

## **INSTITUTIONAL ARRANGEMENT AND WATER RIGHTS IN AFLAJ SYSTEM IN THE SULTANATE OF OMAN**

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### **ABSTRACT**

The scarcity of water in Oman has led to the development of a system of water allocation very different from that which exists in regions graced with more rainfall that is abundant. Omanis have perfected the art of exploiting available water resources to the best advantage over the centuries. An example of this is the falaj system (plural aflaj), which was introduced into Oman about a thousand years ago. Water rights are treated similarly to rights to real property, which is they can be inherited, sold, rent, and encumbered in the same manner, all independently of the land on which the water originates, or on which it is used

The important of water rights arrangement and location can be attributed to the following factors. First, the economic development has been strongly influenced by the ability of a society to control its water resources and to use them effectively and sustainably. Second, water allocations should support long-term goals and investment and also incorporate a renewal mechanism for future generations. Third, water allocation mechanism is highly linked to the society's objectives, that is, if the society wishes to govern land use to meet say poverty alleviation or increase productivity of certain crops, then this becomes a water allocation objective. In this paper review of such system in terms of water rights institutional arrangement have been undertaken. Several important finding have been revealed. For instance, historical link exist between certain instrumental aspects of aflaj water rights and well-social coding. In addition, economic instrument like water market have been established for centuries.

### **1. INTRODUCTION**

Throughout the world, water has always been an important resource. This is because water considered as economic development tool that is needed for crops, mining and other economic activity (Merret, 1997). In addition, from social and religious point of view, water is of great important, as Muslims and Judaism uses it for cleansing and purifying. Almost all Churches or sects have an initiation ritual involving the use of

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water (Abrams, 1996). Therefore, and for that reason it is very well recognized that water, as one of the natural elements, has proven to be a difficult subject matter to regulate. Furthermore, water is regarded as a scarce and highly prized commodity especially in the dry settlement regions. Thus, there are multiple governmental and nongovernmental actors who work to influence and implement policy in a decentralized political system. It seems that developed and developing countries have struggled to formulate an acceptable institutional and managerial framework that regulates water distribution, as pointed out by Frederiksen (1993) that a nation's institutions and the manner in which they are applied, determined how the nation manages its water resources. He added that the existing institutions together with the conditions of the resources and the economy combine to create the important issues confronting a country.

There are many different views about water right law and institutions arrangement. Frederiksen (1993) regarded national institution including laws, customs, organization and all that is associated, as the framework within which society functions. He added that they constitute the framework for every action from group relations to commercial activities. Teerink and Nakashima (1993) stated that water is a renewable resource that may be in limited supply and, therefore, its regulation, control and use is invested in sovereign authority of the nation or its subdivision. The importance of water rights arrangement and location can be attributed to the following factors. First, the economic development has been strongly influenced by the ability of a society to control its water resources and to use them effectively and sustainably. Second, water allocations should support long-term goals and investment and also incorporate a renewal mechanism for future generations. Third, water allocation mechanism is highly linked to the society's objectives, that is, if the society wishes to govern land use to meet say poverty alleviation or increase productivity of certain crops, then this becomes a water allocation objective.

The scarcity of water in Oman has led to the development of a system of water allocation very different from that which exists in regions graced with more abundant rainfall. The art of exploiting available water resources to the best advantage has been perfected by Omanis over the centuries. An example of this is the falaj system, which was introduced into Oman about a thousand years ago (Wilkinson, 1977; Sutton, 1984). Water rights are treated similarly to rights to real property, which is they can be inherited, sold, rent, and encumbered in the same manner, all independently of the land on which the water originates, or on which it is used.

We know much about the role that aflaj have played in the history of dry land settlement, engineering construction that went into building these canals and how water is distributed, but little is mentioned about water rights institutional framework and most importantly what are the policy instruments that behind the success of the system.

The sheer quantity of falaj in Oman has enticed scholars to produce a number of detailed studies for the falaj, but most of these studies focused on the physical and administrative structures. Therefore, the nature of these studies have left a gap in our knowledge concerning water rights and their institutional framework. The following paper presents a more detailed illustration of the issue of water rights and institutional framework that used to manage traditional irrigation water in Oman. The principles set forth in this paper draw from several sources, mostly from earlier studies, together with

fresh information extracted from author own observation. It is not intended as a comprehensive treatment of the subject, but as illustration of an old traditional system that can provide valuable contribution to the existing literature.

