Impact of farm ponds on lives and livelihoods of farmers in Chikkaballapura District, Karnataka

Kiran Kumar Sen[1]

Abstract

Improvements in irrigation can be achieved by focusing on optimizing the returns on per unit of water. In this respect, focus on rainwater conservation and its management in agriculture marks a renewed interest in such practices as opposed to costly large-scale infrastructure projects. To tackle water scarcity and accelerate agricultural productivity, the governments at both state and central level are implementing programs/schemes to promote on-farm water conservation. In Karnataka, Krishi Bhagya programme aimed at conservation, storage and efficient use of rainwater for sustainable growth in agriculture.

Under this scheme, construction of farm ponds was promoted with subsidies of about 90-95 %. Since 2014, 6468 farm ponds were constructed in Chikkaballapura district of Karnataka. A total of 42 farmers consisting of 30 farm pond owners and 12 non- farm pond owners were interviewed to understand changes farm pond brought in their lives. According to them, it impacted them in the following ways. One, storage offered gave more control of water. Two, presence of water in farm ponds gave them immense confidence to decide the cropping pattern. Three, they are able to overcome issues with power schedule and night irrigation. Four, the benefits of drip irrigation was better realised with farm ponds.

Fruits, vegetables, flowers and cash crop started influencing crop choices which have led to positive economic gains among adopters. Given the strong presence of dairy cooperatives, revenue from milk continues amongst farmers who own livestock. Such economic changes have directly impacted their social standing bringing changes in the quality of such farmers bringing both tangible and intangible benefits.

The benefits from farm ponds narrated above are only one part of the story. Harvesting water does not translate into revenues; it has only helped farmers to use water efficiently to grow different crops. The instability in crop prices has resulted in losses for some owners and henceforth were unable to repay their loans. Hence, there is a need for creating an enabling environment where all processes are made robust and offer incentives in the entire value chain to bring value to agriculture. While this assessment provides evidence for economic and social

[1] The author is currently a Wipro Sustainability Seeding Fellow working on improving access to safe drinking water in water quality affected regions with INREM Foundation and part of rainwater harvesting initiatives of Biome Trust.

gains among farm pond owners, studies with the increased sample and long-term impact must be undertaken before confirming farm pond as the panacea for farmer's distress.

Keywords: *farm ponds, Karnataka, irrigation, farmers, livelihoods*

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1. Introduction

71 years post-independence, agriculture continues to be a priority in many states of the country, including Karnataka. Since 1950s, irrigation schemes are effective means in Indian politics for electoral gains as half the population is involved in it. Today half the population in India i.e. 54.6 % is engaged in agriculture and allied activities (Annual Report , 2016-17). But still reports of farmer distress and suicides paint ground realities of today's agrarian India and testimony to the fallacy of such policies. The hard reality is that public irrigation in India is in a dismal state due to ineffective governance. As per a Reserve Bank of India (RBI) study, the country invested INR 2 lakh crores in irrigation and flood control (at 2007 prices) between 1991 and 2007, only to lose additional 3.8 million hectares the area served by government canals due to improper planning and management (Tushaar Shah, 2016).

Irrigation development is not uniform across India due to multiple practical and political reasons due to which about 52 % of the cropped area in the country remains unirrigated (Mishra, 2017). In Karnataka, irrigation is less developed, out of the net sown area in 2014-15, only 36 percent is under irrigation (Profile of Agriculture Statistics, 2014-15). Heavy dependence of rainfed agriculture can be seen from the graph below.

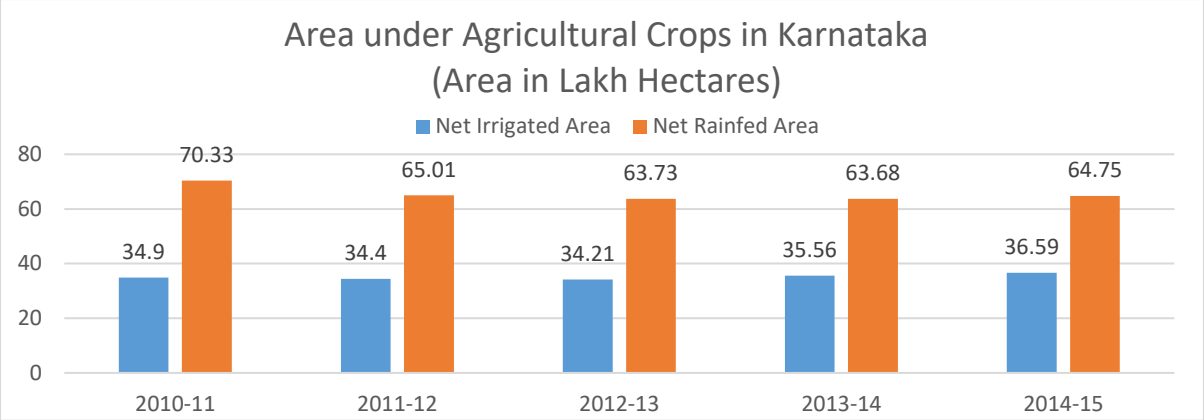


Figure 1: Net Sown Area in Karnataka. Computed by author. Source- Profile of Agricultural Statistics Report 2014-15

The unpredictability of monsoon is making farming in dry regions highly challenging and unsustainable for farmers. This issue is not unknown to policymakers and administration in the government. To offset such scenarios, present irrigation schemes have increased focus on harvesting of rainwater and its efficient use for agriculture.

One such recent initiative is the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) formulated to expand the cultivable area under assured irrigation by adopting water-saving technologies like drip or sprinklers and promote water conservation practices (Annual Report , 2016-17). This focus on rainwater conservation and its management in agriculture marks a renewed interest in such practices as opposed to costly large-scale infrastructure projects. Many states including Karnataka have thus, begun policies or schemes to complement such initiatives, leading us to the focus of this study.

