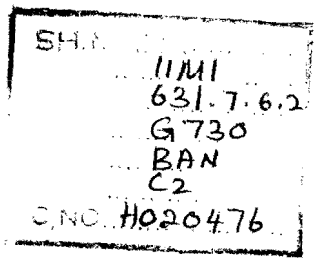
FARM LEVEL IRRIGATION PRACTICES IN CHASHMA RIGHT BANK CANAL[1]



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FARM LEVEL IRRIGATION PRACTICES IN CRBC

INTRODUCTION

One of the main characteristics of the CRBC design relates to its system capacity which provides for a higher water allowance. It allows for a delivery of 8.6 cusecs for 1000 acres (0.60 liters per second per hectare), compared to the more traditional allowances in Pakistan averaging to about 4 cusecs for 1000 acres (0.28 lps/ha).

Benefits from this new design feature, however, would largely depend on the proper management of increased water supplies at the farm level. A disregard to this need resulting in inefficiencies in water use would exacerbate drainage problems, create unnecessary water shortage downstream the river system, and depress overall system performance and productivity of irrigation water. Therefore, the way farmers share the water supplies and the way they irrigate their fields become critically important considerations.

A study was carried out during two cropping seasons in selected sample watercourses in two Distributaries (No. 3 along with Girsal Minor, and No. 4) of the CRBC to understand and document the farmers' irrigation practices. This paper reports the preliminary results of the study and some related observations.

RESULTS OF TWO SEASONS

Rabi 1991/92

Results of farmer interviews and field observations initiated during 1991/92 Rabi season in two distributary canal commands (Distributary No.3 with Girsal Minor, and Distributary No. 4) can be summarized as follows:

* During this season, water distribution on both the Distributaries (# 3 & # 4) was in a state of flux, both because of changes being effected in the physical infrastructure and the lack of experience among the farmers. As the command area was recently brought under irrigation, keeping in line with the normal practice, only the pipe outlets had been provided, later to be converted to *Pucca* outlets after the farm lay out (*Chakbandi*) was fairly stabilized. Some of these outlets were still being relocated to better command the area. A new minor, Jabbar Wala Minor on Distributary # 4, was under construction to better serve the area with the smaller outlet chaks transferring the irrigation of some areas from Distributary # 3 to Distributary # 4.

* An official *Pucca Warabandi* had been drawn up by the Irrigation Department only for one outlet (No. 19248/L of Distributary # 4). For other outlets, farmers had called upon the local Patwaris to assist in the drawing up of their unofficial warabandis, and this process was under way. Of the 8 selected sample watercourses, 4 each on the Distributary #s 3 & 4, warabandi of some sort had been drawn up only in 5 watercourses, where as in the remaining 3 watercourses some adhoc arrangement was agreed upon by the farmers for sharing the irrigation supplies. Only two written down warabandi schedules could be traced.

* In all cases, the duration of the warabandi rotation was found to be 7 days with no apparent conveyance allowance or the Nikal.

* Farmers reported that there was an excess of water during Rabi so that they were not concerned about adhering to any warabandi; changes from the agreed warabandi frequently took place by mutual agreement. At times, the farmers closed off the outlets when there was no demand. During Kharif when there is greater demand, the farmers tend to follow the agreed warabandi.

* No farmer reported any dispute in the operation of the present system. Apparently, no formal request was jointly made by the farmers for the Irrigation Department to step in and lay down an official warabandi.

The situation of the Watercourse No. 14810/R of Distributary No. 3 was illustrative of some of the general observations made above. The farmers belonged to three separately identifiable groups among whom the water distribution plan was made in the first instance. Subsequently, the water allotted to each group was distributed further among their members by mutual agreement. The water distribution thus effected seemed to be inequitable; some landowners received more than their actual right while others received less than their due share. According to field information collected, this pattern was as shown in Table 1.

Kharif 1992

As a follow up of the Rabi season's observations, another rapid appraisal was conducted during Kharif 1992, and the results were analyzed along with regularly collected data. For most of the watercourses, farmers had called upon the local *patwaris* to assist in the drawing up of their unofficial *warabandi*, and in a few cases the official *warabandi* schedules have been issued. However, in most areas, the process is still under way.

