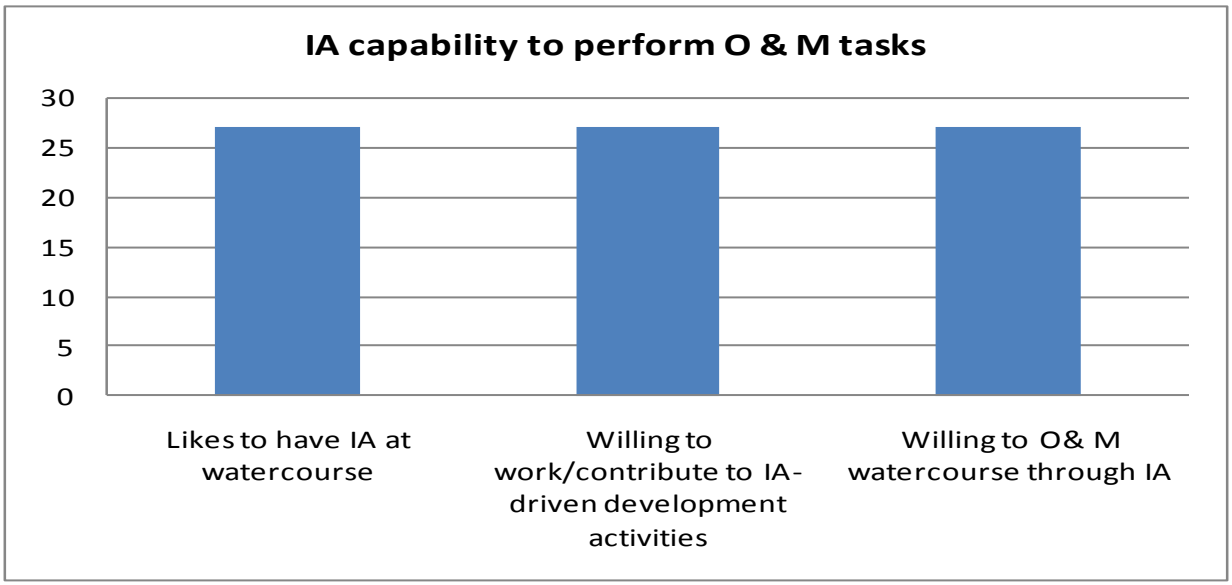
Figure 4: Level of satisfaction at watercourse of informal system



According to the farmer respondent, the current *Mirab* system has limitation. One of its limitation is the irrigation water is managed by a single person called *Mirab, Mirab* cannot make effective communication with farmers for water distribution and allocation because of limited personal. It also faces challenges in monitoring of water distribution. The irrigation management area administrate by *Mirab* is vast and on occasions he is not able to administrate his command area properly. It is influenced by the influential people in the area and it cannot stand to the pressure of people and groups in the area. It is not register with the government as a legal indentify and during these challenges not received support from any legal organization. . Upstream and downstream difference in water availability and accessibility to farmers is a big challenging throughout the area and *Mirab* is ineffective to resolve it.

During discussion it was concluded that Community elders, farmers and IA members were very optimistic about the effectiveness of IA set-up in the irrigation water management for equitable distribution among farmers.

Figure 5: Community perceptions of IAs-set-up



The high turn over is the problematic current community based water management system but also World Bank (WB) on going project which beside building institutional setup, engaged in canal lining, land levelling, extension services and improved inputs provide (figure 5).

During interview one of the respondent described as views about the IA as

"Through the establishment of IA, now we have better communication with the Government and NGO and water sources authorities in the main and sub-canals, we have regularly meeting with them and with association members. We communicate our challenges with them especially in the irrigation infrastructure rehabilitation, through construction of irrigation channels we can effectively connect with the water sources".

4.1.3 Institutional Environment

Within the mandate described in procedures on the Establishment, Registration, Support and Modality of Activity of Irrigation Association (IA) and Afghanistan Water Law permit and encourage IA setup to have an active bond of coordination and collaboration with water users. Water users are organized in groups of members use water at the Main, Sub and tertiary canal level. At the main and sub- canal (water source) water users are assembled in Water User Association (WUA) and at tertiary canal/watercourse IAs are engaged in the operation of irrigation water and maintenance of its infrastructure. WUA have five main water users (a) Irrigation Associations (b) Energy production users (c) Industry users (d) Domestic water use and (e) Environmental protection

During respondent's interviews and documentation of IA setup, it revealed that being an Association IA has an effective communication, coordination and collaboration within, with community and institutional environment.