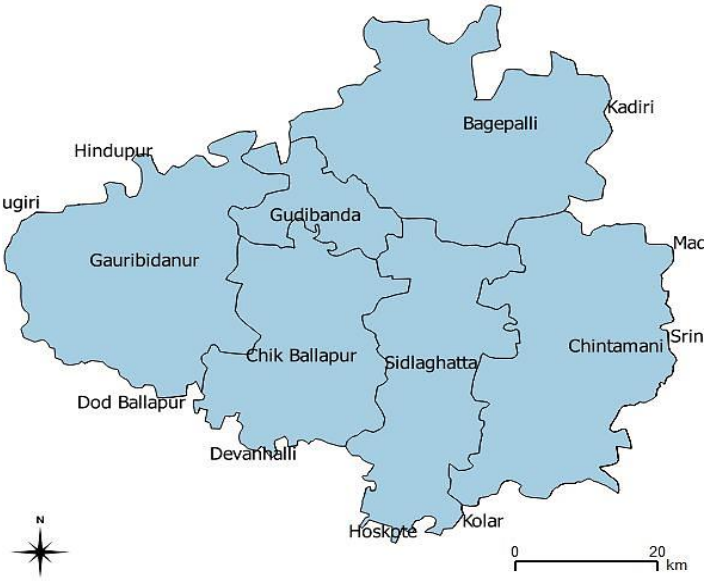
About 55 % of food grains and 75 % of oilseeds grown in the state are produced by rainfed agriculture (Krishi Bhagya, 2017). Farming activities on these dry lands are critical and contribute most to agricultural production. 61% of state population lives in rural areas, of which cultivators and agricultural labourers form about 49 % of the workforce (Karnataka Population Census data 2011, n.d.). However, agricultural production and productivity in the state have received a tremendous setback in recent years due to the continued prevalence of drought conditions from 2014-16. The extent of arid conditions has increased in Karnataka which is now second only to Rajasthan in the country (Bangalore News, 2017).

In 2014, the state launched Krishi Bhagya scheme to secure farmers' incomes by promoting on-farm rainwater conservation and encouraging efficient use of water through adoption of modern technologies. Since the inception, about 1.6 lakh farm ponds are constructed in the

state. It also provides additional subsidies for purchasing plastic sheets, funds for drip irrigation equipment and motor pumps (Flagship Programme Details , 2018). This study aims to understand the experience of farmers in the district of Chikkaballapura where groundwater levels have reached alarmingly low levels. The study focuses on understanding the economic and social benefits gained by farmers who own farm ponds compared to farmers who don't.

2. Study Area and Method

Chikkaballapura is a newly created district in the southern part of Karnataka. It was carved out of the erstwhile Kolar district in 2007 by separating six taluks namely, Gauribidanur, Gudibanda, Bagepalli, Chikkaballapura, Sidlaghatta and Chintamani to form Chikkaballapura. (Karnataka Population Census data 2011, n.d.).



Chikkaballapura District

The district lies in the central part of peninsular India, which has an immense bearing on its geo-climatic conditions. Chikkaballapura falls under the eastern dry agro-climatic zone. It experiences a semi-arid climate characterised by typical monsoon tropical weather with hot summers and mild winters. According to the 2011 census, the population stood at 12, 55,104 of which 77% resides in rural parts. The Scheduled Caste (SC) and Scheduled Tribe (ST) minorities formed 24.9 % and 12.47 % of the population respectively. The sex ratio was 972 females for every 1000 males.

No perennial rivers are flowing in the district. Papaghini, Chitravati and North Pinakini flow through the district. These rivers and their tributaries are small and carry water only during the rainy season. The mean rainfall in the district is 731 mm (KSNDMC report). The mean rainfall

for Karnataka is 1155 mm. Figure 2 compares actual rainfall for the state and Chikkaballapura for the last five years.

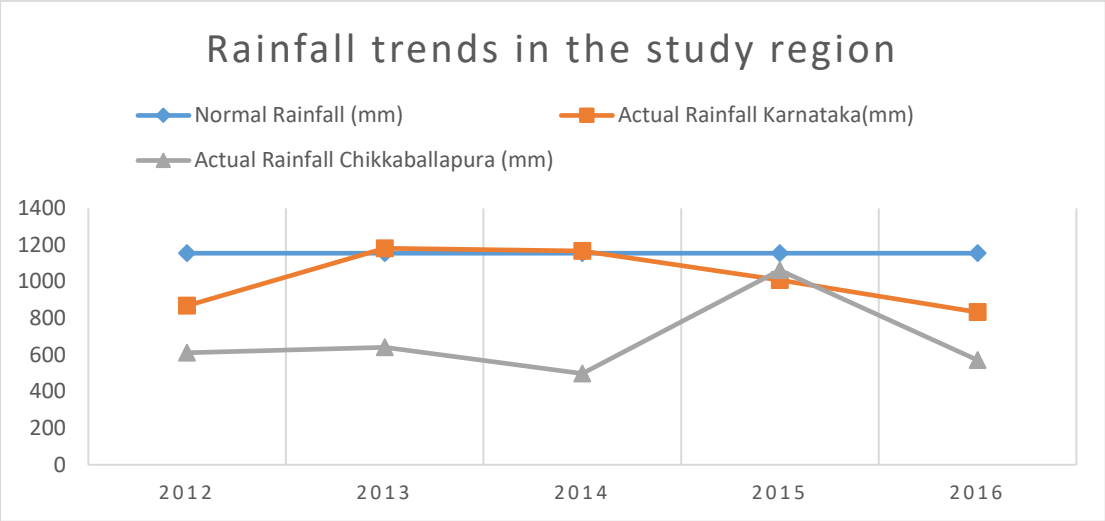


Figure 2: Comparing rainfall between Karnataka and Chikkaballapura district. Computed by the author. Source- Annual Report of KSNMDC, 2016

Chikkaballapura falls under the South Interior Karnataka meteorological zone as classified by the Karnataka State Natural Disaster Monitoring Centre (KSNDMC). Except for 2015, the mean rainfall in this district has been lower than the actual state rainfall causing severe distress to farmers. The land use of the district is reflected in figure 3 below. The total geographical area of the district is 4, 04,501 Ha. The net sown area is 1, 93,250 Ha while the net irrigated is at 50370 Ha. The net irrigated area is 26 % lower than the state average. In the absence of surface irrigation system, groundwater is the main source of irrigation.

