Baseline of Jaldhara V project

2018

Bhawna Mangla

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1 INTRODUCTION

In India, since four decades, access to groundwater has increased through millions of private bore wells. This has led to decline in gravity-flow irrigation and the upsurge of a growing 'water-scavenging' irrigation economy (Shah, 2009)[i]. According to Minor Irrigation Census, in 2001, the number of groundwater irrigation structures has grown considerably with almost every fourth household owning at least one such resource (Shah, 2009). The overuse of groundwater resources is considered to be a major problem with increasing dependence on tube/bore well being used for irrigation. The data from Central Groundwater Board shows that the proportion of unsafe (semi-critical, critical, and over exploited) districts has risen from 5% in 1995 to 33% in 2004 (Shankar et al, 2011)[ii]. The semi-arid regions in India are most affected one because of perpetual water scarcity due to limited availability of surface water resources. States in southern part of India suffers from worst water situation for consecutive two cropping season despite two monsoons a year. In the four states of Andhra Pradesh, Karnataka, Kerala and Tamil Nadu; 68 of 89 districts were declared drought-hit (Venkatesh et al, 2017)[iii]. There is evidence of negative causal relationship between farm level water scarcity and groundwater use efficiency implying that inefficient use of groundwater resources is causing water scarcity at farm level (Varghese et al, 2013)[iv]. The whole situation is worsening day by day and intensity of scarcity of water is getting intensified with every passing second. The existing scenario can be prevented from worsening either by reduced dependence on groundwater resources or by increasing the pool of these resources with sustainable methods of harvest and recharge of rain water.

Owing to water crisis, Sehgal foundation in collaboration with Coco Cola Foundation planned a project focusing on construction and rejuvenation of rainwater harvesting structures in select over-exploited zones districts of Andhra Pradesh and Karnataka respectively. The objective of the project is to improve groundwater recharge capacity by mass recharging through building of runoff water collection and storage structures for water conservation. The benefit of the project is expected to benefit the farming population of four villages[1] in Kolar district in Karnataka and seven villages[2] in Anantapur district in Andhra Pradesh.

The interventions planned under the project includes construction of five new check dams in Anantapur district affecting the agrarian economy of the villagers of seven villages. In Kolar region, the project plans to rejuvenate five traditional tanks through desilting and renovation works. In addition, the project includes creating awareness among the beneficiary population on water conservation. Water and tank user groups would be formed to train them on maintaining sustainability of the structures created as well as efficient ways of water conservation.

2 STUDY OBJECTIVE AND METHODOLOGY

The study captures the existing situation of the intervention region based on selected set of indicators outlined for the project monitoring and evaluation plan. The findings from baseline report would be used as a point of reference to monitor and evaluate the impact of the project against the set of indicators post project implementation.

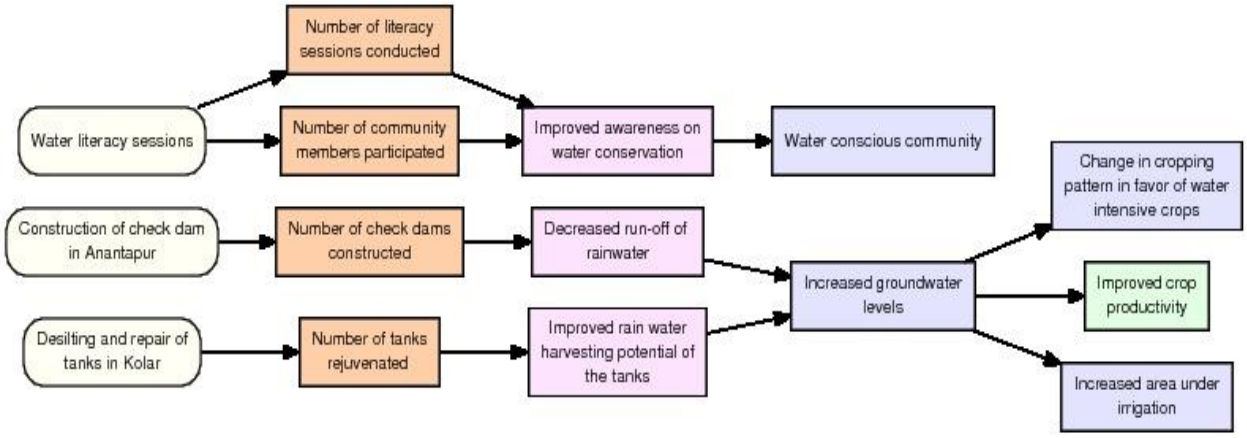
[1] Villages in Kolar are Halepalya, Aningnahalli, Kempasandra and Obatti.

