Impact of Krishi Bhagya Yojana (KBY) Farm pond Technology on semi-arid farmers in North Eastern Transition Zone of Karnataka state in India

Abstract

Efficient water management through farm pond technology is a great initiative by Krishi Bhagya Yojana scheme in 2015. Out of 240 sample farmers, about 180 farmers are adopters and 60 are non adopters of farm pond technology in Bidar and Gulbarga districts of Karnataka.Majority of farmers prefer farm pond of size 30 m × 30 m × 3 m as during Kharif season with storage capacity of 2700 cubic metric which is able to irrigate 1.5 ha land area .Through analysis, it is found that, the cropping intensity was increased to 225 per cent from 203.75 which accounts 9.47 per cent change to that of the base year.The percent change in area under rabicrops was relatively more when compared with farm ponds which directly increase their income by sale of crops in market. The number of migrating people decreased from six to three persons after adoption of KBY by the beneficiary farmers. The most influencing factors in adoption of farm pond technology by farmers are access to rural credit, diffusion of information and adoption of high value crops.

Key words: Water management , Farm Ponds, Krishi Bhagya scheme,Beneficiary ,Income

1. Introduction

About 55 % of food grains and 75 % of oilseeds grown in Karnataka state are produced under rain-fed agriculture (Dupal, 2020). However, agricultural production and productivity in the state have been declined due to occurrence of drought. Nearly, 61 % of population lives in rural areas and about 49% of the workforce include agricultural labourers (Ahamad and Honakeri, 2012).. During the last one decade, the net irrigated area (Figure 1) in Karnataka ranged from 31 to 35 % and remaining area was under dry land. Therefore, water conservation in this drought area need to be addressed and it important to harvest excess rainwater through dugout farm ponds, micro irrigation techniques and supply the stored water to rain-fed crops during the rabi season. Besides providing protective irrigation, these storage structures also used for fishing cultivation and drinking purpose by livestock.

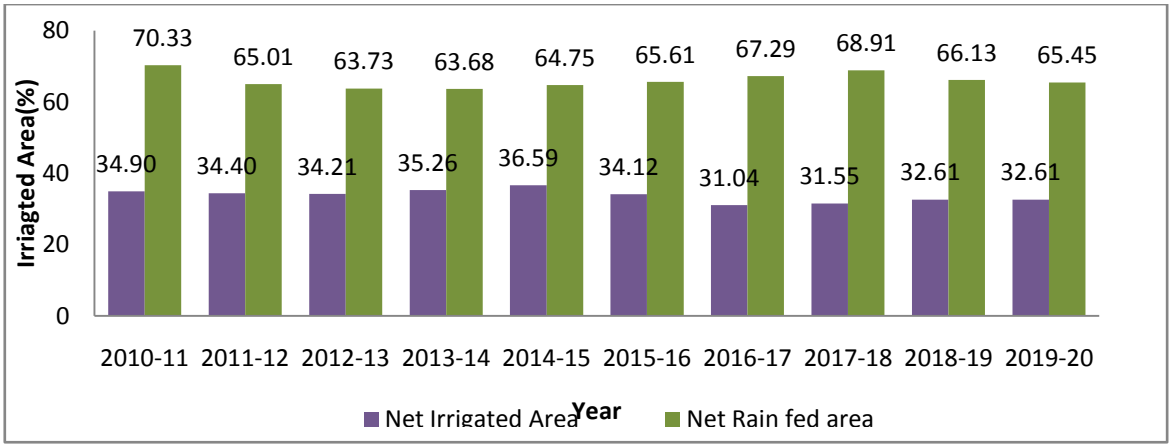

Figure 1 : Rain-fed and Irrigated area in Karnataka

(Source: Profile of Agricultural Statistics Report, 2019-20)

Government of Karnataka has launched Krishi Bhagya Yojana (KBY) farm pond technology in the year 2014-15 with an aim to make available assured water for sustainable agriculture in the rain-fed areas.. It was implemented as a pilot scheme in five agro climatic zones of Karnataka State. After receiving immense demand for the scheme from other parts of the state and looking at the impacts, the scheme was extended to all the ten agro-climatic zones across all 30 districts of the state in a phased manner. The Special package program by KBY is being implemented in seven districts of the state like Kolar, Chickballapura, Ramanagar, Tumkur, Bidar, Hassan and Gulbarga. Therefore, Gulbarga and Bidar which belongs to North eastern transition zone (NETZ) has been selected for study which aims to understand the experience of farmers and the economic-social benefits gained by beneficiaries of KBY-Farm pond scheme.