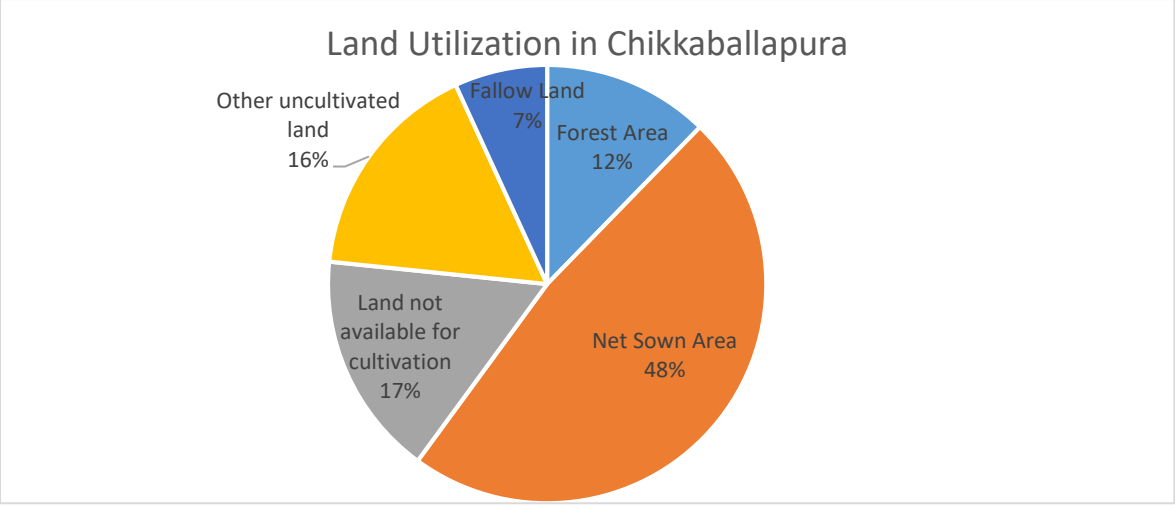


Figure 3: Land Utilization in Chikkaballapura. Computed by the author. Source- Chikkaballapura district at a glance, 2015-16

According to official estimates, there are about 1981 tanks, 733 wells and 28985 borewells in the district. Agriculture is the main occupation of the people. Principal crops in coverage are Maize, Ragi, Groundnut, Red gram. Horticulture crops like fruits, flowers and vegetables are grown. Sericulture also dominates the crop pattern in the district. Agriculture is the biggest consumer of the dwindling groundwater resource. Hence, there is a need for improvements in irrigation which can be achieved by focusing on optimising the returns on per unit of water.

Thus, to tackle water scarcity and accelerate agricultural productivity, the governments at both state and central level are implementing programs/schemes to promote on-farm water conservation. Therefore, regarding water scarcity and the need for efficient use of available water, the district of Chikkaballapura is suitable to evaluate farm ponds as an intervention to increase crop productivity. Under the Krushi Bhagya (KB) scheme, thousands of farm ponds were constructed in the district as seen in the table below.

Sl no	Taluk	Year				
		2014-15	2015-16	2016-17	2017-18	Total
1	Bagepalli	370	344	413	716	1843
2	Chickballapur	242	178	136	222	778
3	Chintamani	582	578	144	362	1666
4	Gowribidanur	170	192	239	212	813
5	Gudibande	194	178	141	36	549
6	Sidlaghatta	179	266	315	59	819

	Total	1737	1736	1388	1607	6468

Figure 4: Farm ponds in Chikkaballapura district. Source- Department of Agriculture, Chikkaballapura

Methodology

A study was undertaken to evaluate the economic and social impact of farm ponds on the lives and livelihoods of farmers in regions of Chikkaballapura. The field data for the study was collected from all taluks of the district, where farm ponds are used for cultivation of crops. A total of 42 farmers comprising of 30 farm pond owners and 12 non- farm pond owners were selected for a detailed field survey. To ascertain the impact, 30 farm pond owners were considered as the "treatment group" and 12 non-farm pond owners were taken as the "control group". Farmers in the "control group" were chosen both from villages where farm ponds are constructed and villages where no farm ponds have been constructed.

The farm pond owners were selected across 14 villages spread across 6 taluks by using random sampling procedure. Snowball sampling was used to identify the next farm pond owner. On the other hand, random sampling was employed to select the non-farm pond owner in the same village. The major objective of the study was to ascertain the economic and social impact of farm ponds on cultivation of crops and returns, which shaped social status of the adopters.

The primary data was collected through a survey method using a questionnaire. A pre-designed semi-structured interview schedule was used to interview the participants in each village after visiting their farm pond site. The interviews were conducted in their respective houses/fields. Relevant data from government and non-governmental agencies in the form of articles, presentations and reports were referred under the study. Relevant quantitative and qualitative tools have been used for analysis. The difference of Difference (DD) method is used to calculate the impact of the treatment. In this method, the "treatment group" and the "control group" are compared by their situation before and after the ponds are constructed. Narratives and direct quotes have been used wherever applicable.

4. Analysis and Discussion

4.1 Characteristics of the study group and region

When it comes to water harvesting structures, like elsewhere in India, Karnataka has a rich history of exploiting and conserving rainwater by constructing tanks, i.e. artificial reservoirs. The extent of tank irrigation can be gauged from the fact that in 1881, Karnataka (then Mysore)

had one tank for every 15 sq. mile, irrigating about 7,66,314 acres and generating revenue from such sources of about 40 lakh INR (Reddy, 1991). The southeastern belts with districts like Kolar, Chikkaballapura, Bangalore Rural and Tumkur have no major irrigation projects and historically relied upon tanks for irrigation. Thus, the concept of farm ponds in that sense is not new in these regions. The key difference is that tanks were constructed at a suitable point to receive runoff from the catchment, while farm ponds are ideally constructed at the lowest point on the farmer's land. Tanks provided community benefits while the latter is meant for private gains and is a preferred choice today

The social group of the respondents include Gollas, Bhovis and Vokkaligas who formed major numbers alongside few Dhobis, Gowdas, Kurubas, Nayakas and Togatas. Those who own farm ponds have a relatively larger share of land than non- owners ranging from 0.40 Ha (1 Acre) to 16.16 Ha (40 Acres) and fall under marginal, small, small-medium categories. The construction of the farm ponds has been picked up in the district since 2014-15 following the scheme. While some farmers immediately constructed farm ponds, others followed once early adopters saw benefits. Under KB scheme, a farmer can avail subsidy of up to 95 % based on the caste and land profile; the, i.e. farmer must have a minimum of 1 Acre or 0.404 Ha. Only four farmers reported they invested on their own and didn't obtain the subsidy.