[2] Villages in Anantapur are Nallapareddi Palli; Kodur; Mudapalli; Subbraopeta; Madirepalli; Kandurparthi and Timadapalli

The study has been conducted in seven intervention villages in Anantapur and four intervention villages in Kolar; with primary focus on water and agriculture situation in the region before the implementation of the project. There are two groups of respondents; one, who is expected to receive benefit of the project activities; and other group is control group, who do not receive any benefit from the project. The sampling strategy applied is stratified random sampling criteria for the farming households in the intervention region with adequate control respondent group. The criteria of selection of farmer in the former category include farmers who have their farmland within one kilometer radius from the proposed site (check dam in Anantapur and tanks in Kolar). In both the regions, two proposed sites were too close (less than 500 meters) to be considered as different sites. Therefore, the sampling is done around three distinguished sites and clubbed for fourth and fifth site in both the region. The targeted sample in the region eighty farming households from each of the eight sites making a total sample of 640 households[3]. In addition to this, control region was selected four kilometers away from the intervention region having similar socio-economic and cropping pattern. Forty farming households were interviewed for each control region of the eight sites. The targeted sample for the non-intervention region (control) is 320[4].

The quantitative data for the study has been collected using structured interview schedule from the respondent farmers in both intervention and non-intervention region. The quantitative findings are triangulated with qualitative information collected using focus group discussions to validate the findings of the study.

Figure 1: Log Frame



3 MAJOR FINDINGS OF THE STUDY

The project plans to improve the groundwater situation in the two regions- Anantapur and Kolar. Since agriculture is highly dependent on groundwater for irrigation, improvement in groundwater is expected to improve agriculture situation in form of increase in area under irrigation, better yield and net revenue for farmers. Also, this could affect the cropping pattern in favor of more remunerative water intensive crops with improvement in availability of water. This section details the findings in two sections for two districts-

[3] However, due to small population size and exclusion of inconsistent interview forms, sample of 80 farmers from each site could not be met. The final collected sample for Anantapur is 304 and 253 for Kolar.
[4] After deletion of inconsistent responses, the final sample collected is 158 in Anantapur and 154 in Kolar.

Anantapur and Kolar. The findings are further sub-divided into five sections- (1) socio-economic; (2) land and cropping pattern; (3) cereal and vegetable crop details; (4) Plantation crops; and (5) livestock.

3.1 ANANTAPUR

Anantapur district is one of the four districts of Rayalaseema Region and the largest among the twenty-three districts of Andhra Pradesh. The district is one of the economically backward districts which is chronically affected by droughts. The geographical area of the district is 19,197 sq.km and is inhabited by a population of 40.83 lakhs. The population density stands to be 213 persons per sq.km (Census, 2011). The total net area sown is 824955 ha (Central Ground Water Board (CGWB) Report on Anantapur, 2013)). The important crops harvested in the district are paddy, jowar, finger millet, chillis, sugarcane, onions and groundnut. The two mandals- Chilamathur and Narpala are recognized by CGWB as two of the five zones notified for regulation of groundwater development in Andhra Pradesh in the year 2013.

3.1.1 Socio-economic and demographics

The socio-economic profile of the respondent farming households helps us to understand the deconstruct the social, economic and cultural context of a region. This includes information on caste category, ration card holding pattern, occupational engagements and about the demographics. A lot of these factors define the asset ownership and access to various resources. With respect to the study region, the Telugu speaking inhabitants of the Chilamathur and Narpala mandal of the Anantapur district live in a patriarchal setup with an average family size of four. 94% in intervention and 92% households in the non-intervention region are headed by males. With respect to religion distribution, the majority of the respondents in the intervention region are Hindu (89.5%) except for few Muslim population concentrated in the village Subaraopet. The caste distribution in the Figure 2 depicts the dominance of the other backward caste group with a moderate presence of scheduled caste and general caste group. The economic caste group is completely dominated by the households belonging to below poverty line with 90% households in intervention region and complete 100% in non-intervention region. This is primarily due to limited earning

Figure 2: Caste distribution of the respondent population (in percentages)