## **2. AN INTERNATIONAL PERSPECTIVE- THE LITERATURE**

Water rights have long been studied by scholars from western countries and Muslim states. Comparison of water rights among these two main institutional sources highlights some of the differences between legal traditional.

In general, public water defined as the water derived from rainfall, streams and lakes. Access to such water varies from country to country, as very much influenced by the doctorial and institutional framework they follow. In the literatures, it seems there are two-main-water doctoring types. The western doctoring that mainly influenced by the English Common Law and the Muslims doctoring based on the Islamic law.

### **2.1. WESTERN WATER DOCTRINE**

Witting (2005) point out that as one of the natural elements, water has proved to be a difficult subject matter to regulate. He then illustrated how common concepts have been formed by stated “the courts have relied largely upon a hybrid of land and tort doctrines in their regulation of water. These doctrines have developed haphazardly and have been subject to changes in philosophical leanings and to a substantial foreign influence. For instance, Teerink and Nakashima (1993) pointed out that allocation of water and development of water rights law in the United States is based on doctrines influenced by European laws.

Reviewing the literature, there are three basic approaches have been developed for establishing water rights. These include:

- The common law system of riparian that is defined as water rights of property vested in the owner of land that abuts a watercourse. Teerink and Nakashima (1993) Another definition was provided by Frederick (1993) stated “ riparian rights gives owners of the land bordering a water body rights to use the water in ways that do not unduly inconvenience other riparian owners. There are three main principal features for the riparian doctrine. First, water use is limited to riparian lands. Second, a riparian land owner can use water at any time as long as the use is reasonable. Third, water shortages are shared by all riparian owners.
- Second, permit system that considers water to be a public resource that only can be used with the permission of the government.
- Third, prior appropriation awards water rights according to the principle of “first in time, first in right”.

### **2.2. MUSLIM WATER DOCTRINE**

Most Muslim countries based water law under the Sharia or Islamic law doctorial. Thus, Muslim’s scholars consider water as public property that cannot be owned. They based their argument on the prophet Mohammed statement “mankinds are co-owners in

three things: water, fire and pasture (Buckari). However, Maktari (1971) classifies water under three headings according to its sources; as river water, well water, and spring water. His classification and discussion can be summarized as follows. First, the water of the great rivers, such as Tigirs and Euphrates in Iraq, must be allowed free access, since such water supply has no case or dispute. Second, the water of small river or spring, which is in sufficient quantity, must only allow to those who dwell in its vicinity. Third, the water of artificial rival or spring is held in common by those who dug the channel. In short, Islamic law in general term consider water as public assets but as effort of mankind and expanses involved then access must be restricted to those who have played part.

Based from the above discussion one can consider water from falaj becomes the property of the people who built the structure. Its use is governed by mutual agreement between the users. A protective area around the falaj or well, referred as falaj protective zone, is created (about 25 m around structure). A community of people with water rights was organized around a falaj, with right being established in proportion to the participation of each in the construction of the falaj. A Similar view, expressed by Al Ghafri at al (2001) stated that after the construction of falaj, farmers create a committee of experienced people to distribute falaj water shares among falaj owners.

## BACKGROUND OF THE AFALJ SYSTEM

A number of definitions have been provided for the afalj system in Oman. In general, falaj system is mainly a channel constructed a long more 2 to 5 km at a gradient stated from the mother well to the village. Such channel has a unique construction design, in a way allows seepage of rainfall water accumulated in the oasis to enter through channels rocks, this have resulted in a continuous water flow by gravity. In the literature, geologist, agriculturist, legislative and economiest have studied aflaj systems and provided different definitions. For instance, Norman et ad (1998) Dull (1989), as they analyzed them from agricultural point of view, described falaj as community-managed systems that access ground water by gravity flow from underground galleries. Birks (1984) and Wilkinson (1977) (geologists) defined aflaj as a tunnel (many kilometers long) which taps water where it concentrates in the ground and leads it to the surface. Finally Sutton (1984) and Haydar and Omezzine (1996) see from legal and institutional framework that used social well-managed codes and regulation that kept the system running for over a thousand years.

