Social Impacts of Canal Water Management: A Case Study of Taunsa Sharif

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Final Approval of Thesis

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ABSTRACT

Present study "Mismanagement of Canal water and its Impacts on the Society" is mainly about to understand the application of the canal irrigation in agriculture. The research question was formulated to explore the reasons of the mismanagement of canal water and what are the consequences of this mismanagement of canal water on the society. The present study has been conducted in south Punjab village Tehsil Taunsa Sharif, District Dera Ghazi Khan. Out of 311 households 100 sample sizes has been selected. In-depth interviews were the main source of data collection as well as participant observation. The main findings of the study are mismanagement is subjective phenomena. It has been experienced differently from person to person as well as at stockholders level. Mismanagement of canal water has vibrant consequences on the villager's lives in terms of reduction in output productivity, water logging and loss of land fertility. These are economic variables. The social consequences of mismanagement of canal water are more severe than economic ones. Due to mismanagement of canal water sense of deprivation has been raised among the farmers at various ends of the canal. It ultimate introduced the social classes that replace the indigenous social organization. Social conflicts have been increased among the farmers who were working jointly since many years.

Due to mismanagement of canal water level of the water logging has been increased that not only cursed for agriculture land but it also put havoc impacts on the residential area. It raised the migration from village that ultimate destroy the social structure of the society. Agriculture economy has been changed. Crops have intensified and new crops have been introduced. Interesting but shocking aspect of this issue is that famers and canal authorities are putting the ball in the other court. No one is ready to perform his function. If this alarming situation persists the entire system of the canal will be destroyed and designed 236000 acres land transformed into barren one again. It will not only loss of single victimized class but it will put devastating impacts on the national level for food paucity. The present study has been conducted from September 2015 to January 2016.

Chapter 1

Introduction

Agriculture is principal economic source in the Pakistan. In this way, water plays significant role for agricultural development. Agrarian societies mainly depend on the availability of water resources. Thus the development of irrigation water for agriculture has led pressure on the available water resources. In this regard it is dire need to manage the water resources both at user level as well as institutional level.

> "Irrigation is a fundamental strategy for ensuring and increasing agricultural production in many societies, and it represents one of the most significant technical achievements in the human use of natural resources".
>
> (Kelly, 1983)

> "The artificial application of water to land for supplementing the naturally available moisture in the root-zone soil for the purpose of agricultural production is termed irrigation".
>
> (Asawa, 2005)

> Pakistan's agriculture is almost completely dependent on irrigation; irrigated land supplies more than 90 percent of agricultural production, with gross commanded area of 16 million hectares. The water sector investment planning study has estimated food, fiber and edible oil shortfall of 23.5 m. tons in the year 2000 and 48.5 m. tons in the year 2013.
>
> (Afzal, 1996)

Chashma[1] Right Bank canal is an irrigated project that has been completed in three phases from 1978 to 2002. CRB canal has been extracted from the right bank of the Indus River at *Chashma* barrage so that it named as CRB Canal. The goals of the project were to irrigate the agricultural land as well as enhance the productivity of the crops to meet the nutritional needs and to reduce the poverty by empowering the masses through irrigated agriculture. To some extent after the execution of the canal it has achieved its goals but it has been observed for few years that canal is not meeting to its goals. It is

[1] Name Barrage on Indus River at Mianwali District.

because of mismanagement of canal water. Mismanagement of water in Canal Zone is not reducing the output productivity but it also contains numerous social issues.

The distribution of the water at international, national and at the local level is a key dispute of the 21st century. The delivery of the water resources is directly connected with two factors, first, one is the administrative role and the second one is the role of users. During sharing of the water resources, assigning roles are not fixed for both elements. The role of the water users in the distribution of water at farms level is extremely considerable. The 68 percent of the total population lives in the rural areas of the Pakistan which are directly or indirectly connected with agriculture. So the distribution of available water is very important for their economies. The nature of the distribution of the water varies from the available resources of the water in particular geographical settings as well as the mode of irrigation in the particular agricultural zone. The supply of the water in canal irrigation mostly depends on upon its users. The initial structure for the distribution of the canal water is provided by the canal administration but the management of the particular structure is the major responsibility of the farmers. Better management of the water in Canal Zone leads to meet the goal of intensive production of the crops as well as to irrigate the maximum land in Canal Zone.

> "Water management is concerned with improving access to and the efficient use of water. Such measures will increase the volume of goods produced by increasing the availability of water and will also improve its productivity by increasing the returns to water by, for example, applying water more efficiently to irrigated crops."
>
> (Ali, 2010)

The maladministration of the water resources is not only limited to create the gap of irrigation water between the head and tail end farmers but is also proving a solid mechanism to destroy the social structure of the society. The level of the conflicts has risen in the village. The traditional family structure has disunited. Water is the source of conflict and cooperation. To get maximum control over water resources shows the social power of certain societies and individual ones. To get maximum control over the water resources needs cooperation. On the other hand, it may prove a source of conflict among

the users of water who have much or less control over the water resources. A Burmese proverbs describes that rain water contains equal rights for all. In the same way irrigation water rights are equal for each farmer. Water is used as a commercial commodity in the present time, so the distribution of the water is more social than the technical issue. The mismanagement of water resources in the Canal Zone is the social issue which is the fundamental theme of the present study. The focus of the study was document issues in an anthropological context. The nature of the problem may be different. It needs investigation.

1.2. Problem

Chashma Right Bank canal is the principal source of irrigation water at the locale. The canal has been functioning at the locale for last fourteen years. But the problem of supply and demand of irrigation has risen for last three years. It is due to technical faults due to seepage of water that has been increased in the locale but the problem here which I am going to investigate is that, what are the socio-cultural reasons behind the mismanagement of irrigation at locale?

1.3. Statement of the Problem

CRB Canal extension has been designed to irrigate the 2, 36000 acres land in the Punjab. After ten years of its execution its capacity has reduced to seventy five per cent. It is because of mismanagement of canal water. It raised the water logging and salinity. Crops production is reducing. Social conflicts have been raised. Mismanagement is defined as in the present study unequal distribution of the canal water from head to tail. The indicators that are used to measure the mismanagement of water are supply of water at each end, output productivity, piece of lands transform into barren and levels of the social conflicts. These indicators helped the researcher to measure the valid hazardous of the mismanagement of canal water on the society.

1.4. Objectives of the Study

- To document the local perception about mismanagement of the canal water.

- To document mismanagement of canal water and changing agricultural economy.
- To document the Socio-cultural factors as motivation for mismanagement of canal water.
- To document the consequences of the mismanagement on villager's lives.

1.5. Locale

The locale for the present will be a village *"Banbhan*[2]*"* which is situated 21 KM in the north of *Taunsa* Sharif city on the national highway N-55. Justification of the locale for the present study is that it is a village that agricultural land is being irrigated through CRB Canal and due to mismanagement of canal water in Canal Zone proving a source of social discomforts in the village. The forms of social discomforts are water logging, migration, loss of agricultural products and proportion of social conflicts that have been raised after the malpractice of canal water.

Moreover, the present village is a buffer zone between the villages on the west bank of the river Indus and villages situated on the east side of the *Suleman* [3]mountain range, so social discomfort in this village is also affecting the adjoining villages. The issue of mismanagement of canal water if remains unsolved it will come at front in the form of regional conflict.

1.6. Significance of the Study

Every study has completed in its own sense and has the certain significance. The significance of the study has depended upon the study and its scope in certain time period. The present study deals with the management of irrigation water resources that how much important it is to manage and use the water resources in a constructive way. The malpractice of water resources in Canal Zone how creating the gap between supply and demand of the irrigation water in the particular agrarian zone? The findings of the study helped at each level to use irrigation water in the better way. This study will not only help the farmers to distribute the canal water in balance way that will meet their

[2] Name of village selected as locale for study
[3] Name of Mountain range near village

irrigational needs as well as it will be very supportive to enhance their agricultural efficiency.

The findings of the study will remind the role of the farmers and canal authorities to manage the canal water in respectable way. The study will also prove a source of integration for the farmers at the head and tale that ultimately promote the integration among the members of the society. The theoretical foundation of the study will not useful only for certain societal level as well as it will be the general guideline to managing the water resources at Canal Zone that will ultimate leads to economic progress.

At the broader level, the study will be favorable to overcome the issue of the maladministration of the water resources at international level. The unique aspect of the study will help the policy makers in future to consider the socio-cultural factors during the execution of such development projects. The practical application of the study will be helpful at the state level to develop a general mechanism to manage the water resources in Canal Zone.

1.7. Theoretical Framework

Marvin Harris is the most prominent contributor in the anthropology of 20th century. He was a strong defender of the four fields of anthropology. He is also considering as the best originator of cultural materialism in the discipline of the anthropology. The term cultural materialism has been coined by the Harris in his book "The Rise of Anthropological Theories" in 1968. Cultural materialism explains the similarities and differences among the cultures as well as patterns for social and cultural change within societal framework in three distinct ways like infrastructure, structure and super structure. Cultural materialism promotes the ideas that infrastructure regulates the two other cultural factors. The "infrastructure" is consisting of material realities like technological, economic, reproductive and demographical factors. The "structure" sector of culture consists of organizational aspects of culture such as domestic and kinship systems and political economy, while the "superstructure" sector consists of ideological and symbolic aspects of society such as religion. There is valuable contribution of various scholars that

promotes the idea of cultural materialism coined by Harris. Ferguson (1984) "Warfare, Culture, and Environment", Goodenough (2003) "In pursuit of culture", Harris (1927) "Culture, people, nature: an introduction to general anthropology", Harris (1968) "The Rise of Anthropological Theory: A History of Theories of Culture", Harris (1979) "Cultural Materialism: The Struggle for a Science of Culture", Margolis (2003) "Marvin Harris (1927-2001)", Milner (1993) "Cultural Materialism", White (1973) "The concept of culture" and Murphy (1991) "Dominican Sugar Plantations: Production and Foreign Labor Integration".

1.7.1 Basic Premises of Theory

- Cultural materialists believe that technological and economic aspects play the primary role in shaping a society. Cultural materialism aims to understand the effects of technological, economic and demographic factors on molding societal structure and superstructure through strictly scientific methods.

- Cultural materialism is different from the Marxists materialism because it focuses on the productive (economic) and reproductive (demographic) factors as primary change agent in the society. Thus cultural materialism explains the structural features of the society in terms of production. Technological, environmental and demographic factors are primary determents of the cultural variations.

- Cultural Materialists believe that all societies operate according to model in which production and reproduction dominate and determine the other sectors of culture, effectively serving as the driving forces behind all cultural development. They propose that all non-infrastructure aspects of society are created with the purpose of benefitting societal productive and reproductive capabilities. Therefore, systems such as government, religion, law, and kinship are considered to be constructs that only exist for the sole purpose of promoting production and reproduction.

- Cultural Materialism holds that over the time and in most cases, changes in a society's material base will lead to functionally compatible changes in its social and political structure, along with modification in secular and religious ideologies. The ultimate goal of cultural materialism is to explain, not only describes the changes in way people live.

Harris also viewed cultural materialism as a vehicle for understanding and solving contemporary social problems. After all, before such problems can be solved, they must be understood.

> "If it is anthropology to struggle against the mystification of the causes of inequality and exploitation, long live anthropology"
>
> (Harris, 1979)

He has used term cultural materialism in his famous book "The Rise of Anthropological Theory in 1968". He used his approach cultural materialism in a different way from the other theoretical stances like evolutionary school, neo-evolutionary and Marxist materialism as well. According to Harris Cultural materialism

> "Is based on the simple premise that human social life is a response to the practical problems of earthly existence"
>
> (Harris, 1979)

According to this statement of the Harris, the central context of the cultural materialism is infrastructural determinism. Moreover, the cultural similarities and differences are explained through material conditions of the humans of particular society. A society's infrastructure comprises of its modes of production and reproduction that is determined through a series of ecological, technological, environmental and demographical variables. The study of society's infrastructure investigates!

> "How people obtain food and shelter, maintain a population base, and satisfy other basic biological and emotional needs and drives"
>
> (Harris and Johnson, 2002)

Hence, a society's infrastructure shapes the structure and superstructure.

> "A society's structure is comprised of its domestic economy (social organization, kinship, division of labor) and its political economy (Political institutions, social hierarchies) while its superstructure consists of "the ideological and symbolic sectors of culture; the religious, symbolic, intellectual and artistic endeavors"
>
> (Harris and Johnson, 2002)

The study of the infrastructure should be on the priority basis because it is buffering force between nature and culture. So if the goal of the science is to establish law-like generalization then one should study those aspects of the socio-cultural system under the great changes are being made. So that study of materials culture in the shape of canal formation is important to investigate the changes in the social structure of the society.
But Harris entirely does not hold the idea that all changes in the socio-cultural systems are due to alterations in their infrastructures while structure and superstructure are completely passive reactors.

> "Cultural materialism holds that over time and in most cases, changes in a society's material base will lead to functionally compatible changes in its social and political structures, along with modifications in its secular and religious ideologies"
>
> (Harris, 1979)

Thus, the ultimate goal of the cultural materialism is to explain the variations in the socio-cultural systems caused by the changes in the infrastructure but not merely to describe the cultural variations in the way people live. To study the stability and change in the social phenomenon on the basis of cultural similarities and differences is the central context of the anthropology discipline. While the cultural materialist approach in anthropology studies these changes on the basis of material conditions of the particular society. Unlike, the other paradigms cultural materialism does not only focus on the single perspective of the social phenomenon to construct reality. But it is the multifaceted phenomenon that includes both emic and etic approach to study the social phenomenon.

> "The mode of production in material life determines the general traits of the social, political and religious process of life. It is not the consciousness of the man

> to determine his existence but on the contrary their social existence determines their consciousness".
>
> (Harris, 1979)

Infrastructural determinism provides a set of principles to formulate the hypothesis and test the theories. Infrastructural variables are fundamental to measures the socio-cultural changes in scientific way. In infrastructural determinism technology is central variable to measure the mode production in particular society. It generates balance between production and reproduction that ultimate reshape the structure and superstructure of the society. Techno-economies are the basic change agent in the socio-cultural factors of the society. Thus technological interventions in certain economy revise the mode of production of the society that ultimate reshape the structure and superstructure. Wellbeing of the groups and individuals is directly connected with the agriculture. The misuse of the canal water resources indicates their poor economic condition. It has deep rooted impacts on their lives.

Technological changes are the basic unit of human evolution. The efficient use of the technology is always connected with the human development throughout the human history. The efficient use of the modern technology for modes of production is not just confined to better economic conditions of the societies but it also ensures their emic structure and superstructure. It does not matter a lot that how technological inventions originate in the individual lives but it is important how these innovations are materialized in social context. It is considerable phenomenon that how these technological interventions influence the modes of production and reproduction.

Cultural materialism describes the evolution of society in more scientific mode rather than evolutionary and diffusions' school of thought. Cultural materialism explains the evolution of the society through their modes of production. For instance variations in the modes of production indicates the cultural evolution hunter gathers to agrarian, chiefdom, pre-state and state. This evolutionary scheme is related to the modes of production. As modes of production have changed society has transformed into next phase.

1.7.2 Cultural Materialism

Marxists argue that production is a material condition located in the base that acts upon and is acted upon by the infrastructure (Harris 1996: 277-178). Furthermore, while Marxist theory suggests that production is a material condition located in the base of society that engages in a reciprocal relationship with societal structure, both acting and being acted upon by the infrastructure sector. Cultural materialism proposes that production lies within the infrastructure and that the infrastructure-structure relationship is unidirectional (Harris 1996: 277-278). Thus, cultural materialists see the infrastructure-structure relationship as being mostly in one direction. Cultural materialism also differs from Marxism in its lack of class theory. While Marxism suggests that culture change only benefits the ruling class, cultural materialism addresses relations of unequal power recognizing innovations or changes that benefit both upper and lower classes (Harris 1996: 278). Despite the fact that both cultural materialism and Marxism are evolutionary in proposing that culture change results from innovations selected by society because of beneficial increases to productive capabilities, cultural materialism does not envision a final utopian form as visualized by Marxism (Engels, quoted by Harris 1979: 141-142; Harris 1996: 280).

1.7.3 Criticism

- The main criticism on this theory is that it just focuses on the infrastructure while structure and superstore and equally importance. Cultural materialists explained infrastructure as active mode while structure and superstructure are considered as passive element in social change prospective. While in the context of the social change these three factors have reciprocal relations.

- The other major criticism on this theory is that infrastructure is always connected with modes of production. Sometimes in the society material forces of production in the society come in conflict with existing relation of production. New modes of production contradict with existence one that ultimate leads the society towards the disintegration.

1.7.4 Theory in the Present Study

Agriculture is main economic source in the village. 90 percent peoples are connected to agriculture occupation to meet their economic needs. Agriculture is core mode of production in the society. The agriculture in the Canal Zone is entirely dependent on the canal irrigation. Canal irrigation is key variable that determine the modes of production in the village. Thus the better management of the canal water ensures the valuable output productivity. Thus agriculture is functioning in the society as infrastructure according cultural materialism approach. Canal irrigation is a central variable that indicates the economic, social, cultural and religious aspects of the society.

Thus structure and super structure of the society relies on the infrastructure. The structure of the society determines through canal irrigation system at the locale. Social organization of the society is comprised on the basis of canal water. Conflict and cooperation among the various social groups is based on the control over the canal water. Formation of the social organization for water distribution and for canal management is based on the kinship ties. Members of the same kin group cooperate with each other to control over the canal water. Thus in the formation of FOs kinship ties play significant role. Illegal manipulation over the canal water is mainly executed through the power of kin.

Traditional social organization at the village is altering because of canal water. Misuse of the canal water is growing the level of the water logging in the tail area of the canal. Tail of canal is located very near to the east part of the village. Thus, it is disturbing the household structure of the village. Due to this reason people in the village are migrating from village to Canal Zone as well as in nearby villages who have finite resources. Thus due to migration of the people from the village, it is causing to alleviate the traditional social structure of the society. It is happening because of malpractices of the canal water. Another aspect of the change social organization is change in the family structure. People who have sufficient lands in the Canal Zone are migrating to Canal Zone. Due to this migration family bonds are losing. It is ultimate reshaping the structure of family. The

nature of the family is also changing from joint to nuclear one. Social and political structure is also varying. It is because of change in the infrastructure of the society. Distribution of the canal water has divided farmers in various social classes to control over the canal water. Emergence of the social classes is on the basis of land located in the Canal Zone, head, middle and tail end irrigator. Total land in the head end of the canal shows the social power, while distance from the water outlet to fields also indicates the social behavior of the farmers. Control over the water at head and tail end indicates the social hierarchy of the farmers in the society. Hence, infrastructure of the society controls the structure and superstructure of the society.

Chapter 2

Literature Review

The review of the relevant literature provides a road map to conduct the study in the light of previous studies. To keep in balance supply and demand of irrigation water is the central focus of all irrigation projects. There are multiple ways that create the gap between supply and demand of the irrigation water. To maintain equilibrium between supply and demand in one hand is the technical issue. As Vander Meer explained that;

> The irrigation system of particular settings is responsible for providing irrigation water from its source to fields that facilitate the desired crops. Such a system involves four elements, one or more source of water, fields, physical structure like canals, water courses and a functioning set of principles and techniques adopted by the humans to create water flow pattern within physical structure related to amount of water available from the source, characteristics and locations of the physical structures, and the varying needs of the fields.
>
> (Meer, 1968)

The gap between supply and demand is one of the very basic reasons behind the mismanagement of irrigation water. The social consequences of an irrigation project are very important to consider that leads you an indigenous solution of the problem. In this context, two factors are important described by Robert A. Fernea.

> "The relationship between a community or communities and a natural resource is one thing: the relationship between a developed system for the utilization of a natural resource and the other institutions and values of a society is quite something else."
>
> (Fernea, 1963)

> The importance of the non-irrigation application of water in the particular irrigation system is little considered. As competition grow between water resources and scarcity of water. It increases the pressure on irrigation to transfer water to the other sectors these other uses of water are clearly important. Thus increasing the efficiency of the irrigation threatens to the other uses of the water.
>
> (Perry, 2010)

Both of above factors are considerable during the mismanagement of water resources. The nature of the relationship in the community toward the natural resources and the utilization of these natural resources are very useful. But here in the present study, the second element is very much important to consider because most of the time the mismanagement of water resources is done by the users or during the usage water resources. Mismanagement of the natural resources in any form further leads to destruction of the natural resources. Mismanagement especially in the context of water resources in one hand deprives many people of their basic rights; on the other hand, it proves an encouraging force for people to destroy the natural resources. Mismanagement of water resources also has a close contact with ecology of certain geographical settings. Mismanagement of the water resources in mega irrigation projects leads to microclimatic changes in the irrigated and soil erosion has increased as N. D. Jayal explains;

> For new cropping patterns and to cope up with nutritional needs and cash crops for economic purposes have increased irrigation water requirements. The higher requirements for irrigation water have generated new instabilities in the ecosystem. Larger irrigation projects are becoming a major cause of deforestation. During the transportation of water in agrarian zone and its seepage in the command area is also proving a major cause of soil erosion in the irrigated zone. Flow of large volume of water and drainage of surplus water has raised the water logging and salinity in the irrigated zone.
>
> (Jayal, 1985)

The demand and availability of the water for irrigation always encourage the users to get maximum water through unfair means. The gap between demand and availability of irrigation water is due to many reasons. The population growth is one of the major causes of this gap.