2. Data and Study area

Bidar and Gulbarga Districts of NETZ (Figure 2) were purposively selected for the study and primary data was collected from a sample size of 240 farmers. Further, Bhalki & Bidar talukas from Bidar and Afzalpur & Jewari talukas from Gulbarga were purposively selected. Semi arid farmers from a cluster of 14 villages from both districts were selected purposively from among those which were categorised under top climate vulnerable villages (KSNDMC, 2020). To study the impact of farm pond technology on livelihood of semi-arid farmers, 45 beneficiaries from each taluka was interviewed which totally accounts for 180 beneficiaries and 60 non beneficiaries. Hence, 240 sample farmers from four talukas of two districts formed the total sample size for the purpose of primary survey .

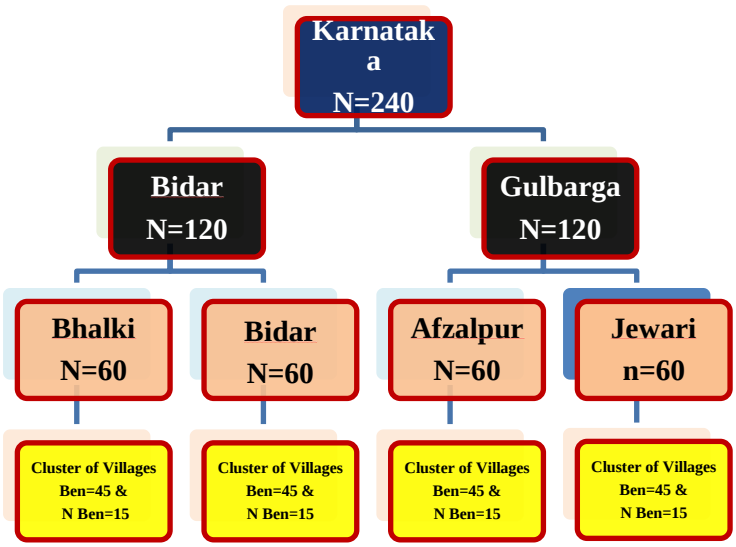

Figure 2 : Sampling Framework of study area (N=240)

3.Methodology

Statistical techniques like simple mean , percentage analysis, tabular presentation was employed to assess situation of urban migration for both the sample farmers group. Comparison between beneficiaries and non-beneficiaries of KBY-Farm Pond are tested through t –test to know the difference of impact among sample farmers and also used

Binary logit model has been used to analyse the factors influencing the farmers to adopt farm pond technology . The probability model is used where the binary dependent variable is a dummy for undertaking any adaptation at all (i.e. Yi has only two possible values 1 or 0, for either adapting or not adapting).

Thus,

$$\ln\left(\frac{p}{1-p}\right) = \beta_0 + \sum_{i=1}^{k} \beta_k X_{ki}$$

P_x is a probability of event occurring for an observed set of variables Xi, (1-Px) is the probability of non-adoption. Independent variables include age, education, social participation, farm size, crop type, availability of credit, diffusion of information.

4. Results and Discussion

4. 1 District level performance of KBY –Farm pond technology in the state

Krishi Bhagya Scheme provided water harvesting structure to farmers with the main aim of focusing on improving irrigation facilities for farmers. It supports the farmers by providing 80 percent subsidies on installation and construction of KBY products with proper

technical guidance. During last 5years, KBY scheme has spent Rs.891.16 crore towards construction of water harvesting structures in the state. It constructed 96312 farm ponds (Table 1) and provided 2447 shade nets, 1.48 lakh micro irrigation and covered 60,876 ha area under farm bunding construction activities in Karnataka. There are 98759 KBY **b**eneficiaries in the state and comparatively Gulbarga, 5561 beneficiaries got benefit of the programmes with from the district with good number of farm ponds.