It is well recognized that in order to appreciate afalj definition and get detailed and full understanding, is of great important to define it according to the three daudi, aini and ghaili. These types differ in terms of physical structure and institutional arrangement.

- **Ghaili falaj:** physical structure consists of a perennial flow in the surface gravels of the wadi or river. The flow is diverted into a man made channel either by a flow bund, or through a short collector gallery. Sometimes, Ghaili falaj are simple diversion channels that bring the water directly from the wadi to the nearby gardens (Wilkinson, 1977).
- **Daudi falaj.** Physical structure is characterized by the fact that water is dug from underground aquifer. Then it conveyed to the village by an underground tunnel that may reach up to 17 km. Also these types are

characterized by relatively high flow of water discharge and have the most stable water flow rate around the year compared to the two other types of falaj.

- For Aini falaj water draws from one or more natural springs. Like Daudi, the water is transported from the springs by a channel up to the agricultural land MRMEW (2002).

Table one summarize the inventory result that conducted by Ministry of Regional Municipality, Environment and Water (MRMEW) in the period from 1997 to 1999. It can be observed from the table that the majority of the aflaj, of a total number of 4112, fall under the Ghaili type, 48 percent followed by Aini 28 percent. Despite the fact that Ghaili falaj form the highest percentage, 54 percent of them are dead. This can be attributed to the fact that these, as pointed by al Rawas (2000), are usually seasonal due to their dependence on shallow subterranean source that disappear during dry seasons. It is important to understand that water collects from over the mountains and through the wadis until it forms a reservoir, and the water is conveyed through a channel, which is normally rectangular in cross-section. In contrast, the source of Aini and Daudi falaj water is from underground aquifer. Thus, one would expect that the flow of water is more consistence than Ghaili type. In fact, Major falj in Oman like Melki in Iski, Daris in Nizwa and Mafjoor in Ibri are of Daudi type.

Region	Estimated Water Demand (mm <sup>3</sup> /year)	Total irrigated Area (Hectare)	Falaj Type, No.			Total
			Daudi	Aini	Ghaili	
Al Batinah	104	6458	193	443	925	1561
Al Sharqiyah	115	5819	318	238	290	846
Interior	135	8132	279	196	275	750
Al Dhahirah	79	4626	152	145	419	716
Muscat	26	1463	25	130	84	239
<b>Total</b>	<b>459</b>	<b>26498</b>	<b>967</b>	<b>1152</b>	<b>1993</b>	<b>4112</b>
<b>Percent</b>		<b>37.4</b>	<b>24</b>	<b>28</b>	<b>48</b>	
<b>Active %</b>			<b>21</b>	<b>33</b>	<b>46</b>	
<b>Dead %</b>			<b>31</b>	<b>15</b>	<b>54</b>	

## AFALJ WATER RIGHT AND INSTITUTIONAL ARRANGEMENT

As pointed out by Wilkinson (1977) that the systems of shareholding and the ways in which falaj water is distributed are complex. Therefore, using a sample of falaj selected among different regions is very important component in order to examine water right in

Oman and to appreciate the basis principles upon which each village develops its individual system of water organization. According to proto-historical theory, a community of people with water rights was organized around a falaj, with right being established in proportion to the participation of each in the construction of the falaj. However, the current appropriation of water from the falaj is not always linked to the construction of the gallery but it is rather expressed based on the historical balance of power between the local population and tribes. Furthermore, the method of organization introduced around the falaj is part of the Omani law and therefore follows a number of rules, based either on Muslim or customary. In short, historically, falaj water rights arrangements have been influenced by several fundamental water rights institutional arrangement based on: community tribal structure, Muslim and customary legislation and well-social codes arrangements.

### **TRIBAL INFLUENCE**

It is important to recognized that in practice, the current appropriation of water from the falaj is not always linked to the construction of the gallery, but is the expression of a historic balance of power between the local population and tribes and families, which were and are still expressed in the form of transactions concerning the ownership and use of water.