A) Irrigation Association with its Institutions

a) Government

Irrigation Association being a legal identity is recognized and registered with the Ministry of Agriculture, irrigation and Livestock (MAIL). Being a legal identity it has certain privileges and rights.

- Can possess legal property and shares
- Can apply for the loans
- Being part of Water User Association(WUA)
- Can proclaim its legal right

b) Member of Water Users

Irrigation Association (IA) is one of the members of Water User Association (WUA). There was no specific mechanism for communication and coordination among the water users. These water users operated along different stages from main, sub and tertiary level. There was limited coordination between water source users and water users at tertiary level/on-farm level. It was one of the main obstacles for the effective allocation of water among different users at different stages for equitable share distribution among the water stakeholders. Based on Afghanistan Water Law and Procedures on the Establishment, Registration, Support and Modality of activity (PERSMA) of Water Users and Irrigation Association an effective mechanism of communicate and coordinate is developed within water users. The five types of water users are organized within WUA in a specific river basin.

c) Communication with Donor Agencies/NGOs

Being a legal identity and representative of the community, it communicates well with donors agencies/NOG. In Afghanistan post-conflict development intervention donor agencies are the key actors. Donors Agencies are currently involved in supporting formal community-based Association/council for strengthen local governance through community empowerment. Based on Afghanistan Law and PERSMAIA, IA can apply for grants /loans allocated by Donors Agencies/ NGOs for the development of irrigation infrastructure and business in the target area. it can implement local projects supported by Donor Agencies/NGOs in its administrated area.

B) Irrigation Associations with its Stakeholders

a) Clients/Water users

Being a community-based formal organization, it has organisational structure composed of executive committee, members. By the development of IA's Procedures on the Establishment, Registration, Support and Modality of Activity (PERSMA), based on Afghanistan Water Law's article 11, sub-unit 5, 18 and 23 it has legal rights as an entity and is registered. PERSMA has defined its role and responsibilities in the domain of (a) administration of irrigation water and infrastructure, (b) operation, and (c) supervision and (d) representation of IA in its domain. IA framework is developed based on PERSMA defined its roles and responsibilities in its domain. Its outcome is increased the chances of effective management of irrigation water by IA through communication and coordination within and with water users.

Moreover, from the interview it was found the IA is established and elected through democratic process which leads to thrust among water users.

b) Irrigation Association Federation

Based on PERSMA Irrigation Association has developed federation of IAs operating in a tertiary canal level. This federation of IAs is composed of a cluster of IAs receiving irrigation water from a specific canal. The IA's federation has to secure social and economic benefits of the IA's federation command area. Based on finding it was revealed that a system of coordination and collaboration among water users for water right along the specific canal administrative area was not present. It leads to irregularities in water allocation among different users along the canal in the target area.

(C) SWOT Analysis

In the SWOT analysis of IAs setup as a community-based institution below, the internal strengths and weakness and existing external opportunities threats are diagnosed.

Strengths, weakness, opportunities and threats (SWOT) of IA setup analysis

Strengths	**Weakness**
- legally register with the Government and has regal rights and can proclaim its rights - Institutionalize through democratic process and has community support - Build on what exist, supporting tool to existing *Mirab* system - Membership of IA federation and Sub-river basin committee - Member of Water User Association (WUA) - legally Can proclaim its share of irrigation water - IA along the canal is select by entire scheme (up/mid/downstream)	- IA executive committee members has not financial incentives/salaries - IA are newly introduced in Afghanistan thus IA members has limited professional skills for the operation an association - IA currently does not have any financial assets/resources for its operations. - IA executive committee members are not specified in location along the canal (up/mid/downstream)

Opportunities	**Threats**
- Financial and technical support from the implementing partners (Government & Donor Agencies). - Can apply for the Grants/loans - Being a formal organization can make private business - Has the ownership of irrigation scheme in its administrative -	- Existing corruption in the Government intuitions - Existing of corruption at local community level e.g water stealing - Existing of warlord and influential gangs - Central government is weak to extend it legal support to IA

4.2 Accessibility to Irrigated water

The precipitation in Afghanistan is time-bounded and seasonal including the IA scheme area in Surkhrod district. Precipitation occurs in winter. In summer from May -August is dry and immense shortage of irrigation.