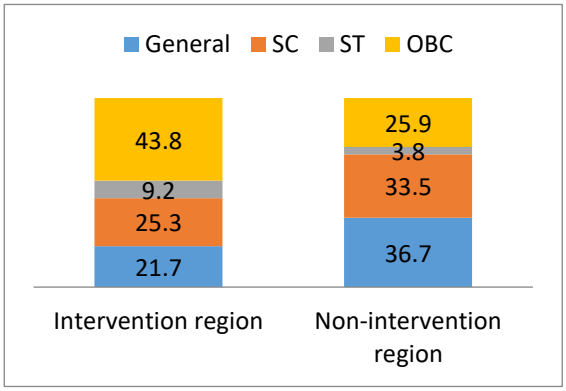
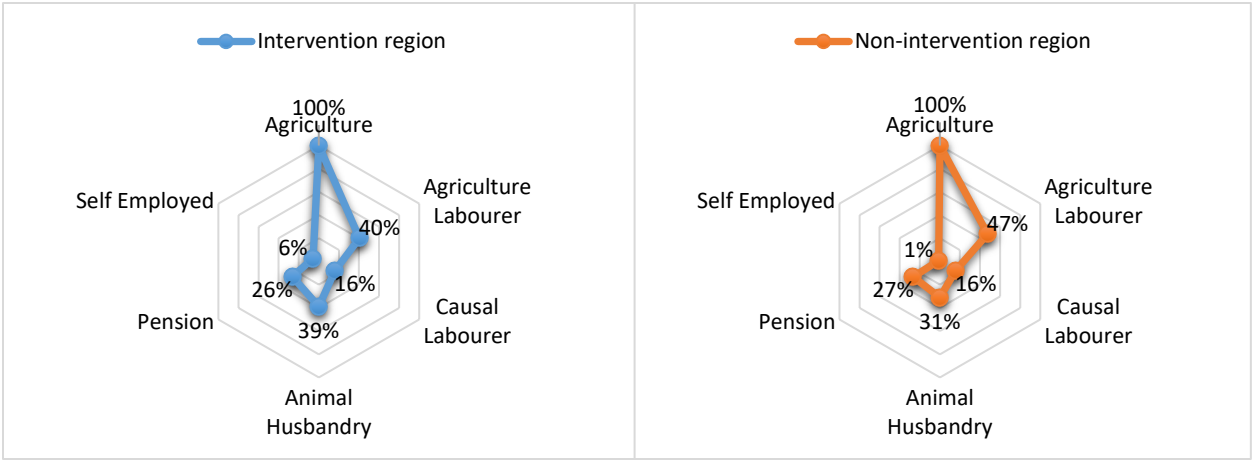


Figure 3: Occupational pattern of respondent households



opportunities in the nearby region. The respondent households choose agricultural labour as second option for earning livelihood. Women in the region are also found to travelling within ten kilometer radius to nearby villages for agricultural labour work. In most of the households, at least one member is found to be migrating (both seasonally and permanently) to the nearby regions for work opportunities in the capacity of casual laborer. They often join factories, brick kiln, mining, etc. type of labor work.

3.1.2 Land utilization, water levels and cropping pattern

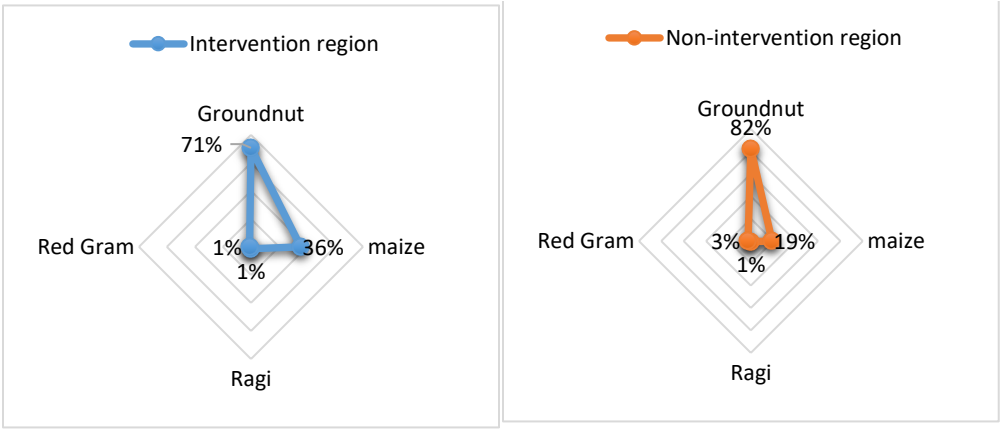
Land is an important asset due to its limited availability. Land can be used for various uses- agricultural and non-agricultural; remunerative and non-remunerative; residential and commercial. In specific context to rural areas of Anantapur, land is majorly used in agriculture. However, the use is sub-optimal due to rocky terrain making the land barren and unfit for agricultural use. The agriculture use of land explains the cropping intensity as well as intensity of water used in cultivation. The table below shows the area under cereal and vegetable cultivation. The cropping intensity is found to be less than one due to area covered by plantation crops and mulberry plantations for sericulture. The cropping pattern along with water levels suggests the pattern of cultivation, availability of water, and degree of dependence on groundwater resources. Also, predominance of resource poor farmers who do not have access to groundwater sources is forced to practice rain-fed cultivation of single crop in the entire year. Resource rich farmers have access to irrigation sources cultivate multiple crops, vegetables and plantation crops. But the proportion of such farmers is not high to pull the cropping intensity more than one.

