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Traditional Rights of Irrigation Water in Some Yemeni Wadis

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Abstract: **Yemen is a one of the poorest country of water in the world. For centuries it is suffering from water shortage, which led to several serious societal conflicts. Each area have its own traditional water-relating rules and regulations. This study aimed to review and analyze traditional irrigation water rights in selected wadis; compare their differences and similarities and propose suitable measures to settle existing problems. It was conducted in selected Yemeni wadis in Hodiedah, Hadhramout, Lahj, Abyan, Sana'a, Hajjah, Ibb and Taiz governorates. It relied on review and analysis of documents and reports, field observations, field survey questionnaire and discussion meetings with selected experts, local officials, farmers and key informants. There exist some standing norms and traditions relating to the organizations, arrangement and shares of water quantities, maintenance and mechanisms of conflict resolution. But, these varied from location to another. Some of these local customs have been violated while others have gradually vanished due to modernizing irrigation structures or socio-political changes, draught and climatic change. This in turn has negatively affected the traditional irrigations systems and the whole society as well. The study concluded with possible suggested action to remedy existing flaws and shortcomings.**

Keywords: **Spate Irrigation, Water rights, Traditional, Wadis, Yemen.**

1. INTRODUCTION

The water issue in Yemen is one of the main challenges facing the government and communities. As it is known, Yemen is suffering of water shortage with a capita rate of water less than 120 m^3 a year[1]. Furthermore, as a result of the high population growth, the expansion of economic activities and the over-use of water irrigation, the country witnesses a sharp decrease of water availability and sources. The per capita share of renewable water in Yemen is expected to further decline to about 72 m^3/cap./year by the year 2025[2].

The flood water/spates in Yemen is a major source of irrigation in different regions and that agriculture depends significantly on it and on a meager seasonal rain water in general.

Both rain and flood are also a significant source for recharging underground water. However, rainfall in Yemen does not exceed 60 days per year and ranges between 200-1000 mm per year. The quantity of spate water is estimated at about 2 billion cubic meter per year, mostly flows to the Red Sea (741 million m^3)[3].

The shortage of water and the pressure on the available scarce water resources led to frequent conflicts within communities in different parts of the country. Due to such conflicts, more than 4000 persons are killed every year[4]. Most of the available water (more than 93%) is consumed by the agricultural activities[5].

Due to the water shortage and the expansion of water need for agricultural activities and other human uses, the conflicts over water right has been dramatically escalating, thus affecting negatively the overall economic development of the country. Keeping this in view, there is a need to understand the traditional ways of controlling such a crucial issue in the past time.

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Through several centuries, the tribal and communities' conflicts led to the development of some customary rules and regulations to manage local water resources and its distribution among water users to avoid and/or settle possible conflict problems.

However, the non-equitable distribution of irrigation water among beneficiaries is one of the main factors that has led to the deterioration of irrigation schemes and their total or partial destruction and originated conflicts and problems.

Review of documents and manuscripts shows that there were strong customs and traditions in different local communities about water rights. During regime of Ibn Muzaffar (through the Rasolate era 1459-1229), it was indicated that the norm of water rights for spate irrigation in general was "field-to-field irrigation", with some exceptions of the priority of cultivation of some land on the other, which may take precedence in irrigation from those of late cultivation[6]. The new lands have the same right of irrigation after the old cultivated land has been irrigated. In some areas some crops such as palm and vegetables were given priority over other crops.

The study aims to identify local irrigation rights' customs and traditions that are still in use and/or abandoned alongside with reasons of their vanishing in the selected study Yemeni wadis. It also attempted to formulate some possible suggestions to remedy the flaws inflicting the present irrigation water rights in the concerned Yemeni Wadis.

2. SCOPE AND METHODOLOGY

The study was based on the compilation and review of available studies, surveys and reports concerning various customs and traditions concerning water rights. Visits were also made to various institutions including administrative departments in Sana'a under the concerned ministries such as Ministry of Agriculture and Irrigation (MAI), Water and Environment (MWE), the Natural Water Resources Authority (NWRA) and the Agricultural Cooperative Union (ACU).