In both Distributaries (Nos. 3 & 4), there were only for 2 outlets, outlet No. 19248/L and 7670/L, both in Distributary No. 4, for which official Pucca Warabandi had been drawn up by the Irrigation Department. However, due to excess water supply these *warabandi* schedules were redundant, and the farmers returned to the practice of the unofficial warabandi which was drawn up with mutual cooperation among the farmers.

In outlet No. 1860/R, an official Warabandi was in the process of being drawn up. Also there was a dispute among the farmers for water distribution on that watercourse. All the paper work had been completed and it required only the approval of the Executive Engineer. However, this process was abandoned when the dispute was resolved, all the farmers agreed to follow the unofficial Warabandi already under practice.

In Distributary # 3, out of 20 watercourses 17 have some form of arranged water distribution pattern popularly referred to as *warabandi*, and all these are unofficial arrangements. In Distributary # 4, the picture is slightly different: out of 36 watercourses, only 14 have *warabandi*, 2 of which (7670-L and 19248-L) have official *warabandi*, though not strictly followed by the irrigators mainly due to excessive water supply.

One possible explanation for the difference in irrigation practices between the two distributaries is, as confirmed by the farmers, the relatively less reliability and availability of water in the watercourse commands of distributary # 3 than of distributary # 4. Another relates to the social characteristics, the population in Distributary # 4 being more diversified and with a higher proportion of recent settlers.

In distributary # 3, in-depth investigations were carried out in four selected sample watercourse commands. The unofficial or the "brotherhood (*kachcha*) *warabandi*" was practiced on all the four watercourses until last Rabi season. During Kharif 1992 some areas of distributary # 3 have been transferred to Jabbar Wala minor of distributary # 4. The command area of one of the sample watercourses (14810-R) has been affected by these recent changes. As a result, even the unofficial *warabandi* of some commands has collapsed during this Kharif season.

In Girsal minor, an official *warabandi* determined by the Irrigation Department is followed in the four sample watercourse commands. At the tail watercourses, although the official *warabandi* have been drawn up after the remodelling, differences already exist between the design-stage and the current practices. For the last 5 tail watercourses, differences are observed due to the soil erosion by the Indus river which has resulted in the decrease of the culturable command area of these watercourses.

Most of the farmers have reported that water is in excess during the Rabi season and that they are not keen about adhering to the *warabandi*. Thus changes from the *warabandi* frequently take place by mutual agreement. At times farmers close their outlets when they do not need any water. During the Kharif season, farmers cultivate a lower percentage of their land and again they are not particular about following their unofficial *warabandi*.

Table 2 gives the type of *warabandi* and the water allocation for 12 sample watercourses.

Farmers in each observed watercourse deviated substantially from their due share according to the uniform water allocation for the watercourse. The actual time durations of their irrigation turns were observed for the 9 watercourses supposed to be having some form of *warabandi* (see Table 2), and the results were analyzed further to see the degree of variation (see Table 3 for coefficients of variation for each of the nine watercourses). There is a high variability in the durations of the water turns as against the allocated time per hectare for the 4 watercourses of Distributary # 3, and the variability is much less in the case of the 4 watercourses of Girsal Minor.

Figure I and Figure II highlight the differences between two watercourses, 10150-R of distributary # 3 characterized by a high variability of water allocation among farmers, and 5767-L of Girsal minor where differences are less. These observations also lead to a conclusion that there is less equity in *kachcha warabandi* as compared to *pucca warabandi*.

WATER SHARING

Even when *warabandi* exists, farmers have the practice of increasing the flexibility of water supply by exchanging canal turns or by purchasing full or partial turns of farmers having an excess of irrigation water.

Most of the time, farmers exchange canal water in partial turns. These partial turns are used to complement the irrigation of some fields when the allocated time is short of 15 to 30 minutes of irrigation to fulfill the field water requirements. This type of exchange is seen to be a daily irrigation practice in the area. According to field survey results, all the sample farmers in Girsal Minor, and 96% of those in Distributary # 3 have exchanged their water turns.

This shows that in fact, the *warabandi* turns have little practical meaning for the timing of the irrigation. Their real meaning lies in the fact that they fix the right to irrigation water for the participating farmers, something that they can use to appeal when their access to water is jeopardized in any way. They refer to this function of *warabandi* as *"haqooq"*.