Table 1: Land details (Net sown area, Gross cropped area and Cropping intensity)

	Intervention region	Non-intervention region	Total
Net Sown Area (in acres)	**1029**	**573**	**1602**
Gross Cropped Area (in acres)	**883.45**	**530.50**	**1413.95**
Cropping intensity	**0.86**	**0.93**	**0.88**

The cropping choice of the respondent farmers indicates the preponderance of two crops in the cultivation pattern which includes groundnut (75%) and maize (30%). Other crops like finger millet and red gram are cultivated by less than 2% of the respondent group. A large proportion of plantation crops are covered by citrus limetta (*mosambi*) followed by mango, coconut and drumstick.

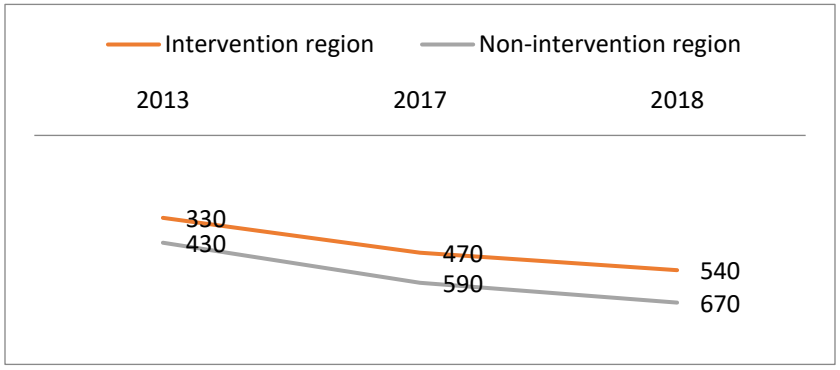
Figure 4: Cropping pattern (Percentage of respondent farmers growing particular crop)



The water levels in the region have shown a major decline over the last five years (Figure 5). Problem of water scarcity is a recent phenomenon which has been initiated around 10-15 years before. This has resulted in continuous spell of droughts in the region. As far as ownership of irrigation sources are concerned, only 22% farmers in intervention region and 15% farmers in the non-intervention region have reported to own ant form of

irrigation source. Among the resource rich farmers who own irrigation source, majority owns bore well (only 5% in intervention region have working dug well) with electric pump for extraction. In last decade, a lot of traditional dug wells have gone dry with shrinking groundwater resources. The electricity connection comes with no variable cost except for minute monthly service of INR 30 per connection. The counterpart farming population which do own any irrigation source are dependent on vulgarities of monsoon for practicing rain-fed cultivation in absence of water sharing practices in the region. On exploring the reasons for absence of water trade market, it was revealed that water available is not sufficient for the owners to irrigate sufficiently because limited extraction of ground water is possible owing to low voltage of electricity. The above situation highlights the vulnerabilities caused due to water scarcity and the planned project intends to provide sustainable water solutions for the same.

Figure 5: Change in water levels in last five years (in feet)

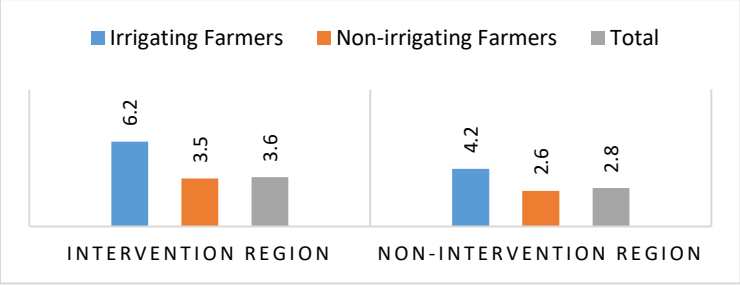


3.1.3 Crop dynamics[5] for two major crops in the region

A majority of water supply in India is consumed in agriculture sector primarily through irrigation[v]. Therefore, it becomes vital to study about cropping dynamics when to understand the groundwater situation. The objective of the project is to improve farm economics with improvement in ground water resources and therefore, in this section we will discuss the cropping dynamics of the two major crops grown in the region- groundnut and maize. It is important to note that irrigation has a vital role to play in the crop dynamics whether it is seed rate, yield per acre cost or net revenue per acre.

Ground nut is the major crop in the region since it is cultivated by 71% farmers in intervention region and 82% farmers in the non-intervention region. Of the total cropped area under cereal crops, groundnut is cultivated in 74%. The amount of seeds used in per acre cultivation of the crop is 38.9 kilograms in intervention region and 39.9 kilograms in non-intervention region. Since the availability of groundwater resources is acute, irrigation is provided by only 5% farmers in the intervention region and 7% farmers in the non-intervention region. The majority of the farmers rely on rainwater for the crop water requirement.