The administrative area of IA covers the entire scheme (up/mid/downstream), it assist in the effective distribution of water along the canal. But tertiary irrigation canal intake and outlets at on-farm is not properly lined and levelled. Irrigation water is allocated at the farm level among farmers through Irrigation roster. Each farmer has a specific duration and time for irrigation water access as illustrated in the irrigation Roster (Annexes Table 11). The duration of irrigation water allocation to a specific farmer is correlated with the size of agriculture land. Farmers received the irrigation water allocation time as 6 jerb/1hr.

Farmer respondents explained the farmer's views about the access to irrigation water.

" *Although irrigation water is allocated based of turn and time. But due to unlined and unlevelled irrigation canal the farm not received it in due time and delay took place the water has to reach to farm gate. It reduced the amount of water required for successful land irrigation. Tertiary*

canal intake and outlets are made of mud. Lock and unlock of outlets and intake along the canal is time and water consuming. It took time than required allocated time to reach the water to farm and cause problem in water accessibility. It reduces the amount of irrigation water to be allocated to the next farmer in the line according to irrigation schedule"

According to IA members interviewed described the current situation of irrigation water accessibility to farmers. Water is allocated to farmers according to acceptable rules and regulation along the canal farmers. IA has not intension and avoid to interfere in the practiced rules or to change water schedule. As these norms are well understand and standardized through local community. Major obstacle for effective access of farmers to irrigation water is not irrigation water schedule or timing. It is the limited amount of irrigation water IA administrative area received from water source. Water steal is due to mud constructed canal and made it quite applicable to break the canal wall and steal the water. This effect the ratio up-stream and down-stream water accessibility to farmers.

Through irrigation infrastructure developed lining of irrigation canal and levelling and construction of cemented intakes and outlets can increased the accessorily of irrigation water to farmers.

During interview a farmer expressed" during the summer season the irrigation water is short and release on short notice and availability. Periodically when water is released from the water source. It is use by the up-stream user and the down-stream users not get information about the discharge of water sources. On some occasion we get informed after the discharge water from the source is thoroughly utilized through the up-stream water users"

Based on finding, lining and levelling of irrigation canal at watercourse, intake and outlets infrastructure construction and water source discharge standardization made it possible for IA to effectively distribute and mange irrigation water within the scheme. Assist IA to manage water between farmers, reduce chances of water stealing, conversance losses, control intake/outlets losses and reduce disputes between farmers and increase the access of irrigation water to farmers at their farm gates.

4.2.1 Effectiveness in Operation and Maintenance of Irrigation Infrastructure

Through IA is structured with formal executive committees but still smooth operation of irrigation system in IA's administrated area is problematic because of absence of well-developed physical irrigation infrastructure. Neither IA nor the community itself is in the position to financially and technically support the construction of physical irrigation infrastructure. Currently World Bank is planning to finance it through Afghanistan Rehabilitation Thrust Fund-ARTF implements On-farm irrigation project to rehabilitate and reconstruct the tertiary level irrigation conveyance system to improve on-farm physical infrastructure in the IA's area. The community is to provide a part of assistant in the form of labour. With cemented construction of channel it has to reduce the chances of water losses, illegal diversion of water, mitigate the risk of flood damage and reduce the conflicts among farmers takes place due to erosion of canal boundaries marks the limit of land possession between adjacent famers on the sides of canal. it was mentioned during interview with one of the IA members,

"It was notified that smooth operation of irrigation water conveyance at on-farm through IA is problematic due to leakage of water diversion points and overtopping due to insufficient free board of canal, animal and human traffic damage the mud constructed canal, farmers are not able to support to reconstruct it for successful operation".