This study was conducted in some Yemeni Wadis relying on spate irrigation, namely; Hodiedah, hadhramout, Sana'a, Lahj, Abyan, Hajjah, Mahweet, Ibb and Taiz. It used the descriptive and historical research method to address its objectives. Researchers collected relevant information mainly from available literatures such as projects' reports and documents, visits and informants interviews. The data collected during the period (from April to August 2013). Some discussion meetings were also conducted with experts/specialists and officials in the selected study sites.

Figure 1. Researchers in a field meeting with farmers

To know the norm, and old habits of water rights, the study included meetings with elderly farmers and key informants in this regard such as the Sheikhs of the "Shareejs" in Tihama, the Sheikhs of "Alobar" in Lahj and Abyan, and "Alkhail" in Hadhramout, etc.(Fig. no. 1) There was a special focus on open discussions in an attempt to seeking important suggestions of farmers' groups on the subject and the problems they face.

The information gathered from different sources were reviewed and analyzed to investigate objectively on basis of the study objectives.

Based on the analysis of collected information, some suggestions were prepared on the water rights.

3. RESULTS AND DISCUSSION

1. The Western coastal plain (Tihama):

a. Wadi Zabid:

It was indicated that in order to provide food for the residents of the city of Zabid, the rules have necessitated control over the Wadi Zabid for the purpose of agriculture and irrigation since the ninth century[7]. Associated rights of water quotas was set by the name of Ismail Jabarti or what is known as the "Al-Jabarti law".

This law was drafted to resolve violent conflicts between farmers on water at the end of the fourteenth century during the time of the judge Muwaffak Al-din Ali Abu Bakr al-Nashiri, who was the judge of Zabid during the period 1391-1400 in

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the time of the seventh King Sultan Sharif Ismail Ibn Abbas (1377-1400)[6] and thus the water quotas were set according to imposed dates.

There is also a known dominant custom that do not allow any land to be irrigated twice within 14 days and no new land is to be added for irrigation or any additional channel to be constructed to irrigate new lands. Groups of farmers benefiting from the water of the channel is usually not distributed according to tribal or clan affiliation, but are gathered for taking advantage of the channel. Here, according to the custom, water and the wadi are public property or belongs to God but the secondary canals are owned by whoever benefiting from the nearby fields.

Figure 2. One of the TDA supervised irrigation structures

At the present era, and exactly since the seventies of the last century, in order to increase the irrigated area and to exercise justice in the distribution and protection of agricultural land from erosion, the Tihama Development Authority (TDA) established in 1971[8] had to take responsibility in the distribution of water and other related matters (Fig. no. 2).

TDA has had to strengthen the traditional system in water distribution in the sub-channels through the "Aukom" which is known to each farmers under the basis of "field-to-field" irrigation. The water is distributed by Sheikh of "Shareege" (canal specialist) and for each sub-channel, there is a Sheikh or a specialist who is usually from the same family and inherited from fathers to sons. This system is still in force to date.

b. Wadi Moore:

In Wadi Moore, irrigation system, as in other wadis, is based on the norm "field-to-field" irrigation, but irrigation system in Wadi Moore is distinguished by irrigation management that is done through what is known to the farmers in the area as "Wakeel Al-Aukom" (WA).

The function of WA is focused on the organization of channels maintenance when needed through the collection of fees for maintenance and operation and supervises the operation of water distribution to the beneficiaries according to prevailing traditions. For this role, the WA gets paid by farmers with 2.5% of the grain yield.

It could be indicated that water diversion structures and modern channels were created in the wadi, to ensure fair distribution of water through the wadi with its three parts (upper, middle and lower parts) through the control of the gates according to the planned schedule with dates for this purpose. However, the situation did not go as was desired, due to many reasons including technical and social reasons such as:

(i) Lack of power supply which operates these schemes. In this case, farmers in the upper part of the wadi continue to control water at a time when farmers in the middle and lower parts of the wadi cannot object due to the lack of power.