Figure 6: Yield of groundnut (quintals per acre)

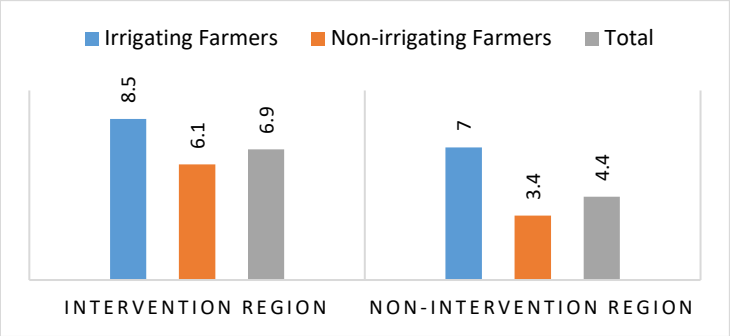


The range of irrigation cycles varies from two cycles to twenty cycles with an average of 8.5 cycles. The average cost of cultivation is approximately INR 7193 in the intervention region and INR 6498 in the non-intervention region. The yield of the crop varies significantly with irrigation (Figure 6). The yield with irrigation is 72% more with no irrigation for the intervention region.

[5] Crop dynamics explains the agronomic information of the crop cultivated in the region, which includes seed rate, irrigation pattern, yield, cost and revenue.

The second important crop of the region is maize is cultivated by 36% farmers in the intervention region and 19% farmers in the non-intervention region. The seed rate of the crops is 26.8 kilograms in the intervention region and 28.1 kilograms in the non-intervention region. The proportion of farmers irrigating maize is relatively more than the groundnut. The irrigation is given by 18% farmers in the intervention region and 20% farmers in the non-intervention region. On an average number of irrigation cycles provided by the respondent farmer in maize cultivation is eight in intervention region and six in non-intervention region. Similar to groundnut, yield of irrigated maize cultivation is significantly higher than non-irrigated maize cultivation (Figure7). The yield in intervention region is 39% more for irrigating farmers than non-irrigating farmers. In non-intervention region, yield increases by 106% when irrigated. The cost of cultivation in maize cultivation ranges from INR 1500 to INR 15000 depending upon choice of labor (imputed or hired); availability of mechanized tools (owned or rented). The average cost of cultivation in the region is INR 6880. Since irrigation is found to be significantly affecting the yield, improvement in availability of water is expected to increase the overall yield of the region. This would further be expected to increase the returns to cultivation for farmers.

Figure 7: Yield of maize (quintals per acre)



3.1.4 Livestock

Livestock is an important part of farming household which provides organic fertilizer for the agricultural field to increase its productivity and milk for the farming household to boost nutrition balance while consuming crop residue as fodder. It also supports farming household by providing additional source of income generated from the sale of milk and milk products. However, due to lack of water and fodder (grass), household dependence on livestock is also decreasing overtime. This section informs about the existing milk yield of the cow and buffalo in the region. The information is collected for livestock that was reported to be lactating when the data collection was ongoing.

In Anantapur, cow is found to be a popular cattle option for the households that practice animal rearing. In the intervention region, 22% of households own lactating cows yielding milk of five liters in a day on an average. Among these, 88% households are found to selling milk contributing INR 3809 on an average to monthly household income. Similarly, in non-intervention region, 14% households are found to be having lactating cows. The average yield is 5.3 liters per day contributing to an additional monthly income of INR 4268 per household on an average.

Lactating buffalo is owned by only 3% households in the intervention. The milk yield is found to be 2.7 liters per day ranging from a minimum yield of one liter to a maximum of six liters. All the households are found to be owning only one buffalo per household but still selling the milk for additional income. On an average, buffalo contributes to an average of INR 2776 in the monthly income of the households. While in the non-intervention region, 4% farmers have lactating buffaloes yielding 4.4 liters of milk on a average day and contributing INR 5296 monthly to household income.

3.2 KOLAR

Kolar district lies in the eastern dry zone of Karnataka and is famous for erstwhile Kolar Goldmines. It covers an area of 3979 sq.km and population of 15.36 lakhs. The population density stands to be 386 persons per sq.km (Census, 2011). This district experiences tropical climate throughout the year. There is a long history of existence of ancient tanks which contributes to district's prosperity and development. There are 3298 tanks which are highest number in the state. In the absence of surface water irrigation system ground water is the main source of irrigation. The district has highest number bore wells in the state.

3.2.1 Socio-economic and demographics

The socio-economic profile of the respondent farming households helps us to understand the deconstruct the social, economic and cultural context of a region. The Kannada speaking inhabitants of intervention region of Kolar district live in a Hindu patriarchal set (more than 90% households are headed by male member). On an average, six members constitute a family in intervention region. There is less than 2% presence of general caste households and is predominantly inhabited by other backward caste category households. Similar to Anantapur, the majority[6] of the households hold Below Poverty Line (BPL) ration cards. According to Karnataka government stipulation, households having land below 5 acres are eligible for BPL. So people have divided land among different relatives in a way to meet eligibility criteria for BPL cards and avail special benefits. While the choice of respondents for the study is farmer purposively, casual labor is found to be the second most common income source for the households in both intervention and non-intervention region(Figure8).