For maintenance of existing irrigation water infrastructure, a traditional system is in placed yet. Farmers organized based on need, mostly organized on annual basis to rehabilitate and maintained irrigation infrastructure. The traditional system of rehabilitee is limited to the siltation. it was find that the existing traditional mechanism of irrigation water infrastructure is not effective in the maintenance of irrigation channels and not able to improve its maintenance to facilitate the operation of irrigation system, preliminary because of lack of financial contribution from the farmers and lack of any well accepted mechanism to collect finances from farmers for irrigation physical infrastructure maintenance.

IA has developed a new and accepted mechanism among farmers for collection of finances for the physical irrigation infrastructure maintenances. It was revealed that largely for maintenance IA has to collect a specific among of cash annually in a joint account from the farmers in the within irrigation scheme for maintenances. The amount of cash received from farmers relies on the farm land holding size of the farmers. Moreover, during interview IA's member stated that

"Maintenance of physical irrigation infrastructure improve the operations at watercourse level and it assist in the management of water distribution among farmers. Maintenance helps in the sustainability of IA. Farmers are willing to pay the allocated among of cash to the IA for maintenances operations".

4.3 Crop Productivity

Crop productivity in the IA administrative area is directly effect by the potential accessibility of irrigation water in the IA administration area. The parameters are taken to find out IA effect on the crop productivity in the scheme, is change in cropping pattern and land productivity with the accessibility of irrigation water.

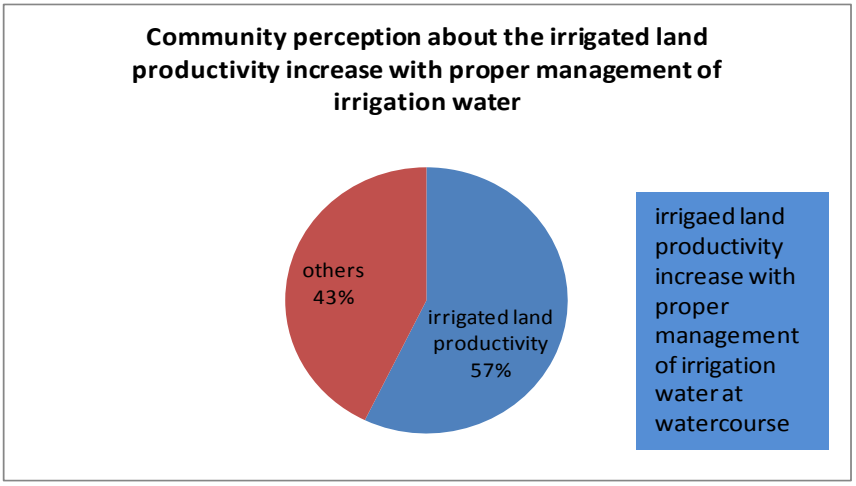
4.3.1 Irrigated land Productivity

The IA's administrated irrigation scheme land cultivated through cropping pattern adapted to water accessibility at watercourse. During interviewing farmers and survey conducted it was find that a potential gap exist between current cultivated land at scheme and potential of irrigated land productive in case of accessibility to irrigation water. The potential obstacle to increase the agriculture productive land is the lack of water in tertiary canals. Lack of water limited the agriculture land development in the irrigation scheme.

According to the respondent in the field, there are furrow lands in the down-stream irrigation scheme but due to lack of water it not receive proper water and remain furrow, through proper management of water allocation throughout the scheme, development of irrigation infrastructure and maintenance, is positional to increase agriculture productive land.

Moreover, in the scheme command area soil erosion of earth made diversion and channels are common. Water overflows to the field and affect the crops in the surrounding field. There was no proper mechanism of maintenance of irrigation channel, diversion and operation.

Figure 6: Community perception of increase in irrigated land productivity with proper management of irrigation water



It was stated that with the proper management (establishment of IAs, canal lining) the maintenance and operation of scheme is to be improved and in productivity will increased with exceed of water (figure 6). Other 44 percent prioritized the other agricultures inputs (improved seeds, fertilizers, chemicals, machinery)

" Since last 10 years our scheme intakes and outlets are destroyed through flood. There was no mechanism for reconstruction and maintenance. Thus our share of water irrigated of 6000 Jerb(1jerb is equivalent to 0.5 hac) agriculture land is distributed in upstream water users (Shagewal). currently because of our share of water is received by them, they cultivated high water requirement crops (rice) in the parts of upstream where water was hardly available for maize cultivation".

