

AN EMPIRICAL ANALYSIS ON SOCIO ECONOMIC AND CROPPING PATTERNS IN INDI BRANCH CANAL OF UPPER KRISHNA PROJECT

P. L. MALGE & G. N. KULKARNI

Department of Agricultural Economics, University of Agricultural Sciences, Dharwad, Karnataka, India

ABSTRACT

The study was conducted to know the impact of water distribution on farmer's socioeconomic conditions and cropping pattern across Indi branch canal of upper Krishna project command area. The Sample size comprised of 135 farmers, selected using multi-stage random sampling method. Field level data were elicited for the agricultural year 2013-14 through personal interview method. For analyzing the data collected tabular analysis was employed. Relatively a large (37.77 % to 48.89 %) proportion of them across different reaches were aged more than 50 years and 41.48 per cent were illiterates. With respect to occupation, large proportion of head reach farmers pursued dairy (42.22 %). The extent of land degradation noticed was more in head reach (12.82 %) out of the owned land. It was noticed that, in the head reach of the canal system *khari* and bi-seasonal crops occupied a large proportion of the cropped area (45.54 and 37.57 %).

KEYWORDS: Head reach, Middle reach, Tail reach, Cropping pattern, command area

INTRODUCTION

The world is passing through a critical phase with regard to water. Water is the most critical input for enhancing agricultural productivity, and therefore expansion of irrigation has been a key strategy in the development of agriculture in the country. In developing countries expansion of cultivable land being limited, with diminishing returns in agriculture and growing population pressure, exploring the possibilities for achieving significant land-augmenting technical progress offered by the "Green Revolution" technology is of utmost importance. However, it requires an increasing inflow of resources, investment on irrigable land and infrastructure, etc. Whatever the output, a net inflow or outflow from agriculture depends on the efficient use of resource and genuine technological progress in the sector (Karshenas, 1993). India has ultimate irrigation potential of 140 million hectares comprising 58.5 million hectares from major and medium schemes, 15 million hectares from minor irrigation schemes and 66 million hectares from groundwater exploitation and the gross irrigated area of 86.4 million hectares and net irrigated area of 63.3 million hectares respectively (CWC, 2012-13)

In India, among the canal irrigation projects typically representing these features, the Upper Krishna Project in Karnataka is going to become economic lifeline of chronically drought-hit districts of Kalburgi, Vijayapura, Bagalkot, Yadgir and Raichur in Northern Karnataka. The Upper Krishna Project has been executed in two stages, initially with the World Bank aid comprised of two composite dams across river Krishna near Almatti and Narayanpur to irrigate about one million hectare on full development. Presently, the irrigation potential realized is about 5, 76,047 ha

(CADA, B Gudi, 2012). The problems in most irrigated command area are associated with its distribution and therefore, there would be unequal water distribution and consequently the farmers in the early reaches of the canal systems tend to use more water leaving less water for others in the farther ends. Consequently, production pattern and farm economy in command areas of these conditions largely influenced by variability in the water availability for crops. So, a study was conducted to analyse impact of water distribution on socio economic conditions and cropping pattern in Indi branch canal of Upper Krishna Project command area.

MATERIAL AND METHODS

For the present study, among the canal systems Indi branch canal was selected based on the highest notified area under irrigation. A multistage sampling technique was adopted for the selection of the study area. The sample of 45 respondents were selected randomly each from head, mid and tail reach making total sample size of 135 farmers. For evaluating the specific objectives designed for study, required primary data were collected from the randomly selected sample cultivators by personal interview method with the help of pre-tested and well structured schedule. The data so collected from the respondents pertained to the agricultural year 2013-14 which includes, general information, size of holdings, cropping pattern followed, inputs used, input and output prices, output obtained and opinions about various problems faced by the farmers in crop production. Simple tabular analysis technique was used to analyse data collected.

RESULTS AND DISCUSSIONS

Based on the analysis of the data, the results on general characteristics of farmers, occupational pattern, and land owned pattern and cropping pattern in the study area presented in the Table 1, Table 2 and Table 3 and Table 4 respectively.

