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NEED FOR RAINWATER HARVESTING

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ABSTRACT

India has been facing water stress and is heading towards water scarcity. Since, agriculture is the backbone for attaining food security; the need to manage scare water resource for agriculture purpose becomes vital. In the present study, the need for rainwater harvesting is discussed. In order to highlight the advantages of rain water harvesting in rural areas for agriculture purpose, two districts in Karnataka state, viz., Belagavi and Uttara Kannada are selected. Farmer's opinions with respect to benefits due to the farm ponds are studied. The results reiterate that, harvesting of rainwater through construction of farm ponds leads to augmentation of ground water resources, increased soil moisture, reduced crop failure, increase in the crop yield, increased land value and employment. Hence the intervention of the government and the NGOs in promoting water harvesting practices has been highlighted.

KEYWORDS: *rainwater harvesting ,* attaining food security, Agricultural Water withdrawal.

INTRODUCTION

Agriculture is the backbone for securing food security. However, competition for water resources is expected to increase in the future, with too much of pressure on agriculture. According to World Bank, agriculture accounts for 70% of all water withdrawals globally. Irrigated agriculture represents 20% of the total cultivated land, but contributes 40% of the total food produced worldwide. As per OECD environmental outlook India is expected to face severe water constraints by 2050. Apart from agriculture sector, there is increasing demand due to Population, Urbanisation, Industrialisation and climate change. Increased incidences of droughts and uncertain rainfall are a result of climate change thereby providing more competition for water resources.

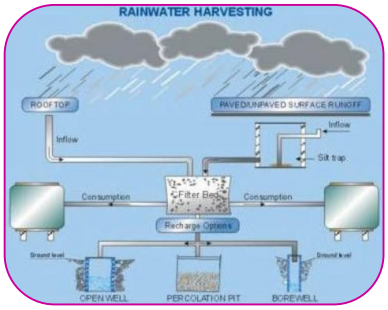
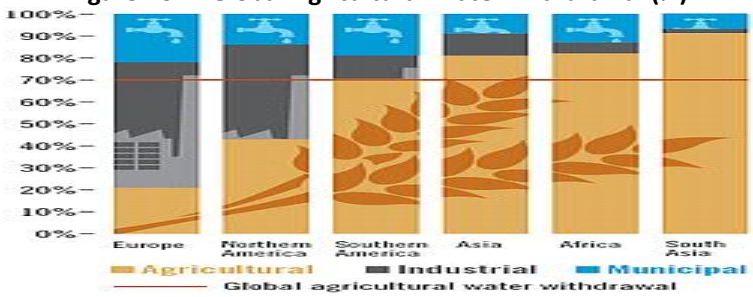


Figure no.1- Global Agricultural Water Withdrawal (%)



Source: www.globalagriculture.org

The figure above shows the global agricultural water withdrawal. Compared to the Industrial sector and the Municipal use, Agriculture sector has been the major sector globally in terms of water withdrawal. The Industrial and Domestic sector account for 54% and 85% of additional demand by 2025 and 2050 (BAU).

The 'Business -as- Usual' (BAU) scenario projects the water demand to increase from 680 BCM to 833 BCM by 2025, and by 2050, it is projected to increase to 900 BCM. Similarly, groundwater withdrawal is expected to increase to 365 BCM to 423 BCM by 2025 and 2050 respectively. With increasing pressure on water there is over exploitation of ground water resources. Over exploitation of ground water may lead to increased rate of well failure and reduced investment in well irrigation. Even though water is available in abundance globally, it is scarce locally; hence there is a need to use the available scarce water resources efficiently. One of the ways could be through Rain water Harvesting or through revival and expansion of the traditional water harvesting methods in the water scarce regions.

