

# METHOD OF IRRIGATION SCHEDULING IN AFLAJ IRRIGATION SYSTEM OF OMAN

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## 1. INTRODUCTION

*Aflaj* (*aflaj* is plural of *falaj*) is a traditional irrigation systems in Oman. In *falaj* irrigation system, water is distributed by time basis. Only in few cases volume basis is used. There are three types of *aflaj*: 1) *Ghaily*, where the source is a base flow of *wadi* (dried rivers). 2) *Daudi*, where the source is a mother well, like the *qanat* of Iran or *Mambo* of Japan. 3) *Ayni*, the source is natural spring.

The most wide spread method uses a water share time unit called *athar*. In this method, the irrigation rotation, *dawran*, is divided to several days (normally 4 to 20 days). Each full day is divided into two *baddas*, daytime *badda* and nighttime *badda*. Each day should have 48 *athars*, so each *badda* will have 24 *athars*. Therefore, *athar* is theoretically equal to 30 minutes<sup>1)</sup>.

This paper will explain the method of irrigation scheduling and its modernization in *aflaj* irrigation systems of Oman.

## 2. METHOD

16 villages in northern Oman have been selected for this study. The majority of the data is collected in the period 2000 to 2001. The main criterion for selecting these villages is that these villages have *aflaj* varied

by type, size and method of irrigation scheduling.

General and detailed data about water distribution and management were collected. Farmers were interviewed informally. Detailed interviews were done with the *falaj* director (*wakil*) and the village head (*sheikh*).

## 3. RESULTS AND DISCUSSION

As a rule, in the traditional scheduling method, the daytime *badda* starts at sunrise and ends at sunset, where the nighttime *badda* starts at sunset and ends at sunrise.

Farmers were using several methods to verify the water share on the field, like estimating time or using the complex sundial and stars system<sup>2)</sup>. After the modern watch became available for farmers in the last century, they start gradually to check the time using these watches, and they came to fully depend on these watches in some systems, by adapting first the *Ghoroobi* timing and then the *Zawali* timing.

When the modern watch introduced to Oman, the timing system which was used is called *Ghoroobi* or sunset timing. In this timing system, the farmers set the watch to 12:00 at sunset everyday. The watch is adjusted everyday according to the change of the

occurrence of the sunset. In the conventional meridian timing, called *Zawali* in Oman, the day starts at 6:00 AM. In the *Zawali* method, daytime and nighttime are fixed to have equal length (12 hours each), regardless the seasonal change. Fig. 1 illustrates the differences between using traditional sundial and stars, *Ghoroobi* watch and *Zawali* watch.

In Table 1, 16 *aflaj* systems are listed with information on the type of the *falaj*, estimated size of the *falaj*, length of *dawran* and the method of irrigation scheduling.

In all the four *ghaily* type *aflaj*,

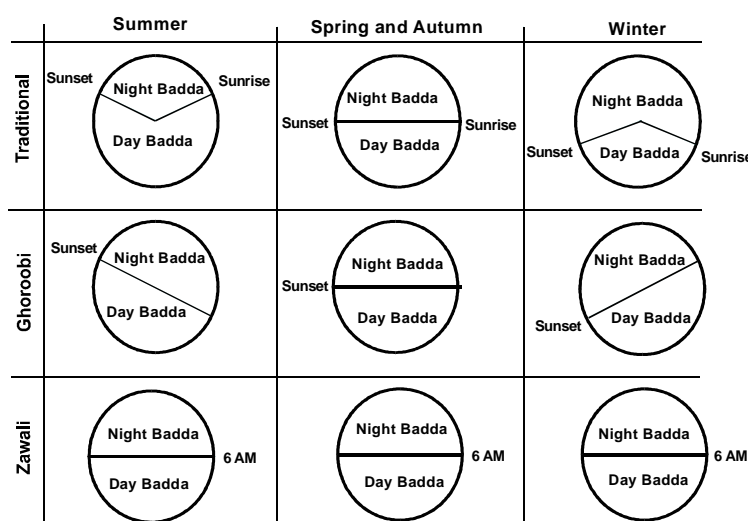


Fig. 1 Different methods of irrigation timing in *aflaj*

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farmers use modern watch. In two of accuracy in measuring water. In many cases, the