FARMERS' OPENING AND CLOSING OF OUTLETS

Especially during the rabi season when there is some rain, farmers deliberately miss their water turns. More generally, when the irrigation water supplied at a Distributary head exceeds the demand of the farmers or the needs of the crops, farmers usually close their outlets to avoid damages to crops or the risk of waterlogging.

This practice is rather common in the 3 areas studied. In Table 4 below it can be seen that 92% of the interviewed farmers have closed their outlets at one time of the year or another.

Table 4 leads to the following: i) no significant difference between the quartiles, ii) in Girsal minor, there seems to be lower prevalence of this activity, and iii) a trend seems to exist from the head to the tail of Girsal Minor, the percentage of farmers closing their outlets decreasing from the head to the tail. This can be explained by the fact that along Girsal there are several escapes that are opened in times of excess supply, so farmers don't need to close their outlets.

ON-FARM IRRIGATION

Irrigation practices in CRBC area are still in an undeveloped stage and are evolving gradually. Two methods observed in the area are the *toke* method (where the farmer distributes his water among several fields at the same time), and the rotate method (where fields are irrigated one after the other). The *toke* method is more frequently used than the rotate method. The combined use of two methods have the highest prevalence. (In older canal systems of the Punjab only the rotate method is being used.)

The survey revealed that the main reason for using a combination of the two methods is the presence of sloping lands. Another reason (in disty #3 & #4 area) is that before the start of CRBC this area was categorized as rain-fed area with small holdings, due to which farmers are hesitant to make farm level ditches, leading to the adoption of haphazard on-farm irrigation methods for crop production.

Due to the high content of clay in the soils of CRBC command, the sloping nature of the soil and no use of recommended agricultural practices, fields are uneven. The majority of the farmers have always the problem of draining the extra water from their fields.

Different practices are currently used by farmers, including the drainage of the excess water to nearby (adjoining) fields and to drain the water to the watercourse itself when possible. Mostly farmers are draining out water to adjoining fields. The survey has also revealed that some farmers use receptacles such as tins to drain the excess water out of their fields (lifting it) instead of draining water by breaking field bunds.

PREFERENTIAL ALLOCATION OF WATER TO CROPS

Generally canal water supply in the area studied was reported to be adequate to meet the crops' requirements. This meant that there was no need to prioritize among crops for the application of irrigation water. Despite this, the farmers were observed to have some preference for particular crops. In Rabi season there are only two competing crops which require irrigation. The data revealed that 72 percent of the farmers prefer fodder over wheat.

Four main crops are grown during the Kharif season. Farmers always give the first priority to Rice. Sugarcane comes second, fodder third, and maize forth. The interview results and field observations suggest that the farm size also has some influence on these preferences.

WATERCOURSE MAINTENANCE

In new areas of CRBC, usually the farmers take the initiative when they feel that the watercourse is full of grasses, that the bunds are in bad conditions with the presence of rat holes and that water flow is not normal. One farmer takes the initiative to inform the others about a specific day for cleaning, this person, however, being generally a big land owner or the chairman of the defunct Water Users' Association, who has some influence in such activities. All farmers get together at the end-point of the lined portion of a watercourse on a specific day. A farmer is selected to lead the cleaning process and to supervise the whole activity including the basic responsibility of dividing the watercourse length among water users according to the size of their farm or the time of their water turns. Each participant stops over at his farm *nakka*. If anyone is absent during this cleaning process due to any reason, his share is left or some farmers clean that and in *lieu* the absentee is asked to pay one day of labor. In some watercourse commands, the absentee farmers are not allowed to irrigate their fields but this happens very rarely.

In the case of Girsal minor, farmers reported the involvement of *patwaris* of Irrigation Department in the watercourse cleaning. According to farmers, during the canal closure, the *patwari* comes to see the big or influential farmers and fixes a day in consultation with them and asks them to inform all the water users. On the fixed date, he is usually present at the location of the cleaning. If farmers give names of absentees to the *patwari* for necessary action, then those are forwarded to the *zilladar* who sometimes imposes fines on absentees.