MAF Study (1993) indicated that there is a great variation among the twelve aflaj studied, in terms of water rights concentration. The twelve aflaj studied can be divided, in term of water right concentration, into two main categories. First categories are those aflaj that characterized of having high concentration of ownership. That is a high proportion of the rights are on the hand of few tribes. An example of such flaj are Abu Thaled (Rustaq) falj and Mafjoor (Ibri) falj. The water rights of the former are hold by 20 tribes among 64 water owners, but only three tribes that control more than 50 percent of the private rights. The Al Hinaii tribe is the most numerous (32 percent). Similary, Mafjoor water rights are spread among 22 tribes, 10 main tribes possess major water rights, with a total of about 260 water owners. The most important tribes is Yakoubi, which control 34 percent of the water rights. The second tribe in terms of importance is Chenadide which hold 31 percent of the rights. The second catogeries is charachterized of having less concentration of ownership. For example, El Malki in Izki, Daries in Nizwa and Al Hamra in Al Hamra. Water rights of these falj are among two to three tribes.

In short, the fragmentation of water rights among many tribes reflects the intensie trading and population movements that have taken place over the years. That is if intense repurchasing of the water rights occurred, a fragmentation of rights among many tribes may occur. This clearly can be seen in the Al Maiser Falj where 36 main tribes are in fact represented in the 167 private owners along these tribes there is sub-groups, that is a total of 50 tribes affiliation. Another example can be seen in the Hali Falj which its water rights are represented among 40 tribes. The most important is the Ruwali, which possesse 14 percent of the private held rights, followed very closely by the Kassabi.

## MUSLIM AND CUSTOMARY LEGISLATION

The method of organization introduced around the falaj is part of Omani law and thus follows a number of rules, based either on Muslim or customary law. Custom defined by Islamic Encyclopaedia (2000) as frequency draw on as a material source of law. Muslim jurists included custom in the law because of the principle that any lawful force. For it could be said that custom is no more than an agreement among a large number of people whence the common maxim. Historically, custom were practiced during the Ottoman Empire in the sixteen century. Modern scholars of Muslim law generally devote a chapter on custom along with their writing on the classic sources. In general, customs applied by community in order to organize their social like, marriage, divorce, with strong connection to Islamic law. However, it should be added that many professions also had their own specialised custom. The best-known example is the body of customary law that control water distribution in the aflaj system.

Author own observation revealed that many falaj water rights are not registered in books, they rather well known by falaj Management Community and water right owner. Sometime they know number of anthers own more than knowing their cultivated land size. This have resulted in well-social arrangement link among the villagers. As Nath (2002) clearly indicated that law is simplest sense is based on customs and traditional rather than written codes, He attributed that to the fact that received customs represent the collective norms of the group and contain rules of behavior considered essential to the well being of the community, societies tend to feel bound to observe them.

Another point to link custom law with the role of Wakil.. In fact, many writers defined Wakil's role in various ways depending on the managerial point of view. Sutton (1984) view wakil role as the overall administrator, who responsible for the organization of falaj affairs. MAF (1993) report pointed out that wakil manages of the falaj budget, consisting of the sale of water shares. Gafri at al (2001) added that Wakil solve water conflicts between farmers. The different view stated above can be explained by the fact that the word Wakil in the root of the Arabic classic linked with Islamic law contains more details. As stated by Ibn Rushed (1996) the principle of Wakil is to take the constitution agency by someone absent, who exercises authority over their own affairs. This principle has been taken in practice by the role of the falaj Wakil. All the water rights holders give full authority to the Wakil in trading, solving conflicts, taking decision on emergency matters and so on.

Generally speaking, public water defined as the water derived from rainfall, streams and lakes. However, there is fundamental Islamic principles concerning the appropriation and use of water. These can be summarized as follows. First, water is free to all. However, it may be appropriated provided that the conservative law is respected. Second, water from falaj becomes the property of the people who built the structure . Its use is governed by mutual agreement between the users. A protective area around the falaj or well, referred as falaj protective zone, is created (about 25 m around structure).