Table 1: Krishi Bhagya Scheme in providing water harvesting Structures in Karnataka

Districts	**No. of farm Ponds**	**No. of Poly house /shade net**	**No. Of beneficiaries**
Bagalkot	9042	164	9206
Bangalore	3729	161	3440
Belagum	6499	101	6600
Bellary	7095	61	7156
Bidar	809	30	839
Chamrajnagar	2358	33	2391
Chikballapur	4230	115	4345
Chikmagulur	653	23	676
Chitradurga	2721	289	3010
Davangere	2464	81	2545
Dharwad	3334	10	3344
Gadag	5029	28	5057
Hassan	2448	106	2554
Haveri	1484	116	1600
Gulbarga	5399	162	5561
Kolar	5904	139	6043
Koppal	3587	89	3676
Mandya	2346	80	2426
Mysore	2359	60	2419
Raichur	3623	155	3778
Ramnagar	2113	75	2188
Tumkur	6851	285	7136
Vijayapur	8950	65	9015
Yagdiri	3735	19	3754
Total	96312	2447	98759

Source: Krishi Bhagya Yojana Reports,Govt of Karnataka 2017

The scheme in convergence with watershed department has resulted in construction of 1.93 lakh farm ponds, polythene lining to 76,320 farm ponds, field bunding in 58575 farms, diesel pump sets to 65915 farm ponds, adoption of sprinkler irrigation system by 87,867 farmers and construction of 2460 poly houses with shade net for growing high value commercial crops. Nearly, 4.24 lakh acre area has been brought under irrigation through the scheme. It also helped tenant and marginal farmers in generating employment and also prevented the migration of farmers from the rural area to the urban cities. Apart from these, the beneficiary farmers are able to integrate farming system with agriculture, horticulture, fisheries and

dairying with a view to enhance on- farm and off-farm income in rain fed areas. Majority of farmers prefer farm ponds 30 m (Length) × 30 m (Width) × 3m(Depth) as the water stored in the farm pond during Kharif season with storage capacity of 2700 cubic metric as shown in the (Table 2) which can approximately irrigates 1.5 ha. The subsidies on KBY farm Ponds range from 50 to 80 percent and those belonging to weaker section of societies are provided with 90 percent subsidy.

Table 2 : Storage capacity of farm ponds constructed under Krishi Bhagya Scheme

Farm pond size	Storage capacity (Cubic meter)	Area to be irrigate (ha)
12 m × 12 m × 3m	504	0.50
15 m × 15 m × 3 m	675	0.60
21 m × 21 m × 3 m	1323	1.00
28 m × 28 m × 3 m	2352	1.20
30 m × 30 m × 3 m	2700	1.50

4.2 Impact of Farm Pond Technology on beneficiary farmers of NETZ of Karnataka

240 sample farmers, i.e. 180 adopters and 60 non adopters of farm pond technology were drawn from Bidar and Gulbarga district of Karnataka. The impact of farm pond technology on cropping intensity, crop productivity, annual income and yield of beneficiary farmers is studied. The before and after approach of project analysis is used to analyze the impact of farm pond technology on beneficiary farmers.

Change in cropping intensity, crop productivity and annual income of beneficiary farmers

Changes in cropping intensity is due to availability of water for an additional crop during rabi and summer season. A change in cropping intensity revealed that the gross cropped area increased by 9.44 per cent after construction of farm ponds (Table 3). Before the construction of farm ponds the cropping intensity was 203.75 per cent whereas after construction of farm ponds it was 225 per cent which accounts 9.47 per cent change over the base period. As far as Kharif crops are concerned there was no much change in area. However, the per cent change in total rabicrops area was relatively more after construction of farm ponds. The area under rabi maize, green gram, sorghum, vegetables and fruits were increased by 18.18%, 13.04%, 3.84 %, 27.27% and 25 % per cent to the total rabi area, respectively. The gross cropped area increased which has helped farmers to bring more area under rabi crops.