The analysis of age of sample respondents (Table 1) across different reaches in the Indi Branch Canal (IBC) indicated that relatively a large (37.77 % to 48.89 %) proportion of them across different reaches were aged more than 50 years in the head and middle reach respectively. It implied that a majority of the respondents fell within 50 years of age and indicative of their ability to absorb, accept challenges and also with stand to the risks in farming especially under irrigated agriculture. These results were in line with results of Prasad (2004).

Table 1 General characteristic of sample farmers in Indi Branch Canal in UKP Command

Sl. No	Particulars	Units	Head Reach (n=45)	Mid Reach (n=45)	Tail Reach (n=45)	Overall (n=135)
1.	Age of the farmer					
	20-40	Years	12 (26.67)	9 (20.00)	10 (22.22)	31 (22.96)
	41-50	Years	16 (35.55)	14 (31.11)	16 (35.56)	46 (34.07)
	>50	Years	17 (37.77)	22 (48.89)	19 (42.22)	58 (42.96)
	Total	Years	45 (100)	45 (100)	45 (100)	135 (100)
2	Family type					
		Nuclear	38 (84.44)	41 (91.11)	39 (86.67)	118 (87.41)

Table 1: Contd.,							
		Joint	7 (15.56)	4 (8.89)	6 (13.33)	17 (12.59)	
3.	Average Size of the family						
	No.		6.07	5.63	5.54	5.74	
4	Education level						
	Illiterate	No.	21 (46.67)	17 (37.78)	18 (40.00)	56 (41.48)	
	Primary school	No.	11 (24.44)	9 (20.00)	10 (22.22)	30 (22.22)	
	High school	No.	10 (22.22)	14 (31.11)	9 (20.00)	33 (24.44)	
	Pre-University	No.	2 (4.44)	3 (6.67)	5 (11.11)	10 (7.41)	
	Degree	No.	1 (2.2)	2 (4.4)	3 (6.67)	6 (4.44)	
	Total	No.	45 (100)	45 (100)	45 (100)	135 (100)	
5	Association with social organisation						
	SHGs	No.	3 (6.67)	1 (2.22)	2 (4.44)	6 (4.44)	
	NGOs	No.	1 (2.22)	-	2 (4.44)	3 (2.22)	
	Village Panchayat	No.	1 (2.22)	2 (4.44)	-	3 (2.22)	
	Taluk Panchayat	No.	-	-	-		
	Zilla Panchayat	No.	-	-	-		
	Total	No.	5 (11.11)	3 (6.67)	4 (8.89)	12 (8.89)	
6	Average land holding		(ha)	3.74	3.21	2.70	3.22

Note: Figures in the parentheses indicate percentage to the total.

Most of the farmers in the command area (41.48 %) were illiterates. It connotes the fact that a considerable of them still remain uneducated and devoid of formal education. This finding was in line with findings of Roy (2005). Majority (87.41 %) of the family were found to be of nuclear type in contrast to joint family (12.59 %). Thus, it could be very well inferred that even among the farming community, the inclination is more towards adaptation of independent/nuclear family type. In command area, it was found that 4.44 per cent of them were the members of Self Help Groups (SHGs) and 2.22 per cent were associated with Non-Governmental Organizations (NGO's) which are connected with carrying out one or the other economic activity to support households. In respect of political participation, only 2.22 per cent were associated with village panchayat. It could thus be implied that the participation of households remained almost very low across head, mid and tail reaches in these economic and social organizations. It is evident from the results that on an average the farmers in the IBC owned 3.22 hectares of land. The extent of per capita land owned by farmers in head reach was found to be relatively more (3.74 ha) than in the other reaches-mid and tail reach. The ownership of land depicts the economic status of the farmers and land in villages even today is a symbol of both social and economic status of farming community in the rural areas as an important source of income and livelihood.