METHODOLOGY:

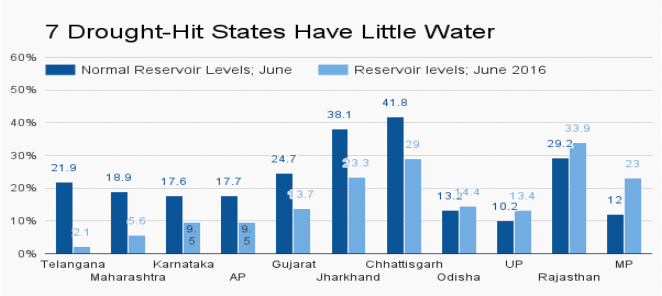
The objective of the present study is to emphasize the role of water conservation. Since, water forms the primary input for agriculture. For the present study primary data as well as secondary data have been collected. In order to know the beneficiaries' perception with regard to rainwater harvesting – (benefits after construction of farm ponds) a survey was conducted with the help of interview schedule. Two areas were selected for the present study. One of the areas was Belagavi district, Ramdurg taluka, Bhagojikoppa Village and the other one was Uttara Kannada district- Sirsi; Siddapur and Yellapur talukas. Both the areas were selected because they fall in two different agro-climatic zones. Ramdurg taluka falls in deficit rainfall zone (North Interior Karnataka) while Uttara Kannada falls in Coastal zone where it experiences excess rainfall. The water harvesting intervention work of the two NGO's - BAIF in Bhagijikoppa and Manuvikasa in Uttara Kannada district - was studied and beneficiaries' perception with regard to the farm ponds was collected. A Sample of 39 farmers from Bhagojikoppa village and 36 farmers from Sirsi, Siddapur and Yellapur was selected.

Drought situation in India:

Drought is said to occur when there is natural reduction in the amount of precipitation over an extended period of time. It has harsh impacts on economy, environment, production of crops and soil health, thereby leading to huge loss to the society. India has been experiencing droughts frequently. The drought prone states of India since independence are Bihar, Orissa, and Rajasthan, Gujarat, Tamil Nadu, Uttar Pradesh, Haryana, Karnataka, Madhya Pradesh, Himachal Pradesh, Punjab, West Bengal and Kerala.

In the figure 2 below, it is clear that seven states had less than average water in their reservoir in June 2016. As per the reservoir data with the Central Water Commission; levels in the dam reservoirs were not more than 10% of capacity for four of the 11 states in June 2016. Telangana reservoirs were at 2% of capacity, Maharashtra at 5.6%, Andhra Pradesh and Karnataka at 9.5%. This shows that South Central India was particularly short on water.

Figure no.2- Reservoir levels in drought hit states of India-2016



Number Of Districts Declared Drought Hit In Respective State

Source: Central Water Commission

The figure above shows the extent of drought in India. Droughts have a direct impact on the agriculture and hence, it is one of the biggest menaces to agriculture compared to all weather-related crises. It results in reduced income of farmers and agribusiness, increased prices of food grains, unemployment and migration, low yield of crops or at times crop failure. If viewed from social perspective it makes way for social unrest, increased criminal activities, Protests, insecurity, suicides, damage to livestock, wildlife and fish habitat. It costs heavily to the government since it has to provide relief measures to such states. For instance, in Madhya Pradesh, Ministry of Rural development released 55% of its annual MGNREGA budgetary allocation of rupees 38500 corers in 2016.

Karnataka lies in the South Western region of India and is the seventh largest state in India by area. It covers 191,976 sq. kilometres of the geographical area, (2011 census).It is the eighth largest state by population. It is divided into three principal geographical zones- 1) The coastal region of Karavali, 2) The hilly 'Malenadu' region comprising of Western Ghats and 3) The 'Bayaluseemae' region comprising the plains of Deccan plateau. The coastal and 'Malenadu' regions receive copious amount of rainfall while the north 'Bayaluseemae' region lying in the Deccan Plateau is one of the most arid regions in the country.