Furthermore, the situation of downstream water accessibility was described as because of the prescribed situation

"We not receive water in-time of cultivation. In every cropping season it delayed up to one and half to two months to receive our share of irrigation water. It makes us not to cultivate our field in suitable required time for cultivation. We only receive water when it get exceed of their use, if not exceed of their use, it is not let to us"

The effect of the above described current practices in irrigation water distribution and allocation in the scheme on the land productivity was mentioned as

"Previous year the above described scenario took placed, Because of lack of access to water land productivity decreased and we only we harvest on average 20 seers (7kg per seer) of wheat per jerb. our current summer crop vegetables cultivated position is similar and are closed to crop failure"

Through the establishment of IA, rehabilitation and reconstruction of physical irrigation infrastructure and maintenance is improved and crop productivity has be effected in positive direction with increased in water accessibility in time and amount in IA administration area in target site.

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4.3.2 Cropping pattern

Since the accessibility of irrigation water is limited and time-bounded with different seasons and years. Thus the cropping calendar, pattern and intensity is dynamic based on the

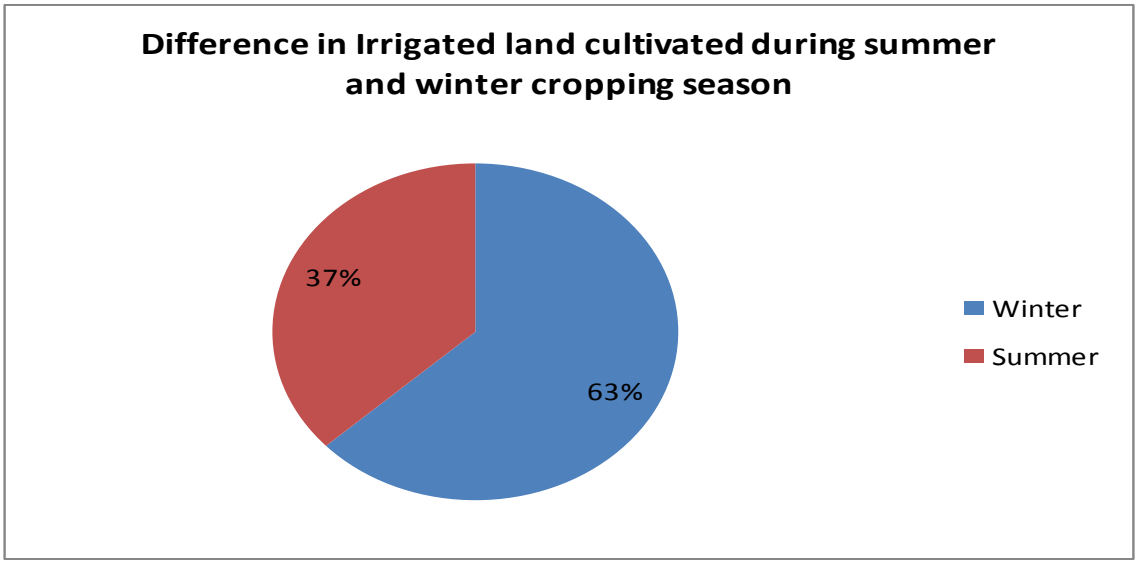
accessibility of water, the amount of precipitation in the specific year. There is excessive shortage of irrigation water during summer. The accessibility of water during summer in the site area relies on the amount of precipitation (snow-fall) in winter. Based on winter precipitation are two main type of cropping pattern in the area. (a) wheat-rice and (b) wheat-vegetables/cotton/legumes . Wheat is staple crop in Afghanistan and is winter crop and is the elementary part of cropping cycle.

Table 10: cropping pattern based on the irrigation water

cropping pattern based on the accessibility of Irrigation water		
	Winter Crop	Summer Crop
Dry-Year	Wheat	Vegetables/legumes/ cotton (low water required crop)
Wet-Year	Wheat	Rice (high water required crop)

The prediction about the selection of crop pattern in the summer to grow a high or low water requirement crop and status of water accessibility during summer is calculated by farmers through their indigenous knowledge in precipitation of winter. Predict water accessibility in summer and the extent of its effect on water accessibility to farmer for successful crop production. The cropping pattern change in summer shift is because of sufficient or limited access to irrigation water. In another words when the water is in access they grow high crop water requirement crops like rice and when the water is limited in access they grew low crop water requirement crops as vegetables and green manures as a cropping strategy.