(ii) Influence of land owners in the upper part of the wadi (an image of blocked channel. The prevailing norm "field-to-field" irrigation has become wrongly understood, as it gives those who are at the upper wadi the right to exploit and expand the cultivation of new lands to provide water for their own rights. (Fig. no. 3).

(iii) Socio- economic issues such as the relations between the owner of the land and the tenant, from one side and the conflict of interest between tenant and owner of the land on which crops is most important to grow from other side.

Figure 3. A sample of blocked irrigation Channel

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During the implementation of the Wadi Moore project by the TDA, water management in the Wadi is done through two levels of control:

1) a committee of 10 persons elected by the beneficiaries and land owners headed by the representatives of the local authorities (the Director General of Al-Zohrah District and a deputy chairperson who is the Director General of Alluhaia District). Both are from large and influential families in the two regions. This Committee is responsible for the distribution of water shares and run the main channels and observe the implementation of important works that make the irrigation system in Wadi Moore effectively managed.

2) a channel observer (CO) of the control, operation, maintenance and transferring the stream's path. Each area has a person who monitor the operation and maintenance of channels and regulate the distribution of water shares. When there is a need for maintenance or rehabilitation of the operating channels, the CO reports to the committee to make the right decision. Maintenance costs are shared by beneficiaries farmers. In some cases, the costs are shared between the landowner and tenant equally.

c. Wadi Rima'a:

In Wadi Rima, there are two main channel: the first one is called "Al- Hadied". In this channel, the water right is divided one-third for right land and two thirds for the lift land. The other channel is called the "southern channel" and has 4 sub-channel. Here, the water right is divided between users equally.

According to the norm "field-by-field", each tribe in the southern area of the wadi has one or more of the gates where their maintenance is the responsibility of the tribe. When there are weak floods, only farmers in the upper wadi benefit, but in normal seasons, the majority of farmers in the wadi benefit.

Selfishness and the sense of monopoly, have also led to the wrong understanding of the prevalent norms by farmers in the upper wadi to utilize most of the spate water for their own interests. Trees and sandbags were used to raise water level to be lifted to their fields.

2. Coastal plain of Hajjah and Al-Mahweet governorates:

Water irrigation in Hajjah and Al-Mahweet governorates is made from field to field according to the norm "field-to-field" irrigation where there are openings called "Hawl". When the upper field is irrigated, the owner of the field open the Hawl to the next field and so on.

The owner of the upper field is not allowed to change the place of the Hawl (Field), and if the Hawl is changed and has affected the next field, the yield loss should be compensated by the owner of the upper field (estimate of the loss is made by experienced key farmers). Sometimes, the opening or Hawl is made only in one side of the field to allow for the withdrawal of excess water from the field.

a. Hajjah Province:

When rain water flow to Almkauiah channel (Aukom[1]), four of armed men are put to guard the water and when land is fully irrigated, shooting is made by the armed men to indicate to Alma'aqam owners that the water has become theirs and therefore the body of the channel is broken to turn water into the main wadi stream. When rain water flows in small amounts in the wadi, it becomes the share of the first diversion structure. In the case of repetition of the flow of rainwater in the wadi in small quantities, it also become the share of the first diversion structure, even if this repeated flood continues for a full year.