> "Pakistan's population is estimated to increase 221 million by the year 2025, the percentage of water requirement would be increased dramatically"
>
> (Environment Report, 2005)

Due to increase in the population at the alarming level, the need for food is directly increasing. It ultimately put the pressure on agriculture to produce maximum food to

meet the needs of the masses. Thus, for intensive agriculture, it is very necessarily to make the irrigation system better. The needs for the irrigation water also increase to cope up with food requirements. According to planning commission report, the shortfall of water availability and requirements will be 31MAF from 2004 to 2025. The irrigation system in the Pakistan is one of the largest integrated systems in the world which is serving 42 million acres of land. As Ayaz explains

> The major storage reservoirs include Tarbela, Chashma on Indus River and Mangla on Jhelum River. The total length of main canals and distributaries are 64,000 km. whereas watercourses comprise another 1,621,000 km. The diversion of river waters into off taking canals is made through barrages, which are gated diversion weirs. The main canals, in turn, deliver water to branch canals, distributaries and minors.
>
> (Ayaz Ahmed, 2007)

As the population of the village growing with the passage of time, the need of the water increased in the terms of drinking as well for irrigation purposes. Intensified agriculture is another fundamental reason to deplete the ground water resources and canal water. To meet the irrigational and domestic needs the people in the Canal Zone have started to control the canal water illegally. According to S.N Lele and K.R. Patil;

> "When the issue of adequate water supply increased farmers at the top end started to install pipes in the water distributary to meet their irrigational and domestic needs. Installation of these pipes in Nepal is named as 'dongla"
>
> (Patil, 2006)

Environmental problems connected with an irrigation project are global. After the functioning of the canal and especially in the context of mismanagement of canal water has a lot of environmental disadvantages. Due to poor control and lack of proper drainage system for surplus canal water is the main reason of environmental destruction. Water logging is the main environmental issue in agrarian zones. Due to mismanagement of canal water logging is increasing day by day. It is not only harm for agriculture but also creating a sense of conflict among the farmers. As Afroz and Singh explained;

> "It has been pointed out that, on a global scale, at least2 00 000 to3 00 000 ha of irrigated land are lost every year, due to salinization and water logging".
>
> (Singh, 1991)

There is no single way to overcome the issue of gap between supply and demand of the irrigation water. The construction of dams is a universal solution to shortage of irrigation water in Pakistan. The construction of dams in Pakistan is more political than social issue. Only two major dams have been constructed in Pakistan after 1947, while in the Turkey and India have constructed 24 and 65 dams respectively in the same era. Other appropriate solution for this severe problem is to formulate appropriate irrigation water conservation strategies. Water management is biggest challenge in the 21st century. The use of modern irrigation technology is very fruitful in this regard. The appropriate strategies by canal authorities can be proved useful to overcome on the wastage of water through seepage and other water losses. As Chaudhry explains;

> In order to overcome the menacing of water shortage and its losses, it has become imperative to work on the lines of "Blue Revolution" which is threshold of the strategy meant for making use of more effective techniques and obtaining optimum results for reduction in water losses. The definition of "Blue Revolution" has been coined as a system of drip irrigation that delivers water directly to the roots of crops by cutting use of water by 30 to 70 percent and raising crop yield on the average by 20 to 90 percent.
>
> (Chaudhry et al, 2008)

Gap between supply and demand of the irrigation water generates conflicts among the users at various levels. The nature of conflict may be different but its existence is always there. Most of the time conflicts in agrarian societies are found among the head users and tail end users. The control and right over the irrigation water is considered high by the head users while the demand for appropriate share is regular slogan of the tail end users. Except this the conflict is always there between water users for agriculture and non-agricultural users. Power relations are very important cultural factors to get control over maximum water. As Straub explains that:

> "There is conflict among the farmers of Bali and the tourism industry in the Bali. Both of parties claim that they have right for more water, but the important point here is to mention the power relations of tourism group and farmers. This leads to mismanagement of water resources, a cause for social disintegration"
>
> (Borsch, 2004)

> Water has long been perceived as a social good, and interaction between human beings and nature has, until recently, been based mostly on the sectoral perception of water resources ecosystems. This has resulted in various forms of water conflicts, which reflect different perceptions from sectoral needs for water or from different concepts of water-use priority in the process of social and economic development. This kind of conflict is called "social conflicts of water management."
>
> (Ali,2010)

Mismanagement of irrigation system is mainly deals with the gap between supply and demand. As this gap enhanced it put worst impacts on the agriculture. According Abidi;

> "The level of the gap between supply and demand from head to tail reduces the output productivity of the agriculture. Unequal distribution between head to tail as well among the provinces its ultimate results appeared in form of loss of output productivity. Lack of adequate water supply is the heart problem for agriculture production"
>
> (Abidi, 2013)

The inequality of irrigation water among the head and tail end users is always due to mismanagement of canal water. The share of the irrigation water is considered high by the famers at the head while the share of the tail end farmers is low. This inequality has generated polarization among the farmers of the head and tail end farmers in various ways. The economic inequality is also associated with the head and tail end farmers, because the famers of the tail end farmers the get low shares of water. The other major reason for inequality between the head and tail end users is conflict. Struggle to obtain canal water between the head and tail end users leads to conflict. As Hussain explains that:

> Not only the farm level income and crop production have reduced at the tail end but also the quality of farm infrastructure and governmental services have

> deteriorated. More incidence of water related conflicts, disputes and court cases are found in tail-end locations than at head- end locations. Thus, the overall earnings and livelihoods at the tail end are at much lower levels than at the head end, and this is in fact much more serious than water logging.
>
> (Hussain, 2002)

The very basic aim of the irrigation is to enhance the agriculture production as well as to increase the agricultural land. It is only possible in the way that how much irrigation is available or obtained through the particular irrigation system. For this purpose, it is all times struggle to get control over maximum water for irrigation to enhance the agricultural productivity. As Dhawan described;

> "Besides the expansion of farm production and through high yielding varieties it is important to raise the agricultural productivity through irrigation water. Through irrigation water, cropping and sown area can also be enhanced. Double cropping is one of the most appropriate ways to multiple the agricultural products that is only possible through an irrigation system".
>
> (Dhawan, 1988)

Our country is agriculture country. Our economy mainly depends on upon the agriculture sector. High output productivity is not only connected to the household economy but its impacts are nationwide. High agriculture productions in the country stable the economy of our country. High agriculture output productivity depends on upon various factors. As Rao explains;

> "High agriculture productivity depends on upon the nature of the soil, use of modern technology and appropriate use of the available water resources. The appropriate management of available water resources has a key role in the high yield of the crops that can stable the state economy".
>
> (Rao V. K., 1967)

In Pakistan urban, rural ratio is 40:60. The rural communities are dependent on the agriculture. The development of the rural portion of the population is possible by providing them facilities in term of agriculture. The introduction of the irrigation is gigantic development strategy in rural areas. As Rao explained;

> "Canal irrigation in the agriculture setting is like day dream for farmers. With the introduction of the canal, irrigation farming has been intensified, output productivity has risen up. Cropping patterns have been revised and seasonal cultivation has been transformed into regular cultivation".
>
> (Rao V. M., 1978)

Intensified agriculture is core reason behind the shortage of the water. Changing cropping patterns in the Canal Zone are also elementary factors to augment the gap between supply and demand. The super solution for this issue is social cooperation in sharing of water. As explained by Sathe;

> "The real well-being of the farmers in Canal Zone is the share of canal water. A sharing basis of canal water may be multiple but the center focus is the well-being of the poor and deprived farmers. In most of the cases, the fundamental condition for sharing of water is reciprocity"
>
> (Sathe, 1986)

Since the ancient times, human beings have been struggling to increase the agricultural products to cope up with their nutritional needs. Various irrigation techniques have been introduced but canal irrigation is considered a boon for the development of agriculture as well as for the society. But the efforts made by human beings to enhance the agricultural products at any cost have generated a lot of curse for the society. The general benefits of the canal are to increase the agricultural products but its dark side always has been covered. Due to mismanagement of canal irrigation system, a lot of environmental hazards have occurred. It creates ecological imbalance, forced migration, water logging, Stalinization and loss of forest area. As Pandy (2013) explains that;

> The intensive irrigational need of green revolution has created a largely wasteful water requirement in the hope of increased food production in limited areas where irrigation has reached. On the other hand, the ecological impact of intensive irrigation has been large scale water logging and development of wet deserts in fertile agricultural lands. Further, this agriculture is so precariously dependent on irrigation that any delay in supply either due to actual water scarcity or due to mismanaged distribution will cause soil water droughts. On the whole, this method of agriculture has increased its vulnerability to drought in many ways.

To get control over the maximum irrigation water is possible through good management of irrigation water. What is good management? It is culturally constructed phenomenon that may vary accordance with certain cultures. While to manage the irrigation water certain factors are very important that must be kept under consideration but these factors are not fixed. In Thai society, water rights are fixed in such terms like social, cultural, economic, technical and geographical conditions as Andrea Neef described that;

> The farmers who have lands in upstream of irrigation system have first priority in water use that leads to unequal allocation of the water. Hence water user's rights strongly reflect local power relations, with members of local elites controlling the water conveyance systems by tapping water directly from the source and claiming a bigger share than others, since the less powerful do not dare to interfere. Powerful farmers also have the opportunity to extract water from different sources, and are thus able to use the legal pluralism in the community for their own benefits and to diversify risk in a rapidly changing institutional environment. Hence, it indicates that how socio-cultural elements are important to consider during the management of irrigation water.
>
> (Andreas Neef, 2005)

> "Improving irrigation efficiency ensures non-beneficial losses; particularly it reduces the amount of water extract from the rivers. Providing liberates water to irrigate large area in the main object of irrigation system but saved water can be used to irrigate downstream uses"
>
> (Matthew P. McCartney, 2007)

The construction and management of canal irrigation are normally controlled by the state. But in the practical sense, the management and maintenance of the canal irrigation are controlled by the farmers. The solution of the problems related to canal management and its maintenance are managed by the farmers and state actors. For instance, the issue of social conflict regarding the water distribution between head end and tail end users is well managed by the local farmers by than that of state or its actors. So the management of canal irrigation system is a triangle among state, canal authorities, and farmers. Each angle of the triangle is dependent on other to perform its true function. As Wade explained;

> "It seems likely that the efficacy of canals might be substantially improved by forms of organization which bring representatives of the state into regular, institutionalized connection with representatives of the affected farmers, both at the stage of construction and of operation and maintenance".
>
> (Wade, 1979)

Maintenance of the irrigation projects is not the sole responsibility of the canal authorities. It is the collective responsibility of the farmers and the canal authorities. According to the PIDA act 1997, it is the responsibility of the farmer's organization to collect the water charges from the farmers according to the schedule of the irrigation department. 50 percent of these charges are utilized for the maintenance of the canal infrastructure. The regular collection of the water taxes leads to the smooth flow of water from head to tail. As Sangal explains that;

> "The operational cost of the canal is the responsibility of the farmers. Water cost of the crops will be collected in the form of water taxes and uses this cost for the maintenance and operation of the canal structure"
>
> (Sangal, 1991)

Allocation of canal water is the huge administrative concern. Various methods are adopted to distribute the canal water, but in all aspects it central focus on the equal and fair delivery of water. The fair share of the water is considered as a right by the farmers. According to Bandaragoda;

> "Water share is the hydraulic property for the farmers who considered it as their right. Allocation of water rights is formed by the designer on behalf of state delivered to the farmers as a right to use the water".
>
> (Bandaragoda, 1998)

Technical factors are considered valuable to ensure the water availability. Due to technical factors, the potential of canal loses gradually. The ultimate disadvantage of issue appeared at the terminal end. At terminal end canal potential is almost to dysfunction. It reduces the output productivity as well the potential of the canal. According to Jairath;

> It is the core responsibility of the canal authorities to ensure the water availability at all ends of the canal. Removal of the technical issues like quantum of water supplied, the certainty of the water and control over the water supplies in terms of timing and quantity are principal jobs of the canal administration.
>
> (Jairath, 1985)

Water supplies are directly connected with the maintenance of the irrigation system. When a channel is running in its full capacity it indicates the satisfactory condition the maintenance.

> "The design of water carrying capacity of each water distributary has a fixed relationship with the maintenance of the water distributary. The function of the channel is completely dependent on the structure of the water distributaries".
>
> (W.W.H.Hart, 1996)

The balance of the salinity in irrigation and fields is the positive sign for the high yields. If the salinity increases in the fields it reduces the output productivity of the fields. Canal water is usually saline thus it is necessary to keep it deep from the root zone. As Wilcox said;

> To maintain the balance between salinity in the fields it is very necessarily to drain out the surplus water from the fields through deep ditches. It prevents the fields from the excess of water that leads to the salinity. Appropriate drain for the surplus water is not only protecting the fields from salinity but surplus water can also be added in the main irrigation reservoirs.
>
> (Wilcox, 1962)

Delivery of canal water is essential for the crops at each end of the Canal Zone. But the method of delivery of water is more important. According to Wade,

> "The practice of the water delivery method is valuable factors behind the fair water distribution. Continuous and rotational methods of water delivery are commonly practiced in the India. Both methods are equally practiced in the North and South India. Through these methods, adequate water is delivered at each end of the canal".
>
> (Wade, 1980)

Development of irrigational structure is the central focus of the government as well as farmers to have sufficient amount of the water from head to tail end. But for the maintenance, there is no centralized system exist that look after the maintenance and operation work of the canal. According to Pandya;

> "The multiple authorities for maintenance and operation of the canal will lead the project to destruction. No one is ready to take reasonability. Thus, the operation of the canal lost its potential".
>
> (Pandya, 2007)

Blindly development of the irrigation projects is increasing the supply of water but the demand of water is still short. Lion's share of the budget is spent on the development of irrigation projects but the sustainability of the irrigation projects is still questionable. According to Reddy;

> Allocation of the huge budget for irrigation projects is only utilized for the technical efficiency of the irrigation projects but the social aspect of the irrigation development is complete neglected. Allocation of budget for technical purposes only enhance the supply of the water but productive utilization of the budget is only possible when social aspect of the irrigation development considered seriously.
>
> (Reddy V. R., 2003)

The concept of the community irrigation is very effective for the irrigation water management. This concept has been practiced historically in the subcontinent, but after the British colonial period in the subcontinent they have control the irrigation water through bureaucracy to get control over the farmers. It was just limited to get control over the farmers but the back reality was to get control over the natural resources and to introduce western model of irrigation.

> "They constructed dams and through modern irrigation techniques they replaced the traditional irrigation system. After that time there is strong controversy the between state and farmers for the management of water resources. Many social movements have emerged to stop the construction of dams because it is policy of state to get managed the irrigation system rather than farmers".
>
> (Lyer, 1998)

Participatory irrigation is the best solution to overcome the conflicts among the farmers of the head and tail end water users. Participatory irrigation system refers to the participation of the famers in canal management system through their farmer's organizations or WUAs (Water users associations). The role of FOs (Farmers Organizations) or WUAs is very impressive to control the quarrels among the famers regarding management of irrigation system. Through these organizations, farmers do have their platform to raise their issues regarding irrigation system. These organizations are equal representation of all farmers head, middle and tail end farmers. As Reddy explains;

> Through the involvement of these organizations the water distribution mechanisms become centralized. The roles of canal authorities have been reduced which make the farmers able to get sufficient water. Devolution of power makes the farmers able to evaluate the members of our organizations to overcome the issues. But the problem here in this system is the lack of awareness among the farmers that indicate the weak structure of these organizations.
>
> (Reddy et al, 2005)

The delivery of the canal water is not controlled by the single authority. Thus it is very difficult to cover the CCA (Cultural Command Area). The control of the water distributary is under the irrigation department while the control of the below outlet is under the farmers. Thus due to mismatch between both authorities it is not possible to deliver the water in whole CCA. As Pant explained;

> "The main reason behind the failure of irrigation water to cover the CCA is due to lack of coordination. Below the water outlet farmers are responsible to deliver the water but due to technical concerns less amount of delivery to the farmers. Adequate supply of the canal water is only feasible when there is strong coordination mechanism exist among the both authorities".
>
> (Pant, 1981)

Management of the canal water resources without the farmer's participation is completely failed. The participation of the farmers in managerial functions of the canal plays a vital role for better management. According to Easter;

> "System of two canals in the Orissa state is distributed between the farmers and canal authorities. The water delivery under the farmer's control field channel was satisfactory. While the delivery of field channel under canal authorities was inappropriate. The cost effectiveness of the field channel under farmer's control was meeting its objectives"
>
> (Easter, 1974)

Canal water is public property. It is an equal right of all farmers. But the gap between supply and demand has transformed into the private entity. Small and marginalized farmers purchased the water share to fulfill their irrigational needs. As explained by the Prasad;

> The introduction of the water trade in canal irrigation system does not only indicate the forceful control of the top end farmers over canal water but it also represents that how public resources are using privately. The farmers of the top end use water as capital. They sold out their water share to generate revenue. This not only illegal practice but it is dishonesty of natural resources.
>
> (Prasad, 2002)

When irrigation is practiced in agriculture, water is the central point of conflict among the farmers. Social conflicts related to irrigation water are like water share, water control and physical administration of irrigation water. There are many formal and informal ways are adopted to solve social issues related to irrigation water. The nature of the conflicts is also important in this regard, for instance, some conflicts are settled through mutual cooperation among the farmers while some conflicts are referred to the local bodies of the farmers. Various severe conflicts related to the destruction of the water courses or stealing of water share is referred to the central government authorities. The role of the central authorities cannot be neglected in this regard. As Daniel Powell describes;

(Powell, 1985)

On the other hand, it is indispensable to use all the above tools for the protection of human society before useful wastage, misuse and depreciation of water resources and before over excessive water withdrawals, demands and arrangements threaten or have a

negative impact on the environment, thereby restricting the future development or negatively influencing the living standard or life - style of the society concerned. The most visible environmental impact of mismanagement of canal water is soil erosion in the Canal Zone. It not only reduce the agricultural productivity but also a constant threat in near and far future to cope up the national nutritional needs that are very alarming one. As Pimentel explains;

> "The results of our assessment not only underscore the serious nature of the environmental and social costs of soil erosion worldwide but emphases the need for immediate implementation of soil erosion control technologies. Sound soil and water resource management policies would be a substantial benefit to all nations now and in the future"
>
> (D. Pimentel, 1987)

Reforms are very necessarily for any system to make it capable of meeting the challenges of the time. The reforms in the irrigation sector are more important to meet the challenges in the irrigation system. The introduction of the water user's associations is the result of the reformations in an irrigation system.

> "It was the non-political way to deliver the irrigation management to the farmers. According to Reddy lot of money and time has been consumed to formulate the WUAs, but non-political aspects of these WUAs still exist. Political involvement is dominated in their functions. Issue of the "elite capture" still exists in the Andra Pardesh".
>
> (Reddy V. R., 2006)

> According to Rehman, warbandi is the traditional method that practiced in the Canal Zone to deliver the canal water among its users. Term warabnadi means wahr (turns) and buandi mean (fix). It is not just distribution of water but it is the integrated system that responsible to flow canal water from source to fields.
>
> (Rehman, 1995)

> There is a notable controversy about the operation of the CRB Canal. Its water requirements are on the basis of crops, which can be calculated through cropping seasons Kharif and Rabi. The issue here in its operation is that it demand based irrigation system but it operating on the basis of supply.

(Juan Carlos Alluralde, 1998)

> According to Robert, plant economy plays is the significant role in canal Zones in India. Especially, in the context of small land owners who have the little piece of land to cultivate can earn huge amount of revenue by planting the trees around their fields. The most advantageous impact of the trees plantation is that it does not disturb their crops.
>
> (Robert J. & Zomer, 2007)

Women play significant role in development of country. Women played a key role in the agriculture throughout the history. But in the context of present study women have very limited role in management of canal water. The management of canal water is entirely gender blind. The role of the women in canal water management is complete absent. As Zwarteveen said that;

> "Gender biased management of canal water is not sufficient to manage the canal water. Women are reluctant to participate in the local committee due to their subordinate role in the society. It is the immediate need to aware them about their role in the management and involved them in managerial activities".
>
> (Zwarteveen, 2010)

Chapter 3

Research Methodology

Each study has a particular methodology for collection of data, but in the context of present-day study, the mixed methodologies which comprise of quantitative and qualitative methodologies have been used. The following data collection methods were followed to collect data.

3.1 Participant Observation

Participant observation is a unique anthropological methodology to collect data. It is useful in a sense that through participant observation the gap between researcher and respondent is reduced. It helps the researcher to collect data in a smooth way.

> "In participant observation, the researcher takes on an active role within the social setting that is being studied".
>
> (Payne, 2004)

Participant observation is also a useful tool to develop the good rapport with the community. Through the good rapport building, researchers have an easy access to the community. The element of trust on the researcher is maintained through good rapport building. Having a better rapport-building among the community is only possible through participant observation. According to the nature of the study participant observation has helped the researcher to document the realities related to mismanagement of Canal water. Through this skill I developed good relationship with respondent from various social classes to investigate the real causes of the mismanagement of canal water. The topic was quite sensitive thus no one was ready to share information especially regarding the water theft, but having close relationship with respondents through this skill I acquired large amount of data. This data did not only highlight the various aspects of the problem but it also helped me to document the real social causes behind the issue.

3.2 Sampling

The sample is the very common technique which is the part of both qualitative as well as quantitative research. Both qualitative and quantitative studies are generally time bounded so it is not possible for any investigator to cover the whole universe in a certain time period. So the use of sampling tactfully is very necessarily to conduct the study timely.

"You are better off with the sample than with the whole population".

(Bernard, 2011)

In the context of anthropological studies, sampling is very necessary for both individuals attributed data as well as for cultural data. To document the cultural facts, it is very essential to use sample because cultural facts regarding any particular context are very subjective one and also time taking, so the use of the sample makes it possible to do it in time. The use of sample frame is the very basic step to select the samples related to your study. For sampling, telephone directory and census can be used but the most valid is to use census. The total population of the village is consist of 311 households among 100 sample has been selected.

I used two types of sampling to select the target group from universe. I used purpose or judgmental sampling technique to select the appropriate sample. I used this kind of sampling because it was the requirement of the study to get detailed knowledge regarding mismanagement. It was only possible by those respondents who have experience of agriculture before and after the canal irrigation. The other rationale to select this kind of sampling technique was to target the farmers, members of WUAs and canal authorities to depict the real picture of the problem. The second type of sampling that has been used in the study is theoretical sampling. Theoretical sampling has been used to cover all aspects of the study in limited time. The cases have been selected through this technique to explore new insights associated with issue. This technique helped me to collect rich amount of the data to meet the study objectives.

3.3 Socio-Economic Census

Socio-economic and census survey is a mixed technique. It is used in qualitative as well as quantitative research methods. It provides the numerical data about any particular social phenomenon. Socio-economic census survey is also very useful to introduce and in rapport building of the researcher in the field to collect more data through multiple techniques. I used this census survey to document the statistical data regarding the mismanagement of canal water. This survey provided me a lot of statistical data including what are water distribution methods, methods of water theft, level of social conflicts, cropping patterns, role of head, middle and tail end irrigators, information regarding family structure, educational status of the villagers, economic status of the villagers, religious affiliation of the peoples, age group, social classes, water logging, maintenance of canal and social hierarchies regarding the control over canal water.

3.4 In-depth Interviews

The interview is a mass data collection tool in qualitative research. I used semi structured in-depth interviews to collect the data. The first rationale to use this method is: because it was not possible for me to conduct structured interviews because nature of study does not allowed me. Semi structured in-depth interviews helped me to collect the data in the natural setting that proved very supportive for me to document the real data. Another rationale to select this technique was that respondents, all the time busy in their routine, thus, it was not possible to conduct the interview in formal settings. The last but not least rationale to select this method was that the social construction of the problem in the indigenous perspective is the main concern of all anthropological investigation thus it was only possible through this technique. This technique allows the respondent to express the knowledge in informal ways and interpret the issue in indigenous mode. To conduct the interview in the field is not an ordinary thing but is highly technical. There are a lot of things which I kept in mind before conducting an interview. For instance, how to start an interview? How to end it? It requires a lot of literature so that a researcher could clear his topic and questions while taking an interview. Control during an interview is highly skillful.

> "Unstructured interviews are based on a clear plan that should be kept in mind, but are also characterized by a minimum control over the people's responses. The idea is to let the people express themselves in their own terms, and at their own pace. A lot of what is called ethnographic interviewing is unstructured".
>
> (Bernard, 2011)

The native language was very important in this context because the wording and context of the question must be clear to the respondents. The administration and order of the questions during an in-depth interview is very important because proper order and careful wording of a question can be a rich source of data during an interview while on the other hand, chances of loss of useful data are also there. I followed all basic requirements for an in-depth interview to meet the best results.

3.5 Focus Group Discussion

Focus group discussion is a qualitative research technique started in 1941 at Columbia University by Robert Martin. In this technique, groups are selected to discuss a particular topic to know the perception of the people regarding the particular issue.

> "Focus groups typically have 6 to 12 members plus a moderator. Eight people are considered a popular size. If the group is too small, it can be dominated by 1 or 2 loudmouths, and if it gets beyond the 10 to 12 it gets tough to manage."
>
> (Bernard, 2011)

In focus group discussion, researcher conducts a discussion from the selected group on particular topic and sets aside and notes it. The key responsibility of the researcher is also to manage the group if it detracts from the topic. This technique requires smart observation technique as well as good note taking skill. I used this technique to investigate the social understandings of the people at locale about the mismanagement of the canal water. It helped me to have multiple views about certain topics that ultimately enhanced the validity of the study.

3.6 Visual Methods

Visual methods are the rich source of data for field work. Particularly it helps to record the field observations in the form of photographs as well as in the form of video. Visual methods are also helpful during note taking in the field. All physical expressions of the respondents and their responses regarding any particular social settings are very difficult to document. So, visual methods are extremely useful in this context. I took help from visual methods during my research. During my field work, I tried to use visual tools suitable. But the use of the visual tools during field may prove a source to make the study biased one because the behavior in front of the camera is different than that of natural settings. The consent of the respondents in this regard was also valuable.

> "Further, people often behave differently when they know that they are being filmed. However, if filming is done unobtrusively – but with consent – people do get used to it: for instance, we tend to take for granted the CCTV cameras in shops and town centers. Bottoroff's study of nurse–patient interactions installed cameras a month before the start of data collection (1994). The actual observations were complemented by interviews".
>
> (Grbich, 1999)

3.7 Field Notes and Daily Diary

Human memory is the most unreliable thing, so it is very necessary to take notes of daily activities in the field. I used to take note of my daily activities in the field. The method to take field's note was comprised on short keys words, abbreviations or by using symbols to denote particular descriptions. Human memory is very poor recording device so; jotting at the spot is the very useful technique to save your data. Jotting works like trigger when we are going to write our notes in detail it reminds us a lot of things. Sometimes, it is very difficult to take field notes because; some of your respondents may not feel easy so, jotting is a good technique to document the data. I used this technique during field to memories rich amount of data.

Field notes are safe to place to document your daily observations in the field while diary is your personal document in which you can hide your personal experiences and your difficulties you faced in the field.

> "A diary chronicles how you feel and how you perceive your relations with others around you. If you are really angry at someone, you should write about it in your diary. Jot down emotional highs and lows while they're happening, if you can, and write them up in your diary at the end of the day".
>
> (Bernard, 2011)

Writing diary is not only a personal document for you in whom you can write your field experiences but it is also a tool for you when you are going to analyze the data. It helped me a lot during data collection. It is the source for you to interpret the data which you have noted in the field notes and it also makes you aware of the personal biases.