**Table 1** Methods of irrigations scheduling in some *aflaj* of Oman

No	<i>Falaj</i>	Village	Type	Estimated <i>falaj</i> size	<i>Dawran</i> (days)	Scheduling
1	Mijzi	Mijzi	Ghaily	Medium	7	Ghoroobi watch
2	Dahir	Dahir	Ghaily	Medium	10	Ghoroobi watch
3	Al Mahyul	Al Mahyul	Ghaily	Medium	7	Zawali watch
4*	Al Farsakhi	Samail	Ghaily	Medium	8	Zawali watch
5	Al Muhaidith	Al Muhaidith	Daudi	Small	10	By badda, estimated time
6	Al Hayyal	Al Hayyal	Daudi	Medium	7	Sundial and stars
7*	Al Muraifa	Samil	Daudi	Medium	9	Sundial and stars
8*	Al Hamra	Al Hamra	Daudi	Large	8	Sundial and stars
9	Stall	Stall	Daudi	Large	14	Sundial and stars
10	Awabi	Awabi	Daudi	Large	15	Zawali watch
11*	Al Haily	Samail	Daudi	Large	18	Sundial and stars
12	Dariz	Dariz	Daudi	Large	19	Mixed
13	Al Air	Al Air	Ayni	Small	7	Tank and scale
14	Thuqb	Thuqb	Ayni	Small	8	Tank and scale
15	Al Hageer	Al Hageer	Ayni	Medium	7	Sundial and stars
16*	Al Kasfa	Ar Rustaq	Ayni	Large	11	Sundial and stars

\* Some of the data for *aflaj* No 4,7,8,11, and 16 are compiled from different publications

them they use *Ghoroobi* timing and in the other two they use *Zawali* timing.

In the *daudi aflaj*, it looks that farmers are more adhere to the sundial and stars system. We can also recognize from the table that only the small sized *aflaj* use tank and scale method; distributing the water by volume basis.

Due to the passive attitude of farmers toward the modernization of the *aflaj* management, technical knowledge about *aflaj* remained only with older generation, and new generations have no interest to learn it. In many systems farmers even do not know the time of the construction or the location of the water source. The terminology and nomenclature of star system for irrigation and units for water share is too complicated and unorganized, as well its knowledge is disappearing. The traditional way of irrigation scheduling is differ from one *falaj* system to another. Even thought in most of the *aflaj*, farmers use *athars* as a standard unit, the way of inspecting the length of each *athar* is varied among different *aflaj*. To shift to use modern watch we have to change all the existing units of time to standard time, hours, minutes and seconds.

It is too difficult to ask the farmers to shift from the traditional way of irrigation scheduling to use modern watch unless a wise strategy is implemented.

#### 4. CONCLUSION

Even thought the *athar* is being used in most of *aflaj*, the way of verifying *athar* length is differ very largely. There are always a lot of margins of un-

watering-cycle does not match with the share- cycle.

Farmers go through several steps to transfer from using traditional irrigation scheduling to modern watch. The old generation strictly opposes any new improvement. Thus, it is necessary to convince *sheiks*, *wakils* and older people of the *aflaj* to convert to use meridian time.

It is recommended to standardize all the existing traditional water-share units by converting all of it to standard time. So, it is so important to document all water share of *aflaj*, before further big changes to be considered in the management or the social system of *aflaj*. Every *falaj* should have a book containing the name of water right holder, amount of water he own (number of *athars*, volume, etc), time to irrigate and time to finish irrigation. Also, it is necessary to keep up this database when any future changes that may be happened to the water system.

#### References:

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