Figure 8: Occupational engagements of respondent households:

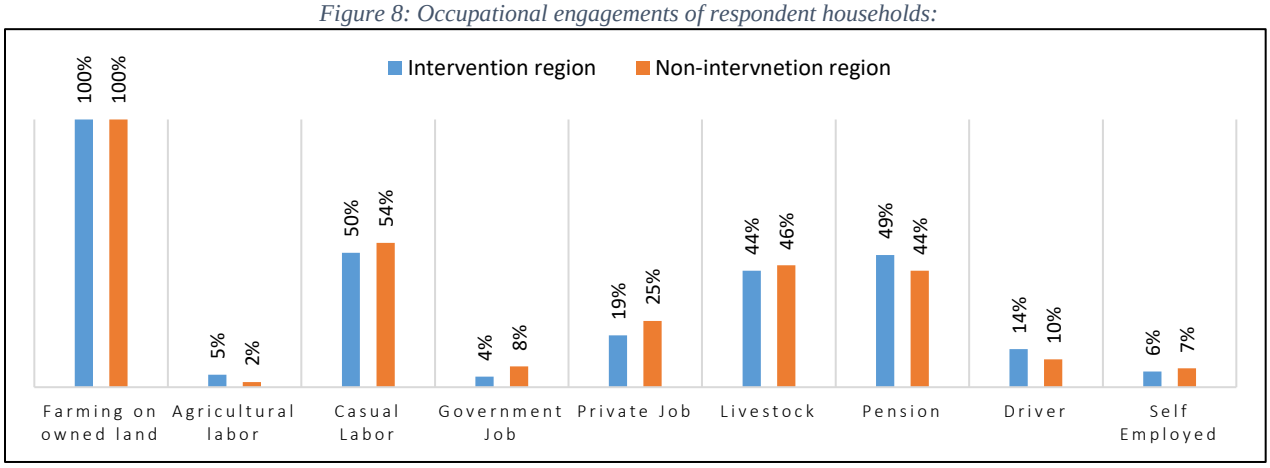


Figure 8: Occupational engagements of respondent households:The above table depicts two things- (1) diversity of income sources for the households including farming, casual labor, livestock, pension, etc; and (2) similarity in the choices between intervention and non-intervention region. In most of the households, at least one member is found to be migrating (both seasonally and permanently) to the nearby regions for work opportunities in the capacity of casual laborer. They often join factories, brick kiln, mining, etc. type of labor work.

[6] 97% in intervention region and 94% in non-intervention hold BPL cards.

3.2.2 Land utilization, water levels and cropping pattern

Land is an important asset due to its limited availability. Land can be used for various uses- agricultural and non-agricultural; remunerative and non-remunerative; residential and commercial. In specific context to rural areas of Kolar, land is majorly used in agriculture. The agriculture use of land explains the cropping intensity as well as intensity of water used in cultivation. Similar to Anantpur, the cropping intensity in the region is found to be less than one. This is largely due to acres of land used for fruit plantations, mulberry for sericulture and eucalyptus plantations. The cropping pattern along with water levels suggests the pattern of cultivation, availability of water, and degree of dependence on groundwater resources. According to Annual Season and Crop Statistics Report, in the year 2013-14, only 5.4% of net land available for cultivation was cultivated more than once. Similarly, in the intervention, a majority of farmers are found to be cultivating only once or even less than once. Due to paucity of resources, a majority of farmers do not own irrigation sources and are forced to leave their land fallow in the rabi season.

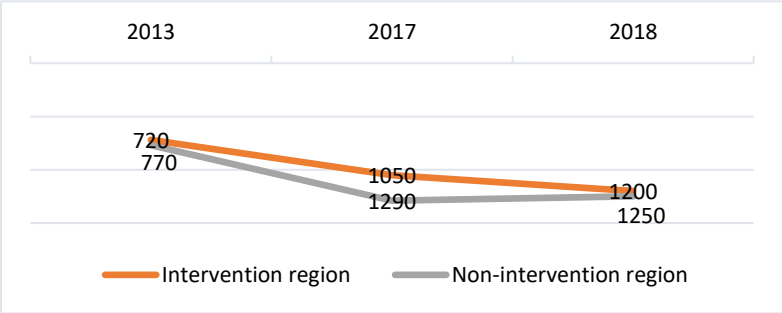
The cropping pattern in the region highlights preponderance of only one major crop- finger millet; cultivated by 86% farmers in intervention region and 94% farmers of the non-intervention region. Crops like tomato, potato and marigold are cultivated by less than 15% of the respondent farmers. In addition, farmers are also found to be cultivating vegetables like beans, capsicum, carrot, cauliflower, cabbage (each crop less than 2%). These are primarily the farmers having their own irrigation sources. Furthermore, plantation of Eucalyptus is practiced by one-fourth of the farmers in both the region.