The above-mentioned aflaj water right institutional arrangements have resulted in certain essential instrumental aspects that helped falaj operation for centuries with miner conflicts among water holders. The following instrument can be illustrated as unique feature of the Omani experience in water management.

## **MARKETS FOR WATER RIGHTS**

Aflaj Water rights marketing in Oman are active and span on several centuries. Observation revealed that these markets can be divided into two main categories. There is a market for the sale of water rights (sometime referred as market for permanent water rights) and another market for short-term rental rights. The latter administered by FMC to rent or lease falaj common water rights in order to generate income for maintenance.

### **AUCTION OF PERMEATE WATER RIGHTS**

Most water markets in Oman fall under the form of auctions. Sale of water rights rarely happens, and usually takes place in case of death of the owner and when inheritors want to sell the water rights.

The sale of water rights is done by auctions. An auctioneer or caller conducts the auction, usually in the village main market. The caller announces the auction. Once the caller considers that enough potential buyers have collected, he starts the bidding asking for quotes. At any stage during the auction, the prospective seller can withdraw either because he feels that insufficient people are present or because he considers the final price is not as expected. Generally, however, attempts to persuade him to accept the arrived-at price will be made not only by the buyer but by the caller as well. When the seller accepts the auction price, it is recorded along with the names of the seller and the buyer. Once the deal is made it is the responsibility of the caller to make sure that the seller receives his money and that the buyer pays. Payment is usually made in cash.

### **AUCTION OF THE RENTED WATER RIGHTS**

Short term markets are based on auctions too. Rented water rights' auctions deal with falaj common property rights. These are usually expressed as a time share of the resource on a week or any other basis depending on the turn of water. Common property rights are the main source of income for falaj maintenance. These water shares are usually auctioned by lots of an ather.

Short term auctions are usually conducted in the same common place at village level, and at an agreed on time, normally on Friday afternoon, a rest day in Oman. The auction assembles the sellers, represented by Wakeel (administrative agent), buyers or farmers who are willing to pay for extra water to irrigate their crops (mostly date-palms), the caller, who seats in the middle of the buyers to bid and the recorder, who is responsible to record the buyers names and the final bidding price. Every falaj does have a book serving to register the water leases' prices, buyers as well as the date and duration of each lease.



## WATER DISTRIBUTION AND USAGE

**Table 2:** Water disytribution through the use of rotation (cycle) among different aflaj in Oman

Falaj name	No. of turns	No. of days	No. of athar
Al Maisre (Rustaq)	13	13	1248
Abu-Thaleb (Rustaq)	11	11	528
Mafjoor (Ibri)	11	4/16	384
Mabooth (Ibri)	14	5/20	480
Al Malki (Izki)	9	19	912
Al Hamra	8	7.5	360
Daris (Nizwa)	9	8.75	420
Al Hali (Smail)	18	18	864
Al Mudhaibi	19	16.5	792
Hamad	2	9.5	456

Water rights are often quite separate from land ownership. However, a water right may be attached to a particular plot. This consists of a proportion of the total volume of water flowing in the falaj over a certain period (Day/cycle). An autonomous measuring system has been drawn up, and is converted into units of time for purposes of convenience.

The most important unit is the badda. In general, a badda can be a day or half day. In fact, as pointed out by Al Ghaifri at al (2000) that normally day has two baddas, dat badda and night badda. This mean that each badda will have 24 athars, since ather usually corresponds to a half hour. In past, as pointed out by Wilkinson (1977) that the length of the two baddas is obviously governed by the rising and setting of the sun. While those of the night are measured by the movement of the stars. However, most farmers nowadays using modern watches.