The Village Head (Al-Agel of the area): He supervises the distribution of water among the beneficiaries according to the size of land owned by each beneficiary. Anyone who violates the use of flood water or do not pay the repair costs will be

[1] Almakauiah is a name of a place/location while the Almakauiah Aukom) means Almakauiah barriers that are built at the beginning of the channel (Alma'akam = a single barrier and its plural is Aukom). Aukom are built using trees residuals, stones and soil. The Aukom/Alokam are easily and quickly removed especially due to impact of strong flood flowing. Almakauiah Aukom are some of the many Aukom existing in the area. Another word is used In some wadis/ areas (Aldhamere). Further details on definitions of these terms appear in the Annex of this paper.

fined by the Agel or to be forwarded to the Sheikh (the head of the tribe) or to the security office in the area in the case of non-compliance.

b. Almahweet Province:

In the Shas Al-Barha Wadi in Khamis Bani Saad of Almahweet province, irrigation depends only on the floods water during the rainy season. Here floods often come down with great force that no one can control. Distribution of water in this case takes the course of one field after the other. When there are small streams, it is the case of the year 2012, distribution is managed by the norm "field-to-field" irrigation. Fields are irrigated from one field to another by a small holes in the end of the field called "Almanaseh".

3. Southern coastal plain (Lahej and Abyan Governorates)

a. Lahej (Wadi Tuban):

During the period August to October, there are three times of floods (once each month). The first flood normally irrigates the fields at the upper part of the wadi next to the first gate and then water goes to the next field and so forth. In the second flood stream, irrigation starts from the next fields that were not irrigated in the first flood. For the third flood, the same way is followed until it reaches the lower part of the wadi.

This system goes right in the case of floods abundance during floods season (August-October). However, it is noted that the lands at the upper part of the wadi gets more water than the fields at the lower parts. Because of drought periods in the area in the past years, water did not reach the lower part of the wadi. The number of irrigated fields in the area do not depend only on the amount of flown water, but also on the status of maintenance of the canals and gates and on irrigation water management by the beneficiaries.

In the past, decisions on water distribution, channels maintenance and area to be cultivated were usually taken by the Agricultural Council (AC) through a public announcement accompanied with a letter from the Director of Security (Police Station). Here, the public announcement used to be made on the street or in the market place by a fluent person accompanied by one soldiers in a carnival with the use of drums to bring as many people as possible. After a loud reading of the announcement, the paper is pasted on the walls of various building including government buildings. The letter of announcement is also directed to the competent authorities such as the department of justice, the security department, the members of AC, the Sheik of Alubar, and the agricultural extension workers operating in the area.

Based on the above mentioned announcement, farmers start to clean the lands from weeds, cultivate the lands, raise the Aswams (borders of the land) and repair channels. In the case of any damage to the main channels or sub-channels, the Sheikh normally send a person with the use of drum to the affected villages to inform them that they must quickly repair the damage in the channel and that each beneficiary has to contribute to the repair of the damage, either by oxen or manual work. In case of rejection by any person, the sheikh normally sends a soldiers to take him to the security department where he gets released only after he has paid his share.

The Sheikh of Al-Aubar or the irrigation specialist is responsible for water distribution and regulating the operation and maintenance at the village level under the supervision of the Agriculture and Irrigation Office (AIO) in the governorate. This irrigation specialist has a good relationship with the Sheikh of the village (Agel) and others. He is assisted by Sheikh Al-Alubar Assistant, who is selected by the beneficiaries, as well as by the agricultural extension agent.

The main functions of the Sheikh Al-Aubar or irrigation specialist are:

- Estimating the amount of water that should go in the main channels, allocating water shares and supervising the distribution of water.
- Diverting floods water.
- Identifying the affected areas that need maintenance, determining the costs of maintenance in the main channels and collecting contributions of farmers for maintenance.
- Mobilizing the workers and equipment for maintenance and distributing work among them.
- Resolving disputes that arise between the beneficiaries on water distribution.
- Determining the type of crops to be cultivated according to the plan specified by the agriculture and irrigation office.

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- Determining the area to be planted.
- Acting as a liaison between farmers and other agencies.
- Reporting about the status of channels maintenance.

The main functions of Sheikh Al-Aubar's Assistant:

- Acting as a link between farmers and the sheikh of Al-Aubar.
- Helping Sheikh Al-Aubar in all of his functions.