Figure 7: Difference in Irrigated land cultivated during summer and winter cropping season



Limited accessibility of water force farmer to chance their cropping pattern and a big portion (63 percent) of them relies on mono cropping (figure 7).

During crop field visit famer express their views of the cropping pattern change because of water accessibility as below

> " *Currently year is a dry one, there was limited precipitation took placed during winter season and I grow ladyfinger in my field. it is not receiving needed amount of water and wilting. Their production is reduced and I did only one harvest at all till now, in normal condition when water accessibility is good I did thrice harvesting until now. He described further the main reason in water accessibility is the cropping patter and mismanagement exist in upstream farmers. The upstream farmers grow high water requirement crop rice which results of water shortage in the down-stream farmers and effect productivity and compel us to change cropping pattern as a coping strategy, but in most cases it is not effective*".

5 CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS:

5.1 Conclusions:

In this study, the introduction of Irrigation Association (IAs) was studied in the Surkhrod district, Dobandi canal site replaced the existing traditional irrigation management system. The set-up of IA was studied at the target area and its impact in the operation and maintenances of irrigation structure to improve water accessibility at the farm gate to improve crop productivity in the site. The dimension of IA's setup, its role in water accessibility (operation & maintenance of irrigation structure) and crop productivity was studied in compression of traditional irrigation management system. Field observation reveals that traditional structure is unreliable anymore in the operation and maintenances of irrigation infrastructure to allocate irrigation water equitable among farmers along the canal to sustain crop productivity. Dysfunction in the operation and maintenances of irrigation structures has limited the access of irrigation water to farmers and reduced farmers' field productivity.

It was found that the setup of IAs has overcome constrains which traditional *Mirab* system was unable to answer in the maintenance and operation of irrigation structure to improve the irrigation water accessibility, but still the setup has few shortcomings.

The setup of IA has overcome the fallowing constrains in irrigation water accessibility:

- It is literally well linked with the water sources (WUA) and local government bodies to have access for rights of water users in their command area.
- The setup of IA is quite sample and role and responsibilities are well recognised.
- The procedure of selection of IA members is electoral and community is well recognized with the process, as the process already existed in community for selection of Water master/*Mirab*
- Setup of IA is build along the whole irrigation canal including(up/mid/downstream) farmers
- The setup of IA is composed of formal executive committee, composed of members, which makes it more realistic to maintain and operate the irrigation system.
- In Afghanistan scenario; institutionalizing of irrigation system assist in the accessibility of irrigation water to farmers and increase in crop productivity.
- Willingness of community to maintain and operate the irrigation system through IA setup along the canal.

The setup of IA has following shortcomings in irrigation water accessibility:

- The members of executive committee of IA is not located and distinguish along the irrigation canal (up/mid/downstream)
- The effectiveness of IA in the operation and maintenance of irrigation canal is not effective until it is supported in the construction, rehabilitant and recover of irrigation infrastructure.
- The procedure of financial support (loan/grants) of IA is not clear and it keep its viability under question
- The procedure of selection of IA members is voluntaries' and it has no financial incentives/salaries and is critical for the IA viability
- The water rights is not characterized among water users along the canal through IA setup

5.2 Recommendations:

Based on the shortcoming of IA setup established in the Dobandi canal, following recommendation are made. The proposed recommendations will improve the institutionalization of traditional irrigation management system with improved access to irrigation water as well as better operation and maintenance of the irrigation infrastructure. The ultimate impact is the improve in crop productivity which is badly damaged because of limited accessibility to irrigation water at farm gate.

- The IA executive committee members selected along the canal. Their location should identify along the canal (mid/up/downstream), with proper ratio. Priority should be given to downstream water users.
- A complete develop irrigation scheme should be hand over to them as IA has not technical and financial capability and capacity to develop the scheme.
- To keep IA viable and active, financial support mechanism should be clearly illustrated. the procedure and source of taking loan/grant should be clarify.
- The members of IA committee in the site are poor and rely on multi-livelihood means, in off-season they engaged in off-farm livelihood activities. It is necessary to keep IA functional. They should be supported through monthly salary until IA is fully functionalized.
- Water rights among water users along the canal should be indentify through IA and agreed before making intervention in the target area for equitable access of water along the canal.