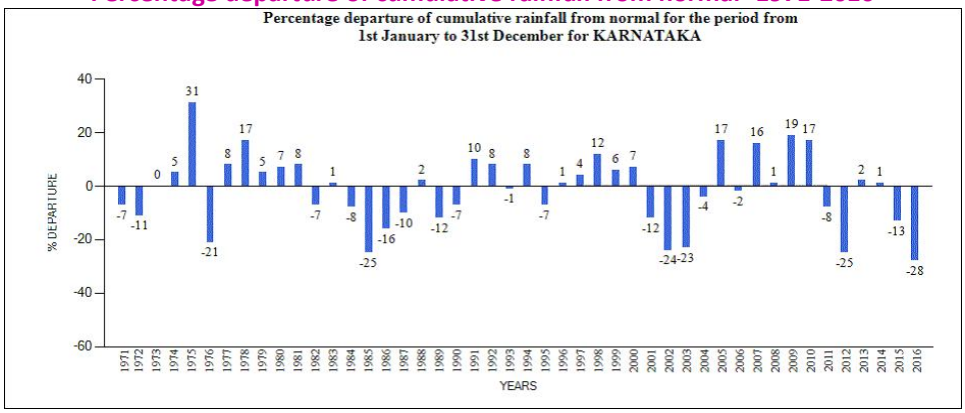
The state comprises of 30 districts and these districts fall under 10 different Agro Climatic Zones. The first zone is the **Dry zone** with comparatively low rainfall and erratic distribution. It comprises of the North Eastern Dry Zone (11 talukas), Northern Dry Zone (35 talukas), Central Dry Zone (17 talukas), and South Eastern Dry Zone (25 talukas) and Southern Dry Zone (19 talukas). The second zone is **The Transition Zone** comprising of the North Eastern Transition Zone (7 talukas), Southern Transition Zone (14 talukas) and the Northern Transition Zone (14 talukas); with relatively more rainfall and less erratic rainfall and lastly the **Hilly and Coastal Zone** consisting of the Hilly zone (21 talukas) and the Coastal Zone(13talukas). The Coastal Karnataka received highest average annual rainfall of 3456 mm, while South Interior Karnataka and North Interior Karnataka receives annual average rainfall of 1286 mm and 731 mm respectively (2016)

It is clear that most of the talukas of Karnataka experience low and erratic rainfall. The occurrence and the distribution of rainfall is not uniform across the state and the mean annual rainfall of Karnataka is 1355 mm. In the year 2016 it was observed that 139 talukas in the state were drought affected during kharif season and 160 talukas were drought affected in the Rabi season. Similarly, in the year 2015, 135 talukas in 27 districts of the state were declared drought hit talukas. Due to erratic rainfall drought has become more or less a permanent phenomenon in Karnataka. Karnataka is predominantly dependent on agriculture where, 68 % of the cultivated land is under rain fed farming, despite this shortcoming 75% of the oil seed production and 55% of food grains production comes from the rain fed areas. Out of the ten agro climatic zones in the state, five agro climatic zones receive an average rainfall ranging in between 450mm - 850 mm annually in the last 25 years.

Rainfall in Karnataka:

Figure no. 3

Percentage departure of cumulative rainfall from normal -1971-2016



Source: Karnataka State Natural Disaster Monitoring Centre

The graph above depicts the percentage departure of rainfall from the normal; since 1971 to 2016 for Karnataka state as a whole. The figure shows that the percentage departure of rainfall for the year 2016 has been (-) 28%, which is lowest in last 45 year.

Table no.1

Region-wise percentage departure of rainfall from the normal for the period 2012-2016.

Region/ State	Normal (mm)	2012		2013		2014		2015		2016	
		Actual (mm)	% Dep.	Actual (mm)	% Dep.	Actual (mm)	% Dep.	Actual (mm)	% Dep.	Actual (mm)	% Dep.
South Interior Karnataka	719	538	-25	675	-6	752	5	922	28	494	-31
North Interior Karnataka	728	519	-29	723	-1	741	2	520	-29	553	-24
Malnad	1914	1453	-24	2112	10	1989	4	1620	-15	1255	-34
Coastal	3451	2726	-21	3612	5	3322	-4	2713	-21	2614	-24
State	**1155**	**869**	**-25**	**1182**	**2**	**1168**	**1**	**1008**	**-13**	**833**	**-28**

Source: Karnataka State Natural Disaster Monitoring Centre

The table above shows the percentage departure of rainfall from the normal for the period 2012 to 2016. For the year 2016, percentage departure of rainfall from the normal, was (-) 28% which is very less compared to corresponding period of past 4 years.

The pre-monsoon rainfall was deficit (-) 31% in the state with 23 districts having recorded deficit rainfall, while only 7 districts recorded normal to excess rainfall. The South-West monsoon rainfall was normal (-) 18%. In the state with 19 districts receiving normal to excess rainfall and 11 districts recorded deficit rainfall. North-East Monsoon rainfall was scanty (-) 71%. With 29 districts having recorded deficit to scanty rainfall and only 1 district recorded normal rainfall.