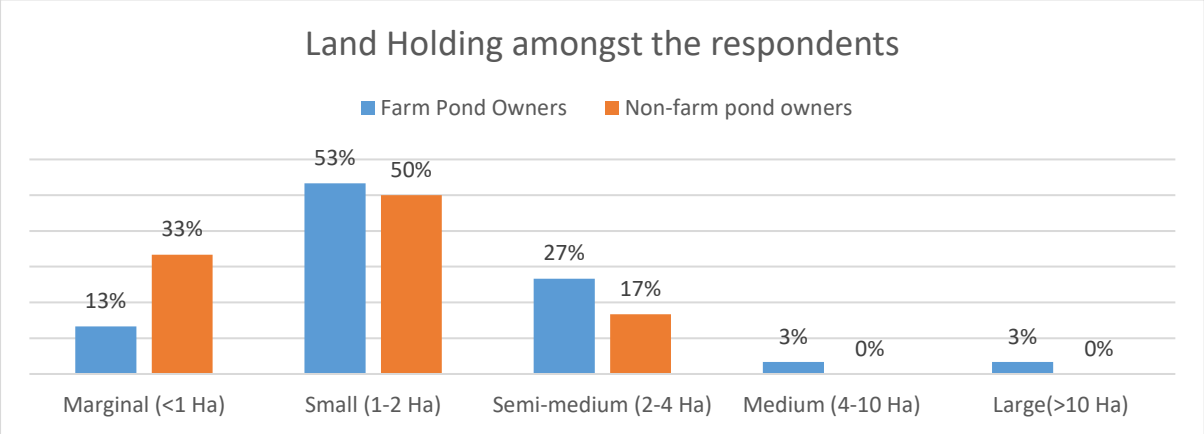


Figure 5: Landholding among respondents

4.1.1 Groundwater- lifeline resource

With significant improvements in water extractions mechanisms (WEMs), most farmers heavily depend upon groundwater to meet irrigation requirements for their crops. Others who lack such WEMs practice rainfed agriculture. The average borewell depth reported is beyond 800 ft, sometimes even touching 1400 ft. Water quality is deteriorated with many farmers

stating that the issue of fluorosis[2] is prevalent in their respective villages. As per the 2016-17 Government data, the district reported 1698 samples beyond the BIS permissible limits of 1.5mg/l of fluoride concentration (National Rural Drinking Water Programme, n.d.). Such is the extent of fluoride contamination that the government has installed thousands of community-based water treatment plants under another flagship "Shudduneeru" scheme. To avoid fluoride intake, more than half the respondents drink filtered water, but few others continue using groundwater. The use of groundwater in irrigation has marginally dropped after the adoption of farm ponds but remains a major source as seen in figure 6. The dependence upon rainwater has reduced post intervention as they store and use groundwater while non-farm pond owners heavily rely on rainwater supplemented with groundwater and tanker water in few cases.

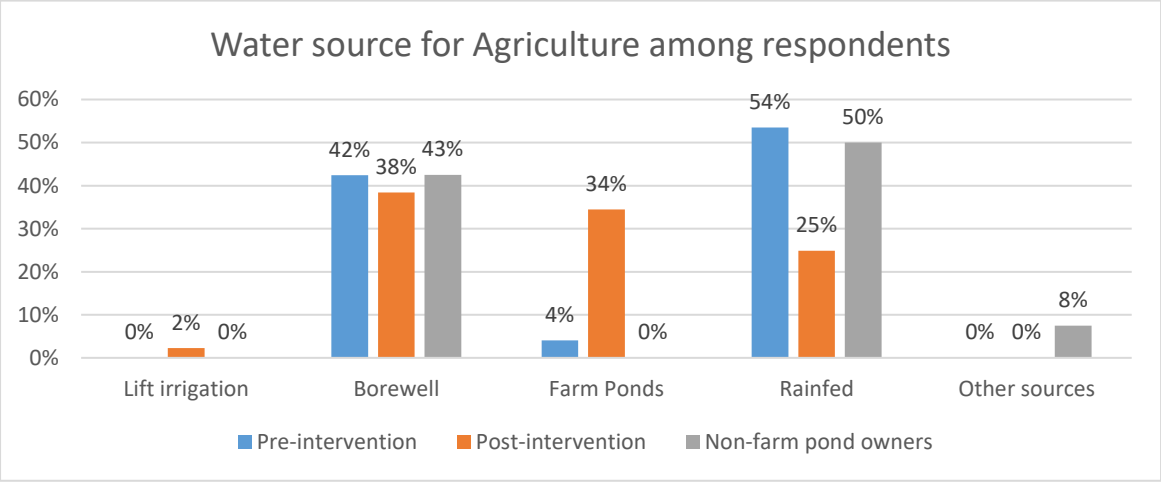


Figure 6: Use of different water source for agriculture

4.2 Impact on crop production

Following sections highlight, the farmer's experience and changes farm ponds have brought into their lives.

Using Water efficiently for more crops

The KB scheme also provides a subsidy for drip irrigation. Farmers say that drip irrigation works better with storage provided in farm ponds. When groundwater is pumped from great depths, changes in the force is observed with which the water gushes out. Due to such changes in force, it irrigates the less cropped area. The intermittent power supply further aggravates this situation. To overcome such intermittence, farmers pump groundwater into the farm pond when

[2] Fluorosis- a chronic condition caused by excessive intake of fluoride through drinking water or food, marked by mottling of the teeth and, if severe, calcification of the ligaments

power is available. Once the farm pond is full, it is then pumped to a drip system achieving pressure which irrigates more land at once. This has helped in maintaining soil moisture creating favourable conditions for increasing cropping area. The author and translators came across a young farmer who quit his studies to become a farmer. The 22-year-old Abhishek from Arikere says, "*Before I used to irrigate 2 acres of land. With the help of a farm pond, I can irrigate twice the land. Getting water to irrigate the land, was a big issue earlier. Now with the help of borewells and farm pond, the combination has enabled better water storage. This has helped in using water more efficiently and avoid wastage".*