From the occupational pattern of farmers across canal reaches in IBC command (Table 2) it could be ascertained that a large proportion of head reach farmers pursued dairy (42.22 %) and sheep and goat (17.78 %) enterprises as source of income and employment when compared to mid and tail reaches. This was mainly because of the advantage of

availability of fodder for major part of the cropping year as a consequence of their close proximity/location to the water source near irrigation canal. Generally, the farmers in the head and mid reaches have a greater access and control over the water resource for being located very close to the canal systems. Along with farm activities (agriculture and allied) such as dairy, sheep and goat rearing, the farm households were also engaged in petty business activities in the study area owing to their ability to invest in such ventures due to higher income prospectus in irrigated farming.

Table 2: Occupational Pattern across Canal Reaches in IBC Command

Reach	Source	Occupation	No. of Households	% Households
Head reach(n=45)	Main	Agriculture	45	100.00
	Subsidiary	Livestock		0.00
		Dairy	19	42.22
		Sheep and Goat	8	17.78
	Others	Business	3	6.67
		Service	2	4.44
Mid reach(n=45)	Main	Agriculture	45	100.00
	Subsidiary	Livestock		0.00
		Dairy	16	35.56
		Sheep and Goat	2	4.44
	Others	Business	3	6.67
		Service	3	6.67
Tail reach(n=45)	Main	Agriculture	45	100.00
	Subsidiary	Livestock		0.00
		Dairy	10	22.22
		Sheep and Goat	5	11.11
	Others	Business	5	11.11
		Service	5	11.11
Overall(n=135)	Main	Agriculture	135	100.00
	Subsidiary	Livestock	0	0.00
		Dairy	45	33.33
		Sheep and Goat	15	11.11
	Others	Business	11	8.15
		Service	10	7.41

The size of the land owned is an important natural factor that influence the size of the farm economy as it decides the nature and composition of the crop enterprises that could be taken up by farmers in particular and especially in different reaches under irrigated farming in any canal command.

The total operational holding was relatively more in case of head (3.28 ha) and mid (3.00 ha) when compared to tail (2.56 ha) reach farmers are presented in the table.3. Of the total operational holding, the owned irrigated area accounted almost on par across reaches and ranged between 72 to 79 per cent and it could be seen that it was relatively more in case of mid reach (79.67 %) and head (76.52 %) reach. While, the rain fed area was highest in tail reach and was accounted 17.96 per cent of the total operational land holding. This was mainly attributed to scarcity of irrigation water in the tail reach. Often in the tail ends the farmers did not get adequate canal water as the farmers in the head and mid reaches used more water for irrigation especially for water intensive crops due to their close proximity to the water source/canals. Similarly, the rain fed area was 10.00 per cent in mid reach and 6.71 per cent of the operational holding in head reach. Generally, the extent of leasing-in land has been influenced by water availability in command area. Thus, it could be observed from the results that it was more in head reach and accounted 16.77 per cent of the operational holding followed

by 10.33 per cent in mid reach and 9.76 per cent per cent in tail reach. The extent of the leased-out land remained almost on-par across reaches and it ranged between 5.86 to 7.00 per cent of the total owned land.

Table 3: Land Ownership Pattern by Farmers

Reach	Head Reach	% Area	Mid Reach	% Area	Tail End	% Area	Overall	% Area
Rain fed area/farm	0.22	6.71	0.30	10.00	0.46	17.96	0.33	11.19
Irrigated area/farm	2.51	76.52	2.39	79.67	1.85	72.26	2.25	76.27
Total owned land	2.73	83.23	2.69	89.67	2.31	90.23	2.58	87.46
Leased-in area/farm	0.55	16.77	0.31	10.33	0.25	9.76	0.37	12.54
Operational land/farm	3.28	100.00	3.00	100.00	2.56	100.00	2.95	100.00
Leased-out area/farm	0.16	5.86	0.21	7.00	0.14	6.01	0.17	6.59
Degraded land (waterlogged and saline)	0.35	12.82	0.21	7.00	0.11	4.76	0.22	8.53
Land value (Rs./ha)								
Rain fed area*	19,64,000		18,23,000		16,76,000		18,21,000	
Irrigated area	33,52,000		30,05,000		23,64,000		2,907,000	

Note: Percent leased-out land is to the total owned land

Land value in rain fed area represent value based on its location from the village