CONCLUSION

Irrigation practices in the new areas of CRBC Stage I are in an evolutionary process. Opening and closing of outlets by the farmers indicate that they already show some form of response to crop water demand. A fixed water distribution schedule in the form of either *kachcha* or *pucca warabandi* has not yet been stabilized in the area. Farmers in the area are mostly new to irrigation practices and welcome assistance to improve their water management. There appears to be a good potential for a gainful effort in irrigation and agriculture extension services.

The general feeling among farmers regarding an abundance of water is not very conducive to farmer organization at the watercourse level. Since there is no felt need to organize themselves for collective action, any real motivation among the farmers to form water users associations cannot be expected in the near future. However, the only way to obtain proper information on certain aspects of farmer behavior as outlined above, such as opening and closing of outlets or any form of demand articulation, would have to be through an organizational mechanism. Since this information will be necessary for action by various agencies to manage the water delivery under these circumstances, the need to have organized farmer behavior will be felt more by the agency staff rather than by the farmers.

TABLE - 1

DISTRIBUTARY NO. 3

BROTHERHOOD WARABANDI FOR OUTLET NO. 14810/R

FARMER GROUP	NO. OF FARMERS	AREA IN KANALS	AREA IN HECTARES	WATER TURN (HOURS)	AVAILABILITY OF WATER PER HECTARE (HOURS)
1	3	350	17.71	31	1.75
2	8	480	24.28	45	1.85
3	9	921	46.59	92	1.97
OVERALL	20	1751	88.58	168	1.90

BROTHERHOOD WARABANDI FOR OUTLET NO. 14810/R - GROUP 1

FARMER SUB-GROUP	NO. OF FARMERS	AREA IN KANALS	AREA IN HECTARES	WATER TURN (HOURS)	AVAILABILITY OF WATER PER HECTARE (HOURS)
1	1	150	7.59	21	2.77
2	2	200	10.12	10	0.99
OVERALL	3	350	17.71	31	1.75

BROTHERHOOD WARABANDI FOR OUTLET NO. 14810/R - GROUP 2

FARMER SUB-GROUP	NO. OF FARMERS	AREA IN KANALS	AREA IN HECTARES	WATER TURN (HOURS)	AVAILABILITY OF WATER PER HECTARE (HOURS)
3	3	108	5.46	10	1.83
4	3	72	3.64	9	2.47
5	1	150	7.59	14	1.85
6	1	150	7.59	12	1.85
OVERALL	8	480	24.28	45	1.85

BROTHERHOOD WARABANDI FOR OUTLET NO. 14810/R - GROUP 3

FARMER SUB-GROUP	NO. OF FARMERS	AREA IN KANALS	AREA IN HECTARES	WATER TURN (HOURS)	AVAILABILITY OF WATER PER HECTARE (HOURS)
7	4	625	31.62	92	2.91
8	1	100	5.06	0	0.00
9	1	24	1.21	0	0.00
10	1	100	5.06	0	0.00
11	1	36	1.82	0	0.00
12	1	36	1.82	0	0.00
OVERALL	9	921	46.59	92	1.97

TABLE - 2

WATER ALLOCATION FOR 12 SAMPLE WATERCOURSES

SERIAL NO.	WATER-COURSE	DISTRIBUTARY	*WARABANDI* TYPE	WATER AVAILABILITY (HRS PER HA)
1	570-L	# 3	Unofficial	2.12
2	6468-L	# 3	Unofficial	1.34
3	10150-R	# 3	Unofficial	2.32
4	14810-R	# 3	Unofficial	1.90
5	1860-R	# 4	No *warabandi*	
6	8980-L	# 4	No *warabandi*	
7	16512-L	# 4	No *warabandi*	
8	28448-R	# 4	Unofficial	1.35
9	5767-L	Girsal	Official	3.15
10	13526-R	Girsal	Official	1.38
11	21516-L	Girsal	Official	3.67
12	24046-L	Girsal	Official	5.44

TABLE - 3

VARIABILITY OF WATER DISTRIBUTION WITHIN WATERCOURSES

distributary # 3		distributary # 4		Girsal minor	
outlet	coef. var.	outlet	coef. var.	outlet	coef. var.
570-L	0.37	28448-R	0.10	5767-L	0.05
6468-L	0.17	-	-	13526-R	0.10
10150-R	0.46	-	-	21516-L	0.10
14810-R	0.94	-	-	24046-L	0.04