Rainfall in Belagavi District:

Table no. 2

Taluka –wise annual rainfall pattern during 2013-2016

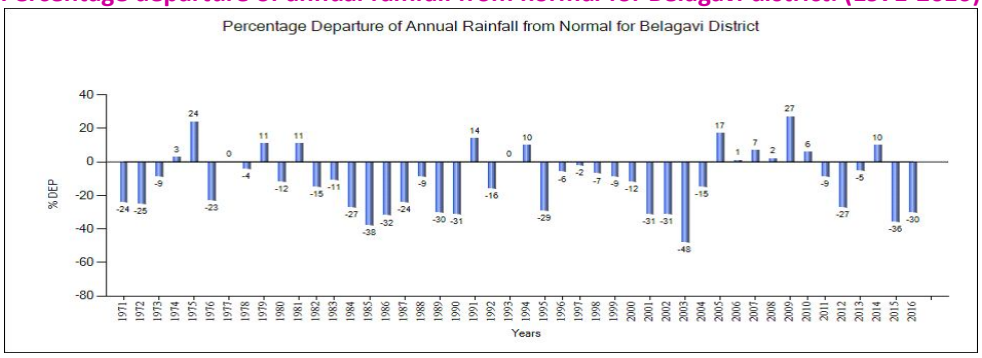
Region/ State	Normal (mm)	2013		2014		2015		2016	
		Actual (mm)	% Dep.	Actual (mm)	% Dep.	Actual (mm)	% Dep.	Actual (mm)	% Dep.
Belagavi	**872**	**831**	**-5**	**962**	**10**	**561**	**-36**	**611**	**-30**
Athani	536	624	16	688	28	471	-22	506	-6
Bilhongal	964	664	-31	903	-6	543	-44	520	-46
Chikkodi	1504	1146	-24	1235	-18	711	-53	854	-43
Belagavi	645	637	-1	763	18	450	-30	587	-9
Gokak	572	439	-23	586	2	355	-38	320	-44
Hukkeri	773	667	-14	751	-3	451	-42	485	-37
Khanapur	1960	2291	17	2378	21	1350	-31	1487	-24
Ramdurga	561	515	-8	674	20	391	-30	372	-34
Raibagh	508	436	-14	566	11	345	-32	380	-25
Soundatti	624	508	-19	730	17	411	-34	388	-38

Source: Karnataka State Natural Disaster Monitoring Centre.

The table above reveals that the amount of rainfall occurred during 2016 was comparatively better than the last year.

Figure no. 4

Percentage departure of annual rainfall from normal for Belagavi district. (1971-2016)



Source: Karnataka State Natural Disaster Monitoring Centre

The graph shows the percentage departure of annual rainfall from the normal for Belagavi district. It can be observed that it was (-) 30 % for the year 2016 which is better compared to the last year (-) 36 in 2015. The highest percentage departure of annual rainfall from the normal was recorded in the year 2003 (-) 48. It is clear from the above that Belagavi district has been receiving deficit rainfall for major period of time.

Ground water levels: The ground water level in November 2016 was compared with the mean groundwater level for the period November 2006-November 2015. It was observed that 89 stations (78%) showed fall in water level in the year 2016 while only 19 stations showed rise in the water levels.

Rainfall in Uttara Kannada District:

Table no. 3

Taluka wise annual rainfall pattern 2013-2016

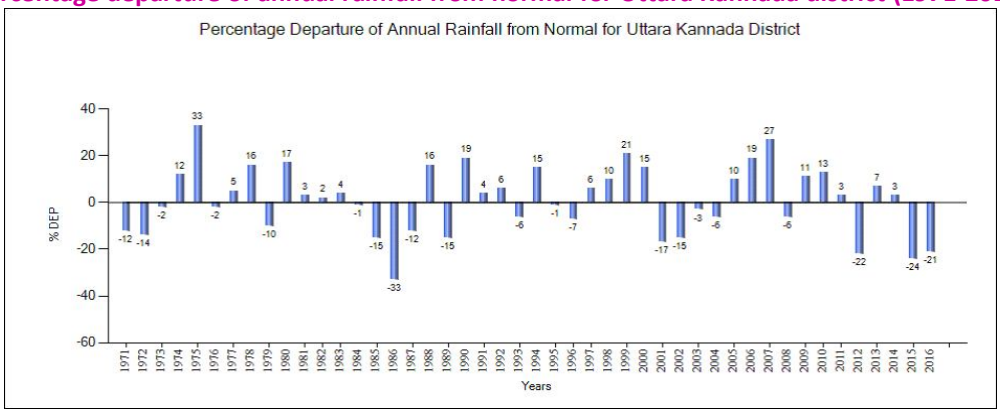
Region/ State	Normal (mm)	2013		2014		2015		2016	
		Actual (mm)	% Dep.	Actual (mm)	% Dep.	Actual (mm)	% Dep.	Actual (mm)	% Dep.
Uttara Kannada	**2787**	**2968**	**7**	**2870**	**3**	**2106**	**-24**	**2194**	**-21**
Ankola	3509	3631	3	3389	-3	2604	-26	2933	-16
Bhatkal	4235	4404	4	3683	-13	3299	-22	3225	-24
Haliyal	1873	1309	-30	1335	-29	802	-57	726	-61
Honnavar	3644	3665	1	3178	-13	3044	-16	3360	-8
Karwar	3220	3807	18	3815	18	2830	-12	2910	-10
Kumta	3552	3988	12	3525	-1	2823	-21	3015	-15
Mundgod	1555	1223	-21	1306	-16	1074	-31	832	-46
Siddapur	2835	3574	26	3280	16	2561	-10	2541	-10
Sirsi	2379	2808	18	2908	22	1972	-17	1951	-18
Supa	2525	3342	32	3291	30	1998	-21	2279	-10
Yellapur	2792	2033	-27	2214	-21	1554	-44	1496	-46

Source: Karnataka State Natural Disaster Monitoring Centre.

The table above reveals that the annual rainfall (-) 21% received in the year 2016 was comparatively better than the last year. Sirsi (-) 18%, Siddapur (-) 10% and Yellapur (-) 46% recorded deficit rainfall for the year 2016.

Figure no. 5

Percentage departure of annual rainfall from normal for Uttara Kannada district (1971-2016)



Source: Karnataka State Natural Disaster Monitoring Centre.

The table shows the percentage departure of annual rainfall from normal for Uttara Kannada district. It is (-) 21 for the year 2016, while it was (-) 24 in the previous year. This shows that the percentage departure of annual rainfall from normal is more compared to the past except in the year 1986 were it was (-) 33%

Groundwater level: Groundwater level in November 2016 was compared with the mean groundwater level for the period November 2006 to 2015. It was observed that out of 81 stations 44 (54%) stations showed fall in ground water level while only 37 (45%) stations showed rise in the ground water level. This shows the amount of stress on the ground water use, for meeting irrigation needs.

Government efforts to mitigate the problem in Karnataka:

Cloud seeding: First such experiment was conducted in the state in the year 2004 for a period of 9 days, after facing four consecutive deficit monsoon years. Its expense was 15 crore. Cloud seeding is a costly weapon to fight the water problem as it would cost the exchequer about 30-40 crore for a week. It includes hiring the aircraft, raw materials for cloud seeding, installation of three radars for monitoring and identifying rain bearing clouds.

The government of Karnataka introduced its flagship programme**, 'Krishi Bhagya Scheme'** in the year 2014. It includes storing the runoff rainwater, using the stored water for crops during dry spells, construction of farm ponds and micro irrigation and animal husbandry. It was implemented to improve the livelihood of rain dependent farmers, conservation of natural resources like soil and water, improvement of agriculture productivity and income levels of farmer. It aims to have a sustainable development of agriculture with its main thrust on prompting horticulture and efficient use of rainwater to enhance farm productivity.

During the year 2014 -15 budgetary allocations of rupees 500.00 crore was made. Similarly, in the year 2015-16 an amount of rupees 375.00 crore was released. The programme was implemented in the phased manner. In the first phase 23 districts and 107 talukas were covered and in the second phase 25 districts, 129 talukas were covered. As per the reports of Government of Karnataka's-Rapid assessment survey of development programmes 2015-16 (Directorate of Economics and Statistics) the survey of 1373 beneficiaries was made in 450 hoblis and 23 districts and the data reveals that the programme has positive results. After the construction of farm ponds, 62 % of the farmers grew additional crops. 72% of the beneficiaries opined that their financial status improved after the construction of farm ponds and 95 % of them were of the view that the farm ponds were filled with rain water once; and more than once during the year. In the coming year this scheme is going to be implemented in the coastal and 'malenadu' districts of Karnataka.