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7 Annexes:

Table 11: Irrigation roster in Dobandi Canal

Dobandi Canal-Irrigation Water scheduling Roster																											
S.No	Name/ Farmer	Date Hrs/Day	1 Fri	2 Sat	3 Sun	4 Mon	5 Tue	6 Wed	7 Thu	8 Fri	9 Sat	10 Sun	11 Mon	12 Tue	13 Wed	14 Thu	15 Fri	16 Sat	17 Sun	18 Mon	19 Tue	20 Wed	21 Thu	22 Fri	23 Sat	24 Sun	25 Mon
1	Qassim		7						7						7						7						7
2	Nayz M.		17						17						17						17						17
3	Gulam			10						10						10						10					
4	Haji Baryali			9						9						9						9					
5	Ghafoor			5	2					5	2					5	2					5	2				
6	Ab-Rahman				8						8						8						8				
7	M.Azim				9						9						9						9				
8	Sardar				5	6					5	6					5	6					5	6			
9	Haji Sartoor					7						7						7						7			
10	Gul M.					5						5						5						5			
11	Farooq					3						3						3						3			

Irrigation Association (IA) Management System Case Study

Questionnaire

Section A: General Information

Interviewer_____

Date_____

Name of the water user_____ Age_____(years)

Father's Name _____

Name of IA_____

Village_____ Main Canal_____

Branch_____ Location along the canal _____

Land under this canal_____(jeribs)

District_____ Province_____

Contact no_____.

Section B: Irrigation Association Institutional set-up:

1. For how long this IA is working?_____ years
2. Have you ever worked as IA member? If yes, then answer the following questions

a) For how long? _____ (years).

b) What is your experience of being a member?

c) Are you satisfied with your job?

3. Do you know how old is your canal system? _____ (years).
4. Do you know how, when and why the IA system has established?
5. What are the responsibilities of IA?
6. What kinds of problems specific to water distribution are there in your irrigation system?

   a) Do you know what the solutions are?
7. Are you satisfied with current system?
8. How do you assess the performance of IA?
9. What is the procedure of IA's member selection and its criteria in your canal?
10. What is your perception about IA?
11. How is IA compensated in your system?
12. Do you like to have IA setup at your watercourse?
13. Are you will to contribute in IA driven development activates?
14. Are you willing to operate and maintain watercourse though IA setup?
15. What kind of conflict usually rises in your system?

    a) Time of occurrence..... Place along the canal.....
16. How are water users usually informed through IA about any activity/meeting in your canal,

    and where do they meet?
17. How and often IA interact with water users?

Section C: Irrigation water Accessibility

1. Do you have sufficient water in your canal?
2. In your view, what changes should be brought to ensure equal distribution of water?

   1. How often the tail users do not get water?

      a) How many farmers and how much area are affected?

      No of farmer_____ Area_____(Jeribs).
3. How is water distributed in you canal?
4. When is your turn? Day_____, Time_____.
5. Do you usually receive water in time?
6. Do you receive the allocated amount of irrigation water on your turn?
7. What alternative you have, when you do not receive the allocated amount of water?

8. What happen to water, when you do not need it?
9. What do you think are the challenges/difficulties faced by IA in water distribution and infrastructure maintenance?
10) How IA resolve the conflicts over the water distribution?
11) Is the physical conditions of water structures improve by IA?
12) What types of major physical maintenance activities are usually carried out by IA?

a) When and how it is done?

b) What are the penalties for the not-participatory water users?

13) Is night irrigation is practiced in your canal?
14) How much irrigated land you have?

a) How many jerbs of your cultivated land you cultivate in winter cropping season?

b) How many jerbs of your cultivated land you cultivated in summer cropping season?

Section D: Crop production

1) For how long have you been involved in agriculture? _____ (years).
2) Crops grown.

1) _____ 2) _____

3) _____ 4) _____

5) _____ 6) _____

3) Crop production before IA's establishment and now after IA establishment?

4) Do you think with the establishment of IA your crop production will increase?