The water stored in the farm ponds enable farmers to provide supplemental irrigation during extended periods of non-rainy days during monsoon. This protects against unexpected dry spells between June and September. The practice of pumping groundwater through borewells is very common in these parts, and thus many farmers are used to cultivating the second crop in Rabi season with groundwater. Changes are seen regarding the availability of water for an additional crop during Rabi and summer season. Mixed cropping is seen among farmers. The confidence to grow the third crop during summer is observed post-intervention. According to field data, six farmers reported planting four crops throughout the year versus only three farmers reporting the same before the intervention. Venkatesh of Gandlahalli village says *"Farm pond has helped in increasing the irrigated area by 0.5 acres. It has helped to cultivate more crops and provide water even in the summer season".*

In some cases, farmers with well-developed irrigation facilities started growing vegetables in the Kharif season. Thus with the intervention, the gross cropped area increased marginally (about 6%). The cropping intensity increased from about 95% to around 103% indicating the number of crops cultivated increased post-intervention.

Crops Average Production (in quintals/acre)	**Post Intervention**	**Pre-intervention**
Maize	31.16 (12)	40.9 (16)
Ragi	10.7 (10)	11.9 (15)
Mulberry	221.2 (8)	47.5 (2)
Red gram	8.26 (5)	1.8 (2)
Groundnut	4.19 (5)	11.31 (7)
Tomato	264 (5)	57 (5)

Figure 7: Changes in yields as reported by farmers. The numbers in the brackets denote observations for which average yields have been computed

The changes in crop yields as seen in figure 4 are significant in red gram, mulberry and tomato. But comparison made in case of tomato crop is useful as the number of farmers that grew before and after the intervention is same. Tomato crop is sensitive to irrigation practices. To obtain high yield and good quality of tomato, it needs a controlled supply of water throughout the growing period (Land and Water, Crop Information, n.d.). In this respect, farm ponds have supported irrigation during such critical phases and hence there is stark contrast in yield of tomato crop.

Switch to revenue crops

Assured storage of water influences farmer's choices to grow different crops which can bring them more revenue. As a result, diversification of crops is seen among farm pond owners. Switching to the short term, but water-intensive crops like Fruits, vegetables, flowers and mulberry have started influencing the cropping pattern of the farmers. The crops grown among the respondents are: ragi and maize among cereals, red gram among lentils are used mostly for domestic consumption. Fruits like banana, grapes and papaya are grown mostly among the farm pond owners. Vegetables like brinjal, ginger, tomato, potato, carrot, cabbage, beans, capsicum, cucumber, Chillies, broad beans, turnip, and ridge gourd were grown among both groups.

Crops like mulberry, marigold, lily, chandu flower, rose, cashew nut, and groundnut are categorised as cash crops for analysis under this study. Many farmers from Sidhlaghatta practice monoculture and grow the only mulberry. Manjunath is one such farmer growing mulberry on 2 acres out of 3 acres of his total land. He is content with the revenue he makes by selling mulberry but says "*if a farmer wants to introduce new crops, the assurance of water in farm ponds gives him the confidence to try the new crops*".

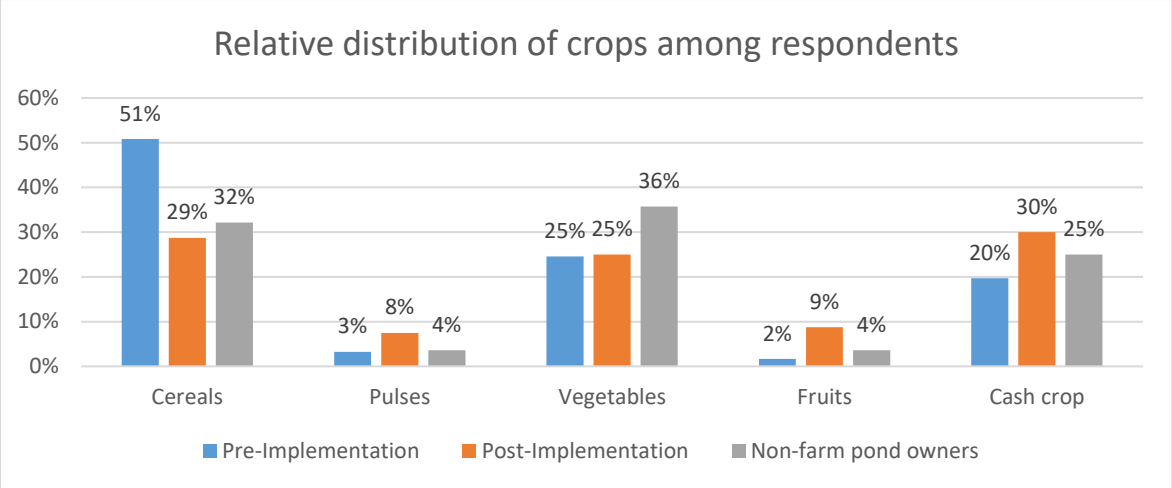


Figure 8: Different crops are grown among respondents

Herfindahl index (HI) has been computed to analyse the crop diversity among farmers. The value of HI varies between zero to one. It is one in case of perfect specialisation and approaches zero in case of perfect diversification. Following table depicts the HI values for each farmer.

Table 1: Comparing the Herfindahl index before and after farm ponds

HI values	Post Intervention (number of farmers)	Pre-intervention (number of farmers)	Category of Diversification
0.2-0.4	4	1	Very high
0.4-0.6	12	9	High
0.6-0.8	3	3	Moderate
0.8-1	11	17	Low

The HI values have gone down for a certain number of farmers post farm ponds. Hence, diversification of crops is seen, i.e. 16 farmers with a higher degree of diversification post-intervention than ten before the intervention. Anandappa, farm pond owner from Bevanahalli sharing his opinion about diversification says, "*Farm ponds have provided a mode to store water and spread water throughout the field. This helps in increasing the cropped area.*

Increasing in the cropped area means more crops. More crops mean more chances for better income".