TABLE - 4

PERCENTAGE OF FARMERS CLOSING THEIR OUTLETS

Location of outlet	Percentage of farmers closing outlets			
	Distributary # 3	Distributary # 4	Girsal	Total
1st quartile	83	100	100	94
2nd quartile	83	83	100	89
3rd quartile	100	100	83	94
4th quartile	100	100	67	89
Overall	92	96	88	92

TABLE - 5

SEASONAL OPEN/CLOSE RECORD

WATERCOURSE 11920-L DISTY # 3; KHARIF 1992

	APR	MAY	JUN	JUL	AUG	SEP	OCT 1-15	SEASON TOTAL
# DAYS OPEN	7	20	20	17	17	5	5	91
PERIOD 1	0	6	5	8	5	5	2	31
PERIOD 2	1	9	6	4	10	0	3	33
PERIOD 3	6	5	9	5	2	0	0	27
# DAYS CLOSED	14	3	0	7	3	16	5	48
PERIOD 1	5	1	0	0	1	0	4	11
PERIOD 2	6	0	0	3	0	7	1	17
PERIOD 3	3	2	0	4	2	9	0	20
# DAYS P/C	2	3	4	0	7	1	3	20
PERIOD 1	0	1	4	0	2	0	2	9
PERIOD 2	2	0	0	0	0	1	1	4
PERIOD 3	0	2	0	0	5	0	0	7
TOTAL DAYS MONITORED	23	26	24	24	27	22	13	159
% OPEN	30	77	83	71	63	23	39	57
% CLOSED	61	11.5	0	29	11	73	42	30
% P/C	9	11.5	17	0	26	4	19	13
TOTAL	100	100	100	100	100	100	100	100

TABLE - 6

SEASONAL OPEN/CLOSE RECORD FOR RABI AND KHARIF 91/92
WATERCOURSE 11920-L OF DISTY # 3

	RABI 1991/92						KHARIF 1992							SEASONAL TOTAL	SEASONAL TOTAL EXCLUDING ANNUAL CLOSURE
	OCT 15-30	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT 1-15		
# DAYS OPEN	15	16	22	6	1	19	7	20	20	17	17	5	5	170	170
PERIOD 1	0	5	6	0	0	9	0	6	5	8	5	5	2	51	51
PERIOD 2	5	8	7	6	0	8	1	9	6	4	10	0	3	67	67
PERIOD 3	10	3	9	0	1	2	6	5	9	5	2	0	0	52	52
# DAYS CLOSED	0	8	4	21	27	3	14	3	0	7	3	16	5	111	70
PERIOD 1	0	2	3	7	10	0	5	1	0	0	1	0	4	33	23
PERIOD 2	0	1	1	3	10	0	6	0	0	3	0	7	1	32	19
PERIOD 3	0	5	0	11	7	3	3	2	0	4	2	9	0	46	28
# DAYS P/C	0	0	0	0	0	2	2	3	4	0	7	1	3	22	22
PERIOD 1	0	0	0	0	0	0	0	1	4	0	2	0	2	9	9
PERIOD 2	0	0	0	0	0	0	2	0	0	0	0	1	1	4	4
PERIOD 3	0	0	0	0	0	2	0	2	0	0	5	0	0	9	9
TOTAL DAYS MONITORED	15	24	26	27	28	24	23	26	24	24	27	22	13	303	262
% OPEN	100	67	85	22	4	79	30	77	83	71	63	23	38	56	65
% CLOSED	0	33	15	78	96	13	61	11.5	0	29	11	73	38	37	27
% P/C	0	0	0	0	0	8	9	11.5	17	0	26	4	24	7	8
TOTAL	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Figure - 1

Warabandi in 10150-R (Disty. 3)