3.8 Research Site

Being the main route for invaders and the conquerors, the village *Banbhan* and its surroundings were used by different Afghan ruling and rebel armed groups and while staying in the area for a short time at the right bank of River Indus they left some of their people as their heirs near the village locale. Among the heirs, both of the brothers were well known for their tribal entity *Lakha*[4] and *Bakha*[5] who inhabited the village with an unknown name. The two main castes were named as *Lakhvani* and *Bakhail* after the names of these brothers. There lived a famous Hindu trader *Bahnbar*[6] in the village. This village was named after the Hindu traders as *Bhanbar* village but with the passage of time, the name of the village changed from *Bhanbar* to *Banbhan.*

3.9 Location of the village

The village *Banbhan* is located 5km away from the right bank of River Indus, 1km in the east of Indus highway, 21km south to north from *Taunsa* Sharif city. Geographical location of the village is very important because a link road is passing through the village connecting many villages across the *Chota*[7] River and Chita River to Indus highway.

[4] Local caste Lakhvani originate through this man
[5] Local Caste Bakhail trace their lineage through this man
[6] Name of Hindu Trader in ancient time in the village
[7] Tributary of Indus River

Table 1 Location of the Village.

Area	Latitude	Longitude
Village *Banbhan*	30°54'21.46"N	70°36'37.39"E
CRB Canal	31° 3'7.77"N	70°42'1.77"E

Source: Google Earth

3.10 Major castes of the village

The word caste in the strict sense of distinguishing lower and upper groups of people is used in the Hindu society, but the terminology of caste is entirely different from that of Hindu society. Here the lingo of castes was meant for different ethnic groups existed in the village while the word *Zaat*[8] is used in the village that is more appropriate to highlight the significance of ethnic and occupational groups of people.

Lakhvani and *Bakhail* were two major castes of the village while *Dahar* and *Gunb* were two other major castes consisting of migrants from other areas to the village long ago. Other ethnic and occupational castes of the village *Banbhan* were Tarkhaan (carpenter), *Lohar* (Blacksmith), *Kuttana* (sweeper), *Mochi* (Shoemaker), Kasai (Butcher), *Nai* (Barber), *Kumbar* (Potter), *Sunnr* (Goldsmith) and *Choria* (Gazer).

In the village *Banbhan*, there were diverse groups of people belonging to different sub-castes known as *Noran Wale, Sulmani, ChandanWale, Bano Wale* and *Maliks.*

Table 2 Caste Frequency in the Village.

Sr. No	Caste	Percentage
1	Lakhvani	44
2	Bakhil	23
3	Dahar	11
4	Gunb	9

Source: Socio-Economic Survey

[8] Local word used for caste

3.11 Climate

The climate of the village is characterized by low rainfall with dry and long hot summer season of almost eight months. Summer starts from the mid of April and lasts till the end of September with an average temperature of 44 degree Celsius. The winter season is short lived, starts with the first rainfall in the first or second week of November and ending the last week of February. Winter might start late in case of late rainfall. The short interval of winter is characterized by the dry chilly winds falling the temperature low as zero degrees Celsius.

3.12 Crops and Plants

There are many varieties of crops cultivated in the village. Most common varieties are wheat, cotton, paddy, sugarcane, sunflower and sorghum. Before the execution of the canal farmers used to cultivate the traditional crops, but after the execution of the canal farmers have changed their cropping patterns. It is because of high yield as well as uncertainty of canal water due to mismanagement. Farmers have changed their cropping patterns according to available water resources. For instance famers have started to cultivate sugarcane and paddy in the head end due to excessive availability of water. On the other hand, they cultivated sorghum, millet and maize in the tail end areas.

Plant economy has a valuable share in village economy. Before the execution of the canal, there were small quantity of wild plants and bushes grew in the Canal Zone. After the canal irrigation, farmers have started to plant the timber and fruits plant in the Canal Zone. The other main reason for plant growth in the Canal Zone is that due to excessive availability of water plants have started to grow. Water logging is other principal cause to intensify the plants in the Canal Zone. Trees like eucalyptus are frequently planted all around the fields to reduce the level of the water logging. It is not surplus economy for farmers but it is also helpful for them to increase the fertility of their lands.

3.13 Cattle

Animal husbandry is other key economic source in the village. Cattle's farming is closely associated with the agriculture. Cattle farming were very rare in the village before the

execution before the execution of the canal because there short grazing lands in the village. After the introduction of the canal irrigation agriculture has intensified. Intensified agriculture also rose the grazing lands it ultimate cause to accelerate the cattle farming. Easily availability of the canal water is major cause to enhance the cattle farming. The most common cattle in the village are buffalos, cows, camel, sheep and goats. These animals have lion's share in farmer's economy. Agriculture economy is annually and biannually but cattle are considered as cash economy.

3.14 Language

The main language of the village *Banbhan is Siraiki* which is spoken by the majority of its population, while the *Pushto* and *Balochi* were also in practice with other indigenous languages spoken by the immigrants from tribal areas of KPK and Baluchistan while *Balochi* language *Buzderakki* is also spoken by *Buzdar* tribe.

Siraiki language is considered one of the most ancient languages of Indo-Pak subcontinent not only spoken by more than twenty million peoples. Many of the literary and poetry masterpieces have been produced by the *Balochi* scholars. The well-known names of literary figures are Irshad Taunsvi, Riaz Asmat, and Ahsan Waga while poets are Muztar, IqbalSoukri, ShafqatBuzdar, Bashir Ahmed Shaiq.

3.15 Family structure

The family structure in the village is mixed; there were joint family as well as nuclear family pattern practiced by the inhabitants. After the Canal irrigation, the family structure has changed because the ratio of joint families is more than the nuclear families. Causes and effect of changes in the family structure after the canal formation are explained in details in the next chapters.

Table 3 Number of Families.

Sr. No	Family Structure	Number of families	Percentage
1	Nuclear	61	61
2	Joint	32	32
3	Extended	7	7
Total		100	100

Source: Socio-economic survey

3.16 Marriage

The major pattern of the village is arranged marriages within the caste and clan. On the marriages, all the family, relatives, and friends participate and celebrate the occasion. The occasion is celebrated with different social and cultural activities. The participants were served with exclusive feast, dance and music programs were held while the marriages were solemnized in the presence of Mullah (a religious leader) and witnesses. Life partners were commonly selected within the family or the tribe. The details have been highlighted in the table- 4 below:

Table 4 Marital status.

Sr. No	Gender	Total	Married	Unmarried	Widow	Percentage
1	Male	1545	853	243		55.21
2	Female	1623	973	650	14	59.95
Total		**3168**	**1826**	**893**	**14**	

Source: Tehsil Population Welfare Department

Types of marriages

In the village *Banbhan,* the pattern of marriage is endogamous, while exogamous marriages were also practiced by the educated families. The educated and economically advanced families prefer mate selection free from the bonds of kinship but the traditional societies or families claiming high ancestral status to marriage within their relatives. However, three types of marriages were in practice as given in the table:

Table 5 Type of Marriage Patterns.

Sr. No	Type of Marriage	Number of Spouses	Percentage
1	Endogamy	57	57
2	Exogamy	37	37
3	Polygamy	6	6
Total		100	100

Source: Socio-economic survey

3.17 Housing Pattern

The structure of households in the village is mix, the traditional pattern and modern pattern. There were three types of housing patterns as observed by the researcher:

- *Katcha*[9] houses
- Semi *pakka* houses
- *Pakka*[10] houses

The majority of *katcha* houses were made of mudstones, having no proper boundary wall and decoration. Interior portion consisted of one or two rooms having no proper kitchen and washroom. The *katcha* houses were owned by the tenants, landless and of lower status people.

The semi *pakka* houses were in thin majority constructed with bricks having 1to 2 rooms, a small kitchen without a proper washroom and boundary wall. There is no costly decoration made in the semi *pakka* houses but were well constructed. Such houses were owned by the middle class.

The *pakka* houses were constructed with backed bricks, cement and iron bars and were well decorated having 3 to 4 rooms, a drawing room, separate kitchen, attached wash rooms, a visitors room *(Bethak)* with a vast boundary wall and costly iron gate. The *pakka* houses were mostly owned by the landlords, armed personals and working abroad.

[9] Mud house structure in the village
[10] Bricks house structure in the village

Table 6 Structure of the households.

Sr. No	Type of Houses	Number of Household	Percentage
1	*Katcha*	52	52
2	*Semi Pakka*	7	7
3	*Paka*	41	41
Total		**100**	**100**

Source: socio-economic survey

According to census survey, there were fifty two percent *katcha* households in the village, seven per cent were semi *katcha* and forty one per cent were *pakka*. The housing pattern of the village shows that there were either poor families or the landlords while the middle class is in the minority.

3.18 Community Meeting Places

Community meeting places were considered very important in the village culture. There were numerous meeting places as observed by the researcher during the visits to different places for research purposes. The major community meeting places were:

- *Bethaks*[11];
- *Chappar*[12] *Hotel;*
- *Deras*[13]in zone;

The concept of *bethak* as meeting place is an old tradition that had decreased in the last few years because after the functioning of canal irrigation, most of the landowner shifted to the Canal Zone for agrarian activities, while the daily wages workers and tenants also shifted their base camps near the fields to facilitate their daily attendance and there is no gathering in the *bethaks.*

[11] Drawing room but its cultural interpretation is different
[12]Hotels with particular wood structure in village
[13]Community meeting place particularly in the Canal Zone settings

The use of *chapar* hotel is another meeting place, which is still in practice where the working people visit after finishing their jobs for having *addha*(half cup of tea) playing *qattar* (a local game), watching TV and making gossips with each other to pass their evening time. The *Chappar* hotels were the places of interest for the researcher to sit with the elderly farmers who had a lot of information about the Canal irrigation system, its impact on the people and overall in the area.

While the *deras* have their own significance for people's get together. When people get free they meet at *derra* they take tea and talk to each other on different topics. The tradition of evening get together is also in danger due to the canal irrigation as most of the people have shifted to the Canal Zone to water their land for cultivation taking their workers and tenants with them. Thus the availability of people is not there to continue the traditional *dera* sitting in their free time.

3.19 Economic Organization

There is no single mega industrial unit in the village except few of the cotton and flour mills located two km away from the village established in the year 2000. In spite of higher rate of cotton production in the area, the fewer employment opportunities of labor and skilled workers have been created. The small industries relating to making handmade matting, wooden combs, weaved baskets, handmade carpets, small scale dairy farms were established after the functioning of the Canal.

There is a well-known craft specialist Allah Ditta Khumbhar but after the Canal irrigation, he switched from his profession and moved to agriculture. The handmade rope is single manufacturing item that is famous at the village level; it is made of *peesh*[14] or special *dhaga* was known as *Suttor*[15].

3.20 Water Resources

[14] Soft leaves of the Date Plant
[15] A special kind of rope made up with cotton

In 2002, there were limited water resources available in the village, while the available drinking water is polluted, most of the villagers used to fetch the drinking water from the nearby village *Basti Naseer*[16] while the water resources for the agrarian activities were also limited before the formation of CRB Canal. The irrigation is performed with the tube-well water but after the construction of Canal, the water level rose to the nearest earth level that has not only facilitated the village population to use underground water for drinking purposes but also for irrigation purposes. Almost each and every family has its own hand pumps installed with electric motors for pumping out the water from the underground reservoirs.

3.21 Occupations

Before the execution of the Canal, fifty percent people were related to the occupation of labor work, fifteen percent were connected with agriculture due to lack of water resources, fifteen percent people were doing business while thirty percent were the government servants but the occupational pattern is changed immediately after the functioning of Canal. The data collected on the subject has been highlighted in the connection with the occupations of Government job. These occupations have changed after Canal irrigation which is shown in the table.

Table 7 Types of Occupations.

Sr. No	Occupation	Percentage
1	Agriculture	90.7
2	Govt. servants	1.9
3	Wage labor	7.4
Total		**100**

Source: Socio-Economic Survey

3.22 Education

Educational facilities are not sufficient in the village as there is one Government Boys High School and one Primary School, one Government middle school for girls and two

[16] A small village located in the east of the locale.

primary girls' schools. The number of schools is insufficient for the whole of the population, while for higher studies, there were no colleges in the village. Along with Government schools, there were two public high schools in the village. The literacy rate of the village is better but the rate of female education is lower than males while the inclination of the population is also not hopeful regarding getting of higher education due to lack of resources and institutions. Agriculture is the single major economic source in the village thus other social institutions are closely related to economic institution. After the execution of the canal, economic conditions of the people have improved. Due to stable economic conditions after the canal execution, people have started to invest on the education. People started migration in near town for better education of their children. The inclination toward higher education has also increased.

Chapter 4

Farmer's perception about Mismanagement

The phenomena of management and mismanagement is a subjective one. It is more important for this study is to define the term management and mismanagement of the canal water in cultural context. The Concept of the management and mismanagement of the canal water in literature is different from the local perception of the farmers. According to literature,

> "Water management is concerned with improving access to and the efficient use of water".
>
> (Ali, 2010)

But according to the farmers, the administration of the canal water is its equal delivery from head to tail. The equal distribution of the canal water from the head of the outlet to its tail indicates the better water management. Maladministration of the canal water is also defined differently by the farmers. According to the farmers, reduction in the output productivity is mismanagement of canal water. Malpractice of the canal water is a loss of output productivity at head end as well as at the tail end. As quoted by a respondent Abdul Ghafoor; "Mismanagement of canal water is mostly loss of productivity at the head end instead of the tail end. He added that at head end farmers irrigate their fields again and again because they have a lot of access to canal water. As a result, they spoil their crops by mismanaging canal water."

4.1 Crops Productivity

Due to maladministration of the canal water farmers at the tail end receive little water. This little amount of the canal water is not sufficient for them to irrigate their fields thus due to lack of water their output productivity reduce. According to farmers, mismanagement of the canal water is mostly related to the poor administration of the irrigation department. Irregular monitoring by the department is a central cause of the maladministration of the canal water. The mismanagement of the canal water is not only confined to the loss of canal water but it is also proving a constant source of unrest for

farmers. This social unrest among the farmers due to the meager performance of the irrigation is elaborated through following case study.

4.1.1 Case Study

One of my respondents has ten acres of land at distributary no. 42. He said that, at one week I had surplus water turn, because I had no need to irrigate the fields. My neighbor Muhammad Naseer said to me that, I need your water turn this week. I replied, okay. At the night of the turn, I handed over my water share to him. He was irrigating his fields alone. At 3-am sudden increase water level in the distributary. He could not control the water. It damaged the water distributary. In the following morning, when I come to know that water distributary has been damaged. I went there and observed the situation. I said to my brother; please bring out the tractor very soon. I repaired the damaged portion of the distributary. After two days of this incident, someone in the village said to me that SDO of irrigation department is calling to you on the *dera.* I went there. He said to me that irrigation department has registered a case against you and your all brothers. I asked the reason of it. He said to me that, water distributary has been damaged during your water turn. I told him that this is not my fault. This is the fault of your department. The gatekeeper at main canal was not present when leveling of water increase in main canal. I said to him if gatekeeper present there, he must control the water level. But he did not listen to me. I hire a lawyer to defend my case. After spending lot of money and time, I got bail. This period was seriously crucial for me. Due to the negligence of the irrigation department, I suffered a lot. There are various examples are there in Canal Zone. Due to irresponsibility and poor performance of the irrigation department is not only destroying the irrigation system at locale as well it is also proving a constant source of discomfort for the farmers.

Outcomes of case study

- Importance of administration for irrigation management
- Mismanagement of the canal water, a source of discomfort
- Indication of gap between farmers and canal authorities

4.2 Social Conflicts

The farmer's perception about the malpractice of canal water is not only confined to the mismanagement at water distributary level but, it also includes the delivery of water from head to tail in the fields. Seventy eight percent of the respondents said that maladministration is being practiced below the *moga*[17] due to water delivery not being fair. At the head of the *moga* water delivery is paramount. While at the tail of the *moga* water delivery is not sufficient to irrigate the fields. It is due to mismanagement of the canal water at both ends canal authorities and farmers respectively. Farmers who have lands at the head of the *moga* misuse the canal water by threatening to the middle and tail end irrigators and stealing their share. Respondent, Abdul Ghafoor said that; "The farmers who have lands at head they spoil their crops through over -irrigation. When they irrigate their fields again, it raises the water logging and salinity in the fields which in return reduces their crop production".

One of my respondents is tenant since 2005 at the head end of the distributary no. 37. He said that I am observing for last 10 years at the head end of the water distributary that the output production is reducing continuously. In 2005 one acre wheat production was 2500 kilograms. But now it reduces to 900 kilograms per acre. Almost more than fifty per cent production has been reduced. Mainly it due to over irrigation at the head end.

The management of CRB canal was designed very fairly by the experts. CRB canal was designed to irrigate the both *Rabi* and *Kharif* crops. According to its fundamental design, it was constructed to irrigate half of the land in Rabi and another half to be irrigated in the *Kharif* crop. But the implementation of this plan failed. Due to the failure of this plan mismanagement of canal water was introduced in the Canal Zone. The plan failed at both ends canal authorities as well as farmers' end. Before the implementation of this plan, no legal structure has been developed by the Government to execute the plan truly. Beside this, it was the lack of awareness among the farmers to follow the plan. The present Canal Zone was quite barren before the execution of the canal. When canal irrigation was introduced in this zone, farmers tried their best to cultivate their whole lands. The present

[17] Hole in the water distributary at its particular point. It is used to extract the water from canal to fields.

action taken by the farmers has led the base of mismanagement of canal water. Farmers at the early time were unaware of its consequences. But with the passage of time when the consequences appeared it was too late. The other reason of mismanagement of canal water was the lack of interest by the canal authorities, who never performed their responsibility in its true sense. As a result, the entire scheme was ruined. Respondent, added; "If farmers follow the scheme they can get more benefits. Due to mismanagement of the canal water, it has divided the village into two portions. One who has lands on the upper side of the Indus Highway and second on the lower side of the road? Upper side land owner is enjoying the privileges of the canal while the lower side deprived the people from their basic need of food. Due to over irrigation in the upper side, surplus water is absorbed by the lower side lands. It spoils the lands at the lower end. Last 3 to 4 years the lands in lower side turn into barren lands. People who were entirely dependent on the agriculture are now deprived of their basic needs".

After the introduction of the canal irrigation, it raises awareness among the farmers to change their crops and cropping patterns. The introduction of the cash crops in Canal Zone is also a major cause of the mismanagement of canal water. At an early stage, farmers have little knowledge about the new crops. At the cultivation of new crops, farmers over irrigated their fields due to little knowledge of irrigation. It not only caused to reduce the water level at the tail end as well as it has created conflicts among the farmers who have adjoining lands. Over - irrigation is also problematic for the adjoining lands because surplus water is absorbed by the adjoining fields. Consequently, it raises the conflict among the farmers. The following case study will indicate that how conflicts arise among the farmers due to mismanagement of Canal water.

4.2.1 Case Study

One of my respondents is an old man of fifty three years. He is an Ex-man from the FC. He has seven acres land in Canal Zone. After his retirement, he used to cultivate his land. His cousin has adjoining land with him. On 7th October 2015, his cousin was irrigating his fields. He said to his cousin that when you will irrigate your fields please inform me.

His cousin when irrigated his fields he left the water to his cousin fields. Respondent was not present at his fields.

In the following morning, he came to his fields with his two sons. When he saw that his field is over-irrigated. He got furious. He called up his sons and moved toward the fields of his cousin. Harsh words exchanged between them. Suddenly my respondent's sons pick up the stick and through it on the head of his cousin. He went into unconscious condition. When this news heard by the brothers of the victimized they rashly moved toward their fields. They attacked respondent and his sons. They fractured the arm of respondent's son. Farmers working in nearby fields moved hastily toward them. They played the role of mediator and brought back them to the village.

The village, they again start up the fight. Both parties with their women set up their positions in nearby ground. Both sides women exchanged abusive language and thrown mudstone on each other. By the involvement of the some prominent landlords from the village, the fight has come to an end. Both parties were also having affinal relations. Both parties called back their daughters to their homes. The issue raised up the divorce. But due to the involvement of the local political personalities issue has been resolved.

Outcomes of the Case Study

- Mismanagement of canal water is raising social conflicts
- Mismanagement of canal water affecting the social relationships
- Water management is influencing the kinship ties
- Canal water management connection to gender role

Mismanagement of canal water is happening at both ends. Below the *moga* maladministration of canal water is happening at farmer's end while above the *moga* malpractice is happening at canal authorities' end. According my respondent Mr. Ali khosa; "There is no *wali*[18] of this canal. If there is some Government control over the administration, this system works effectively. Another reason is that farmers have no

[18] Supervisor

personal interest to manage the canal system. If called them to dig up the water course no one is ready to come".

There is no appropriate system of monitoring and cleanliness of the canal. No one is ready to perform his job. The poor mechanism of cleanliness at main canal, water distributaries and water courses are main cause of the mismanagement of the canal water. Due to poor cleanliness water distributaries have filled with mud and silt. Water carrying capacity of the water distributaries have been reduced to half. It ultimately leads toward the theft of water through illegal means to fulfill the irrigational needs. Due to poor cleanliness of the water distributaries their beds have been filled with mud and silt, when large amount came into it they started over flowing. This over flow of water is not creating only shortage of the water at tail ends but it also spoiling the service roads of the water distributaries. Below plate 1 will illustrate the conditions of the water distributary due to over flow of the water.

Fig. 1

Condition of service road due to over flow of the water from Water Distributary.

The poor delivery of the water at tail end is mismanagement of canal water said Mr. Abdul Aziz Dahr one of my respondent. He said that I have my land tail of water distributary no. 38. I received little water at the time of the need. It reduced the output

productivity. While on the other hand access of the water, when I have no need of it is causing of water logging. Hence, in both cases due to mismanagement of canal water I am suffering. A central cause of mismanagement of canal water is its uncertain availability. Farmers have no appropriate water availability schedule by the canal authorities. The sudden shortage of the water or sudden availability of sufficient water is an ultimate loss for the tail end farmers.

According to socio-economic census survey, twenty five per cent lands are barren due to the sudden availability of sufficient canal water. Due to uncertain availability of the canal water, farmers at the head end of the water distributary as well at *moga,* fulfilled their irrigational needs irrespectively their water turn. When they fulfilled their irrigational needs they left the water to the tail. At that time, farmers at the tail end require less water. Thus, this surplus water is proving a cause of water logging in their fields. It is due to inappropriate availability of the drainage system for surplus water. The tail of the each water distributary has been left open to the fields. Thus, it is proving a vital force to destroy a hundred acres of land at the tail end.

Another local perception regarding the mismanagement of the canal water is that it is a free entity that's why it is being mismanaged. The water charges are not fixed. But according to the canal authorities, water charges are fixed. Water charges are 85 rupees per acre for *Kharif*[19]crop while sixty five rupees per acre are fixed for *Rabi* [20]crop. At the initial time of canal execution in 2003, President Pervez Musharaf relieved the farmers from the water tax. But according to field data only percent of landowners have paid partial water taxes so for. A collection of water taxes is the responsibility of the revenue department. The explanation in this regard from the revenue department was that they visited frequently the landowners but they delayed it to next time. According to Mr. Mosa Khan;"Water is free for the people but they have the little importance of it .As a result, the farmers mismanage the canal water. They never come to clean the water course when they are called for it. Water courses are filled with mud, bushes and their water carrying

[19] Cropping season starts from April to October
[20] Cropping season starts from November to April

capacity reduced to less than half. That's why; farmers at the tail are unable to get sufficient water for their fields"

Mismanagement of canal water is also associated with the time of canal execution. In earlier time people wasted a large amount of the water because there were no fix water distribution methods. With the passage of the time, irrigation system at locale evolved. Farmers fixed water shares with their own cooperation and with an involvement of *PIDA*[21] . This water share method was named *Awami Warabandi*[22]. Through this *warandi* water shares were fixed for each landowner for five to six minutes per acre. This water distribution system does not ensure them to equal water distribution because it is not fixed by the canal authorities. If someone does not follow, no legal action is taken against him. But to some extent, it ordered the water distribution system at the locale. Due to *Awami warabani* mismanagement of canal water reduced. So in initial time and now mismanagement of water resources reduced. Additionally, cause of greater mismanagement with the passage of time is that almost 90 percent of the lands in Canal Zone were lying barren before the functioning of the canal. So in earlier time fields absorb the huge amount of water thus at tail end it reduced the level of the water. But now fields at the head are mostly filled with water thus, they required little water to irrigate them. Thus, sufficient amount of water is now available for a middle and tail end. This large amount of surplus water is also a cause of more mismanagement.