The short span of these crops helps them harvest in a matter of months which in turn generates income from earlier seasonal basis towards a monthly basis now. Such observed changes in the efficient use of stored water for additional crops is the primary motivation for non-farm pond owners desiring to have farm ponds. The additional crops brought profits to farm pond owners, which is currently absent among non-farm pond owners as seen in figure 8.

Many farmers have echoed similar views about possibilities for more economic gains post-intervention. The numbers in the table below reflect the economies of farming amongst the two groups. Without any doubt, the revenues of the farm ponds show a staggering increase many times more than their past experiences. The economic condition of the non-adopters shows distress caused by several challenges farmers face and details will be discussed in the latter sections.

Parameter Average values	**Before Intervention**	**With Farm Pond intervention**	**Non-farm Pond Owners (Present)**	**Non-farm Pond Owners (Before)**
Total Land Owned (in Acre)	5.26	5.26	3.26	3.26
Gross cropped area (in Acre)	4.28	4.56	2.96	3.02
Cropping Intensity (in decimals)	0.94	1.03	1.11	1.19
Cropping Intensity (In %)	94.6	102.6	111	119
Total Cost of cultivation (in INR)	76240	151733	135083	65167
Total Sale from Agriculture Produce (in INR)	90650	537887	100275	27513
Net Return from Agriculture (in INR)	14410	386153	-34808	-37654

Figure 9: Changes in different parameters computed from study data

About four farm pond owners have reported more than 10 lakh INR in income from crops. If we were to remove their contribution from the total, then the average of net return from agriculture would plummet from 386153 INR to 50870 INR which is true for many farmers who are trying to get back their investments.

Non-farm pond owners showed higher crop intensification as they cultivated vegetables more than the farm pond owners. 38% of the non-farm pond opted for vegetables versus 29% among the farm pond owners. Hence, the cropping intensity of such farmers was about 7% higher than farm pond owners.

Cost-Benefit Analysis

This exercise is needed to evaluate whether the intervention is viable in the long term. The following calculations have been made based on the assumption that a farm pond lasts for 15 years. It is important to note that farmers have received up to 90 % subsidy prescribed for farm ponds, plastic sheet for lining, and motor pumps. The subsidy varies based on the size constructed by the farmers, their caste, and horsepower of the motor pump.

As per the study data, the average contribution made by farmers comes to INR 44200. The social benefits, migration and ecological benefits are difficult to express in monetary terms, hence are excluded from the calculation. The average inflation rate based upon the Consumer Price Index from 2008-2018 is 8.01 % (Inflation India, n.d.). Thus the interest rate of 8% is used for calculations. Most farmers constructed the farm ponds in the year 2016, calculating interest for two years is added to the average cost, and the present cost amounts to INR 51272.

Table 2: Cost-Benefit Analysis for different scenarios

Parameters	Scenario 1- Total farm pond owners	Scenario 2 – Farm pond owners without outliers
Present Value of Cost (INR)	51272	51272
Incremental Return from Agriculture (INR)	371743	36460
Incremental return from livestock (INR)	55668	55668
Expenditure on livestock (INR)	48000	48000
Net Cost (INR)	99272	99272
Net Benefit (INR)	427411	92128
IRR (%)	431	90

Due to various subsidies, increased crop prices and other unknown factors, the sales of agricultural produce has contributed to an increase in incremental return from agriculture. In this scenario, the Internal Rate of Return (IRR) is exceedingly higher than suggesting that farm ponds intervention bring fortune to farmers. Few farmers, i.e. 4 of them have reported sales of more than 10 lakh INR, if we take them as outliers for our discussion, then the incremental return from agriculture falls from 371743 in column 2 to 36460 in column 3 in table 2. The IRR also falls sharply from 431 to 90 % suggesting the gap between the scenarios. In both the scenarios, it can be concluded that investment in farm ponds is more than reasonable investment and opens the opportunity for the farmers to improve economic gains from farming.

Curious case of prices

The numbers suggest farm pond intervention has incredibly contributed in increasing incomes of these farmers. However, this is far from true as higher revenues is not uniform amongst all the farm pond owners. Several farmers didn't even get back their investment and made losses. The substantial revenue of a few farmers has biased the analysis presenting a more favorable picture that may not exist. Hence, it is necessary to highlight such cases not to mislead the reader and uncover the reality.

45 year old Anandappa from Gauribidanur seems like any other person who owns a farm pond. In 2012, way before the scheme was decided, he reported spending 1 lakh INR to construct a farm pond with the dimension of 40*40*12 feet. According to the sample data, his farm pond is the oldest and in use for the last 6 years and it never stands empty. Either rainwater or groundwater keep it from drying up. He owns 5 acres or 2.02 Ha of land and irrigated his entire land last season with the help of the farm pond. That year, he decided to grow tomatoes spending 6 lakh INR on the cost of cultivation. The yield was phenomenal, almost 750 quintals. He says he got 'lucky', because the price of tomatoes rose up right when he harvested them. The fluctuating prices suddenly rose upto 1200 INR per box weighing 15 kg. He sold the 5000 boxes which brought him revenue to the tune of 60 lakh INR. He made additional 7.5 lakh INR by selling 300 quintals of cucumber and almost the similar amount from sales of 180 quintals of beans.

Another farmer from Sidlaghatta reported that he made 18 lakh INR by selling 90 quintals of ginger. About 4 farmers have reported more than 10 lakh INR in net sales from crops. If we were to remove their contribution from the total, then the average of total sales from agriculture would plummet from 5, 37,887 INR to 1, 91,003 INR. Still far better than the net returns prior to the intervention.

There were others who ended up being on wrong side of the distribution who facing the wrath of the price crush of tomatoes. Farmers like Santosh from Chikkaballapura Taluk who grew tomatoes reported he incurred losses of 1 lakh INR as prices crashed. Similarly Ventakeshappa, 51 year old farmer from Gudibande Taluk whose farm pond was built in 2016. Prior to this, he grew tomatoes on 0.5 acres of land which produces more than 20 quintals but it fetched a mere 150 INR, he says " *the price crashed, I got merely 1 INR per box*".