Table 3 : Cropping intensity before and after construction of farm pond

Crop Type	Before farm pond (ha)	Percent (%)	After farm pond (ha)	Percent (%)	%Change
Kharif					
Paddy	27	32.14	29	33.72	6.89
Groundnut	9	10.71	5	5.81	-80
Red gram	12	14.28	14	16.27	14.28
Cotton	14	16.66	16	18.60	12.5
Sorghum	8	9.52	6	6.97	-33.33
Maize	7	8.33	9	10.46	22.22
Vegetables	6	7.14	7	8.13	14.28
Fallow	1.8		0.75		
Kharif Cropped Area (A)	83	100	86	100	3.48
Rabi					
Maize	18	22.5	22	12.57	18.18
Green Gram	20	25	23	13.14	13.04
Sorghum	25	31.25	26	14.85	3.84
Horticultural Crops					
Vegetables: Tomato, Chilli, Brinjal etc)	8	10	11	6.28	27.27
Fruits:Mango, Banana, Citrus, cucumber etc	9	11.25	12	6.85	25
Fallow Land	1		0.25		
Rabi Cropped Area (B)	80	100	94	100	14.89
Gross cropped area (A+B) before farm ponds	163		180		9.44
Change in Kharif and Rabi area (%)		9.44			
Net cultivated area		80			
Cropping intensity	203.75		225		9.47

The productivity of major crops *i.e.* rice, cotton, sorghum, maize, groundnut, and green gram were considered because as the farmers grown these crops on more acreage. Before the construction of farm pond the mean annual income is 2.08 lakhs as shown in (Table 4). The cropping intensity was 203.75% (Table 4). The productivity of major crops likerice, sorghum, groundnut, maize, Tur, cotton and green gramwere (18q/ac), (8q/ac), (12q/ac), (7q/ac) , (3q/ac), (5q/ac) & (2q/ac) respectively. After construction of farm ponds there was higher mean of annual income (Rs. 3.40 lakh) and cropping intensity (225 %). The productivity of major crops likerice, sorghum, groundnut, maize, Tur, cotton and green gram were(25q/ac), (12q/ac), (14q/ac), (12q/ac), (4q/ac), (9q/ac) & (3.5q/ac) respectively increased after the construction of farm pond.

The per cent change in productivity of crop eventually had a greater impact on change in income obtained from crops enterprise when compared to base year 2014-15. It is revealed

(Table 5) that majority of Kharif and Rabi crops showed increase in net income over the base year such as rice (33.33%), sorghum(48%), ground nut 18.75 %),maize (57.98%), Red gram (32.96%),cotton (84.21%) ,Green gram (78.26%). The annual income of the beneficiary farmers of farm ponds also increased by 38.78 percent.

Table 4: Average net income of farmer from major crops

Crop	Cost of cultivation (Rs/ acre)	Sales (Rs/kg)	Without farm Pond			With farm Pond		
			yield kg /acre	Gross income (Rs)	Net income (Rs)	Yield kg/acre	Gross income (Rs)	Net income (Rs)
Rice	26000	65	1800	11700	91000	2500	162500	136500
Sorghum	11000	30	800	24000	13000	1200	36000	25000
Groundnut	20000	60	1200	72000	52000	1400	84000	64000
Maize	15200	45	700	31500	16300	1200	54000	38800
Tur	14500	150	300	45000	30500	400	60000	45500
Cotton	17000	40	500	20000	3000	900	36000	19000
Green gram	20000	90	200	22500	2500	350	31500	11500