4.3 Unseen Hands behind the Mismanagement

The mismanagement of the canal water is more concealed than visible social act. It is hidden because no one is ready to take responsibility of its wastage. But according to my respondent Faiz Boshi ; "Eighty percent canal water is mismanaged at farmer's ends. It is due to their order of lands at particular water distributary. The farmers at the head end installed Chab[23] at their particular mogas. Due to this chab, they stop maximum water of water distributary. It ultimately reduces the water level. Some of the farmers at the head end even block the whole destroy with sand bags and by overflowing they irrigate their

[21] Punjab Irrigation and Drainage Authority
[22] Local Water Distribution method without participation of Canal Authorities.
[23] Artificial blockage of water to obtain illegal canal water

fields. At water distributary no. 37, forty percent farmers have made holes in water distributary in front of their lands. The dilemma is that no one has the courage to stop them. Thus, these are the unseen hands behind the mismanagement of canal water."

Fig. 2

Illustrating the illegal holes in water distributary

An additional unseen hand behind the mismanagement water canal water is that the role of canal administration is completely hidden. The canal administrations never visit the field. The overseers with other canal authorities are never ever seen at water distributaries.

As added Mr. Faiz that single *Baildar*[24] is appointed to watch over the water distributary. He is the local one. He visits the water distributary twice or thrice in the year hardly. Unfortunately, if he even visited the field he did not take the risk to inform the higher authorities. He is an employee working at very low wages not willing to take a risk. Being scared of his social honor and as a member of this particular community, he does not want to have the tense relationship with other village men. In this way, no one is

[24] An employee of Irrigation Department to watch over of the water distributary

ready to take the pain of this problem. Everyone in the Canal Zone is suffering from the problem but no solution is suggested to resolve it.

One more cause behind the unseen hands of canal water mismanagement is that farmers at locale have kinship ties with each other. These kinship ties are more solid and old than that of canal functioning. Farmers at the locale of the view that canal irrigation is our present but our social ties are out past, present and future. We cannot just break our ties for the sake of only water. Water and social ties are two sides of the same coin. Canal water is connected to our economy while kinship ties are connected to our social lives. Faiz said that; "Farmers at locale hide all wrong doings of the others because they are part of same social settings as well as they also get involved in mismanagement. Farmers think that if they produce obstacles for other in next morning they also have to face. The problem can be solved through single way when someone is ready to accept his mistake and ready to expose the problem at societal level"

4.4 Time Management

Time management in the irrigation system is the management of whole irrigation system said, Mr. Ghulam Farid. Mr. Ghulam Farid said that; "Time management in irrigation is very effective. The particular task in the agriculture has its own time span. For instance, I have my water turn tonight, if I will not irrigate my fields I will miss my turn till next week. So to cope of with my fault I will use an illegal way to irrigate my fields that ultimately will lead to the mismanagement of the whole system"

Same in the way, poor time management of water delivery has put bad effects on the output productivity. Farmers, especially at the head end, have the major role in the mismanagement of canal water in the respect of time. Farmers at the head end of the water distributary as well as the head of the outlet, they always in a struggle to have water share in the day time. They said that we have lands in the head then why we should suffer to irrigate our fields at night time. In this poor time management that not only faces losing of productivity but also has weakened relationships with middle and tail end farmers.

Farmers, especially at the tail end of the outlet they usually not frequently visit the *moga* in the night time. Due to 65 per cent *kacha Khala Jatts*[25], it is always the risk of their breakage. Farmers of the tail end of the views that it is very difficult for us to monitor the water courses at night time. It is due to no availability of service roads with water courses. Five feet land has been put the spare on the sides of the water course for service road in earlier time of its construction. But with the passage of time farmers include it into their fields. So, when they did not frequently monitor the water course sometimes, it breaks at weakens points. It causes to fill the fields of the farmers at the head end. It not only ruins their crops but they also get angry with water turn holders. Sometimes, issue transforms into conflict at *Bradri* (Kin group) level.

Time management is also very useful during the cleanliness of water courses during the time of the *Bandi*[26]. During the time of the *Bandi,* farmers start cleaning their water courses. It is limited time span. In this period, they have very short agrarian activities. Every farmer is called up of this collective activity by the head of the particular *moga*. This structure of collective activity is named as *Wingar*[27]. But it is observed in the last few years that the farmers did come for *wingar*. They said that to the head of *moga* for a division of water course and left their *Gani* for cleaning. Head of the *moga* remind them frequently, but they never listen to him. They put the work pending until *Bandi* period comes to an end. So they waste time and therefore suffer whole the year. Due to poor time management, they have no other chance to clean the watercourse until the wait for next *Bandi* period. During this time water courses filled with herbs, bushes, and mud. Their water carrying capacities reduce. A little amount of extra water can be the cause of water course breakage. Due to herbs and bushes, it gets the leak at my points. It is ultimately loss of water. Poor time management of the farmers has resulted in enormous loss of irrigation system.

The role of the cultivator is also very important in time management. The experience of the farmers regarding irrigation is very important. The agriculture at the locale has

[25] Mud watercourses in the Canal Zone
[26] Blockage of the canal water for certain time period for maintenance and cleanliness purpose.
[27] A group of people work without payment on the basis of social obligations.

entered a new phase after the introduction of the canal irrigation. People at locale have very little knowledge of the canal irrigation. Famers who have previous experience of agriculture are good at irrigating their fields in a moderate way. The farmers who have started cultivation after the execution of canal, always over irrigate their fields. Farmers who have already experienced of agriculture irrigate their fields after twenty two days. While the farmers who have no experience or little experience they irrigate their fields after 10 days it is not only waste of water resources but it is highly harmful for crops that reduces the crops productivity. This kind of poor time management does not only lead to mismanagement of canal water but it proving a constant source of decline in output productivity. Following case study will indicate that how over irrigation is decline the output productivity.

4.4.1 Case Study

One of my respondents is a very influential landlord at the village. He has eighty three acres lands in Canal Zone. He has two sons. He said that I am not able to cultivate my whole land because both of sons are Govt. employees. After the execution of the canal irrigation, it was great opportunity for me to cultivate my barren land in Canal Zone. Finally, I decided to hire a tenant. I hired a tenant on the 1/8th share. I directed my tenant about the water share. After hiring of the tenant I did not frequently visit my fields. One day a neighbor of my land in Canal Zone came to me and complaint against my tenant that he does not care for canal water. Due to his negligence, our fields are being ruined. I did not attention to it. He irrigated the fields at each turn but did never clean the water course my land neighbor added. Poor cleanliness of the water presents in the result of seepage and overflow of water at various points. Through this poor management and carelessness of the tenants fields are all the time get over irrigated.

After the complaint of my neighbor one day I visited my fields. I surprised to see that field is full of water. Water course is filled with bushes. Water is overflowing through water course. I called up the tenant. He came at *Dera*[28]in the evening. I asked him why you do not care for the water. He replied I have very little time because I have to irrigate

[28] Community meeting place particularly related to an influential landlord in the village.

the lands other than your land. It is not feasible for me to cover all my expenditure only cultivating this piece of land. I have also taken more land at 1/8th share to fulfill my expenditure. So it did not focus all only on your land. He convinced me through his strong argument. But when I threshed wheat crop I really upset to see the output. It reduced from 2000 kg per acre to 1100 kg per acre. Many experienced farmers who were presented there said to me that it is only due to over irrigation. They said that due to over irrigation grain losses its weight thus it reduces the overall productivity. Right after this crop I suspended my tenants and decided to cultivate the lands myself. Although at the earlier time it was very difficult for me but with the passage of time and experience, I overcome on such issues.

4.4.1.1 Outcomes of Case study

- How time management is important for better productivity.
- What is the role of the tenants in the mismanagement of canal water?
- How better management of irrigation water leads to the maximum productivity.
- How conflicts raise due to poor management of time in the irrigation system.

In the geographical settings of the particular Canal Zone wheat crop is required three to five turns of water to get it matured. But due to poor coordination between the irrigation department and farmers, farmers at locale irrigate their wheat crop approximately 6 to 10 times irrespective of reasonable irrigation gap. It is due to insufficient coordination on one hand while it is mainly due to inappropriate time management of canal water. It mainly happens during the *bandi* period. Due to insufficient information about the *bandi* farmers at locale irrigate their fields on each turn because they have uncertainty about the next turn. It happens in the month of December. In the month of December, it is heavy fog in the Canal Zone. Due to heavy fog in Canal Zone little water is absorbed by the fields in this season. Fields are wet with previous water and dew then again fields are irrigated due to the fright of *bandi.* In between 10 December to 10 January 85 per cent fields are irrigated 3 to 4 times. This is growing stage of the crop; besides the irrigation water it also needs sunlight to dry the fields but when it repeatedly irrigated it lose its power. Consequently, it became the central force for the reduction in output productivity.

Another aspect of the poor time management of canal water is that *bandi* period is not fixed. It is announced for one month at early but it extends sometimes more than two months. It is the very crucial period for the crops because due to sunlight the roots of the dry very soon. Beside this, it is the season in which water is required to have more fruit. Due to poor management, it causes to reduce the crop productivity. The remaining business is done by the availability of water right after the removal of the *bandi*. After the removal of the *bandi*, farmers are waiting for water. As water available to them they irrigate their fields more than its need. This is a period for crops to get mature at this stage crops required little water, but due to lack of irrigation knowledge and awareness farmers over irrigate the fields that ultimately lead to reducing the output productivity.

4.5 Irrigation Knowledge

Irrigation knowledge plays the key role in the management of irrigation water. Farmers at locale have little knowledge about the irrigation system. Especially, knowledge about canal irrigation is very low at the locale. Farmers have some indigenous knowledge regarding irrigation but it is most relevant to tube well irrigation. The control of the canal irrigation water is very important and also challenging regarding the management of canal water. Farmers at locale adopted indigenous knowledge and techniques to control the canal water that is very tough, and as a result, they lost the control over the irrigation. This kind of mismanagement is not only being a cause to waste canal water but is also proving a central force of water logging in the Canal Zone. Gull Muhammad one of my respondents said; "One day I was visiting my fields my field's neighbor was irrigating his fields. Suddenly water level rose up in the water distributary and it broke out the Kacha Khalla .My field's neighbor Lal Din tried his best to control the water but he in vain. At last, he laid down his fraternal nephew in the water course and hastily put sand around him. After some struggle, he succeed to control the water"

Gull Muhammad said that incident like this is happened frequently in the locale due to little knowledge about the control of irrigation water and lack of irrigation technology application in the locale. Due to poor control over the irrigation water fifty per cent water waste through various means. Farmers at locale have little importance to the canal water

because they think that it is the free entity. There is the huge lack of awareness among the farmers regarding the fruitfulness of irrigation water. Famers at the locale mostly prepare their fields in such way that the whole field looks like a playground. When I asked them during in-depth interviews, they replied that we do this all because it is very easy to irrigate the fields in this way. We use single *tukka*[29] and then we went our *kothi* (Small hut) and enjoy the sleep. The following morning when we get up our field is irrigated.

They irrigate their fields in such way because they have little importance to the irrigation water as well as it is due to lack of the irrigation knowledge. If they divide their fields in small *pakhhis*[30] they can irrigate their fields in a good manner. This kind of irrigation is not only positive to save irrigation water but is also a constructive thing for their output productivity added Mr. Gull Muhammad. This kind of irrigation is also very problematic for positive social relationships in the Canal Zone. The following case study of Mr. Tufail Khan will indicate that how little knowledge about irrigation is generating conflicts among the farmers in Canal Zone.

4.5.1 Case Study

One of my respondents is the small land owner in the Canal Zone. He has seven acres land in the Canal Zone. His land is irrigated through distributary no-37. His land is situated at the tail of the water distributary no-37. Due to his small piece of land his water share is only thirty five minutes. It is fixed by the local farmer's body through *Awami Warabandi*. During a winter night, Mr. Tufail Khan and his brother Mr. Muddasir was irrigating their fields. Mr. Tufail said that at that night water level in the water course was high than its normal level. We were rotating the water to each *Phakki* one by one. Suddenly field water course has been broken out at its weak point. We tried our best to stop the water to waste, but after a long effort, we cannot stop the water to waste. After unending efforts, we could not control the water. We ran rashly toward the *moga* and closed the *moga.*

[29] Cut in water course for irrigation purpose

[30] Small Soil Beds in the large field.

Our land was situated at the tail end of the water course as I explained earlier; we have consumed almost 30 to 35 minutes to block the water course. During this time canal water has entered into the wheat field of the Mr. Abdul Qadir Lohar . Mr. Abdul Qadir lohar has irrigated his field one night before this. After blocking the water outlet we came back home. We did not notice that water has entered into the field of Mr. Abdul Qadir lohar. In the following morning when he visited his fields he got furious to see that his field is full of water. He asked his neighbor Mr. Javed Wachi that who has irrigated his field last night. He told my name that he has irrigated his fields last night. Mr. Abdul Qadir hastily moved toward my home. He called me out as I appeared before him he started abusing me. We exchanged harsh words. Finally, I admitted my mistake and do sorry to him. He was not ready to hear my argument in the meanwhile a member of the local farmer's body came there. He inquired the matter. I explained the whole issue in front of him. He played his role as a mediator to resolve the issue. Lastly, he gets ready to understand the issue and accepted my apologies. We have very little experience of canal irrigation thus, we have not suffered only the loss in the form of low output productivity but due to all this, our social ties also weakened. After this issue, I decided that we will not cultivate our fields until we have sufficient experience of the canal irrigation.

Outcomes of the Case Study

- How irrigation knowledge is important to save the canal water resources.
- It indicates the lack of interest of the canal authorities in the management of canal water.
- How social ties are getting weak through lack of irrigation knowledge?
- How lack of irrigation knowledge is being cause to reduce the output productivity.

An additional aspect of the poor knowledge about the canal irrigation is that it is not only confined at farmer's level that they are not aware of the canal irrigation knowledge but it also observed at the canal authorities end. Forty to forty five per cent of canal water is the waste due to seepage and overflow of the water through *Kacha khalla Jatt*. A project has been initiated by the water management department to convert the *Kacha Khalla Jatt* into *Packka Khalla Jatt*. In this project, eighty percent of the finance is managed by through

Asian Development Bank while twenty per cent of the finance share is accumulated by the farmers. Through this project, sixty percent of the water courses have been converted from *Kacha Khalla Jatt* into *Packa Khalla Jatt*. According to my respondent Mr. Haider Dad;"This project is completely failed. He said that due to this project upper portion of the water courses which consists of 500 to 600 feet has been converted into cement water course. While remaining 900 to 1000 feet are still laying Kachaa, a thus issue is still there because farmers at the tail end are still suffering from an issue like short of water".

This project has also widened the gap between the head end, middle end, and tail-end farmers. Farmers at the head were already enjoying due their geographical settings. Through this project, their control over the water increased. Mr. Haider, Dad said that;
"Before the construction of these Khalla Jatt Irrigate whole of my land, but due poor engineering work the upper portion of the watercourse is lower thus it is unable to flow the water to lower part of the water course. Due to this poor engineer work my 10-acre land is lying barren for last two years."

Because of poor knowledge of the canal authorities' people at the locale are suffering issues like shortage of water but due to their negligence the single income source of the masses is vanishing. Besides this all, *Nakkas*[31] are installed in the cemented water courses. Due to the installation of this *Nakkas,* another phenomenon named as *Nakka* politics has emerged in the Canal Zone.

4.6 Nakka Politics

Nakka is an opening from the cement water course that opens in the fields or in the field channels. The concept of the *nakka* has emerged after the construction of the cemented water courses. At the early phase of *nakkas* construction, no one knew the importance of the *nakkas of being* an opening for irrigation water, but after its execution, it is indirectly or to greater extent indirectly related to the irrigation politics in the Canal Zone. Now at locale *nakka* politics is at its height. The installation of *nakka* is no more different from the control over masses by using various political tactics. The installation of the *nakka* at

[31] Particular opening in cemented water course towards fields

the particular point in the watercourse is indirect control over the people who have lands at particular field channel. In this way, landlords' class has tried their best to install the *nakka* in their own lands. Even they have paid money to the water management authorities for this purpose. Once they succeed in an installation of *nakka* in their land they have achieved their irrigational purposes as well as political purpose. Landlords have emerged most dominant political group in the village after the execution of the canal irrigation system. Their influence over the other farmers has more strengthened after the introduction of *nakka* politics. Through the installation of *nakka,* their control has been increased over the middle and tail-ender irrigators. They have already control over the canal water due to their geographical location at water distributaries but their control has more increased through *nakka* installation. Through the installation of the *nakka* now they threaten the farmers at middle and tail end farmers that they will stop their water if they challenge their political status. Their vote bank has increased due to *nakka* politics. Haji Saleeh Muhammad said; "I am suffering from the curse of the nakka. During the political campaign of the local bodies' election, an influential landlord has told me that if you did not vote for my candidate I will block your nakka which is opening on my land".

Nakka politics is the true indication of the poor awareness of farmers about the canal irrigation system. Canal water is used as the private entity rather than public. The transformation of the water courses from mud to cement it also indicates the ill knowledge of the canal authorities, about the canal irrigation system. Through this transformation social aspects have been neglected related to this change. Half and one-third part of the cement water course has increased more control of the canal water in the hands of the landlord class. Now it seems the whole system of the canal water and its management has been high jacked by the landlord class or put it consciously in the laps of the landlord class.

4.7 Mismanagement at Farmer's End

Twenty percent of the total agriculture lands in the Canal Zone have been affected by the water logging. Out of twenty per cent, 16 per cent lands have been converted into barren lands while remaining four per cent's output productivity has been reduced enough that

no farmers take risk to cultivate it. It is due to an ignoble attitude of the farmers toward canal water. The gap between supply and demand is increasing day by day. The gap between supply and demand is increasing mostly at tail ends. The negligence of the farmers toward modern agriculture and irrigation technologies is the principal source of the gap between supply and demand. Due to little use of the modern agrarian technology level of fields are not well. The poor leveling of the fields is ultimate loss of irrigation water at all ends of the fields in an equal way. According to Nazar Khan Khosa one of my respondents said that: "Fifty percent of the total water share has been wasted due to poor leveling of the fields at head and tail ends of the field. Sometimes it wastes through overflowing from one field to another due to poor leveling of the fields."

But unique information that has been shared by a respondent Haji Tariq is that; "Due to enormous supply and demand gap of irrigation water between the tail and head ends farmers' level of feuds are not enhancing with this ratio. It is because of farmers have lands on both sides of the village. They have lands in the Canal Zone and other than Canal Zone. Some piece of their land is cultivated at the same time thus they ignored the gap between supply and demand in the Canal Zone by thinking that some of their lands are cultivated so there is no need to have the feud with other farmers."

In this way, the level of the feuds is not increasing in the Canal Zone. The gap between supply and demand is self-created rather than it is the technical or departmental concern. Farmer's at the both ends have numerous ties rather than irrigation system in the Canal Zone. As earlier explained that; poor leveling of the fields is the vital source of mismanagement of canal water, lands in the Canal Zone are not level at its all ends. Thus, a farmer who has land at the top when he irrigates his land again and again and sometimes over irrigates, it causes to damage the level the other farmer who has land at the lower end. It is not only due to poor control over the irrigation water but it contains various social aspects too numerous social issues with other farmers and their social consequences are also expressed in this way. Over-irrigation is sometimes not the central cause of the damage to the neighbor's field it may have various social aspects as well.

Another aspect related to the mismanagement of the canal water farmer's end is that they are always reluctant to participate in the maintenance activities of the irrigation system.

The role of the farmers is very vibrant in the management of canal water below the water outlet. It is due to mud water courses. In the presence of the mud water courses it needs to clean them on a regular basis, otherwise, it is filled with silt in its bed that reduce the water carrying capacities of the water courses.

Another reason of regular cleaning of the water courses is that due to the regular flow of the water ,various kinds of herbs grow in it that ultimately reduce the water carrying capacities of the water courses. Thus, it requires the compulsory attention of the farmers to flow of the water below the outlet in a smooth manner. In this regard, the farmer's role is quite essential. According to one respondent Mr. Hajja Khan; "In *Kacha Khal Jatts* fifty percent water waste in the water courses due to its poor cleanliness. It wastes in the forms of overflowing and through seepage because water carrying capacities of the water courses reduced. It mainly happens due to negligence of the farmers."

As mentioned that the fifty per cent of canal water is wasted due to an ill maintenance of the water courses in the Canal Zone. So it has been noticed by the local farmer's to convert mud water courses into concrete ones. It was not possible for farmers to do it all. With the assistance of the water management department, it has been decided to convert the water courses from mud to concrete ones. For this purpose eighty per cent of the finance is sponsored by the water management department while remaining twenty per cent share will be paid by the farmers for this purpose. Seventy per cent mud water courses have been converted into concrete ones through this project but only one third part of water course is concreted of each water courses. It is due to non-payment of farmer's finance share. One day during my field Government officer visited field to accumulate the arrears.

A government official said to farmer Mr. Abdul Aziz' "please pay your arrears". Mr. Abdul Aziz replied to him that I will not pay the arrears until you ensure the water availability to me. Government official replied to Mr. Abdul Aziz that this is not my business to ensure you water availability. Mr. Abdul Aziz warns him that he will not pay the arrears until water availability is ensured to him by your department.This kind of

farmer's attitude is mainly responsible for the mismanagement of the canal water. Due to poor cleanliness and mud water courses, fifty percent of the water is wasted. If they cooperate with Government authorities in this regard they have an opportunity to convert the mud water courses into concrete ones. It ultimate will reduce the mismanagement of canal water.

4.8 Awami Warabandi

Awami warabandi is a system of canal water sharing among the farmers on the basis of mutual consensus. Canal water is divided among the farmers who have landed at particular water outlet. Canal water share is fixed on the basis of availability of water from single water outlet and amount of cultural command area of the particular water outlet. Water shares vary from 5 to 8 minutes per *Kanal*[32]. *Awami warbandi* is another central reason for the mismanagement of the canal water. Through this method of water sharing, there is no legal framework available for its accountability. Thus, there is no equal distribution of the water available at all ends of the water courses. Through this method water share is different at head, middle and at the tail end. Farmer's at the head of the water outlet considered that they are rightful to have lion's share of the water. They claim more share by hook or by crook. This ultimately raises the gap between supply and demand at the head and tail end. According to Mr. Hanif; "Farmers who have lands at the head end of the outlet considered themselves as powerful. They have the power to steal the water share of the tail end irrigators because water courses are passing through thekir lands. If they require water they get it through using unfair means for instance by installing pipe in main water distributary"

Awami warabandi does not only enhance the mismanagement of canal water but it is also proving a source of feud rising in the locale. But the level of the feud is not too much worse. These feuds are settled down at the local level because *bradri* system in the village is very strong.

4.8.1 Role of *Bradri*

[32] Local Measuring unit for land it is generally 5400 square feet but not fixed.

Local *bradri* system plays very significant role in the management of canal water. Kinship ties are very strong at the village. People at locale use these ties to manipulate the canal water resources. Lands in the Canal Zone are distributed on the basis of clan members. Each member of the clan has adjoining land with other members of the same clan. Thus, their water share is shifted to another member in the same manner. Before the introduction of the *Awami Warabandi* water distribution system in the Canal Zone, rotation of water method of water distribution was very popular in the Canal Zone. This system was truly based on the kinship ties. But after the introduction of the *Awami Warabandi*, the practice of the water rotation method has been declined. In *Awami Warabandi* role of the local *Bradri* system is similar to water rotation method. In *Awami Warabandi* farmers share their water turn on the basis of kinship ties, for instance, someone who has the spare water turn always tries to share it with his blood or *affinal*[33] relatives. According to the one of my respondent Mr. Hanif Kalati;"I always prefer to share my water turn with my relatives other than anybody else who is needier than that of my relatives. This practice is common among the land owners as well as in the tenant's class".

Due to the scarcity of the water in the Canal Zone, it has been observed that another class is emerging who cooperate with each other to manipulate the canal water resources. This class is consisting of members who have lands in the head end of the water distributary or water outlet. This class is not based on the kinship ties but rather based on the control of canal water due to their geographical location in the Canal Zone. This is mostly consisting of the landlords who have at least fifty acres lands at the head end. This class is not a lot in number but only consists of fifteen to twenty members but their influence is observed in the whole Canal Zone and in the local farmer's body to be very vibrant.
Another role of the *bradri* is that on the basis of local *bradri* system farmers select an irrigator of the particular water outlet who has lion's share of the water for managerial functions at the particular outlet. He is selected by the members of the *bradri* because all members of the *bradri* have lands at particular water outlet. Certain *bradries* have lands at particular water outlet but the member of the local farmer's is selected by the *bradri*

[33] Relationships on the basis of marriage

who have maximum lands at particular *moga.* Mr. Hajji Ramzan one of the respondents said that; "In one way local *bradri* system is useful to manage the irrigation system in the better way because the member of the farmer's body can easily control the members of the *bradri* and he has the ability to use his *bradri* for the better management of the irrigation water. On the other hand management of the irrigation system on the basis of *bradri* has numerous negative impacts including the biased attitude of the member, unjust with members of the other *bradri* and small landowner of the particular water outlet."
Due to dominate role of the certain bradri at a particular outlet is proving a central reason for the mismanagement of the canal water. This is not the case of the single water distributary or it is happening at the particular water outlet, but it is practicing on the both water distributaries no. 37 and 38 on all their water outlets irrespectively.