Table 2: Land details (Net sown area, Gross cropped area and Cropping intensity)

	Intervention region	Non-intervention region	Total
Net Sown Area (in acres)	**485.2**	**313.39**	**798.59**
Gross Cropped Area (in acres)	**364.05**	**221.76**	**585.81**
Cropping intensity	**0.75**	**0.71**	**0.73**

With respect to ownership of irrigation resources, the baseline data reveal that 32% farmers in intervention region and 21% farmers in non-intervention region own irrigation sources. Among these farmers in the intervention region, fourth-fifth extract groundwater from bore well and one-fifth extract from dug wells. Electric pumps are used to extract water at no cost. Unlike Anantapur, farmers in Kolar are charged nothing (not even minimal service charge) to extract groundwater. Therefore, the irrigation cost is inclusive of only fixed component and variable cost of extracting water is zero. However, despite free availability of water resources fail to create water trade in the region. Farmers who do not own irrigation sources practice rain-fed cultivation only. Additionally, in both the regions, a little more four-fifth of the farmers owning irrigation sources use drip methods to provide water to the fields. Since majority of these famers are cultivating vegetables, which are highly water intensive, drip irrigation is essential to maintain sufficient moisture in the farmland. As far as levels of groundwater are concerned, according to water levels reported by respondent farmers for the year 2018, 2017 and 2011; they have found to be declined by 65% in intervention region and 63% in non-intervention. With implementation of the project, the intervention region is expected to harvest rain efficiently and thereby checking the depletion of groundwater levels.

Figure 9: Change in water levels in last five years (in feet)

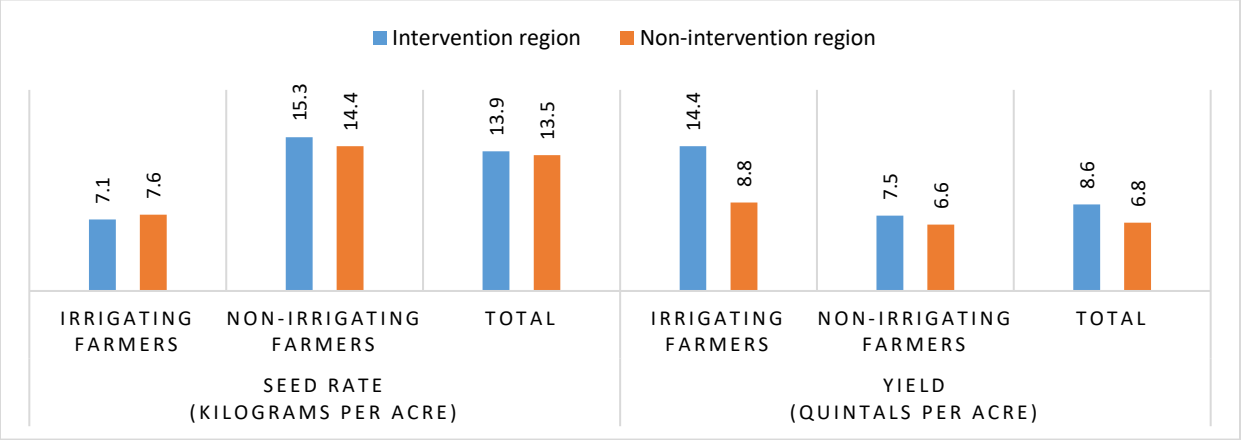


3.2.3 Major cereal and vegetable crop cultivation

The primary objective of the project is to improve groundwater recharge and therefore increase the water available for irrigation leading to improved yield of the crops cultivated in the region. This section will discuss yield and irrigation dynamics of major crops like finger millet, tomato, potato and marigold.

Finger millet is the most popular choice (86% farmers in intervention region and 94% farmers of the non-intervention region) of crop cultivated in the region because it could be cultivated with and without irrigation by farmers having or not having irrigation sources respectively. Irrigation defines the inputs and

Figure 10: Seed rate and yield of finger millet



thereby cost of cultivation considerably. In case of finger millet, baseline data suggests that seeds used per acre of plot is significantly different[7] for farmers who are providing irrigation and who are not. Among the farmers cultivating finger millet, 17% farmers in intervention region and 14% farmers in non-intervention region are providing irrigation to the crop. The seed rate is almost double for the farmers providing no irrigation. This is because farmers believe that more seeds would be required for sufficient germination in absence of artificial water. With respect to yield of the crops, in the intervention region, yield for irrigating farmers is double than that of non-irrigating once. The difference is yield for irrigating and non-irrigating farmers is found to be statistically significant at 5% level of significance. The comparison highlights the importance of irrigation which provides double the yield with application of half the amount of seeds. Furthermore, the average cost of cultivation of finger millet on a one-acre plot is INR 11,065 for farmers in intervention region and INR 12,584 for farmers in non-intervention region.