The extent of land degradation noticed was more in head reach and was 12.82 per cent of total owned land followed by 7.00 per cent and 4.76 per cent in case of mid and tail reaches. The large areas degraded in head followed by mid and tail reaches was largely associated with the inappropriate irrigation and water management practices in the command area. The overall per hectare land value of the rain fed and irrigated areas in the command area were Rs. 18,21,000 and Rs. 29,07,000, respectively. When a comparison is made for land value in head and mid and tail reaches it was noticed that the value of the land was largely influenced nearness of the land to the water source. Hence, the land value in head reach was found to be more at Rs. 33, 52, 000 per hectare where such lands have access to abundant canal irrigation water. The mid reach lands received the next best value for land at Rs. 30,05,000 per hectare and it was Rs. 23,64,000 per hectare in tail reach. Thus, land value declined in the command area as the location of the land was away from water source. However, the value of the land in the command area which is not covered under irrigation (rain fed) varied between Rs. 16, 76,000 to Rs. 19, 64,000 per hectare.

Based on the reaches of the canal system the season wise shares of area under the various crops of the sample respondents were analyzed and are presented in Table 4. It was observed that, in the head reach of the canal system *kharif* and bi-seasonal crops dominated the cropping pattern occupying a large proportion of the cropped area (45.54 and 37.57 %) followed by *rabi* season crops which accounted only 16.89 per cent of the gross cropped area. During *kharif*, paddy crop dominated which accounted substantially a large area of 34.38 per cent of the gross cropped area. All other crops like hybrid sunflower (4.33 %) and hybrid bajra (3.42 %), hybrid maize (2.28 %) and groundnut (1.14 %) remained as minor crops that occupied very small area during the season. Thus, in all put together they covered only 11.17 per cent of the gross cropped area in the head reach. In *rabi* season, the cropped area was only 16.89 per cent to the gross cropped. Of this, chickpea occupy 6.83 per cent of the gross cropped area followed by paddy crop (5.74 %). All other crops namely, *rabi*

sorghum (2.28 %), wheat (1.59 %) and sunflower (0.46 %) together accounted an insignificant portion to the gross cropped area. Among the bi-seasonal crops, Bt. cotton occupied a largest area of 25.05 per cent of the GCA, followed by pigeon pea with only 7.97 per cent area. The other bi-seasonal crops that were grown on minor area were sugarcane (2.96 %) and chilli (1.59 %).

In the middle reach of the canal system, bi-seasonal and annual crops occupied a large proportion of the gross cropped area (55.32 %) followed by *kharif* and *rabi* (23.64 and 21.04 %), respectively. Among annual crops in the mid reach, sugarcane crop dominated which accounted a large area of 20.80 per cent of gross cropped area, followed by bi-seasonal crops where Bt. cotton accounted for 17.73 per cent area to the total. Other crops like pigeonpea occupied an area of 11.82 per cent and a very meager area was under chilli crop accounted 4.96 per cent area. In the *kharif* season, the gross cropped area was 23.64 per cent and of this, hybrid maize occupied a large area of 13 per cent followed by sunflower with an area of 7.57 per cent. Other crops namely, hybrid bajra (1.42 %) and groundnut (1.65 %) together accounted insignificant portion to the gross cropped area. Among the *rabi* season crops in the middle reach, of the total 21.04 per cent of gross cropped area, wheat accounted a larger area (7.09 %) followed by chickpea (5.20 %). The other crops like groundnut (2.36 %), *rabi* sorghum (3.31%) and hybrid sunflower (3.07 %) occupied the only a marginal area.