4.9 Drainage for Canal Water

Drainage for the surplus canal is an essential part of any irrigation system. At the early stage of the execution of the CRB canal, drainage for surplus canal water has not been taking seriously. It was due to large absorption capacities of the lands in the Canal Zone. The area irrigated through the water distributary no.37 and 38 mostly consisted of the sandy soil. Its water absorption capacity is higher. With the passage of the time and excessive irrigation of the lands at a head, the end has proved a vital source to reduce their water absorption capacities. An issue of the drainage of the surplus water arose at locale for last 5 years. When water absorption capacities of the lands have reduced surplus water transferred into adjoining fields. Surplus water has been shifted from head to tail end fields as well as from top fields to lower ones. Its ultimate consequences have been faced by the tail end area that is situated below the Indus High Way N-55. Tails of the both water distributaries no. 37 and 38 are not only comprised of the agriculture land but it is also having covered with the residential area of the two main villages and three small villages. Surplus canal water is not problematic for agriculture now but it is also proving a principal cause of disturbing the household structure of the village. According to Mr. Abdul Aziz one of respondents said that;" The issue of the surplus canal water is not only confined to reduce the output productivity of the agriculture land, but it also has destroyed the local house structure. People of the village are very anxious about the level

of water logging which is destroying their house structure. Many villagers are suffering even the way to their house because their house is surrounded by the surplus water of the canal. It is due to the poor drainage system for surplus water of the canal".

Flood carrier channel have been constructed around both sides of the water distributaries. But there is no appropriate system introduced to cope of with this issue. At the early stage of the canal execution Seem *Khala Jatts* have constructed from mid of the water distributaries to the flood carrier channel, but due to poor civil work, it did its business fairly. Another main reason of the failure of these Seem *Khalla Jatts* is that at early stage farmers have used these Seem *Khalla Jatts* irrigation purpose because in early days there was the shortage of the canal water. Due to a frequent flow of the water various herbs have grown in these Seem *Khalla Jatts*. It water carrying capacities have reduced day by day and it entirely got blocked due to poor cleanliness. The remaining work has been done by farmers who have planned it and add it into their fields. Now it seems that nothing exists there. The following plate will illustrate the worst opening condition of the surplus water carrier.

Fig. 3

Blockages of Opening of Drainage Channel.

When there was no appropriate drainage system available for the surplus water it entered into the village at the tail end. The eastern part of the village entirely effected from the water logging due to surplus canal water. The habitats of the eastern side of the village who have sufficient resources then migrated to the Canal Zone mostly, while remaining

one suffer from various troubles. The following table will show that how surplus water is being problematic for farmers of the head, middle and tail end irrigators.

Table 8 Impacts of Surplus Water.

Surplus Water Effected Area	Agriculture	House Structure	Migration
Head End	20	02	0.1
Middle End	26	18	14
Tail End	43	42	38

Source: Socio-Economic Survey

The head end lands in the Canal Zone are located at high altitude with respect to middle and tail end thus; it is little possibility for head end lands to effect from the surplus water. The three little amount of the surplus water in the head end lands that have enormous impacts on the output productivity. Due to poor drainage for the surplus water twenty per cent agricultural activities reduced in the head end. Two per cent household structure has been disturbed in the head end. Migration rate is very low to 0.1 per cent in the head end because the household structure is not too much affected in this area. At the middle end of the water distributary, twenty per cent agricultural activities have been disturbed because of poor surplus drainage water. It is because of that in the middle end lands the level of the lands is low with respect to head end lands thus there is sufficient amount of the surplus water is available in both *Rabi* and *Kharif* seasons crops. Eighteen per cent household structure has been disturbed due surplus canal water. The rate of migration is higher in this area it is fourteen per cent in this area.

The most affected area in the village due to the poor drainage system of surplus canal water is tail end. At the tail end, whole surplus water is added there. It has various reasons but the fundamental one is that it situated at the lowest end as compared to a head and middle end. All surplus water over the head and middle end flows towards the tail end. Forty three per cent agrarian activities have been reduced in this area. Output productivity of the crops has been reduced to more than half. A Hundred acres of fertile land have been transformed into barren ones. Household structure of this area is badly

affected. Forty two per cent household structures have been destroyed due to the constant availability of surplus water around the houses. Migration rate is very high in this area. Thirty eight per cent habitats of this area have been migrated to Canal Zone, nearby villages and some have been shifted to the town. Reaming masses of this area are those ones who have no sufficient resources to migrate.

According to Mr. Ghulam Sadique one of my respondents;" The role of farmers in poor drainage of surplus water is central. Canal authorities have once provided us a suitable system of drainage but it has been destroyed by the framers themselves and now they are crying" He expressed signs of anger on his face when he was sharing this information. After observing his condition I inquired him about the reason for his anger. He replied that;"I have lost my three acres land due to this problem at water distributary 38. I had purchased 5 acres land out of which three acres have been transformed into barren due to destruction of the drainage system by the farmers" According to respondent Nazar Khosa; "The principal reason behind the poor drainage is the poor cleanliness of the water courses at the farmer's end. Due to poor cleanliness of the water courses, water waste through the seepage and overflow. This surplus water is not only problematic for the agriculture but it also creating problems in the residential area. The single and feasible solution for this problem according to my experience is that farmers must focus on the cleanliness of the watercourses".

4.10 Theoretical Discourse

The mismanagement of the canal water is a subjective phenomenon. Perception regarding the mismanagement of the canal water varies from person to person but, the most common perception regarding mismanagement of canal water in the Canal Zone is the irregular supply of the canal water from head to tail. It contains various factors including the canal administration, FOs, and role of the farmers in this regard.

All factors are equally important and rich in socio-cultural justifications. The role of the canal authorities is very vibrant in this context. Delivery of canal water and its fair distribution are included in the main job of the canal authorities. Poor maintenance and cleanliness are the chief causes behind the irregular water supplies at main distributaries

level. Maintenance and cleanliness of the main water distributary are the principal jobs of the irrigation department. But they justify their poor performance by arguing that they have little budget to overcome on such issues as well as they have faced the lack of cooperation from farmers in this regard. They justify their role to stop the illegal withdrawal of canal water by saying that they have the shortage of staff, but the negative role of the farmers in this regard discourages us. We remove the *chab,* but as we return back they rebuilt it.

The role of farmer's organizations is very central. They are enjoying the privileges obtain by the irrigation department through reforms in the irrigation system. The control of the water distribution has been shifted to the FOs. Thus, they are misusing their role to manipulate over the canal water. Unfair distribution of canal water by the FOs presents the dark side of the coin. Farmers play a key role in the mismanagement of canal water. It is because of that more than 40 per cent canal water is wasted below the moga. The control of the water below moga is 100 per cent under the supervision of the farmers. Their poor role in the maintenance of the water courses and excessive irrigation by the top end farmers are the root cause of the mismanagement at farmer's end.

The level of the conflicts at village level due to mismanagement of the canal water is other core social hazard of the mismanagement of the canal water. The levels of the conflicts are rising at the village. Due to mismanagement of the canal water high level of the social conflicts is promoting disunity among the members of the society. Social unity is the basic trait of the agrarian society that is losing due to mismanagement of the canal water. Irregular supply of canal water from head to the tail end of the canal is promoting the social classes in the village. The level of hostility is growing among these classes due to poor water delivery.

Water distribution methods in the Canal Zone are other core reasons behind the mismanagement of canal water. Poor water distribution method of canal water is creating the sense of insecurities among the farmers. Poor water distribution methods are accelerating the gap between supply and demand. Favorable timings of water turn for one

class is another reason of mismanagement of canal water. Lack of awareness among the farmers about irrigation knowledge is another key role in the mismanagement of canal water. Low output productivity of crops due to mismanagement of the canal water is serious economic loss.

The role of cemented and mud water courses in the delivery of canal water is very fundamental. Mud water courses produce the serious threat to the regular delivery of canal water from *moga* to tail. Seepage and overflow of the canal water through mud water courses enhanced the gap between supply and demand of the water at head to tail end. The poor cleanliness and maintenance of the mud water courses have reduced their water carrying capacities. It ultimately raises the gap between supply and demand. The transformation of the mud water courses is the serious issue of politics. Landlords and political class at the village have confined the cemented water courses to their lands and rail end of the water courses are still at their previous positions.

Poor drainage system for surplus canal water is a severe impact of the mismanagement on the agrarian activities. Excessive irrigation at the top end is proving a serious cause of water logging in the tail end of the canal. Due to unavailability of appropriate drainage for the surplus water, it gathers in the tail end thus it spoils the crops in the tail end. It not only reduces the crop productivity but 30 per cent land in the tail end has transformed into barren. The additional severe impact of the surplus canal water is that it has shattered the social and family structure of the village. Surplus canal water has disturbed the household structure of the village. It forces the people to migrate in various areas including Canal Zone and nearby villages that intrude the social as well as the family structure of the village.

- The findings discussed in this chapter acutely represent the basic theme of the cultural materialism explained by the Marvin Harris. Technological and material development in the society reshaped the structure of the society.

- Modes of production of the society defined the social structure of the society. Changes in the modes of the production are reforming the social relationships among the farmers. Social conflicts have raised among the farmers due new irrigation practices.

- Introduction of the new irrigation practices economies of the village has been revised. It has introduced the social classes in the village on the bases of canal water supply, because of this social structure of the society that was based on the traditional agriculture economy has been changed. The findings of this chapter prove the validity of Marvin Harris theory cultural materialism.

Chapter 5

Canal Irrigation and Agricultural Economy

Water always remained a productive source for the societies whose economy depends upon the agriculture. It can play a revolutionary role in an agrarian economy when it can be used in efficient way. It is very necessary for the agrarian economies to cope up with available water resources and their needs to use these resources. With increase of the population water resources gets decreases with the passage of the time. Thus it is very necessary to manage the available water resources, well organized and systematic steps to be taken to meet the requirements of the masses. On the other hand mismanagement of the water resource especially in the field of agriculture is real threat for the agrarian economies. In irrigated agriculture it is always a narrow chance to mismanage the water resources. In irrigated agriculture mismanagement of water resources means you have missed the opportunities to get appropriate benefits from your lands. This chapter will deal with mismanagement of canal water through various means and how it is proving a change agent for agricultural economy.

Mismanagement of the canal water is happening at various ends. There are some technical issues as well as social issues that lead to the mismanagement of the canal water. When water resources are not effectively utilized, it ultimately changes the agrarian economies. Here initially I will discuss reasons that become the catalyst for mismanagement of canal water resources.

5.1 Conveyance Losses

Conveyance losses deal with the wastage of the water from the water distributors to the fields. The only reason of the wastage of water is not of its technical fault, but sometimes these losses are more social than technical ones. The present study will also closely deal with the conveyance losses due to social reasons.

5.2 Seepage

Seepage is defined as;

> "The infiltration downward and lateral movements of water into soil or substrata from a source of supply such as reservoir or irrigation channel".
>
> (Ali, 2010)

There are number of factors that enhance the rate of the seepage. The amount of water waste through seepage depends upon the type of the soil which is used for water course. Seepage of water is ninety per cent higher in the mud water courses with respect to cemented one. Sandy soil has greater chances for seepage in compare to loamy soil. Beside this it also depends upon the level of the water course, if water is sloppy from head to tail the amount of seepage reduces, because there are little chances for blockage of the water in the water course that ultimately proves a central cause for seepage. Depth of the water course is another reason for the seepage of the water. If the water course is deeper it has little chance for seepage while on the other hand if it is not deep it has maximum chances of seepage. Another reason for the seepage is the amount of herbs in the water course. If particular water course have little amount of the herbs there are less chances of the seepage, on the other hand if a water course is filled with herbs there are maximum chances of seepage. This was all about the seepage in the case of the mud water course. In the case of the cemented water course there are different factors of the seepage. In the case of the cemented water course the amount of the silt in the bed of the water course is most important factor for seepage. Beside this the lines between the two plates are also important factors for seepage in the case of the cement water course.
According to respondent Mr. Ashique Hussain; "Due to technical reasons behind the seepage only 20 per cent water is wasted but due to social reasons 40 per cent water is wasted consciously by the farmers"

The major social reason behind the seepage is poor cleanliness of the water courses by the farmers. Due to poor cleanliness fifty per cent water could not reach at the tail end. In the earlier time of the canal execution an appropriate schedule has been developed by the farmers to clean the water courses. Total length of the water course was divided to

number of irrigators and share of the each irrigator has been fixed according to their land. This system was very useful regarding the cleanliness of the water courses. Due to practice of this method equal water distribution at each end was possible. According to Mr. Aziz one of respondent; "Due to proper cleanliness of the water courses at early stage of the canal execution the level of the seepage was very low, we saved fifty per cent water due to control over the seepage. There was a little gap between supply and demand of the water requirements for the crops that ultimate increase the output productivity of the crops".

Another central reason behind the seepage of the water at the farmer's end is that the standard size of the water outlet at the main water distributary has been changed illegally. The size of the water outlets had increased at various points. Due to this cause amount of the water increase in the particular water course that is higher than the water carrying capacity of the water course this amount of surplus water is wasted through seepage or through over flowing. With the passage of time the amount of the seepage water has increased, that ultimate cause of the unequal water distribution at each end.

As irrigation system regulate in the Canal Zone, farmers have diverted their attention from the cleanliness of the water courses. There are multiple reasons behind this issue. First and foremost one is that farmers in the Canal Zone have lands at various water courses than that of single one. Their attention has been diverted toward all of their lands rather than single piece of the land. Thus cleanliness of the water courses gets poor day by day. Another important factor behind the poor cleanliness of the water course is that in early days of the canal execution, farmers used to cultivate their all lands by themselves. But after three to five years of the canal execution farmers who have land more than hundred acres they decided to hire it to the small land owner or land less class of the village it was because that their hundred acre land were not irrigate through single water course.

When tenants started cultivation over there they did not took pain to clean the water course. Local farmer's body divides their *Gani*[34]and told them to clean it in due date. Dead line is very short because it is only possible in the period of the *Bandi.*[35] They did not clean their *Gani.* It happen at all ends of the water course. Thus output productivity reduced at all ends of the water course. Another major factor behind the seepage of the water course is that eighty per cent water courses in the canal zone have been transformed into cemented ones, but one third part portion of the water course has been transformed into cemented. Two third part of each water course is still lying *Kacha*[36]. Due to this transformation no one is now ready to clean the reaming two third part of the water course. Thus large numbers of herbs and grass had grown in the water course bed as well as along the service bed. According to Mr. Abdul Ghafoor; "Seepage in the *Kacha Khalla Jatts* has been increased up to sixty per cent. This abrupt increase of the seepage is happened very after the transformation of the *Kacha khalla Jatts* into *Packka*[37]. After these transition farmers never clean up the remaining two third part of the water course"

Fig. 4

Poor Cleanliness of water Course

[34] Portion of water course fixed for cleaning
[35] Official blockage of canal for cleaning purpose annually
[36] Local term specifically used for mud water courses
[37] Local term specifically used for cemented water courses

5.3 Surge Effects

Surge effect deals with the mismanagement of the irrigation water due to sudden increase and decrease of the irrigation water. It is also multifaceted activity that happened in the irrigation system. In the context of the canal irrigation it occurred at managerial level as well at farmer's end. It does not matter where it is happening at farmers or at managerial end but its consequences is equally worst at farmers as well as at managerial end. Primarily I will discuss the surge effect the managerial end. The CRB canal management hierarchy is shown under;

5.3.1 WaraBandi[38]

Warabandi is method of canal water distribution. It ensures the availability of the canal water from head to tail end equally. It's main managerial cause for surge water in the Canal Zone. In the Canal Zone there is no legal method of the water distribution, it has been introduced by the canal authorities to distribute the canal water in the fair way. Thus local farmers have introduced a system of water distribution with mutual consensus named as *Awami Warabandi.* Through this water distribution method availability of water is not regulated. The available amount of the water at various ends and in various seasons is different. Thus availability of the water at each end of the water distribute is not equal through this method. It is manifold issue. The first factor behind this issue is that local farmer's body has no appropriate record of the cultural command area in the Canal Zone. Thus it is not possible for them to distribute the canal water in equal manner. According to Mr. Mosa Khan;*"Awami warabandi* is system of the powerful and landlords who distributed the canal water in unjust way. There is no universal irrigation time at each end of the canal. At some water outlets it is fixed five minute for each *Kanal*[39]and at some water outlets it is 8 to 10 minute are fixed for each *Kanal".*

Due to this unfair distribution of canal water, availability of water varies from head to tail. In the head area excess of water due to unjust water distribution while at the end it

[38] canal water distribution
[39] unit used to measure the lands

produce scarcity of water. The amount of the water increase at the tail end in off season that ultimately damage the crops in final stage and it also proving a destructing force for the habitants of the village in middle and end. Another major factor that is causing surge effect due to water distribution is that, due to unavailability of Government water distribution method in the Canal Zone there is no legal system of punishment at misuse of the canal water. Farmers are free to have control over the canal water through their own means. They have no fear of law. It is corroborating the farmers to use unfair means to control the canal water. According to Mr. Qasim member of local farmer's body; "There is no appropriate system of *Jama Bandi*[40] is existing in the Canal Zone. Through *Jama Banadi* it is possible to share the canal water in equal way. It is also possible through the *Jama Bandi* to implement the punishment for misuse of canal water resources".

5.3.2 Uncertainty of Canal Water

Uncertainty of canal water availability in the Canal Zone is other central cause of the surge effect. It happens equally at each end of the canal. The water of the CRB canal is divided between the two provinces KPK and Punjab. The lion's share is controlled by the KPK province because it has 3, 70,000 acres of cultural command area that is irrigated through *Chashma* Right Bank Canal. While 2, 36,000 acres cultural command area of the Punjab province is irrigated through this project. Cultural command area of the Punjab is situated at the tail end while the cultural command area of the KPK is situated at the head end of the canal according to the geographical setting of the project. Uncertainty of the canal water in the main canal is generally generated at the provincial level. Although the management of the main canal under the control of the WAPDA that is federal authority but beside this it is not ensured by the WAPDA to deliver the canal water according to fix share of the provinces. In busy irrigation season gap between supply and demand is enhanced at the tail end. This kind of uncertainty is major cause of the surge effect at the tail end of the main canal. According to respondent Mr. Abdul Ghafoor; "Punjab has 1800 cusec share out of 4879 cusec of total water, but delivery of the water in the main canal never touched to the 1400 cusec. The delivery of the water is generally around the

[40] Local Revenue term used for overall land acquisition in the Canal Zone

900 to 1000 cusec in cropping season. At tail end of the main canal it reduced to 250 to 300 cusec in busy cropping season".

Uncertainty at the main canal level is not only concern with the less share of water but it is more problematic when amount of water sudden increase in the off season. This kind of uncertainty is major cause of water logging in the Canal Zone as well as harmful for the output productivity. The following case study of a gate keeper at distributor no. 36 will describe that, how effect surge is harmful for the sustainability of the irrigation system in the Canal Zone.

5.3.2.1 Case Study

Muhammad Nazwaz is an old man of the forty five years. He is the resident of the nearby village in the Canal Zone. He has 5 acres land in the Canal Zone. His total land is fifty three acres. Forty eight acres of his land is situated out of Canal Zone. Before the execution of the canal he used to cultivate short piece of the land to support his seven family members. In 2004 he has appointed as *baildar* at distributor no.36. He said that, in winter season of the 2009, gate keeper of the distributor has left the job. Canal authorities have ordered me to do the job of the gate keeper for few days until someone replace you. I agreed on this. I started to go there. My duties were to open and close the gate of the water distributor according to the amount of the water available in the main canal. I have been instructed by the engineer that when water touches the red line you must open the full gate, otherwise it will damage the main canal somewhere.

Almost twenty one days passed normally. It was off season of irrigation. One night I was at my duty I observed that unexpectedly amount of water rose in the main canal. It was happening first time during twenty one days of my duty. I really got worried and confused because I had little experience of the gate keeper. As I saw enormous amount of water the instruction of the engineer was revolving in my mind. I took the screw driver and open the gate of the water distributary to its full mode. Higher amount of the water entered into the water distributary. The amount of the water was higher than the water carrying capacity of the water distributary. I really was worried to observe the situation. I

was sure that it would damage the water distributor. After two hours I saw few lights are moving hastily toward the canal. I understand the situation. I hide myself because I was sure farmers will not tolerate it. Four motor bikes stopped there. They are calling me. I did not reply to them. They were abusing me constantly and saying that it is because of me water distributor had broken at two spots. They closed the gate of the water distributor and went.

In the following morning I came to know that water distributor was broken at two spots. The service roads of the distributor have completely destroyed. Local farmer's body called off me. I went there at noon. More than fifty farmers were gathered there to rebuild the water distributary with tractors as well as with men force. All of them were very angry at me. I explained the reason and convinced them by saying that I was ordered by the engineer to open the gate in the case of high amount of the water. Finally they left me by saying that you will leave this job and return back to my own job.

Outcomes of the Case Study

- Uncertainty of water how problematic for irrigation sustainability
- Role of canal authorities in mismanagement of irrigation system.
- How surge effect is damaging the canal irrigation system.
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5.4 Monitoring of Canal water Resources

Monitoring of the irrigation system is another main cause that accelerates the surge effect in the Canal Zone. There is no appropriate monitoring mechanism exist in the Canal Zone. Single *Baildar*[41] is available to watch over the 5 to 6 km long water distributary.

5.4.1 Role of Baildar: (Awaz Clerk)[42]

Baildar is a person appointed by the government on the head of the main canal to regulate the water requirements in the water distributaries. He is highly influential person in term of authority. He is supposed to open the water in the water distributor. He exploits

[41] Employee of irrigation department to watch over the water distributary
[42] Local word critically used for *Baildar*

the farmers when they required water, he demands money or get in kind payment to open the water on the turn of particular farmer. He has a biannual contract with farmers to have payment in kind to get lion's share water on their turn. If anyone denies him to give cash or kind payment he blocks the water on the turn of particular person, consequently he deprived him from the canal water that is very serious loss for his crop. Thus he not only gets money but also has strong relationships with influential land lords and political persons of the locales. So he has a key role in term of mismanagement of canal water.

He does not perform his duty in fair way. Due to his negligence canal water did not regulate in the water distributary. The amount of the water varies from outlet to outlet that is problematic for the farmers to control it. Consequently it affected the crops especially in its maturity time. Another vibrant role of the *Baildar* is that due to his poor job performance farmers have enhanced the size of the water outlets and even dig up the illegal water outlets. Through these unfair means it is not possible for farmers to control the amount of water from the water outlet that is increased up to fifty per cent. It is because of that the water courses and field channels are not capable to control the large amount of the water. Consequently, it damages the crops.

5.4.2 Coordination

Coordination is the main tool to regulate irrigation system. The management of the irrigation system is no single fold task it is multifaceted task. The triangle of the farmers, canal authorities and local farmer's body is very central in the context of the irrigation system management. There is no central communication mechanism available for this triangle in the Canal Zone. This is another major cause for irregularity of the canal water at its all ends. Due to lack of appropriate coordination between canal authorities and farmers also being a cause of discomfort for tail end irrigators in the sense of access of water in off season destroys their crops that are near to ready. There is no immediate coordination is being made between the canal authorities and farmers when there is lot of surplus water in off season for instance in October and April. Hence, unexpected large amount of the canal water destroys their crops.

5.5 Mismanagement at Farmer's End

The mismanagement of canal water is no single side phenomenon. The role of the farmers is same as the role of administrative in mismanagement but the distinction here is that the role of the farmers in mismanagement is under the *Moga* is widely while the role of the administrative unit is widely above the *Moga* including water distributary in main canal. The other distinction is among the farmers of the head and tail end.

5.5.1 Role of Head End Farmers

The role of the head end irrigators is very central to mismanage the canal water. The initial motive for the head end farmers to mismanage the canal water is that they claim that geographically they have lands at head end so that their share must be huge and control over the water resources is more than that of tail end irrigators. Head end farmers have an advantage that they have geographically at top end so that when they required canal water they just cut the water course or install the pipe form the *Thoker*[43]to meet their irrigational needs. Consequently, it enhances the gap between supply and demands of canal water. Another common way to mismanage the canal water by the head end irrigators is that, they have an idea about turn of the each farmer and they knew that how much distance is between the *Moga* and field thus they just pick the *nakka*[44] and fulfill their need. When farmer of the tail end come to know that water is getting low so, he comes towards *Moga* and saw that water course has been cut from the specific point but no one is present there. Thus his *Bharai Water*[45] gets down and consequently he did fulfill his irrigational needs.