The sheikh of Al-Aubar used to be paid a part of the crop produce for his fee, estimated as Kailah of grain (8 kg of grain) per feddan (4200 m^2)[2]. At present, farmers associations, have replaced Sheikh Al-Aubar, as the association provides a maintenance plan with costs to the irrigation council (IC)[3], which consists of 21 members representing the association management, the local council, the AIO, the court, the security department and others. The irrigation council is chaired by the secretary general of the local council. This composition has taken advantage of the Sultani decree issued in 1950 in this regard (Yemani-Tuban Cultural Forum, Undated).

Irrigation Council meets twice, the first is when distributing water shares in channels and among beneficiaries, and the other to discuss the plan of maintenance of channels and irrigation schemes. The functions of the association is the maintenance of sub-channels while the functions of the local council is the maintenance of irrigation schemes and main channels. The irrigation supervisor is the one who allocates water shares for each channel and defines the type of needed maintenance and costs. Maintenance costs are obtained from the contributions of farmers which is 500 YR/Feddan and contributions from the local authority and almsgivers donations.

b. Abyan Province:

I. Wadi Ahwar:

Distribution of flood water in wadi Ahwar, before unification, was done by water user groups. In each area, there was an entity who is responsible for distributing water shares, operation and maintenance and even improvement of each system, including the channels. The water is distributed to beneficiaries according to the norms agreed between them, and under the supervision of agricultural cooperatives. Farmers pay irrigation taxes for the service provided to them. In this case, all farmers in the wadi get water with justice.

The Sultanate Decree for regulating the spate irrigation in wadi Toban- Lahj governorate:

The Sultan of Lahj has issued in 1950 a decree number (1) is known as the law of the "agricultural council and agricultural court". It contains many important items that can be used at the present time, including the membership of the Council from the local authority and representatives of the land owners, farmers, and even the sheikhs and key figures in the Wadi as consultants. The Council has a number of tasks including: the organization of irrigation, the distribution of irrigation shares, the distribution of lands between small and large farmers, the organization of leasing and share cropping, dividing the wadis, operation and maintenance of irrigation schemes, the organization of the differences on Al-Aobars and wadis, establishing a special fund, the imposition and collection of fees, as well as penalties and fines on violators and other tasks.
The Council meets twice a month, and in the season meets twice a week (Monday and Thursday of each week) or when needed. The decree has (3) chapters, the first is the formation, and the functions of the Council, the second is the persuasion, the compensation and the Treasury of the council, and the third is the agricultural court. The law also has 4 sub-chapters which are the tribunal set up, purchase and sales of agriculture, land rent and penalties.
With regard to maintenance and operation, paragraph (4) In Chapter (2) that the cost and type of maintenance is estimated by a person assigned by the agricultural council where the costs are distributed to beneficiaries according to the return of the land. The costs is handed over to Sheikh Al-Aubar with two others selected by the Council in consultation with the beneficiaries to supervise the expenditure, the work and prepare accounts. As indicated in Chapter (2) of the Decree (persuasion of compensation) in items (4 and 5):
The Decree also noted the financial resources of the Council which are returns from fees, penalties, fines and donations.
In the violations chapter a provision in the decree above, there are clear provisions in this regard that the violator shall be the aggressor or specific fines, including cash or equivalent to what is cultivated in his land or to be prisoner from 10 days to 3 years. In other cases, payment of fines and imprisonment is done at the same time[9].

[2] . Aker= 4000 m^2.
[3] AC and IC actually refers to the same as an entity and duties with only some changes in some names, functions and titles of members and/or agencies stemming from the process of restructuring.

After unification, WUAs have disappeared and the big land owners became the main users who have monopoly over irrigation water, and no one can stop this unfair act as there are no laws or legislations that could help the local authorities to intervene in this respect.