Water Allocated versus Design

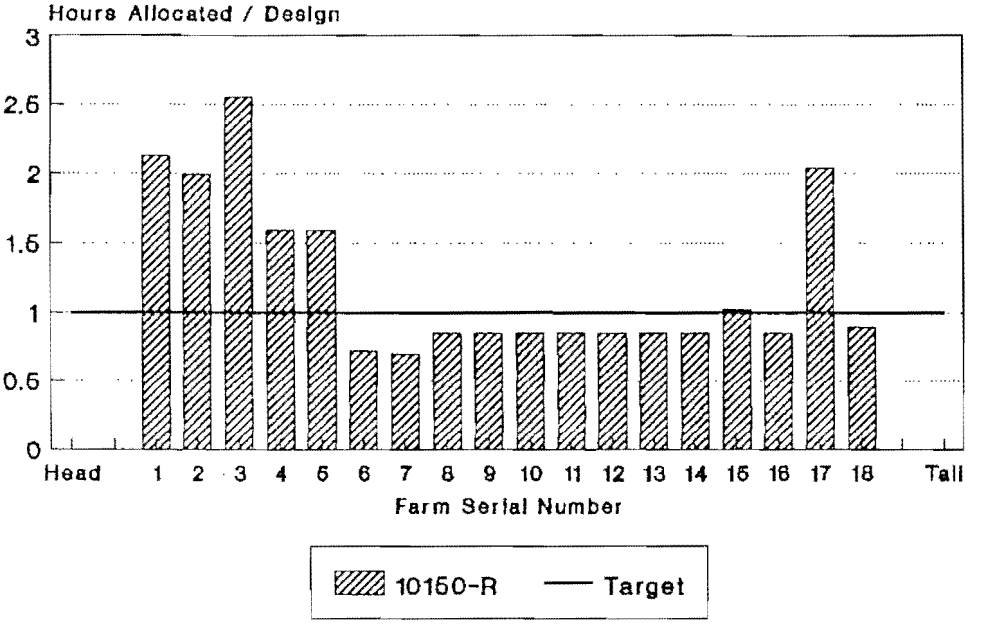
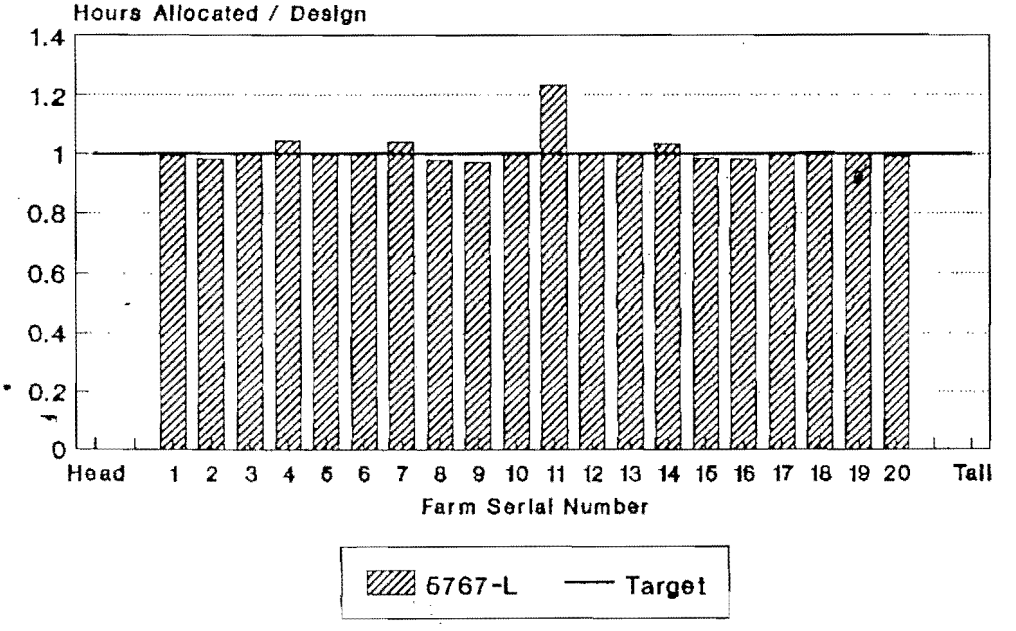


Figure - 2

Warabandi in 5767-L (Girsal Minor)

Water Allocated versus Design



Open & Closure of Outlets

Distributary 3, CRBC (11/91 to 08/92)