> "Conflicts in water management evolve with the scope and intensity of the interaction between human beings and nature, among individuals, and between communities."
>
> (Ali, 2010)

This is very common way to mismanage the canal that is practiced by the head end farmers and it ultimate leads to the social conflict between the head and tail end farmers.

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[43] Civil engineering term used for small bridge particularly used to level the canal water at all ends.
[44] Particular opening from water course to field channels
[45] Amount of surplus water transfer from one share holder to another

The following case study will indicate the role of head end farmers in mismanagement of canal water and how it leads to conflict.

5.5.1.1 Case Study

One of my respondents is an old man of sixty years. I have thirty eight acres land in Canal Zone which is divided in head, middle and tail area. I have also two acres land which is irrigated by the D-38 while all other land is irrigated through D-37. My twelve acres land is located in head area of D-37 but it is at the tail of the water course. One night, I was irrigating my fields. My turn was consist of twelve hours. Four hour in the day time and remaining eight hours in night time. At night time suddenly I noticed that water is getting down. I ran towards the *moga* to know what has happened. I was walking briskly toward the *moga* at the service road of the water course; suddenly I saw that water course was cut towards a specific field channel. I blocked it with difficult because it was mud constructed. It was cool winter night, I was very furious at that who has cut the water course. I saw around the cut but no one was present there. Due to this cut *bharai water* has almost dead. I have lost almost one hour of my water turn. After blocking the cut I came back to my fields. After some time I observed that water is again getting down. So again I moved toward the *moga* and astonished to see that water course has been cut from the same place. I blocked it with difficulty. I waited and round there to catch the person but no one was present there. Thus I came back to my field. Again after some time it happened same. This time I decide to trace the person so I hide myself in near field. After some time I saw that a man is climbed up the tree near by the water course. I was very furious. We exchanged hot words to each other. Finally the matter comes to fight but I get back when I thought that he has land at head so I give up to fight. I said to him, "please you do irrigate your field or mine" after that he did not cut the water course again and I irrigate my field. During all this I have lost two hours water share of my turn. Consequently, crop production has reduced due to unavailability of water in time.

Outcomes of Case Study

- Hegemonic behavior of the head end regarding water control.

- How tail end farmers suffer by the mismanagement of canal water by head end farmers.
- How mismanagement of canal water is leading to conflicts in Canal Zone.
- How mismanagement of canal water is reducing the crop production by the head end.
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5.6 Mismanagement of Water Turn

The timings of turn are most important to manage the canal water at farmer's end. The distribution of the canal water is distributed in twenty four hours of the day. The share of the water is allocated to the farmers at the day time as well as in night time. The influential landlords and members of the farmer's organization allocate the water share in the day time for themselves while they allocate the water to other farmers at night time. The other reason for allocation of water share in the day or night time to specific farmers is that, the system of *Warabani* is farmer centric not by the canal authorities thus they allocate the water share to specific persons in specific timings. It is massive root to mismanage the canal water. It is not easy to manage the canal water in night time with respect to day time. Especially in *Rabi* [46] season it is very difficult to manage canal water due to cold and poor condition of water course service roads. Due to poor condition of the service roads toward the *moga* farmer did not frequently visit to the *moga* resultantly water waste at several points in the water course. The other main reason of mismanage of canal water is that, at night time farmer at tail end of water course when fulfils his irrigational needs he did not get pain to go at the *moga* to block the water rather than he cut the water into nearby fields that is not only waste of canal water but it is also proving a cause of conflicts among the farmers. It is also being a key source of the water logging in the Canal Zone. Following case study will indicate the importance of the timings for management of canal water.

5.6.1 Case Study

[46] Classification of the cropping season on the bases of monsoon it starts from October and ends on March

One of my respondents is forty two years old. He is living in nuclear family. His father is retired teacher. He has one brother. His father divided his land between his sons. Hajja khan's share is consisted of hundred acres. He has twenty five acres land at tail end while remaining seventy five acres is located in middle and top end of the water distributary. He is of the view that, my water share is at night time at tail end land, so it is very difficult for me to control the water at night time especially in the *Rabi* season. In winter nights, it is quite hard for single man to irrigate his fields as well as to visit at *moga* frequently to check the condition of the water course. So many times it happens that water course has been cut at various points due lack of visit. One night I was irrigating my fields in the tail area. It was the month of December, I irrigated my fields it was about 3am. Next share holder was not present at the spot. I thought what to do now? Firstly I thought I must have to block the *moga* when I fulfill my irrigational needs but due to cold I lost the courage. I left the water into water course and came back to my home. Next morning I was sleeping when my son came to me and awakens me and said that uncle Mushtaq is calling you at the door. I came out and frightened to see that Mr. Musthaq has got furious. He said to me angrily that you have destroyed my crop by leaving the water last night. I told him that I did not leave the water in your field but he replied me that last night you were irrigating your fields. I tried my best to convinced him but in vein. Finally matter referred to local farmer's body for solution. The head of the *moga* called me in next morning. Next day I appeared before the farmer's body, they listen both of us. Finally I confessed my mistake. They charged me fine regarding the nature of the crop. I request the body to give me time until my crop ripens then I will pay the fine. Thus due to poor time management in water distribution I have to suffer financially as well as mentally. Beside this it has spoiled my relationship with my neighboring farmer.

Outcomes of the Case Study:

- How allocation time of turn is important to manage the canal water?
- Importance of equal time distribution of water share.
- How poor time management is being a cause of social conflicts among the farmers?

- How poor time management is damaging the agricultural economy as well domestic?

5.7 Agricultural Economy

This portion of the chapter will deal with the changes occurred in the agricultural economy due to mismanagement of the canal water. According to the Mr. Salih Muhammad one of my respondent; "Sixty five per cent economy of the village was based on the agriculture before the functioning of the canal. But after the operational of the CRB Canal the economy of the village raised up to ninety per cent on the agriculture."

The agricultural economy was mainly based on the *Rabi and Kharif* crops. In early years of the canal execution output productivity was very high. It was mainly because of gigantic transformation of the irrigation from tube well to canal irrigation at locale. The other principal cause behind the high output productivity was that sixty per cent lands were lying barren since many years. About two per cent of them are irrigated through rain fed. When these barren lands have been irrigated through canal irrigation their output productivity was very high. But with passage of the time, mismanagement has been started in canal irrigation. It does not only decline the output productivity but it also proved a change agent for the agriculture economy of in the Canal Zone. The following table will indicate the changes in output productivity of the crops year by year.

Table 9 Change in Output Productivity

Period	Name of Crops				
	Wheat MTs/Acre	Cotton MTs/Acre	Rice MTs/Acre	Sunflower MTs/Acre	Sugarcane MTs/Acre
2002-2004	2	1.5	0.5	1	N/C
2004-2006	2.4	2	0.8	0.8	48
2006-2008	2.4	2.2	1.5	1.2	40
2008-2010	2	1	1.8	1	42
2010-2012	1.8	1.2	2	0.8	32
2012-2014	1.6	1	2.4	O.5	24

Source: Agriculture Department Tehsil Office

Year wise changes in output productivity of various crops have been showed through table no. 9. Variations in the output productivity are due to various reasons but no single reason is separate from the management of irrigation system. Per acre output productivity is mainly due to mismanagement of canal water. In some cases, it is due to the scarcity of water at the time of its extreme needs while on the other it is due to an excess of water that is being the main cause for water logging in the Canal Zone.

Agriculture economy is not only confined to output productivity of the crops but it has revised the cropping patterns in the Canal Zone as well as irrigation choices of the farmers. It also deals with the soil utilizations, use of modern agriculture technologies, formation of agrarian communities, water sharing methods, involvement of local politics, introduction of irrigation politics, gender role in agriculture economies and role of local social organization in management of irrigation system.

5.7.1 Water logging

Water logging is foundational issue regarding the agriculture economy. The total land of the village has been divided in three portions after the execution of the canal. Before the functioning of the canal the land of the village was divided into two portions. First portion was upper area of the Indus Highway that called the *Bani*[47]. The second portion was below the Indus high way to the bed of the River Indus. This portion called *Kach or Bait*[48]. While after the execution of the canal the land of the village has been divided as, upper portion of the Indus Highway to Sulman Mountain range is named as Canal Zone, below the Indus Highway area is named as the tail of the canal and the portion of the land near the Indus River bed is named as *Kacha.* This new segmentation of the village land is not only confined to its distribution but it has very distinctive role in term of agriculture. Basically this new division of the land is on the bases of its level from canal toward Indus River bed.

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[47] Term used for area located near Sulamin Mountain Range
[48] Term used for area located near Indus River bed

Fig. 5

Illustrates the Water Logging due to Surplus Water at Tail End.

First few years of the canal execution there was no issue of the water logging exists in the Canal Zone. It was because of that lands in the Canal Zone were lying barren since many years, their water absorbing capacities were better than now. But with passage of the water absorption capacities of the lands have been reduced. According Mr. Atta Ullah one of my respondents; "Water absorption capacities of the lands in the canal zone have been reduced. It has many reasons but major one is excessive irrigation to the fields. In early yers of the canal execution one acre piece of land take one hour and twenty minutes to irrigate it. We consume two water turns to irrigate single acre of land, but now one turn is sufficient for one acre land to irrigate it in full mode"

Water absorption capacities of the lands have reduced to fifty per cent. It is mainly in the head end but in the middle and tail lands the absorption capacities have been reduced to forty and thirty per cent respectively. Major reason behind the water logging is excess of irrigation especially in the head area. The farmers who have lands in the head area of the canal they irrigate their fields on each turn of their water share it is major cause of the water logging. They did this because of greed and in many cases they have very little knowledge about the irrigation. Excessive irrigation is not only harmful for their field in

term of low output productivity as well as soil fertility of the lands is losing with each passing year. Water logging is not only pain of the head end irrigators but due to their carelessness in this regard middle and tail end irrigators are suffering a lot. The level of the lands in the Canal Zone is in descending order head, middle and tail end. Thus when top or head end lands are irrigated excessively surplus water shifted into nearby fields in lower part. It is less harmful for the top end land but more worst for the lower one. In this case output productivity of the lands reduced in same order. Table 10 will indicate the decline in output productivity of the lands in various portions of the lands.

Table 10 Comparative production of wheat, cotton and rice.

End in Canal Zone	Name of Crop		
	Wheat MTs/Acre	Cotton MTs/Acre	Rice MTs/Acre
Head End	1.4	1.2	0.6
Middle End	1.72	1.36	0.52
Tail End	2.2	2	0.64

Source: Socio-Economic Survey

In table 10 it has been shown that how output productivity of the various crops is reducing from end to end. Output productivity is declining in descending order because head end is less affected from the water logging with compare to middle and tail end. The rice output productivity is less reducing because paddy is kharif[49] crop and it required more water than cotton and wheat. Wheat is more affected crop due to water logging at all ends it is due to it is crop of Rabi[50] season and it also required less water with compare to cotton and rice.

5.7.2 Reasons of Water Logging

[49] Classification of the cropping season on the bases of monsoon it starts from March and ends on October

[50] Classification of the cropping season on the bases of monsoon it starts from October and ends on March

Water logging is multifaceted phenomenon. Its nature varies from locale to locale as well as it depends upon the nature of the irrigation system. In canal irrigation it is mainly because of water distribution methods. Water distribution method in the canal irrigation system is responsible of fair water distribution at each end. When water is not delivered fairly at each end it causes water logging at one end and scarcity of water at other end. According to Mr. Gull Muhammad,"Government system of warabandi is very useful to deliver canal water equally. Through this method every farmer is receiving his share fairly. No one find illegal ways to get lion share of canal water. Thus this method is very useful to overcome on the water logging".

Another reason behind the water logging is that farmers have little used of modern technology to control over the irrigation system. Traditional irrigation methods are still practicing at the locale that is central role in the water logging. Due to poor leveling of the fields it is not possible to irrigate the whole fields in same way. Due to poor leveling of the water gathered at single end of the field that ultimate cause of the water logging. According to Mr. Allah Baksh one of my respondent; "Water logging is mainly because of farmer's carelessness. They did not divide the field into small soil beds. Due to this carelessness water did not circulate in the field equally that causes the water logging"
There is no appropriate awareness campaign from the irrigation department as well as by the agriculture department. Due to poor awareness of the farmers about irrigation and agriculture technique they are taking true benefits of this magnificent irrigation project.

According to Mr. Ahmad one of my respondents;" We never tested the soil of our fields to know about that what kind of crop will be compatible for this soil. We are cultivating traditional crops even by suffering loss in form of low output productivity. Due to incompatibility of the crops with traits of the soil the potential of the lands are losing day by day. Water logging is mainly due to incompatibility of soil for certain crops".

Surge effect is other main reason of the water logging. It is mostly occurred because of the head end farmers. They stop the water by using *chab*, in busy cropping season, but they removed the *chab* when they fulfilled their irrigational needs. This sudden large

amount of water when reached at tail end causes not only for water logging but intrude the crops. Another main reason for the water logging is that the tail of the each water logging did not connect to Small River to drain out the surplus water of the canal. The tails of water distributaries are lying open. Thus surplus water especially in off season for irrigation spread in the lands. It does not only threat for the agriculture but the impacts of the water logging due to incomplete drainage system have started appearing in the village residential areas. The eastern part of the village which was consisted of 14 to 20 households is completely destroyed. Habitants of this part have been migrated to Canal Zone or in near town.

5.7.3 *Bandi*[51] Period and water logging

Bandi period is time period of one month in which canal is blocked for the purpose of its cleaning and maintenance. This is annual time period of one month usually starts from 10 December to 10th of January. This is *Rabi* season. This period is very crucial for the wheat crop. In this period it is need of more water to irrigate the fields because crops are in inflorescence period. Beside this the uncertainty and poor communication by the irrigation department about the *Bandi* period are very important factors that influence on the output productivity as well as major cause of water logging. Farmers are sure about the *Bnadi* period. It is announced by the canal authorities that canal will be blocked on 10th of December. Thus it utmost strife of the farmers to irrigate their wheat crop 2nd time before the *Bandi* period, but actually *Bandi* period starts from first week of January month. This one month period plays central role in declining of per acre output productivity. According Mr. Ghulam Farid; "Wheat crop needed at least twenty two days gap between irrigation periods; it is because of in the Rabi season water requirement of fields is low due to their little water absorption capacity. But due to uncertainty about the *Bandi* period, in single month farmers irrigate their fields at least twice or thrice. Thus wheat crop is irrigated three to four times in one month, while it required four to five turns of irrigation to get mature. This kind of excessive irrigation is main cause of the water logging and declining of output productivity of the crops".

[51] Local term used for illegal blockage of canal water

Another major negative impact of the *Bandi* period is that, this is not fix time of one month. In last three to four years it has been observed that it goes up to two months. This is inflorescence period of the *Rabi* crops, crops required at least two irrigation turns to get it mature, but due to unavailability of the water in time crops lost their output productivity due to shortage of the water. Opening of the canal after *Bandi* period is another curse of *Bandi* period. In this season when canal is reopened after *Bnadi* crops are almost get matured. But due to greed and poor irrigation knowledge farmers irrigate their fields at least two to three time. Thus due to this unnecessary irrigation the output productivity gets low but it also raises the level of the water logging in the Canal Zone. Period short after the *Bandi,* there is no need of canal water, all volume of the canal water gathered at the tail end and due to poor drainage of the water distributaries it causes the water logging at tail end.

5.7.4 Problems of the tail Enders

Due to Water logging the most affected area is below the Indus high way because it is the tail of the water distributaries. Due to lack of proper *warabandi*[52] and construction of the distributary is not completed to the *Chota*[53] River so that the lands below the Indus high way suffer in two ways;

- Due to scarcity of canal water their crops suffer and that ultimate reduce the yield.
- Due lack of proper *warabandi* and mismanagement of the canal water in off seasons tail receives a lot of water that is being cause for the water logging in the particular zone.
-

Due to poor maintenance tail receives little water in the time of need while it receives maximum water when there is no need of it. It is because there is no proper system introduced to manage the extra water before the tail area. Top ender's are also having a vital role to destroy the land at tail end. The scarcity of water is self-create by the top Enders that is ultimate loss of the tail Enders in terms of loss of agriculture land as well as the earning opportunities of the tail enders. The other major way through tail end

[52] canal water distribution
[53] Indus Water distributary passes near the village

farmers suffered is that when water is blocked through *chab*[54] by the top end farmers to get maximum water, after fulfilling their irrigational needs they released the *chab* suddenly that have a huge pressure of the water and it may be the cause of destruction of water distributary as well as destroy the mud water courses at tail area and destroy the crops at tail area. Beside the destruction of the crops its constant stay in the field is proving a huge source of water logging at tail. Table 11 will indicate the role of the water distribution methods in enhancement of the water logging at various ends of the Canal.

Table 11 Water Distribution Methods & Water Logging

Water Distribution Method	Water Logging at Various Ends		
	Head End	Middle End	Tail End
Warabandi Method	10%	16%	30%
Rotation of water Method	8%	10%	12%
Water Trade Method	2%	3%	N/A

Source: Socio-Economic Survey

Table 11 indicates the role of the water distribution methods in water logging. Through *warabandi* method water logging has been increased at various ends. It is because of that, there in practice of *warabandi* set by the canal authorities but it is *awami warabandi* in which water in not distributed fairly at each end of the water distributary. Rotation method is more effective in this regard. Due to rotation method water of canal is not left unchecked. One farmer rotates the water to another after irrigating his fields. Water trade is not common practice at the locale, but at some outlets it is being practiced. In this method water is treated as economic commodity thus there are chances to waste it that cause of water logging.

5.7.5 Water Logging and Cropping Choices

Water logging is increasing day by day in the Canal Zone. It is happening mainly due to mismanagement of canal water. There are hundreds of acres in the Canal Zone that has been transformed into the barren due to water logging. At the middle and tail end output

[54] illegal blockage of canal water

productivity has been reduced. Farmers in at locale are changing their cropping choices due to mismanagement of the canal water. In early years of the canal execution farmers used to cultivate the traditional crops at locale e.g. cotton, wheat and paddy. According to Haji Ramzan; "In early years we cultivated the traditional crops but due to excess of canal water and mismanagement of the canal water resources level of water logging has been increased in the Canal Zone. It diverted our attention to change agrarian choices to save our precious lands. In this season I brought a new variety of the cotton seed from District Vehari it takes large amount of water to irrigate it and its output productivity is thirty per cent higher than that of traditional seeds I used to cultivate before this variety of seed".

Agrarian choices of the farmers have been shifted from traditional to modern one as well their attentions have been shifted to save their lands from the water logging. One central reason behind the water logging is intensive cultivation. According SDO Irrigation Mr. Muhammad Sabir; "The design of the CRB extension was designed in the way that it will irrigate the half of its cultural command area in the *kharif* and other will be irrigated in the Rabi season. But farmers did not follow this principle. They start cultivated whole of their land in single cropping season to get maximum economic benefits but its consequences have started to appear now in the form of water logging".

Farmers at the locale have now started thinking over it. They are now changing their cropping choices with respect to cropping season as well as their irrigational needs. Its best example is cultivation of the sugarcane in the Canal Zone. Sugarcane is an annual crop and its irrigational needs are almost double to wheat and cotton. Sugarcane is cash crop as well as due its cultivation the water logging level is declining with each passing season. The soil in the Canal Zone is not favorable for paddy cultivation. In early years of the canal execution its cultivation was very rare in the Canal Zone. But when after the level of the water logging has been increased in the Canal Zone, farmers have started cultivation paddy intensively. It is because of that paddy required large amount of water. Thus it is suitable for that piece of lands that are most affected from the water logging. Due to intensive cultivation of the paddy crop the level of water has started reducing.

Sunflower is another invention of these new agrarian choices due to water logging. Sunflower did not cultivated in the Canal Zone before these agrarian choices. Farmers now started cultivation sunflower. It is not favorable to reduce the water logging of the fields as well as it is cash crop and fortunately the soil is very suitable for its cultivation. Output productivity of sunflower is not bad; thus it is rich source revenue generation for the farmers also.

5.7.6 Plant Economy

Plant economy is another outcome of the agrarian changes occurred in the Canal Zone. Before the execution of the canal there was very little amount of plants were present in the Canal Zone. Most of the plants before the execution of the canal were naturally grown. But after the functioning of the canal, farmers have started to planting in their fields. They started to grow vegetation plants as well as fruit plants. According Shmla Khan; "There were very few plants before the functioning of the canal, but after the canal functioning we started to grow plants. It was only possible after the availability of water. Now plants have a rich contribution in our economy"

The importance of the plants has risen up among the farmers when water logging has started to rise. Farmers who have lost their lands due to water logging, started plantation on their fields to reduce the water logging level. The best choice in this regard was eucalyptus. This plant has required large amount of water to grow. The fields in the tail area, eucalyptus have been planted there to reduce the level of the water logging. According to Mr. Nawaz; "I planted two thousand plants of the eucalyptus all around my fields. My field was lying barren before this due to water logging. After this intensive plantation all around my fields it absorbs the water of the fields. After the one year my field was complete dry. I started cultivation over there. In early years output productivity was low but with passing of each year its output productivity has improved".

The role of the plants is not only to reduce the level of the water logging in the fields, but it is rich source of revenue for the farmers. Fruit plants are other rich source of the economy for the farmers at locale. Although fruit plant has not been grown intensively,

but their economic share quite valuable. Another valuable contribution of the plants is that it is rich of timber as well as utilized as firewood at locale. Additional benefit of the plants growth in the Canal Zone is that it is proving a valuable contribution in maintain the biodiversity of the village. It balances the ecosystem at locale the temperature in the Canal Zone has been reduced due to intensive plant growth. Beside this plants are very helpful to manage the canal physical structure. Plants growth along sides of the water distributary is very helpful to strengthen the canal services road. It is natural protection of the canal system. Thus the introduction of the plants growth as economy in the Canal Zone is vital source of economy for the farmers as well as it has valuable contribution in maintaining of irrigation system. According to Mr. Mosa Khan; "Plants are blessing of God on the farmers. It is rich economic source for us. I have grown fifteen hundred plants of eucalyptus before five years. Five hundred plants did not get matured. I have sold one thousand plants after five years and get revenue of 2.5 million rupees. It was large amount for me".

5.8 Women Role in Agriculture Economy

The role of women always has been significant in agriculture. The role of the women varies from region to region as well as it depends upon the nature of the irrigation system that is being practiced. In the canal irrigation system the role of the women is very central. In the case of the present study, the role of the women in agriculture is less in the fields. Due to cultural norms of the present society women are not allowed to go out of their homes. But with the passage of the time canal water resources has been started misused by the farmers. Due to mismanagement of the water resources in the Canal Zone water logging has been rose up to dangerous level. Its immediate consequences appeared in the form of low output productivity. The economy of the villagers is mainly depends on the agriculture. Thus they worried about this condition because due to low output productivity they were unable to manage their financial issues as well as it was not possible for them to continue their cultivation. It was happening in small land owner class as well as among the tenants class.

The alternative solution for this problem was that to change their agrarian structure. The farmers at the village have started to raise the cattle forming at household level. They brought the grass from their fields and feed it to the cattle. At small scale farmers handle the all activities related to cattle, but due to financial requirement of their family. They started to transform the small number of cattle into cattle farming. In this case they needed help from their females. Division of labor has been fixed in the sense that male bring grass and other feeding material to their homes and other domestic work is managed by their women. Now cattle forming has lion share in the economy of the farmers at locale. Due to this economic change, the status of the women also has been changed. According Wasso Mai; "Before the cattle farming all agriculture work was managed by my husband. But due to introduction of the cattle farming I managed the all work at home. I feel very happy to help my husband by staying within the boundary wall of my house. My status has been changed due to this transformation because now I have also contributed with my husband in management of household economy."

According to Mr. Rasheed; "Now I did not fight with my wife because I think that if I quarreled with her she will leave my house and if she left my house how I will manage my cattle alone. When I think about it I tolerate her mistakes and valued her that she is my supporter I must respect her. She has equal economic share in household as I have thus we must cooperate with each other and tolerate the mistake of other to make our house peaceful and prosper".