Access to water was reflected on the relationship between land owners and tenants in the division of revenue from agricultural land. For those farmers who are dependent on flood irrigation, usually at the wadi upstream, the tenant gets half of the produce, while the other half goes to the land owner. For farmers in the wadi downstream, who are mostly dependent on irrigation from wells, the land owner gets only 25%, while the tenant gets 75% of the produce.

II. Wadi Bana:

In Wadi Bana before, the irrigation system was under the responsibility of agricultural cooperatives and the state farms, who were responsible for the distribution of irrigation water to farmers, as well as maintenance, operation and improvement of irrigation schemes.

After the unification (1990), the responsibility of operation and maintenance of irrigation schemes was given to the AIO in Jaar. The responsible department prepare, each year, an irrigation schedule with the help of representatives from local committees. The role of local committees in water distribution is in the distribution of water to the farmers as well as in solving problems that result from the distribution of water to farmers. The following considerations are usually taken when scheduling irrigation quotas:

- Determination of water shares is estimated based on the quantities that were distributed in the previous season.
- The degree of reliance on floodwater.
- The degree of salinity of agricultural lands.

Despite these efforts, some land owners do not respect this distribution system which is associated by the absence of laws and legislations to govern water distribution as well as the poor performance of the local authority.

4. Eastern plateau (Hadhramout):

Water rights are well rooted in Hadhramout, as in many parts of Yemen, because of water shortage in one hand and due to the increasing demand for water on the other hand. Beneficiaries have developed a robust system for water distribution on irrigation channels and agricultural fields. Despite the multiplicity and divergence of wadis in Hadhramout governorate, irrigation system and water rights as well as maintenance and operation of irrigation schemes are almost similar to a large extent with some differences in names.

When the water flows in the wadi, it enters the main channel (Sakia) and then distributed to the entrances (Alharat) and openings (Albodod) at the same time. The first fields near the openings and entrances are then watered and when it receive sufficient supply, water is diverted to the next fields through openings known as Manaki that are about 45 cm high. This irrigation system is applied for the lands cultivated with annual crops, but for the lands cultivated with perennial crops such as date palm, different Manakis are used with height of 75 cm.

4. CONCLUSION AND RECOMMENDATION

There exist some traditional customs and practices relating to water rights of irrigation systems in different regions of Yemen with relative variation of names and arrangements. In general, the main norm of water right in everywhere in the country stems from the rules: "the main wadi is a public right"; "field-to-field irrigation", "from upper stream to dawn stream". To control the common norm and system, there exist special constructions. However, due to some natural, socio-economic and political developments such as draughts, shortage of water, the modern irrigation structures and the government and economic restructuring, these norms and traditions were disrupted and caused some unwanted effects. These effects includes the dominance of influential large scale farmers, the introduction of high-irrigation water consuming crops (banana, Mango, vegetable etc.), and the neglect of irrigation schemes operation and maintenance. Furthermore, there is no specified authority and serious efforts to solve the water right conflict and that could deter violators. Therefore, the government needs to seriously consider the formulation and issuance of a law organizing water rights and determining tasks and responsibilities of various partners involved on basis of those traditional norms and practices such as Aljabarti rules (Zabid), the Sultani decree of 1950 and other prevailing arrangements.

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ANNEXURE

Definitions of Some Important Common Local Terms Used in this Study[4]

1. Sharj (pl. shruj):

Sharj is an agriculture captures slope wash from a relatively small catchment area to agricultural terrain, concentrating runoff usually onto a single field.

2. Al Dhameer:

Is the barrier in the beginning of the main irrigation channel, this channel is none by its name, it has number of sup channels or branches.

3. Al Okam

Is the barrier in the beginning of the main channel, its same as Al Dhamer in other area, its comen nam in Tehama area, each Okam irrigated sertaine area.

4. Aswam:

Is the plural of the word (Sawm) which is a border of the field from the front side.

5. Alubar:

Is the same as sharij or Okam, but commonly used in different area.

[4] . Definitions of the terms 1-3 are quoted from the last reference in the references list of this paper.