Table 5: Change in average net income of beneficiary farmers from major crop

Crop	Net Income (Rs)		Percentage change (%)
	Without farm Pond	With farm Pond	
Rice	91000	136500	33.33
Sorghum	13000	25000	48.00
Groundnut	52000	64000	18.75
Maize	16300	38800	57.98
Tur	30500	45500	32.96
Cotton	3000	19000	84.21
Green gram	2500	11500	78.26
Total net income	208300	340300	38.78

Table 6: Impact of farm ponds on beneficiary farmers N=90

S.No	Dimensions of Agricultural development	Before (mean)	After (mean)	Change (%)
1	Cropping intensity (%)	203.75	225	9.41
2.	Annual Income (%)	208300	340300	38.78
3.	Total impact (%)	48.19%		

As a whole as shown in, (Table 6), that there was total impact of 48.19 per cent due to adoption of farm ponds by beneficiaries. Assured storage of water influences farmer choices to cultivate various crops which can generate more revenue. The crop diversification water-intensive crops like fruits, vegetables and cash crops started influencing the cropping pattern of the beneficiary farmers. Most of the vegetables like brinjal, ginger, tomato, potato, carrot, cabbage, beans, capsicum, cucumber and chilies were grown among beneficiary farmers. The

annual net income (Table 7) generated from the horticultural enterprises i.e. vegetables was Rs. 217500 while for fruits was Rs. 239500 andfrom livestock was Rs. 1,23,000 which helped the farmers to repay their debts, meet expenses on their children education and increased their savings.

Table 7: Average annual net income of Beneficiary from horticultural crops & livestock

a) Vegetables	**Cost of cultivation Rs/ acre**	**Sales Rs/kg**	**Yield Kg /ac**	**Gross income (Rs)**	**Net Income (Rs)**
Tomato	25000	30	1200	36000	11000
Chilli	5000	80	1500	120000	11500
Carrot	30000	25	8000	200000	170000
Brinjal	38000	30	2100	63000	25000
b) Fruits	**Cost of cultivation Per acre**	**Sales Rs/ kg**	**Yield Kg /ac**	**Gross income (Rs)**	**Net Income (Rs)**
Mango	220000	100	3100	310000	90000
Citrus	150000	52	5500	286000	136000
Papaya	34000	25	1900	47500	13500
Total	404000	177	27600	643500	239500
c) Livestock	**Sales Price**			**Annual Net Income(Rs)**	
Eggs (Dozen)	55				
Dairy Milk (ltr)	25			1,23,000	
Meat (per Kg)	175				

Impact of KBY on urban migration of KBY farm pond beneficiary farmers

The migration and mobility details of the beneficiaries before and after implementation of KBY is shown in (Table 8). The number of migrating people decreased from six to three persons after adoption of KBY among the beneficiary families. There was a 50 per cent change in nature of migration. Before implementation of KBY , families were migrating, which was reduced to after KBY. The duration of migration was 92 days before implementation of KBY which was reduced to 35 after implementation of KBY. The 't' values were found to be significant at five per cent level for both number of persons migrated as well as duration of migration. The nature of mobility was purely single person. Before implementation of KBY 25 beneficiaries were moving to other places and it was reduced to 9 persons (-64 %) after the implementation of KBY. Duration of mobility was also reduced from 45 to 15 days (-33.33%) and majority of beneficiaries moved for farm activities. The 't' test was found to be significant at five per cent level for number of persons and duration of mobility. It is revealed that after the implementation of the scheme, migration and mobility were reduced as beneficiaries got more employment on their farm than before adoption of KBY promoted farm ponds.