5) Cropping pattern changed of IA establishment?

6) What is your total amount of land?

7) Out of your total land, what proportion you cultivate during summer and winter?

8) Is there potential to increase agriculture productivity in IA established area?

Figure 8: Research Framework

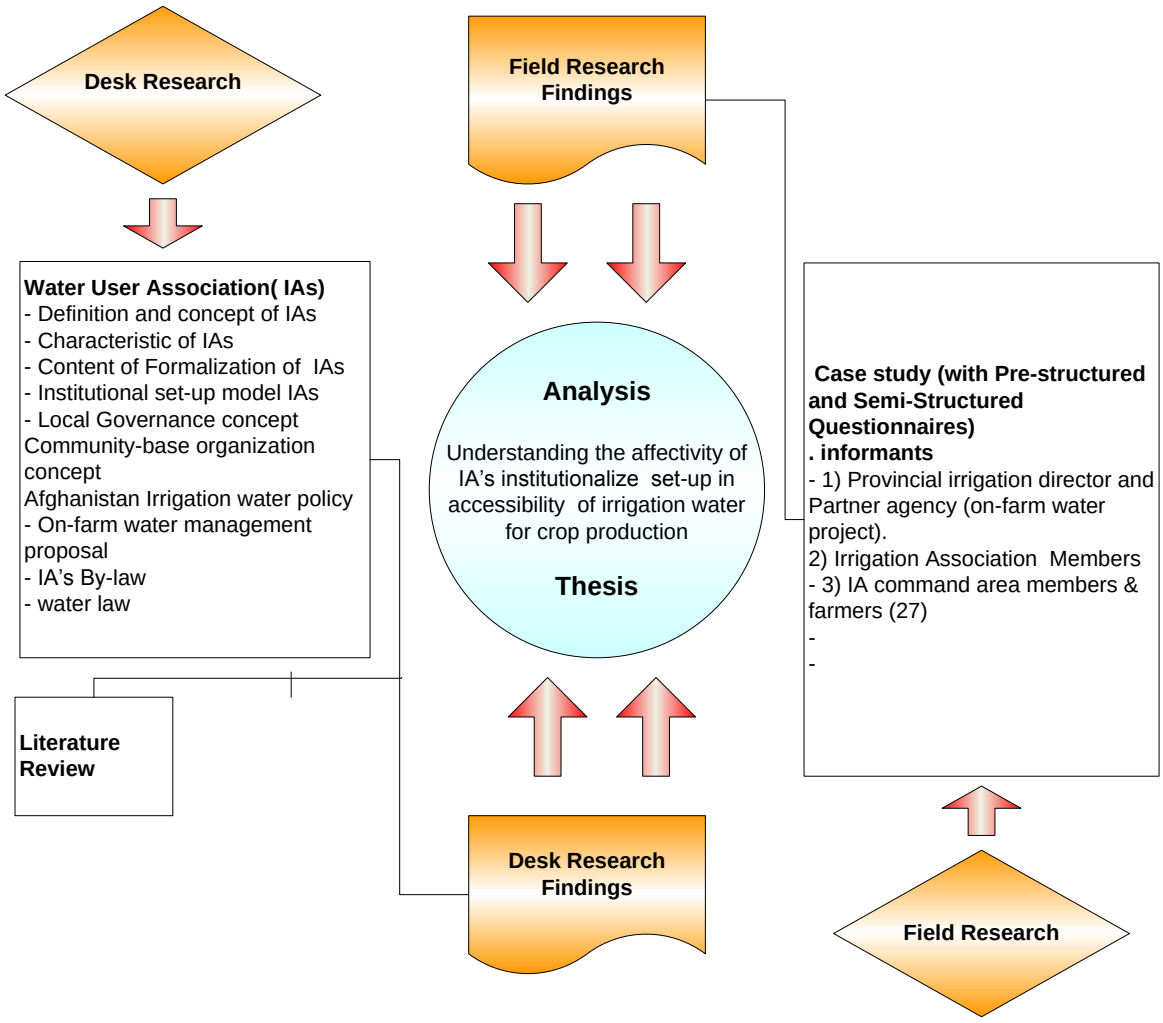

Figure 4: Irrigation Association establishment pictures