4.3 Impact on Livestock

Maintaining livestock requires considerable investments in their food and healthcare. Because farmers have switched over to more milk yielding varieties of cows, it requires them to bear expenses on food from the market. Before the intervention, farmers reported greater numbers of livestock. The traditional occupation of the Gollas and Kurubas is associated with shepherding. However, they reported the proportion of livestock has decreased over the years. Given the strong presence of dairy cooperatives, milk from cows/buffaloes is sold which contributes to revenues from the livestock. There is a marginal increase in the revenue which is based on changes in the rates for milk over the years. The availability of water post-intervention has allowed farmers to grow maize which is used as fodder for livestock and reduced some expenses.

Hence, the expense for fodder is more in non-farm pond owners, with 42 % amount spent compared to 24% among farm pond owners.

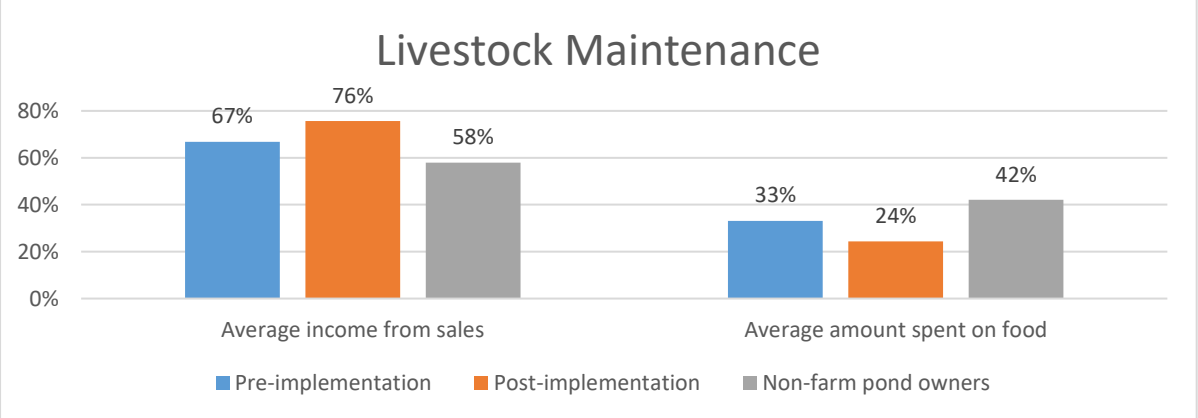


Figure 10: Maintenance of livestock among respondents

4.4 Impact on the lives of farmers and livelihoods

Impact on quality of life among farmers

With fair stability in the earnings, farmers have invested in assets which have impacted their social life. From the numbers, it may so appear there is no significant change except for TVs and bikes. More insights came from the qualitative responses and summed up that changes are more reflected in ownership of the latest equipment. For instance, they currently own colour TVs; some even LED TVs compared to bulky Black and White TVs they possessed earlier. Many farm pond owners have invested in bikes to help them commute for private and work-related activities. The keypad phones have given way to smart 'touch' phones. Some farmers responded that they had built homes, educated their children and married their daughter's post-intervention. The value of such changes can't be put down in numbers. One such farmer *Devaraj of Sopanahalli says "After farm ponds, there is an increase in the incomes from the crops. This has enabled me to invest in constructing a house for my family. This way, I feel my life has changed".*

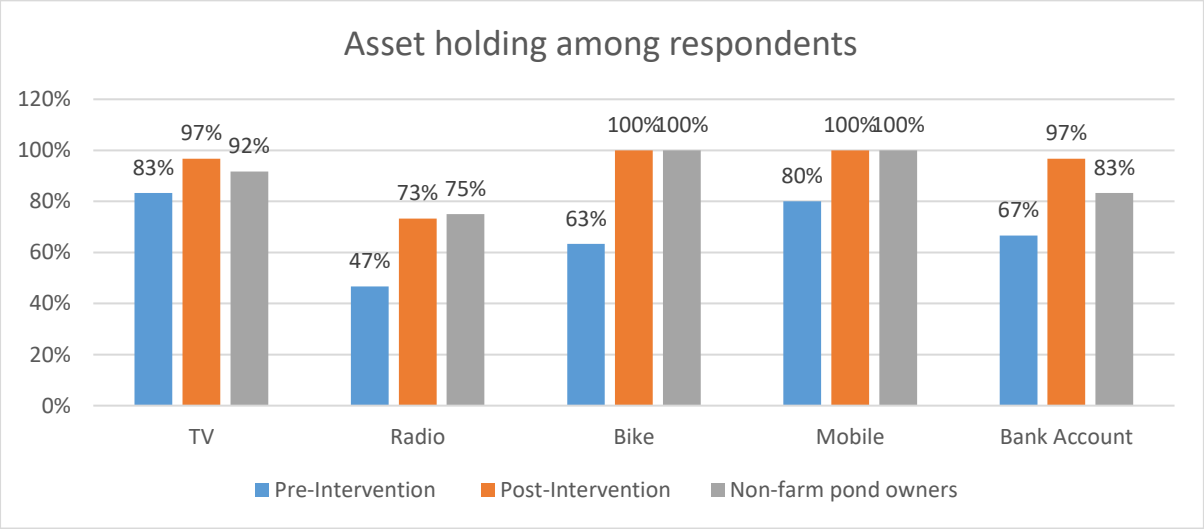


Figure 11: Asset holding among respondents

In some cases, the changes have not been just monetary. The sight of water in their farm ponds gives its owners enormous confidence. It is reflected in their attitudes towards farming, for instance, Venkatappa, whose story was mentioned earlier made losses for his tomato crop and says farm ponds can increase the area of irrigation, and he can grow more crops. He feels confident and patient about his ability to clear his loans. About 85% of the farmers reported cooking gas had replaced firewood they used earlier. This change had a positive impact on the

women and reduced their worry to get cooking fuel. It has become the task of mostly men who use bikes. When asked about changes in their diets, all responded they continue similar food eating habits with no significant changes.

Labour and Migration

Crops demand labour at various stages of the crop cycle, but it is highest during seeding and harvesting process. Post-intervention as the number of crops have increased, it has naturally created demand for labour who come from surrounding villages. The labour services are informally remunerated on a cash basis. This work attracts more women, as the daily wage for the men is higher as seen in the figures below. Farmers report that men are called for heavy manual work like digging which earns them 350-400 INR each day. Weeding, trimming, application of fertilizers, plucking harvest etc. are managed by women earning between 150-250 INR a day. Even though women are heavily employed during most of the crop cycle, they are paid less compared to men.