The second most popular crop cultivated in the region is tomato (19% farmers in intervention region and 8% in non-intervention region). It is exclusively cultivated by farmers having access to own irrigation sources. Irrigation to the crop is largely given thrice a week making a total of forty-eight irrigation cycles provided during four months of cropping cycle. Tomato is largely staked[8] with use of drip irrigation to provide water. The average yield of tomato in the intervention region is found to be 136 quintals per acre which is five quintals more than the average yield in non-intervention region.

Overall, farmers with access to irrigation resources are found to be cultivating water intensive vegetables in contrast to their counterparts cultivating rain-fed crops exclusively. Thus in this region, with availability

[7] At 5% level of significance using ANOVA test.

[8] Staking provides ability to the tomato plant to grow without bending to the point where it breaks the plant stopping its growth. It also prevents the fruit from beginning to rot as it sits on the ground over the time as the stalk grows.

of more water post project completion, it is expected that farmers will change their cropping pattern from rain-fed farming to water intensive farming.

3.2.4 Plantation crops

Horticulture sector has contributed more than one third share to the economy of agriculture and allied sectors and has emerged as an important component of the economy of the State (Economic Survey of Karnataka, 2018). The climatic conditions in Karnataka are congenial for medicinal and aromatic plantations. The land of the region also accommodates plantations which also consumes lot of groundwater. Since the project would improve groundwater levels and spoil moisture, this section discusses the plantation pattern in the region before the implementation of the project. The land in the region is utilized for growing plants like eucalyptus cultivated by one-fourth of the population. In addition, coconut, mango and silver trees are cultivated by less than one-tenth of the respondent farmers.

In context of eucalyptus plantation, it is found to be highly remunerative where a farmer is required to invest in plantation in the beginning and the tree provides an approximate of INR 50,000 to 1,00,000 per acre. Discussions with the villagers reveal that the tree extract water and mineral from ground and doesn't need any pesticide or insecticide. Therefore, eucalyptus plantation requires investment at the time of setting up in form of saplings, otherwise, there is no variable cost of maintaining the plantation in particular. The market for its produce is gigantic. Due to its medicinal properties, essential oil extracted from leaves is widely used in soaps, mouth wash, massage oils, bug repellant and air fresheners. The buyers from the industry bears the cost of harvesting and transporting of leaves of the plant themselves.

A different angle to plantation, especially to eucalyptus, is that a lot of studies have reported them to be the reason for depleting groundwater resources (Davidson, 1995)[vi]. The characteristics of eucalyptus makes it high bio-mass producing plant but also it consumes lot of water. The groundwater consumption makes other species in the vicinity to compete for water resources leading to allelopathy and fastens the rate of depletion. It is not advisable to plant such tree in low rainfall areas, whereas, Kolar has been declared drought prone since 2011.

3.2.5 Livestock

Livestock is an important part of farming household which provides organic fertilizer for the agricultural field to increase its productivity and milk for the farming household to boost nutrition balance while consuming crop residue as fodder. It also supports farming household by providing additional source of income generated from the sale of milk and milk products. This section informs about the existing milk yield of the cow and buffalo in the region. The information is collected for livestock that was reported to be lactating when the data collection was ongoing.

In Kolar, findings reveal that cow is a popular cattle choice in the study region where approximately one–fourth households are found to be owning high milk-yielding varieties of cow. The yield of milk ranges from one liter to twenty-four liters in a day. In the intervention region, 24% households own lactating cows yielding milk of 7.2 liters in a day on an average. Among these, all the respondent households are found to selling milk contributing INR 7451 per cow on an average to monthly household income. Similarly, in non-intervention region, 28% households are found to be having lactating cows. The average yield is 10.5 liters per day contributing to an additional monthly income of INR 8738 per cow on an average.

On the other hand, buffaloes are owned by only 8% households in the intervention having. The milk yield is 4.4 liters per day ranging from a minimum yield of one liter to a maximum of twelve liters. All the households are found to be owning only one buffalo per household but still selling the milk for additional

income. On an average, a buffalo contributes to an average of INR 3309 in the monthly income of the households. While in the non-intervention region, 6% farmers have lactating buffaloes yielding 2.5 liters of milk on an average day and contributing INR 1540 monthly to household income.

4 REFLECTIONS

Overall, the groundwater resources in the intervention region is already declared over-exploited by Central Groundwater Board of India, there is a dire need to increase groundwater levels and check on further depletion. The planned rain water harvesting project for the region is expected to contribute significantly to the larger objective of conservation of water. However, the regional dynamics with respect to absence of water sharing market despite nil variable cost of extraction could limit its impact. Especially, in Kolar, which have considerable water-intensive vegetable cultivation by owners of irrigation sources. This also makes building capacities of communities on water conservation extremely crucial. A water conscious community is essential to understand the concept of water conservation to use limited efficiently.

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