NGO efforts in Belagavi district and Uttara Kannada district of Karnataka:

The study was conducted to find out the impact of farm ponds on the beneficiaries of Uttara Kannada district as well as Belagavi district. Bhagojikoppa village in Ramdurg taluka of Belagavi district and Sirsi, Siddapur and Yallapur talukas of Uttara Kannada district were selected for the present study. The NGO intervention in water conservation activities in these areas was studied and the data with regard to farmer's perception with regard to farm ponds was collected.

Table no. 4

Benefits perceived by the farmers of Uttar Kannada district (No.)

Perceived benefits (No of farmers)						
Type of farmer	Small farmer			Medium and Large farmer		
Perceived benefits	Strongly agree	Agree	Disagree	Strongly agree	Agree	Disagree
Soil erosion reduced	18	9	0	5	4	0
Groundwater level raised	19	8	0	9	0	0
Soil moisture increased	22	5	0	7	2	0
Reduced crop failure	18	9	0	6	3	0
Increase in yield	10	17	0	5	4	0

Generated employment	6	19	2	1	7	1
Increased land value	8	19	0	3	6	0

Source: Field data

The table above reveals that majority of the farmers (all type) strongly agree to the fact that rainwater harvesting in the form of farm ponds leads to ground water augmentation, reduced soil erosion, increased soil moisture, increase in yield, employment generation and increased land value. However, some farmers in Uttar Kannada district believe that, since the farm ponds are excavated with the help of machines, construction of farm pond does not generate much employment, but employment is generated in other farming related activities.

Table no.5

Benefits perceived by the farmers of Bhagojikoppa village, Belagavi district

Perceived benefits (No of farmers)									
Type of farmer	Small farmer			Medium farmer			Large Farmers		
Perceived benefits	Strongly agree	Agree	Disagree	Strongly agree	Agree	Disagree	Strongly agree	Agree	Disagree
Soil erosion reduced	8	6	0	6	3	0	8	8	0
Groundwater level raised	9	5	0	6	3	0	12	4	0
Soil moisture increased	8	6	0	3	6	0	7	9	0
Reduced crop failure	5	9	0	3	6	0	6	10	0
Increase in yield	4	10	0	4	5	0	5	11	0
Generated employment	3	11	0	4	5	0	6	10	0
Increased land value	4	7	3	0	7	2	0	12	4

Source: Field data

Similar results were notice even in case of Belagavi district. All the types of farmers strongly agree that due to construction of farm ponds positive results in terms of above-mentioned benefits were realised. However, in this village; NGO's had involved the farmers in farm pond excavation work and it was done manually so it helped in generating employment and stop migration, caused due to droughts.

CONCLUSION:

Sustainable management of water in agriculture is critical to increase agricultural production and reduce the growing gap between demand for and supply of water .It is of utmost importance to revive and expand the traditional Water harvesting methods at the grass root level in Karnataka and the country, particularly in the dry regions. Such rainwater harvesting practices promoted by the NGOs and the government are very important in the view of the heavy recurring expenses, incurred both due to enormous wastage of water coupled with the maintenance costs of large irrigation systems.

REFERENCES:

- Dhawan, Vibha, 2017. 'Water and Agriculture in India", Background paper for the South Asia expert panel during the Global Forum for Food and Agriculture, (GFFA).
- Balooni, Kulbhushan, Bagalkoti, S.T., Kalro, A.H., (2006). 'Case Studies and Performance of Traditional Water Harvesting Methods in Dry Regions of Karnataka', IIMK, Kozhikode.

- Amarsinghe, Upali, Shah, Tushaar, Anand B.K., (Undated). 'India's Water Supply and Demand from 2025-2050: Business-as-Usual Scenario and Issues. IWMI, New Delhi, India.
- Karnataka State Natural Disaster Monitoring Centre.
- Jat, M.L., Singh, P., Bhakar, S.R., and Sharma S.K.(2010). 'Drought Management', Kalyani Publishers, New Delhi, India.