Gender	Average labour used/farmer	The average amount paid/day (in INR)
Male	18	376
Female	38	219

Figure 12: Comparing labour rates in the study region

When not as farm labourers, the young and middle-aged men migrate to towns like Chikkaballapura, Hindupur, Anantapur, Bangalore or Hyderabad for better avenues. They work as labourers and earn about 10000 INR per month, while salaried workers earn between 15000-25000 INR a month. As per the study data, migration is reported higher amongst non-farm pond owners indicating that farm ponds have contributed to the confidence of earnings from agriculture. However, further probing is required to ascertain this behaviour.

Migration	Farm Ponds owners	Non-farm pond owners
Present	20 %	33%
Absent	80%	67%

Figure 13: Migration among respondents

Farm ponds which are constructed for private gains also offer certain social benefits, reserved for livestock. In months of summer, it is a task for shepherds to find food and water for their

livestock. It was observed in villages of Gudibande block; shepherds brought their sheep and goats to farm ponds to quench their thirst. Owners of the farm ponds did not mind as they believed livestock should not be deprived of drinking water.

All tangible incomes and expenses have been computed, and comparison has been made among adopters and non-adopters in the following table. This reflects remarkable profits made among farm pond owners.

Parameter **Average values (in INR)**	**Farm Pond Owners** **(30 in number)**	**Non-farm pond owners** **(12 in number)**
Net expenditure	230510	181540
Net income	652351	149155
Net revenue	421841	-32385

Figure 14: Comparing incomes and expenses among farmers

Challenges faced by farmers

The discussions on net returns among farm pond owners suggest that they are mostly happy about the benefits from farm ponds, then it is far from the truth. Storing water does not translate into revenues, but it has only solved one problem in the entire value chain in agriculture, i.e. from ploughing until farmers receive remuneration from crop sales. As if uncertainty with monsoon was not enough, these following issues test their faith time and again. These are mainly about intermittent power supply and fluctuating crop prices.

Farmers interviewed were bitter about the intermittent supply of power. Farmers in Karnataka receive six hours of power for agriculture, which is the lowest in south India (Mallapur, 2018). The power is supplied in shifts of three hours each per day. Due to lower voltages and intermittent supply, several farmers reported shorting of their borewell power box. Sometimes, power is supplied at nights when shifts changes. Night irrigation posed inconvenience as they had to irrigate at odd times and danger of wandering on fields. Sometimes, the women also joined farmers to water the crops at night increasing risk of encountering by poisonous animals.

The most significant issue raised by the majority of farmers is of fluctuating crop prices. There is no stability in crop prices. In most cases, farmers did not receive adequate prices incurring

losses and were unable to repay their loans. As discussed earlier, the economic benefits as computed here is not the indicative of the real farmers' face in Chikkaballapura district. A farmer from Chintamani says "*farmers usually don't get the proper amount for their produce. This increases our vulnerability to losses. Production is heavily dependent upon high input costs like fertilisers. The market doesn't fetch good prices for their produce. Also, crop diseases are affecting crop production*". During several field visits under this study, the author observed a large number of tomatoes being dumped on the road due to low prices. Farmers said transporting the harvested tomatoes is more expensive than their worth. The prices also fluctuated for other dominant crops like maize, tur dal, and groundnut. Crop diseases and rising input costs were also flagged as concerns. Severe gaps in the value chain of agriculture contribute to farmer distress which is a pressing problem in need of immediate attention.

5. Concluding Remarks

The study shows that farm ponds helped farmers to use water more judiciously. Dependency on rainfed agriculture has reduced post intervention and with the use of groundwater has resulted in a marginal increase of 6% in gross cropped area and increased cropping intensity from about 95% to 103% post farm ponds. The major impact is seen in the cultivation of an additional crop during Rabi and summer season. There is a rise in confidence among farmers to take up the summer crop. It has helped farmers to overcome some pre-existing issues to an extent. For instance, due to the storage offered in farm ponds, the drip systems have worked better to overcome concerns of adequate pressure and intermittent power supply to increase irrigated area.

When such concerns were dealt, farmers switched to short-term, water-intensive crops. Fruits, vegetables, flowers and cash crop like mulberry are influencing their choices for more revenues at short intervals. All these changes have contributed to the increase in the economic gains post-intervention. The analysis observes an astonishing increase in revenue from agriculture alone when the entire sample is considered. Given the strong presence of dairy cooperatives, revenue from milk continues amongst all farmers who own livestock. However, the cost of maintaining is reported lesser among farm pond owners as they grow some fodder from the increased availability of water.

Such economic changes have directly impacted their social standing bringing changes in the quality of such farmers. The older belongings are replaced with the modern ones. Some indirect changes like attitudes towards farming, education of children can't be assessed quantitatively in monetary units. Farm ponds mean to quench the thirst of wandering livestock. Post-intervention, as the number of crops has increased, it has created demand labourers. Due to existing mindsets which portray women as inefficient and are mostly involved in less labour intensive work, they are paid less compared to men. As the transaction is informal, such practices cement the man-woman divide on equal payment every single day. As per the study data, migration is reported higher amongst non-farm pond owners indicating that farm ponds have contributed to the confidence of earnings from agriculture.

The benefits from farm ponds narrated above are only one part of the story. There is another side to the story that needs equal attention. Harvesting water does not directly translate into revenues, as it only helped them to use water efficiently. It seems to have solved one concern in the entire value chain in agriculture. Intermittent power supply still troubles farmers and sometimes relegated them to night-time irrigation causing inconvenience. Another significant issue raised by the majority of farmers is that of fluctuating crop prices. As a result, the economic benefits are not uniform amongst all the farm pond owners and in most cases depends upon "stability of price". The unpredictability of the monsoon is now well known, but the prices of the crops seem like a lottery. The Minimum Support Price (MSP) has been a dicey issue for the government and farmers alike. If there was a bumper crop in the preceding years, it impacts the prices in subsequent year's crop. Such instability in crop prices has impacted farmers who incurred losses and henceforth were unable to repay their loans. Hence, there is a need for creating an enabling environment where all processes are made robust and offer incentives in the entire value chain of agriculture to afford value to farmers.

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