Table 4: Cropping patterns adopted by sample farmers in IBC command

Crops	Location							
	Head Reach		Mid Reach		Tail Reach		Overall	
Kharif	Area	% area	Area	% area	Area	% area	Area	% area
	(ha)		(ha)		(ha)		(ha)	
Paddy	61.13	34.38	0.00	0.00	0.00	0.00	61.13	11.94
Hy. Bajra	6.07	3.42	2.43	1.42	8.91	5.46	17.41	3.40
Hy. Sunflower	7.69	4.33	12.96	7.57	6.07	3.72	26.72	5.22
Hy. Maize	4.05	2.28	22.27	13.00	16.19	9.93	42.51	8.30
Groundnut	2.02	1.14	2.83	1.65	20.24	12.41	25.10	4.90
Sub total	80.96	45.55	40.49	23.64	51.41	31.52	172.87	33.75
Rabi								
Paddy	10.20	5.74	0.00	0.00	0.00	0.00	10.20	1.99
Groundnut	0.00	0.00	4.05	2.36	3.24	1.99	7.29	1.42
Rabi sorghum	4.05	2.28	5.67	3.31	16.60	10.17	26.32	5.14
Chickpea	12.15	6.83	8.91	5.20	14.17	8.69	35.22	6.88
Wheat	2.83	1.59	12.15	7.09	11.74	7.20	26.72	5.22
Sunflower	0.81	0.46	5.26	3.07	2.02	1.24	8.10	1.58
Sub total	30.04	16.90	36.03	21.04	47.77	29.28	113.85	22.23
Bi-Seasonal/Annual								
Pigeon pea	14.17	7.97	20.24	11.82	50.61	31.02	85.02	16.60

Bt. Cotton					44.53	25.05	30.36	17.73	6.07	3.72	80.97	15.81
Chilly					2.83	1.59	8.50	4.96	2.43	1.49	13.77	2.69
Sugarcane	5.26	2.96	35.63	20.80	4.86	2.98	45.75	8.93				
Sub total					66.79	37.57	94.74	55.32	63.97	39.21	225.51	44.03
Gross cropped area (GCA)					177.79	100.00	171.26	100.00	163.16	100.00	512.23	100.00
Total operated area					147.77	100.00	135.22	100.00	115.38	100.00	398.77	100.00
Cropping intensity (%)					169.08		223.05		201.05		196.48	

In the tail reach *bi*-seasonal crops dominated occupying 39.21 per cent of the gross cropped area followed by 31.52 per cent under *kharif* crops and 29.28 per cent under *rabi* crops. Among the important *bi*-seasonal crops pigeonpea occupied substantially a large area (31.02 %) and other crops like hybrid cotton (3.72 %), sugarcane (2.98 %) and chilli (1.49 %) covered only a very small area. During *kharif* season, of the gross cropped area *kharif* crops occupied 31.52 per cent area. Among these, groundnut occupied a large area (12.41 %) followed by hybrid maize (9.93 %) and hybrid bajra (5.46 %). The other remaining crop namely, hybrid sunflower (3.72 %) covered less area. During *rabi* season, *rabi* sorghum (10.17 %) occupied a large area of the cropped area (29.28 %) followed by chickpea (8.69 %) and wheat (7.20 %). Other crops like groundnut (1.99 %) and sunflower (1.24 %) covered only a small area.

Overall cropping pattern in the IBC canal system indicated that *bi*-seasonal crops occupied the substantial area (44.03 %) followed by *kharif* crops (33.75 %) and *rabi* crops (22.23 %). Among the *bi*-seasonal crops, out of the total gross cropped area of 44.03 per cent, pigeonpea occupied (16.60 %) largest area followed by Bt. cotton (15.81 %) and sugarcane (8.93 %). The remaining crop that occupied minor (2.69 %) area was chilli. During *kharif*, of the total cropped area of 33.75 per cent, paddy occupied (11.94 %) a large area followed by maize (8.30 %). Other crops like hybrid bajra (3.40 %), sunflower (5.22 %) and groundnut (4.90 %) covered only a marginal area. During the *rabi* season, out of the total cropped area of 22.23 per cent in this season, chickpea (6.88 %) was a major crop followed by wheat (5.22 %) and *rabi* sorghum (5.14 %). The other crops namely, paddy (1.99), groundnut (1.42%) and sunflower (1.58%) occupied smaller area.

CONCLUSIONS

The distribution of water in the canal command area has very significant impact on change in socioeconomic conditions and cropping pattern. There is a difference found in socio economic condition and cropping pattern followed in head, middle and tail reach of canal command area. Provision of irrigation facilities has been responsible for the increase in cropping intensity, farm income and change in cropping pattern.

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