Table 8 : Impact of KBY-Farm ponds on urban migration of beneficiary farmers per farm

Table 8.a Migration details of beneficiary before and after adoption of KBY farm pond

S.No	Particulars	Beneficiaries		Mean Difference	Change (%)
		Before	After		
1	Migration				
	No.of Persons	6	3	-3.00*	-50
	Duration (Days/year)	92	35	-57.00*	-61.95
	Single	4	2	-2.00	-50
	Family	2	1	-1.00	-50
2	Mobility				
	No.of Persons	25	9	-16.00*	-64
	Duration (Days/year)	45	15	-30.00*	-33.33
	Single	22	9	-13	-59.09
	Family	-	-		

Table 8.b Migration details among the KBY- Farm Pond beneficiary and non-beneficiary

S.No	Particulars	Beneficiaries	Non Beneficiaries	Mean difference over beneficiaries	Percent change Over beneficiaries
1	Migration				
	No.of Persons	3	7	+4.00	+57.14*
	Duration (Days/year)	35	72	+37.00	+51.38*
	Single	2	5	+3.00	+60.00*
	Family	1	2	+1.00	+50.00*
2	Mobility				
	No.of Persons	9	16	+7.00	+43.75*
	Duration (Days/year)	15	55	+40.00	+72.72*
	Single	9	16	+7.00	+43.75*
	Family	-	-		

*****Significant at 10%

The (Table 8.b) represents the migration and mobility details of beneficiaries and non-beneficiaries of KBY. Number of persons migrating to other places was more in case of non beneficiaries compared to beneficiaries, 57.14 per cent more number of non beneficiaries migrated to other places over beneficiaries. The nature of migration was more of single type in both categories when compared to family migration. The duration of migration was relatively more (51.38%) in case of non-beneficiaries over beneficiaries. It further highlighted the mobility details among sample farmers. Duration of migration was more in non-beneficiaries (55 days) when compared to beneficiaries (15 days). In comparison to non-beneficiaries, the movement of beneficiaries to other places for job was less as they got employment on their farm after the KBY .

Determinants of adoption of KBY farm ponds by farmers of NETZ

Three groups of variables are noticed as determinants for the adoption of farm ponds by farmers. The first group is based on the characteristics of the farmers and comprises variables

such as age, educational level and participation in farmers' organizations. The younger farmers are more willing to accept new irrigation technologies and are likely to adopt farm ponds. On the other hand the older farmers seem to be reluctant about the adoption of new irrigation technologies but due to less awareness they are unable to adopt. Participation in farmers' based organizations constitutes an important social network from which the member farmers can obtain information on new irrigation technologies and are more likely to adopt farm pond systems.

Table 9 : Logit model for the determinants of adoption ofKBY Farm Ponds by Farmers

Factors	Coef.	Std. Err.	P>|z|
Age	-1.832	0.862	0.034**
Education level	1.4333	0.943	0.129
Social participation	4.9357	1.500	0.001***
Farm size	2.5417	1.259	0.044**
Crop type (High value crop & mixed production)	2.6097	1.406	0.063*
Availability of rural credit	7.4307	2.216	0.001***
Diffusion of information	5.4427	1.867	0.004***
_constant	-95.506	31.032	0.002**

It is observed that (Table 9), education level of farmer didn't have significant influence for adoption of farm ponds. The second group of variables is based on characteristics of the farms and the agricultural production, such as the size of the farm and the diversification of the production. It is found that, the farm size and crop type has positive effect on adopting farm ponds. When the farmers are cultivating high value crops & mixed production, then the farmers are more likely to have farm ponds. The third group of variables is related to systemic factors, such as access to rural credit and diffusion of information which has showed positive influence leading to higher probability of adoption. It is also observed that, the higher the credit availability the greater the probability of adoption of irrigation technology by farmers.

5. Conclusion

Krishi Bhagya Yojana helped the farmers in the rain-fed region by supporting them in constructing of farm ponds to harvest the rain water. Due to availability of regular water resource , the beneficiaries started cultivating water intensive crops which has positive effect on increasing area under cultivation.The scheme has positively affected the cropping pattern, productivity and socio economic condition of farmers. The implementation of programme needs to be continued and also recommended to extend to other dryland areas which will motivate the farmers to cultivate high value and demand driven crops such as fruit, vegetables & floricultural crops which may help the farmers to gain additional income. Thus,

it will be step forward in stabilizing agricultural production, livestock maintenance and Income generation and need to extend the scheme to arid and semi arid states in India.

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Competing interests

Author has declared that no competing interests exis**ts.**

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