5.9 Cropping Pattern

Mismanagement of the canal water resources has entirely changed the agriculture economy in the Canal Zone. Due to mismanagement of water resources it has raised the water logging in one hand and on the other hand it is due to scarcity of water at tail end which has reduced the output productivity of the fields. Such kind of enormous changes in the management of canal, water resources have compelled the farmers to revise their whole agriculture structure to meet with such challenges. Change in cropping pattern of the crops at locale is significant agrarian change made after the mismanagement of canal water resources. First major change that has been made in the cropping pattern is preparation of the fields for the crops. Due to increasing level of the water logging

farmers now avoid to irrigate the field in single plot shape field. They divided the field of one *Bigga*[55] or one acre into small soil beds. It is easy for them to irrigate the fields with in short time as well as it is very useful to overcome on the issue of the water logging. Another change made in the cropping pattern is that they have started t cultivate the new verities of the seeds that are suitable in these conditions. New varieties of the seeds are not only good for their output productivity, but these varieties are useful to cope of the soil conditions in the Canal Zone. The use of the new technologies for ground leveling is good example of change in the cropping pattern in the Canal Zone. Laser technology is used to plough the fields and level it from head to tail. By using the laser technology the issue of poor leveling of the fields has been reduced that ultimate reduced the level of the water logging.

Further, important change in the cropping pattern is that now plot is ploughed before one to two months of its cultivation and left it without irrigating. This method is useful in reducing of the water logging as well as it helps the fields to increase its fertility. Cultivation of the vegetables in form of small plots is another change made in the cropping pattern in the Canal Zone. It is very useful because it take little amount of water to irrigate that is very suitable to control over the water logging level. Besides this it is the source of revenue generation that carries throughout the year. In concluding comments, mismanagement of the canal water resources is central concern of the study. Mismanagement of the water resources is happening at various ends for instance at farmer's, canal authorities as well at the level of the local farmer's body. In the same way mismanagement of the canal water resources is occurring at all ends of the water distributary as well as at water outlet level. The consequences of the mismanagement are appearing in the same way at various ends of the canal in terms of water logging low output productivity as well as loss of the land fertility. Due to mismanagement of canal water resources, versatile changes have been made in agricultural activities to cope up the economic needs. Agriculture economy has been changed through new cropping choices, plant economy, agro based economy, gender role in economic activities and through new cropping patterns.

[55] Term used for measuring the land generally equal to half of acre

5.10 Theoretical Discourse

Irrigation choices in the village have constrained the farmers to switch their agrarian economies from traditional to modern ones. Surge effect of the canal water has modified the economies of the farmers. Due to surge effect, it was not possible for the farmers to cultivate their lands through traditional methods. The uncertainty of the canal water availability is serious cause to change the agrarian economy. Poor coordination among the various departments of the canal administration and farmers is also problematic. Due to an uncertainty of the canal water output productivity of the crops is reducing with each passing years.

Water logging is a supplementary cause of changing agriculture economy. Water logging is because of various reasons. First and foremost are the geographical settings of the Canal Zone. The upper level of the Canal is situated at high altitude beside this the soil of the head end is sandy. Excessive watering in the head end surplus water shifted from head to tail end. Another social reason behind this problem is that farmers at the head end did not care about the tail Enders. The excessive watering of the top end farmers and flow of the surplus water toward the tail end are chief causes of the water logging. Water logging is changing the agriculture economy by changing the cropping patterns in the Canal Zone.

Another change in the agriculture economy is the introduction of the plant economy in the Canal Zone. Due to the high level of the water logging, it spoils the fertile lands in the tail as well is the head end in the Canal Zone. Fertile lands transform into barren due to water logging. Farmers started to grow plants in the lands that affected from the water logging. This transition did not only help the farmers to reduce the level of the water logging in their lands but trees plantation has proved a rich source of revenue generation. Plants take a large amount of water than crops thus; high water requirements of plants have reduced the water logging and again transformed the barren lands into fertile one.
Due to change in an agrarian economy, the role of the gender has also changed. Low output productivity of the crops due to mismanagement of canal water forced the farmers to get revenue through cattle farming. Cattle farming started as the alternative economy.

The role of the women in agriculture was passive in the village due to various religious and cultural norms. But their role dominates in cattle farming because it was house job in the boundary wall. All in-house activities related to cattle are administered by the women. Hence, they directly participated in the economic activities of the household. Due to their direct and key participation in the economic activities, their social status has been improved.

- Cultural materialism is fundamental vehicle to understand the social problems. Changing agrarian economies due to material and technological changes has reshaped the entire economic structure of the society. Material changes are basic change agent for infrastructure while infrastructure contains the modes of production of particular society.
- According to Harris infrastructure of the society operates the structure and super structure of the society. Change in the infrastructure due to material changes; change the structure of the society that comprises on the social organization, kinship ties and division of labor in the society.
- Super structural changes including symbolic, intellectual and artistic features of the society and indirectly connected with modes of production. Changes in the modes of production have revised the elements of the super structure. The findings of the present chapter prove the validity of the theory.

Chapter 6

Socio-Cultural Factors of Mismanagement

Mismanagement of the canal water resources is a multifaceted phenomenon. The reasons behind the mismanagement of canal water are culturally embedded. Socio-cultural factors are a rich source of motivation as well a hindrance to the execution of any social phenomenon. In the case of the present study, the role of socio-cultural factors is being presented as a motivation to mismanage the canal water resources. Mismanagement of the canal water resources is more a social issue rather than a technical one. The role of the technical issues related to the mismanagement of canal water resources is confined to the maintenance of the canal irrigation system, while, the role of socio-cultural factors is connected to the operation of the canal irrigation system.

The mismanagement of canal water resources is occurring Sixty per cent below the water outlet and forty per cent of mismanagement is happening above the *moga.* The role of society is cardinal in the mismanagement of canal water resources because the control of the water is in the hands of the farmers below the water outlet. Mismanagement of the canal water below the water outlet is culturally justified, thus, it is very challenging to overcome this issue.

6.1 Social Classes

Every society is divided into various social segments. The classification of the society is made on the basis of several social issues. In the present study, society has been divided into various social classes on the basis of the control over the water resources. The society is classified as:

6.1.1 Top End Irrigators

Top end irrigator is the social class in the Canal Zone who has lands catered by the top ten water outlets. They consider themselves as the more privileged class. They justify their class since they believe they have more right to the canal water because geographically they are privileged by God. According to Mr. Malik Saeed; "It is the

blessing of God that our lands are situated on the top end of the Canal. In this area, the level of the water is always high and the size of the water outlet is greater than other outlets in middle and at tail end".

Top irrigators paly significant role in the mismanagement of canal water. They use high *Chab*[56] to control the canal water. This is the central reason behind the water logging in the Canal Zone. Due to high *Chab* pressure the water suddenly rises in the water distributary that overflows from service roads of the canal. It destroys the services roads of the water distributary. Beside this, it raises the gap between supply and demand at middle and tail end. According to respondent Haji Salih; "The role of the top-enders in the mismanagement of canal water varies from person to person. Some farmers have very good relations with tail Enders. They cooperate with them to irrigate their fields. They share water turns with tail Enders. They do care for the water share of the tail Enders. but on the other hand, some farmers have very tense relations with tail Enders. They always try to get benefit from their geographical location at the water distributary".

There are some technical issues that are responsible for the mismanagement of canal water top end. For instance due to the inappropriate drawing of the water distributary, some water outlets are unable to deliver the canal water towards water courses. Since the level of the lands is higher than the level of the water outlets, thus it needs high *Chab* to make the water flow from water outlets to field channels. According to Mr. Ghulam Farid; "I have lands in the top end of the water distributary no 37. The level of the water outlet that irrigates my fields is lower than the fields. Thus, it required high *Chab* to flow the water from outlet towards fields." These are some of the social justifications of the head end irrigators for indulging in illegal activities to get maximum control over the canal water.

6.1.2 Middle-End Irrigators

Middle-End irrigators are the class who has lands in between the top and tail water outlets. They have little control over the water compared to top end irrigators. The

[56] Illegal way to blockage the water of outlet

majority of this class consists of middle land owners. This class is dependent on the top end farmers for control over the water resources. The level of the *Chab* is shorter than that of top end irrigators. They have a valuable share and have importance in the formation of local farmer's body. This class controls water resources below the water outlets. They have a significant role in the water distribution below the water outlet. This class is the major influential class in terms of misuse of the water resources below the *moga*. According to Mr. Ramzan; "Middle-end irrigators have the worst role in the mismanagement of canal water resources. The chairman and members of the local farmer's body mostly belong to this class who manipulate the water resources for their own benefits. This class is more terrifying than that of top end irrigators because this class controls the whole water of the water distributaries while the top end class leaves some water for tail Enders".

6.1.3 Tail End Irrigators

Tail end irrigators are the class who has lands at the terminal end of the water distributary or *moga*. This is the marginalized class of the particular water outlet or distributary. This class consists of small land owners. This class is always in trouble whether there is a surplus amount of water available in the water distributary or a little amount of water. They suffer through multiple ways. According to Mr. Sarwar; "We are tail Enders not only since we are on the tail of the water outlet but we are also treated as tail Enders in every aspect of the canal irrigation system. Farmers of the top and middle-end irrigators treat us in the way sinners are treated. They control our water share. We cannot peacefully engage in the irrigation of our fields. There is constant fear in our minds regarding when the top and middle-end irrigators will cut down the water course".

During and after the *Bandi* period, the most affected class is tail end irrigators. Surplus water is the constant source of discomfort for tail Enders. No one is ready to clean the water courses or field channels. Everyone thinks it's the duty of the tail Enders to come and clean the water course when the top and middle irrigators are watering their fields. Tail Enders class is always at the mercy of the top and middle-end class. They have little importance in local farmer's body.

There is another side of the coin also regarding tail Enders which is quite different. They also play a substantial role in the mismanagement of the canal water in various ways. The first one is that when tail end farmer fulfills his irrigational needs, he does not block the water outlet to stop the water from wasting. Tail end farmers come back to their homes after irrigating their fields, and do not block the *moga* which causes water logging. The other major role of the tail end farmers in the mismanagement of canal water is that they do not participate in the cleaning of the water course by saying that they if are not receiving their water share, they are not obliged to participate in the cleaning of the water course.

All classes play their role in the mismanagement of canal water resources, but each class has its own social and cultural justification for mismanagement of canal water. Everyone is in try to put the ball in another court. No one is ready to take his responsibility. Everyone is escaping himself through the socio-cultural justification of their fault but an issue is still unresolved.

6.2 Distances from *Moga* and Farmer's Behavior

Distance from *moga* to the field is imperative not only to control over the water resources but it also regulates the behavior of the farmers. The role of the top Enders is briefly described above but in the case of the distance from the *moga* they have some advantages as well as disadvantages of their geographical location. In early years of the canal functioning, they were enjoying the privilege of their location due to easily access to the canal water but now they suffer from issues like water logging, loss of fertility and tense relations with the adjoining landowners. Due to seepage and overflowing, water from water course directly affects their crops and so they are always exchanging hot words with other farmers who irrigate their fields through the same water course. According to Mr. Ali Khosa; "Distance from the water outlet plays a key role in regulating the behaviors the farmers. Nearness to the *moga* is a source of pride for the farmers of a particular location. They think themselves superior. As the distance of lands get far from the *moga* their importance decreases. The behaviors of the landowners vary as the

distance increase from *moga* since it changes the dynamics of control on water resources".

The distance from the water outlet in early years of the canal functioning was important in this way that the owners of land near the *moga* were very happy and enjoying their geographical location. But now the game has taken the turn. Due to continuous availability of water at the top end, it has lost the water absorption capacity. Water logging level have risen in these lands; and their importance is decreasing day by day. In the present time the farmers at the tail end are enjoying. They have got the little amount of water that is useful for their lands because the overall absorption capacity of the land has decreased. Now a novel transition has been observed in the behaviors of the farmers. The tensions among the near and far end farmers have been increased. It is not because of the high demand of water from the far end farmers, but it is due to seepage and overflow of the water in near end lands. Farmers at the near end of the *moga* claim that their lands are being spoiled and their fertility is decreasing on account of far end farmers. According to Mr. Mosa Khan; "Now farmers at the top end are not angry because they are suffering from scarcity of water, but rather because they are worried about the excess of water. One farmer of near end has blocked the watercourse that was passing through his land by saying that canal water is cursed for me and it is destroying my crops".

The distance from *moga* is a source that controls the behavior of the farmers. As the distance from the *moga* increases or decrease, it indicates the behavior of the farmers. It is a unique aspect of the canal irrigation system that is culturally embedded. Distance from the *moga* not only specifies the control over the water but it also indicates the importance of the near and far end farmers and how their behaviors change with respect to the location as well as control over the water.

Table 12 Behavior of the farmers during water delivery at various end

End of Canal	Behavior of Farmers		
	Request	Demand	Forcefully
Top End	15	40	55
Middle End	45	35	20
Tail End	80	15	5

Source: Socio-Economic Survey

Table 5 indicates the behavior of the farmers at various ends of the water outlet during the delivery of canal water. Fifteen per cent top Enders make the request to have water share from the other farmers. This is because in this area farmers have the adequate amount of water. Forty per cent top Enders demand their water share by middle and tail end farmers. Fifty five per cent top end farmers forcefully control the water resources because they think that it is their right to exercise control over the water resources because of their geographical location.

Forty five per cent middle-end farmers make the request to have water share. Thirty five per cent middle-end farmers demanded water because their control over water is more than that of tail-end farmers. Twenty percent of the middle-end farmers forcefully control the water due to their geographical location. Eighty per cent tail end farmers make the request to have water because they are always at the mercy of top and middle-end farmers. Fifteen per cent tail end farmers demand the water because they consider that it is their right to have the equal share of water. Five per cent tail end farmers forcefully get water share. It is not possible for them to take water forcefully, but in fact they remove the *Chab* at a top and middle end in the night time.

6.2.1 Level of *Chab*

Chab is the artificial way to gain maximum water through moga. The level of the *chab* is culturally defined and justified. Farmers said that without *chab* it is not possible for them to make the water flow through the *moga*. They are of the view that due to the poor drawing, little amount of the water flows through the *moga*. On the other hand, farmers of the middle and tail of the particular moga say that it is illegal to control water by the head

end farmers. Blockage of the water through chab means, they are occupying our water share by using unfair means. According to Mr. Aziz Dahar; "*Chab* is in fact show of power by the top and middle-end farmers. Even if they do not need the water, they mount *chab* to show their power, and challenge the tail end farmers saying that "we are occupying your water share and you are unable to do anything against us". In reality we are unable to take any action against them. We register several complaints against them with the irrigation department and in the local police station but they never listen to us".

The level of the *chab* indicates the social hierarchy of the society. Higher the level of the chab means high social rank and social power in the society. As levels of chab reduce from top to tail end the level of chab also decreases. This indicates the order of the power in the society. The level of the chab also indicates the segregation among the top, middle and tail end farmers. When I asked a question regarding the fixing of chab the farmers of the top end proudly replied that; "It is our right to control the maximum share of the canal water because we have distinction through our geographical location and that what sort of justification it would be if top Enders remains thirsty and tail Enders enjoys the benefits of the canal water".

Fig.6

Illustrates level of the *chab*

6.3 Cleaning and Maintenance

Cleaning and maintenance of the main canal, water distributaries, and water courses and fields channel have an important role in the management of canal water. The management of canal water in all domains is the relatively hard task; this is because administrative authorities are different for each portion. For instance, the main canal is under the authority of WAPDA, water distributaries are under the governance of the irrigation department while below the *moga* administration is controlled by the farmers. There is the triangle of the management stages as well as the triangle of the issue, thus, coordination is very essential in order to have the appropriate job of each segment. Coordination is very difficult among the various departments because WAPDA is a federal department; irrigation department is provincial while another stockholder is entirely diverse. The government of the Punjab pays WAPDA for maintenance and cleanliness of the main canal. According to SDO Irrigation Mr. M. Sabir; "Government of Punjab has paid 28 cores in the year 2014 and 56 lac for January 2015 for the purpose of cleanliness and maintenance of the main canal".

Cleaning and maintenance of the water distributaries have been under the control of the irrigation department. Irrigation division of CRB canal in Punjab portion consists of water distributary no 24 to 53. It is divided into four rotational groups. Two groups are functional at one while remaining two groups are closed for maintenance purposes. The rotational plan is designed by the irrigation department but it is implemented by the WAPDA. Due to lack of coordination rotational plan is not accomplished accurately which leads to mismanagement of canal water. The center of the mismanagement of water distributary is dependent on the role of the gatekeeper. According to *Ziladar*[57] of irrigation department; "Most of the time water distributary gets damaged due to the carelessness of the gatekeeper at the main canal. He does not follow the schedule provided by the irrigation department. He is the employee of WAPADA. Thus, we write to the WAPDA authorities all the time but they never take the issue seriously. If the management of the main canal is transferred to irrigation department it will be easier to overcome this issue."

[57] An official of Irrigation Department.

According to the farmers and field observation, there is no appropriate system of cleanliness and maintenance in the Canal Zone. Only in the period of the *bandi,* water distributaries are cleaned but this happens once in two or three years. But maintenance is very poor at water distributaries' level. The following plate will illustrate the poor maintenance of the water distributary.

Fig.7

Illustrate the meager condition of the water distributary maintenance

The cemented plates have altogether disappeared and it does not seem to be a cemented water distributary at any stretch of imagination. The maintenance of damaged parts is performed by the farmers themselves with mutual cooperation. Due to weak service roads, it is not easy to control the canal water at any point. Thus, farmers have installed pipes on this point to save the water distributary. Through these pipes, surplus water is drained out in *Nala Masowah*[58]and through this *Nala* surplus water is drained out into main flood carrier channel to the south of the village. This raises another issue in the village. Drainage of the surplus water through *Nala Masowah* is provides a central force to raise the water logging in the village. Due to the constant availability of water in the *Nala Masowah,* the level of water logging is raised day by day which has a very negative

[58] Stream used for irrigation purpose in the village before the Canal irrigation.

impact on the household structure of the village. Irrigation department has justified their fault by saying that it has been damaged by the farmers and that they are not responsible for such kind of damages.

6.3.1 Role of Farmer's Organizations

PIDA is the government authority that is responsible for transferring the management of canal water and its maintenance to the farmers through farmer's participation. PIDA has formulated TORs to select the farmer's organization. By following these TORs, the local farmer's body is selected. This body consists of one chairman and six members for each water distributary. A farmer's body is also formulated at the water outlet level. It consists of one chairman and three members for top, middle and tail respectively. FO is responsible for delivering the canal water, collecting water charges and maintaining the physical structure of the water distributary as well as maintaining the cleanliness of the water courses and field channels.

The role of the FOs is very central. It is the local body of the farmers selected by the farmers themselves by the show of hands. Thus, FOs can play a key role in the better management of canal water resource. It is the transfer of power from canal authorities to the farmers. FOs played an efficient role in the management of canal water by delivering water to tail end, maintenance and cleanliness through *Wingar*[59] system and playing the role of mediator for the reconciliation of the disputes among the farmers. Gradually these FOs transform into an irrigation community. Farmers gather in the Canal Zone on daily basis and share their issues related to the management of irrigation system. The issues related to management of canal are resolved through mutual consensus.

With the passage of time however, the role of the farmer's body started to transform into a political organization rather than a farmer's organization. FOs started to misuse their power by the allocation of water prejudicially. Fifty per cent of water taxes are fixed for maintenance purposes, which are collected by the FOs. They misuse the finance allocated for the maintenance and cleanliness of the water courses and field channels. According to

[59] A group of farmers work together without payment on the basis of social relations.

Mr. Haji Salih; "FOs is not the body of farmers but they are present only to get control over the poor farmers. They misuse our money collected in the form of water taxes. They are biased. They allocate water only to their chosen ones. They have destroyed the whole system of the canal from delivery of water to maintenance and cleanliness".

Presently the farmer's body has entirely transformed into a political organization. Irrigation politics has emerged in the Canal Zone. FOs is performing their role politically rather than socially. They are using their power in a political context. Farmer's body threatens the farmers by saying that they will deprive them of the canal water if they do not support them in the election. In local body election of 2015 they played a key role as a show of power.

6.3.2 Role of Water Management Department

Water management department is the provincial authority to manage the water resources. The core job of this department is to save the water resources. This department is liable to lessen the seepage and overflow of the water below the *moga*. The other fundamental role of this department is to introduce the recent scientific innovations to save the water resources. The principal achievement of this department was the introduction of the cemented water courses. This project was initiated by the aid of the ADB[60] and collaboration with the farmers. The finance composition was: 'Eighty per cent finance share covered by the ADB while 20 per cent share collected by the farmers.

The highest aims of the project were to reduce the level of seepage, water logging, and overflow and make possible the delivery of water from head to tail of the water outlets. The total project was distributed into 3 phases. The project has been started under the supervision of the water management department. Twenty percent portion of each water course has been cemented. It raises several issues in the locale. Twenty per cent of water course covers the head end and some part of the middle end. The issue still exists at the tail end. Beside this, due to poor civil work, the level of the top end is high with respect to tail; thus water never flows toward the tail end. This enhances insecurities between the

[60] Abbreviation of Asian Development Bank

head and tail end farms. Water management department justifies their fault by saying that farmers did not pay their share and thus they were unable to construct a complete water course. According to Mr.Aziz; "It is a worthy step taken by the government to save the water. Through cemented water courses Fifty percent water can be saved. But incomplete water courses as well as faulty drawing of the water courses, has increased the gap between supply and demand especially at tail end".

Fig. 8

Illustrate the Cemented Water Course

6.3.3 Corruption and its cultural Justifications

The nexus of corruption is culturally justified by the Canal bureaucracies. The canal bureaucracies are of the view that they are appointed in the areas which are too far away from their native areas; therefore in these areas, they are unfamiliar with the local culture of the landlords or other irrigators. Hence, according to them, they are pressurized by the local landlords or influential persons to indulge in corruption. Furthermore, they plead that it is not possible for them to manage within their meager salaries and they are thus socially compelled to do corruption to meet their domestic and social needs. An auxiliary justification given by the canal bureaucracies is that they are compelled to take gifts in

kind at each harvesting seasons. Consequently, they are socially bound to accept these gifts.

6.4 Canal Water a Free Commodity

Execution water taxes have been waived by the present government. This relaxation was announced by the president of Pakistan Pervez Musharaf. But this relaxation was announced for a period of time. Beyond the relaxation time period, water charges have been fixed by the irrigation department. The rate for the *kharif* crop was fixed at 50 rupees per acre whereas the rate for Rabi crop was fixed at 80 rupees. Collection of the water charges was the responsibility of the Punjab revenue department. Irrigation department sent the list of land owners and amount of their water taxes to the revenue department to collect the water charges through *Patwaris*[61]. But after the formulation of Punjab irrigation and Drainage Authority (PIDA) this responsibility shifted to them. PIDA now collects the water charges though FOs.

The whole system of revenue collection has failed entirely. Famers say that during 14 years after the execution of the canal one comes to them for tax collection except in two or three cultivation season. According to Mr. Ghulam Sadique, "Water charges have never been collected by any department from the farmers. In last few seasons, two or three times, water charges have been collected by the FOs. But they did not provide any proof of receipt to us. FOs collects the water charges and they spend it on their luxuries and claim that they have used fifty per cent of these charges on maintenance of the canal".

Canal water is a completely free commodity. Thus, farmers never considered it important for them. The misuse of canal water is mainly due to this reason. They do not take care of the canal structure. The structure of the canal has been artificially remodeled by the farmers for their own benefits. The sizes of the water outlets have been enhanced. Artificial water outlets have been constructed. Another reason behind this issue is that twenty five per cent farmers are living in the Canal Zone while seventy five per cent

[61] An influential officer of Land Revenue Department

farmers are still living in the village. They irrigate their fields and go back to their houses in the village. This is the reason why water is not valuable for them. They cut water into their fields and go back; that water will be wasted due to their negligence is never their focus. According to Mr. Gull Muhammad; "This canal is not a canal of water but a canal of deshi ghee [62]. We are not taking care of it because it is free. Canal water acts like blood in our barren lands. We know of its importance because we cultivate the lands through good irrigation and only get small output after doing a lot of hard work, but the new generation is unaware of its importance because they never faced hardships in agriculture. He expressed his anger while sharing this information".

6.5 Water theft and its cultural Justifications

Illegal withdrawal of canal water is known as water theft. There are numerous factors behind the water theft. Basic factors behind this issue are technical and social. In the case of the present study, the issue of the water theft is more social than a technical one. In the early years of the canal execution, it was very difficult to fulfill the irrigational needs because officially, this canal was designed to irrigate half the land in *Kharif* crop and half in Rabi season crops. But farmers in the Canal Zone did not follow this rule. Thus, it raised the gap between supply and demand. Another reason for the scarcity of canal water in early years was that lands before the canal execution was lying barren for many years. Thus, water requirement was very high in early years.