Table 2 summarizes water turns and the corresponding total athars registered in each falaj. As mentioned previously that ather for each owner of the water right is the bases of which irrigation cycle is calculated. For example, if we take falaj Melki in Iski which hold 912 athars. First number of athars divided by two (for the day and night turns or badda) equal to 456 hours then we divide this by 24 hours to convert hours into days then the result is 19. Thus, we say that this falaj has an irrigation cycle of 19 days. However, not all falaj in Oman structured using such methodology. A number of considerations are essentially important in order to clarify things. These can be summarized as follows. First, the water cycle varies depending on the availability of water, which may vary enormously from one year to another, and from one season to another within the year. It is based on 16 units (Badda), each lasting 6, 12 or 24 hours

depending on the quantity of flow available. The cycle may thus last 4, 8, or 16 days, with an average 8 days for 16 *badda* of 12 hours each. For example, falaj mafjoor in Ibri hold 384 *athers*, with 8 irrigation cycle. However, due to water flow it can be short as 4 days or long as 16 days. Second,

Water distribution is based on two different principles. One is based on time and the other on the volume of water. That based on time is common, but in many mountain villages with large variation in flow, the unit of distribution is that of a full cistern rather than of flow over a given period. Where time is the basis, the four that are followed are shown in Table 1.

**Table 1:** Equivalence of Terms Used in Irrigation.

Term	Meaning
<i>Badda</i>	12 hours
Rabiya	3 hours
Ather	½ hour
Qama	7½ minutes

These additional units are based on a shadow's length, and are, therefore, not exactly equivalent to chronometer time. For example, The term "*ather*" means the shadow of a man while he is standing during daytime. As daytime passes with accordance to the sun movement, different shadow can be obtained and thus time can be measured. Originally, water flow was measured by the increase in the length of a man's shadow, and at night by the movement of the stars.

The unit on which the distribution is found depends on the size of the falaj. The smallest uses whole *baddas*, the largest *qamas*, with *rabiya*s and *athers* the commonest. These units of time are all part of total time cycle of water application to a particular plot. This varies in length from village to village. The main system of shareholding is the *Dawran*, i.e., the rotation or cycle by which the *falaj* water is distributed to individual farms every 7-10 days. The cycle (*Dawran*) starts from Friday to Thursday and each shareholder will obtain his share once a week on the average. However, During drought periods, when the flow of water is low, some of the shareholders will have their share after 12 days. It is important to note here the significance of using time unit ( *ather*) rather than volume, as an unit used to measure water right. The fact that if volume were used, means that during draught period or low flow rate some people will have less water than others. But the use of time unit give more fearless in the system i.e. change occur in the length of the cycle rather than volume of water distributed.

## CONCLUSION

The overall picture drawn from general examination of water rights on the traditional aflaj system in Oman reveals a number of characteristics. These can be summarized as follows. First, the basic water needs is free to all. However, it may be appropriated

provided that the above law is respected. Thus, water from falaj becomes the property of the people who built the structure. Its use is governed by mutual agreement between the users. Second, Ownership of water is often independent of land ownership in falaj in Oman. The objective of this separation is to allow water to be exchanged freely. Third, falaj water rights are recognized at the national level and have the same legal aspects as any other private asset. Thus, a water right may be sold, inherited, or instituted as Waqf. Fourth, rights for each owner are measured on time basis. The measurement of time most commonly used for individual rights is the Ather, which lasts about half an hour.

One of our finding reveal that water rights in aflaj irrigation system may be classified into three categories.

- Private water rights. These can be either explicit water rights with property licenses or implicit without written licenses owned by individuals. The difference between the two categories is mainly the opportunity to trade water. In fact, for the implicit water rights, the right is exclusively a use right that could be inherited but in no case traded or even rented, it is tied to land property.
- Common water rights. These are water rights owned by falaj community members. These rights are mainly established to generate income for falaj maintenance and operation expenditures. The common water rights are rented weekly, half yearly, or on an annual basis through water lease auctions. This type of common water rights is of great importance since it aims to prevent the free riding problem in relation to the cost recovery of maintenance of the water system. By pooling together a set of water rights, based on a percentage of individual shares into a common property right owned and rented by falaj's manager it provides a continuous monetary flow. It is important to note that this is the particular originality of the Omani falaj system management in comparison with similar water system such the ones in North Africa and Asia Minor called Klettara, Foggara and Qanats (Garduno-Velasco, 2001).
- Quasi public water rights owned by charity institutions, now under state control.. The returns from right's rents are used to finance mosques, schools and needy people. These water rights are managed in the same way as common water right that is by falaj manager. The quasi public water rights could not be sold but could be only leased in short term markets. Consequently these water rights may increase by donations of private water rights, but never decrease.

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