These were the leading reasons that accelerated the water theft in the Canal. It was due to the technical issue. Thus to meet the water requirements of the lands, farmers started to withdraw canal water illegally. The popular methods for this act were the installation of pipes in the main water distributary, *Chab* and cut down the water course during the turn of other farmers. These methods initially were practiced to meet irrigational needs. This kind of water theft is placed in the category of water theft due to technical complications. It raises the level of the conflict among the farmers due to a scarcity of canal water. Water theft due to the technical issue was only to meet the irrigational needs but not for the show of power.

[62] Clarified Butter

With the passage of time, the economic conditions of the landlord's class improved in the Canal Zone. It was because of high output productivity of the lands. The economic status of farmers in Canal started to improve. They started to show the power by controlling the water at a particular *moga*. Few years after the execution of canal, the irrigational needs of the lands started to reduce. The gap between supply and demand of water started to reduce. Thus, there was no logic to withdraw canal water illegally. Therefore, head end and middle-end irrigators started to steal the canal water on social basis. During this phase, they did not need water for their irrigational purposes only wanted to withdraw canal water to exercise illegal control over the small land owners and tail end irrigators. According to Mr. Shahzad one of my respondents from top end irrigators; "At present we do not maintain maximum control over the canal water for irrigational needs but have to do it because we are the owners of thousands of acre of land and no one is ready to accept our influence in the canal region. Canal water is the best option for us in this regard to show our social power to the middle and small landowner and it maintains our political rank in the region".

6.5.1 Political Benefits

Achievement of political benefits is the chief social factor that motivates the farmers to gain illegal control over the canal water. This is done most of the times by the landlord class. Landlord class who is landed at the top end of the canal does not need water only for irrigational needs but they use canal water as a tool for their political objectives. Landlord class is already influential in the Canal Zone but paramount control over the canal water raise their social status in the Canal Zone. They have sufficient time for irrigation that not only fulfills their irrigational needs but it is surplus for them. They use a surplus amount of water to gain political stature. They share the water with other farmers who have less amount of water for their irrigational needs. In the time of election of local farmer's body, they use water as a tool for getting elected. Besides this, they also use water as a tool in local body election as well as the general elections. According to Mr. Ramzan; "We support our landlords because they also support us in times of trouble. When our crops are being affected they contribute their water share with us. When any kind of conflict arises they resolve. They protect our honor by resolving our issues at

community level. But the most important kindness is that they share canal water with us because we have very irrigation time".

This is the fair way to achieve political sympathies from the small land owner. But numerous illegal ways are adopted by the landlord class to gain political benefits. Water theft is most commonly practiced for this purpose. The most common method for water theft is the installation of pipes in the main water distributary. The pies are installed at *Thokar*[63] of a particular *moga*. In this method, they use 4 to 6 inches pipes. Water extraction capacity of these pipes is double than the volume of moga. These pipes are installed openly at service roads of the water distributary. Canal authorities never try to take action against them. According to Mr. Abdul Ghafor Khosa; "It's rare to see canal authorities taking action against these illegal pipes that reduce volume of the canal water by twenty per cent. One day while I was irrigating my fields. I saw that a van of the irrigation department came to the fields. Canal officials and workers stopped at the *moga* and tried to uninstall the pipes. Meanwhile *Chelley*[64] of landlord came there and they attacked the canal officials and workers with sticks. Canal official and worker ran towards their van and went away".

[63] A particular point at high altitude on water distributary constructed to keep the level of water distributary same.
[64] Worker of landlord's person in Canal Zone

Fig. 9

Illustrate the installation of pipes in the main Distributary

They utilize the greater share of the water from the *moga* as well as through pipes. This surplus amount of water is utilized to control the farmers. Another common method used for illegal withdraw of water is remodeling the size of the *moga*. According to Mr. Saeed; "It is not difficult for any stranger to find the landlords' in the Canal Zone. The easiest manner to find them is that one should observe the size of the *moga* in the Canal Zone, the greater the size of the *moga*, the greater the power of landlords".

Through large size of *moga* they extract double the volume of water. This water is shared among the farmers of adjoining land owners. Another method that is practiced to withdraw illegal water is the construction of new *mogas*. These *mogas* are built illegally and are not in the design of the canal. These *mogas* are built by the landlords in front of their lands. They justify their illegal acts in a socialized way. They are of the view that they withdraw illegal water from the canal only for the small landowners who are not able to get sufficient water share. Besides this, they proclaim that they are our neighbors; and so it is their very core responsibility to serve them. Our water share is sufficient for our land. Therefore, instead of wasting canal water we share it with our neighbors. Another social justification that they provide for their illegal act is that they claim that all irrigators in the Canal Zone are members of a single community. They proclaim that they

were all disunited before the canal execution, but the canal water has united them all. And through canal water, they take care of each other and support each other in the time of need. Thus, according to them, illegal withdrawal for welfare objectives is not a crime. They claim to feel great inner satisfaction by helping the poor farmers through water and say that they will never stop doing this activity at any cost. According to Mr. Ghulam Farid; "I am a small land owner. I have minute water share that is not sufficient for me to fulfill the irrigational needs. Mr. Shafi shares his water share with me. He helps me in the time of trouble. Why should I not support him during the election? I always will support him. I do not care who the candidate is. I just have concern with the fact that Mr. Shafi has asked me to vote for him".

6.6 Socio-cultural Factors

Cultural factors are more important than any other factor. They did not only provide a rational for the illegal activity, but it also shows the normative structure of the area and normative and cognitive structure is very necessary to find out the solution of any societal problem. In this chapter, the researcher has given a brief and short introduction of the cultural factors in term of illegal withdrawal of irrigation water.

The concepts of *izzat* (honor), *haq* (right) and *taqat* (power) has played a dominant role in the process of illegal withdraw of irrigation water in the village *Banbhan*. All the concepts were socially approved rather than by the laws of the state. *Izzatdar*[65] was a very important aspect of the normative structure of the area. Every person strives for his *izzat* and he does not allow any person to damage it and is ready to give any sacrifice which preserves his *izzat* and enhances it.

Izzat and taqat are interrelated with each other and reciprocal. A person of the village who has *taqat* to show his authority for the manipulation of irrigation water and other activities is considered *izzatdar*. This is achieved or created through one's *talaqdari*[66]

[65] Local word used for respectable person
[66] Kinship ties used to manipulate the canal water

which helps him in making links with concerned institutions for illegal manipulation of canal water.

The illegal manipulation of canal water shows one's taqat in the area thus creating *izzat* in the hearts of other persons for him. The concept of *haq* was also related to the concepts of *izzat* and *taqat*. The farmers say that canal water is their *haq* which they have been using for a long time while small landowners have no right to make them use water according to the rules. The researcher could not find any terminology which highlights the government's concept of illegal withdrawal of water or water theft. They used the term *Pani trona* [67]which was not in line with the government's concept of illegal manipulation of canal water.

6.6.1 Social factors

The area of research was predominantly agricultural and agriculture was the major source of income of the people. The changing social structure was generating its own norms and values and the norms and values provide the social rational for water theft. The factor causing an inclination towards theft of water is the status fight for acquisition of power while the social indicators manipulate economic and technical factors activity involved in the illegal withdrawal of Canal water.

Social Status in the village is illustrated through the concept of *Izzat* and *Taqat*. While the value of *Izzat* and *Taqat* determines the social position or status of any person in the society and the concepts like *Izzat* and *Taqat* require its application to control the canal water illegally. *Taqatwar* [68]farmers of the village show their power by withdrawing illegal water to fulfill their field's needs and to deprive their opponents of the access to water.

It was the right way to provide a rationale for the water theft in a social context, but the most appropriate rationale for illegal withdrawal of canal water was the gap between

[67] Withdraw of canal water illegally
[68] Local word used for social power in context of water control

supply and demand. The farmers quarrel with canal authorities; they have feuds with farmers of the village to reduce the gap between supply and demand that ultimate cause them to lose their social status. The research data shows that scarcity of water is only a lame excuse and underlying factor for illegal withdrawal. Canal water theft was a social, not economic or technical, problem.

Farmers cut the distributary and block the flow of water not on account of any technical problem but their intention is the social context. Research data revealed the proposition that farmers withdraw water illegally just to increase their *Taqat* over their opponents. The blockage of water of the opponents was not due to the shortage of water.

Irrigation department has launched different campaigns to stop illegal withdrawal of water and water theft but all the campaigns failed because of the ignorance of social and normative factors which were more important than any other factor. Irrigation department has a comprehensive administrative staff but the problem persisted. Harsh penalties and punishments also failed to stop water theft. The above-described circumstances illustrate that the actual problem lies in the normative system. Illegal withdrawal of Canal water has reduced to some extent after the introduction of social mobilization program by PIDA, but the small success of this program is only because of the local social structure.

6.6.2 Role of Irrigation Department

The officials of irrigation department play an important role in the illegal taking of water. As already explained that due to contribution of different factors, the officials are directly or indirectly involved in it at the level of SDO, Overseer and XEN who show their inability to stop the theft of water due to various reasons. First is the political pressure. *Taluqdars* usually use political pressure for the illegal withdrawal of water. According to *Ziladar* Irrigation department; "We regularly follow the complaints of the farmers; we take immediate action against them but the political influence is stronger in the Canal Zone. Political personalities of the village call the police station up and say that the accused is their worker and that he is to be released immediately. Sometimes it happens that even before we come back from the police station, the guilty person is released".

According to SDO irrigation; "We do not follow the complaints during the night because of political or influential persons. During the last year, SDO and XEN followed a complaint during the night. They were removing the chab while somebody fired at them. It is a life risk to canal staff at night time, thus, we do not follow the complaints of water theft at night."

According to an SDO, when they catch someone involved in the theft, he is bailed out by the influential political leaders because of their links with the higher ranks in the irrigation department, while they bribe some of the officers both in cash as well as in kind. The officers are given wheat, dates, rice and cotton usually collected by the *Baildar* from the farmers and delivered to the officials. A key informant told the researcher that in every *dera* (house) of an influential landlord, there are kept some cattle for SDO and overseers. The cattle are looked after by the farmers but their milk is sent to the involved officers/officials of the irrigation department while the *Baildars* are usually acting as the paid agents of *talaqdars.* They give them a specific quantity of grains in every season which they called *daiep* in return of their services. The payment is usually in kind. Though the social and economic factors help the influential people for getting illegal water but it is also important to describe the triangular dimension of *talaqdari*, *taqat* and *izzat* which are the basic reasons for illegal withdrawal of Canal water.

The triangular concepts act in a reciprocal way. The illegal withdrawal of canal irrigation water is considered a powerful act and those who are involved in the activity are called *taqatwar* (powerful) based on their influence. The persons or groups who are successful in an illegal withdrawal of canal irrigation water are considered *izzatdar* (honorable) in the society and for them; social honor is more preferable compared to static honor.

6.6.3 Role of social contacts during water theft

The social factors have played a central role in illegal withdraw of Canal water. In the motivational context, multiple social factors operate in a reciprocal way. During the illegal withdraw of canal water, social contacts are very valuable. Thus, the role of *talaqdari* is very important in this regard. It motivates the farmers to extract the canal

water illegally. A *Talaqdar* uses his *Talaq* (relationships/influence) to withdraw water from the Canal; there is hierarchical grading in *Talaqdari,* the farmers at the upper hierarchy have more access to draw water than the farmers at lower hierarchy, but the hierarchical divisions are not permanent and stagnant. There is fluctuation with regards to time and location while *Talaqdari* has its influence within and across the social boundaries. *Talaqdari* is not only used in illegal withdrawal of canal water but also in other matters by the village people. They practice it to escape from the charges of illegal withdrawal of canal water but continue the illegal activity for either their personal gain or in order to damage the socio-economic status of their opponents.

There are certain factors which play an important role in the creation of *Talaqdari.* The first is kinship ties. In the village *Banbhan,* the kinship ties are very strong, while kinsmen are obliged to help each other out. Caste loyalty is another element that generates *Talaqdari.* The caste bounds people to have a great sense of cooperation with their caste fellows. Research findings illustrate that caste distinction has played an important role in getting illegal water. Relationships with the officers of the Irrigation Department is also a major source of *Talaqdari* while social distinction of family background and membership in local *Punchayet* [69](local council to settle disputes) is also a major element in the acquisition of *Taluqdari.*

The role of the specific caste and their social and religious background is a very important factor for the manipulation of the canal water. *Merani*[70] Caste at Distributary # 37 and *Leghari*[71] caste at water Distributary # 38 are two dominant caste groups. Lion's share of illegal water is controlled by these classes. They have strong political background as well as a strong influence in the local civil bureaucracy. They have large manpower. It is considered very positive to have a large number of men to exercise control over the canal irrigation. Even members of large families have an influential role in manipulating the canal water. Farmers from the low castes are the most victimized

[69] Council consists of influential farmers to solve the social issues.
[70] An influential caste in the village in term of control over canal water
[71] An influential caste in the village in term of control over canal water

class of the society. According to Mr, Sabir, "I belong to a low caste. I have always suffered from the shortage of water. If water is required by the *Merani* class, they don't care for anyone turn, especially of farmers from our class. They occupy our water share and also beat us".

6.6.4 Moral justification of water theft

Both social and cultural factors are justified by the morality standards of an area; the morality standard has relevance with legal morality. The activity of water theft and illegal withdrawal from the canal is not considered a questionable crime. The farmers who are involved in the activity do not feel guilty because getting water for their fields is their *Haq* (right) while getting of water from the government's sources is not a violation of another person's rights since the water was provided to them for their use. Moreover, they proclaim that when the state is not fulfilling its commitment to facilitate water supply to the farmers according to their quota, why the farmer should be forced to use less water than his share. Secondly, it was observed that Irrigation Department was also involved in the illegal withdrawal of water. Irrigation Department's *bailder* and fellows' worker get a fixed share in the crops which they called deip. *deip*[72] is the payment of services from the farmer to the occupational groups. Legally, this *deip* to the irrigation employees is nothing but bribe, but both farmers as well as the employees of the department think it the right way.

Another justification for illegal withdrawal and water theft explained by the village farmers was that when the construction and cleaning of Canal was undertaken by the Irrigation Department, the farmer's services were also utilized for the purpose without any payment or incentives. Therefore, they believe they deserve a certain quantity of water to fulfill their agricultural needs, without considering it unjust in any way. According to the local farmers, the maintenance and cleanliness of the Canal with their participation should be considered reciprocal in the sense that the farmer provides services to the Irrigation department and in return, they should have the right to use the

[72] Local term used for specific amount but not fixed paid in kind for services of particular person

Canal water for their fields. The phenomena explained is a triangular network which operates in a very complex way.

6.7 Theoretical Discourse

Mismanagement is no single side phenomenon. It is because of technical socio-cultural and administrative question. But socio-cultural factors are dominating one. Various cultural factors perform a role of motivation to mismanagement of canal water. Socio-cultural factors are the source of motivation for both farmers as well as for canal authorities. Social classes on the basis of landholding in the Canal Zone as well according to their location in Canal Zone are the central theme behind the mismanagement of canal water. Head, middle and tail end irrigators have their own culturally rich justifications of water mismanagement.

A Certain distance from the moga regulates the behavior of the land owners. Distance from the moga also encourages the farmers to manipulate the water. Top end of the moga considered it their right to withdraw large amount of water from the water distributry because they located at the head end, While the farmers of the far end of the moga justified their role in mismanagement by saying that when we received little amount of the water then why we should participate in maintenance activities. Corruption of the canal bureaucracies is another main reason behind the mismanagement of canal water and their corruption is culturally justified. They said that if farmers serve us we are also serving them. Their fix share is paid in kind of cash forms which motivates the farmers to control the canal water illegally.

Due to non-payment of the water charges water of canal is treated as the free commodity that encourages the farmers to withdraw canal water illegally. When they are misusing the canal water they are not taking notice of it but when they irrigate their fields through tube well irrigation they did care of single drop of water because it is paid water. Water theft is also culturally justified. Water theft through any method is ultimate enhancing the gap between supply and demand. Surplus water through illegal means is not only for irrigational needs it is used as the tool to get control over the small land owner by socially, economically and politically. The class involved in the water theft justifies their

illegal activity by saying that they did not control water for their irrigational needs but we share this surplus amount of the water among the poor farmers who did not get sufficient amount of the water.

Socio-cultural factors are highly culturally justified for mismanagement of canal water. The farmers considered water is their right and them of the viewed that there is no shame to use illegal means to get your right. To show the social power is another cultural factor that motivates the farmers to mismanage the canal water. Farmers say that water is not only for irrigation but maximum control over the water indicates our social power. It is the natural entity that can be used to defeat our opponents. We do not stop the water of our opponent for irrigation purposes but it obliges our foes to come at our house and request us to open their water. It has the real and unique taste to defeat our opponents. This is central, social and cultural factor of motivation.

Social contacts including social, kinship ties and tribe can play a key role in the mismanagement of canal water. Farmers of the same kin group cooperate with their other kin even for illegal withdrawl of canal water only on the basis of kinship ties. Illegal withdraw of canal water and its distribution is also based on kin group and tribe based. The role of the affinal relations is also valuable in this regard. Farmers who have affinal ties with someone give preference to distribute the canal water. In concluding comments, mismanagement of canal water is no single fold phenomenon. It is versatile in its application that contains technical, social, cultural and administrative factors.

Findings of this chapter deals with role of socio-cultural factors in manipulation of canal water. Socio-cultural factors are core factors to get control over the canal water. How social fabric operates in this mode.

- Technological changes are the basic variables for change in the modes of production. On the other hand socio-cultural factors are more reactive variables in passive ways. Socio-cultural factors determine the structure of the society that is particularly associated with control of water.
- Manipulation over canal water guarantees the safe economic conditions. Maximum control over the water resources indicates the social power in the

society. To obtain safe economies and social power are gained by control over the water resources. Canal water resources are mainly obtained through socio-cultural factors. Thus change in the modes of production ultimate varies the social structure of the society. It truly justified the Harris argument that infrastructure of the society controls the structure and super structure of the society.

Chapter 7

Summary and Conclusion

7.1 Summary

The research question of the present study focused on the mismanagement of the canal water and its impacts on the society. The principal objectives of the present study were to study the local perception of the farmers regarding mismanagement of the canal water. The other fundamental objective of the study was to focus on the changing agricultural economy due to mismanagement of the canal water. Perceptions of the farmers regarding the mismanagement of canal water vary from farmer to farmer. It is the multidimensional problem that contains the technical socio-cultural and administrative factors.

Technical issues mostly are related to the canal administration including the poor maintenance and cleanliness of the water distributaries. The design of the canal is also a big issue that accelerates the technical issues. Water distributaries are maintained and cleaned up annually during the canal blockage period, but in fact, water distributaries are not cleaned up in the true sense. It is because of that the administration of the canal is not under the single authority. Due to multiple administrative authorities, each of them is always trying to put the ball in another court. The role of the farmer's organization is also central in this regard. These organizations misuse their power to mismanage the canal water through various means. The practice of biased water distribution of canal water by these organizations is another central cause of the mismanagement of canal water.

Farmers are also playing core character in the mismanagement of canal water. The introduction of the various classes on the basis of the location of their lands in the Canal Zone is also playing a key role in the mismanagement of the canal water. After the introduction of the social classes gap between head and tail end has been increased. It is because of that below the moga complete control of the canal water is under farmers. Thus, they can play a significant role in the promotion of better water management. Due

to inefficient control over the canal water by the farmers is causing to raise the social conflict in the village.

Lack of irrigation knowledge is another cause of the mismanagement of canal water. Farmers at the locale have very little knowledge about the modern irrigation and agriculture technologies thus it is causing the mismanagement of canal water. Excessive irrigation is another central cause of the mismanagement of the canal water. It is not only reducing the crops output productivity but it is proving a central cause for water logging and salinity in the Canal Zone. Due inappropriate availability of the drainage system in the Canal Zone is also proving the main factor behind the high level of the water logging and salinity in the Canal Zone. Poor drainage for surplus water is also a serious threat for the residential area of the village. Surplus water meets at the tail end which is very close to the residential area thus it is disturbing the household structure. People with sufficient resources are migrating from the village to the Canal as well as in the nearby villages.

Poor maintenance of irrigations system below and above the water outlet is another severe problem that accelerates the mismanagement of canal water. Poor maintenance and cleanliness of the water distributaries and water courses increase the seepage and overflow of the canal water are real problems in the provision of the canal water from head to tail in a fair way. Surge losses are deals with sudden increase and decrease of the canal water. Surge effect is the main reason of seepage and overflow in the water distributaries. It accelerates the gap between supply and demand at head to tail end. The element of the uncertainty in water availability is another severe cause of the mismanagement of the canal water. It is the main reason behind the low output productivity.

Timings of the water turn by the FOs are the central role in the mismanagement of canal water. It biased distribution of the water turns encourages the tail end farmers to withdraw illegal water of the canal that enhances the gap between supply and demand of the water. It also increases the level of the conflicts among the head and tail end farmers. Water logging is responsible for changing the agriculture economy at the village level. Due to the high level of water logging farmers in the Canal Zone are revising the cropping patterns as well as their cultivation season.

The introduction of the plant economy is major agriculture change in village economy. Plants economy has increased due to reducing the water logging. The status of the women has also changed due to change in agriculture economy. Through the cattle farming, in-house activities of the women have changed that upgraded her status at household as well as society level. Socio-cultural factors are acting as motivation force to justify the mismanagement of canal water. Social classes at the village level justify their illegal withdraw of canal water in cultural context.

Canal water is the free entity for the farmers in the Canal Zone. Thus, water is used as the exploitative tool to get control over the small land owners. Landlords also use water as the tool to defeat their opponents. They also justify their illegal withdraw of canal water by saying that canal water is their right and they use illegal means to obtain their right when it is not provided to them through fair means. Another cultural justification of their illegal withdraw of canal water is that they did control over the maximum water share for irrigation purposes but their basic aim in this regard is to serve the small landowners or the tail end farmers. They also justified their role by saying that farmers at the tail end are not able to acquire sufficient amount of water for their fields thus, we share our water turns with them for their good beings.

7.2 Conclusion

The conclusion of the study revolves around the basic findings of the study. The matter of maladministration of canal water is more social than the technical issue. Thus, its impacts are more social than technical ones. The problem revolves around the agriculture but it covers all aspect of the society. It is just not mishandling of the water, in other words, it is misrule of the society. Its technical or non-technical aspects are directly related to the farmers, which is lion's share of the village population. Mishandling of the canal water at the technical end is not only confined to administration level but it also covers the entire activities of the farmers.

Canal Water is a key for the crops in the Canal Zone. Scarcity or unnecessarily excess of the canal water is the severe threat for the farmers in the form of low output productivity. It is the economic loss for the farmers. In the same way, when scarcity water increases at the tail end, it indicates the gap between supply and demand from head to tail role. It does not matter that scarcity of the water is due to technical or administrative reasons but enhancement gap produces feuds among the farmers at various ends. The entire economy of the village depends on upon the agriculture thus water availability and its fair use ensure the economic surety to its inhabitants.

Maladministration of canal water at various stages that produces the water logging is uninviting cause for loss of output productivity. But the impacts of the water logging in residential areas of the village are alarming for a social and family structure of the village. Migration because of water logging is upsetting the social structure in a form of alienation while the family structure is transforming from joint to nuclear ones. Head tail relations among the farmers for water delivery are being hostile with the passage of the time. Irregular accessibility to canal water is captivating the farmers to adopt substitute's ways to manage their economies. Substitute ways of economy referred to change the agrarian activities in terms of shifting cropping seasons, cropping pattern and introduction of modern irrigation and agricultural technologies.

Administrative matters cannot be ignored in the mishandling of canal water. The role of the administrative authorities from the government end as well as from the farmer's end in from of FOs is very essential. Lack of responsibilities at both ends is the serious threat for the functions of the canal. Maladministration of the canal water is ultimate because of poor performance of the irrigation department and the biased role of the FOs. It encourages the farmers to obtain the canal water through unfair means. Control of the canal water not confined to irrigation purposes but it is also used as a tool to get control over the farmers. This illegal control over the canal water is high cultural justified.

Researcher has full agreement with Marvin Harris (1979) Cultural materialism. The present study entirely represents the cultural materialism propagated by the Marvin

Harris. In the light of present study agriculture is principal economic source in the village. The agriculture in the village is entirely dependent on the canal irrigation. Mismanagement of the canal water is on other hand mismanagement of village economy. Thus change in the mode of production or infrastructure of the society has brought the visible changes in the structure and super structure of the society. It is the central theme of the cultural materialism by Harris and the present study is one of its pragmatic sources.

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