Success Story of Watershed Management: Case study of Naregudem Village, Kattangur Mandal, Nalgonda District, Telangana

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Abstract
Water supports life, population growth and itsImpact in all development spheres. With only 2.4 percent of the world landmass and 4 percent of the renewable water supplies, India supports 18 percent of the world population and 15 percent of all livestock. India largely relies on its agricultural sector as it contributes to its 14 percent GDP and 11 percent exports. Roughly half of the population relies on agriculture as their main source of income and other industries use agriculture as a source of raw materials. 76 percent of the global population had less than 5,100 cubic metrics per annum percapita water availability. It is estimated that by 2030 most population of the earth is going to be living under low supply of water (source: International resource panel (IRP)). The categories of water users in the world are estimated not to change much projecting an increase in the consumption of water considering urbanization in the developing countries. The control of water scarcity has been aimed at improving the efficiency of water use and closing the shortage of infrastructure through watershed management.
India has the Integrated Watershed Management Programme (IWMP), which is carried out by the Ministry of Rural Development in Telangana with the objective to reduce the impact of long-term famine. This program facilitates planned agricultural development in rural areas with planned watershed interventions. A good example of how watershed management and livelihood intervention strategies can be successfully integrated is in Naregudem village in Kattangoor Mandal, Nalgonda district.

Keywords : Watershed Management, Agriculture, Urbanization, Naregudem, Success story.

Introduction

Water is an essential natural resource without which there can be no life and development. The water supply of the site which is sometimes tapped, might run dry or run out. Conversely, the under soil of the earth is often rich with the ground water which occurs in various forms and densities. The exploitation of groundwater to develop agricultural, residential, industrial and rural supply systems has been on the rise in the development of any nation. Owing to the anthropogenic factors affect on the increasing water consumptions in metropolitan areas (Carpenter et al.,1998, Jarvie HP et al.,1998), water resources have deteriorated through the industrial and agricultural needs and erratic precipitation patterns as a result of the alterations in metrology. Water can be utilized in many ways, the most common is in domestic, industrial and agricultural industries and the demand of water is growing at a fast rate as a result of speedy industrialization and population rise especially in developing nations such as India. Water is a vital part of life and when it becomes overexploited through the use of ground water, then it can be considered a big problem in any developing country. Nearly a fifth of the water in the world is provided by the groundwater. The water on the Earth can be found in different forms, which include: water vapour (clouds), fresh water in the rivers and the lakes, icebergs and seawater, glaciers and aquifers/Groundwater. Water on the Earth undergoes an enormous transformation cycle into gaseous state through evaporation and taking it back to Earth as precipitation.

Study Area

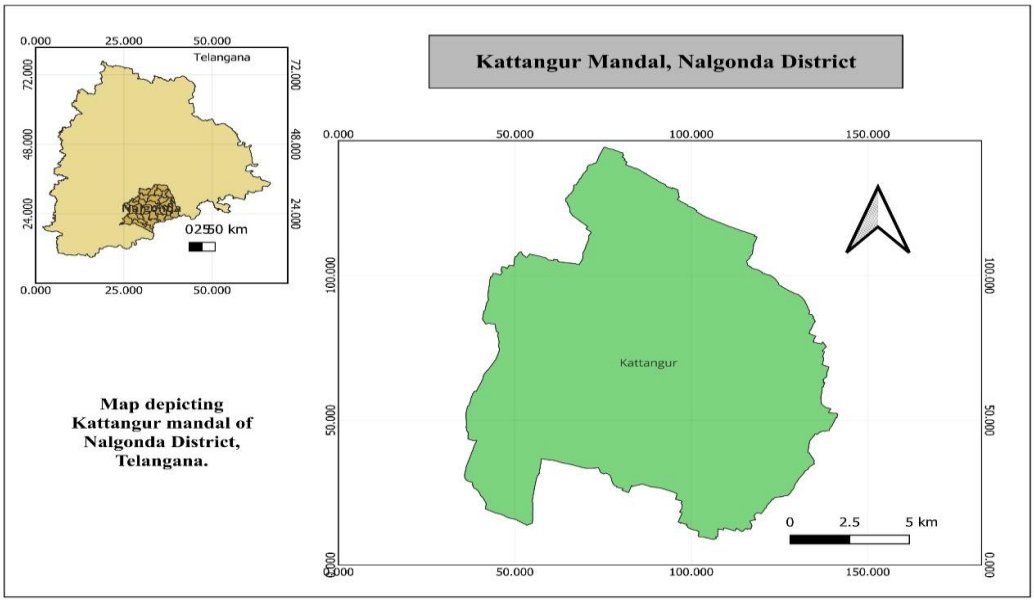

Fig 1: Locational Map of the Study Area

The current study site is within kattangur Mandal of the Nalgonda district that falls between 17deg1546" N and 79deg1727 deg E,the toposheet of Survey of India is E44 N7,and the elevation is 256 MSL. The history behind the name of this village is two-fold- one is that the farmers in this village would visit other villages to obtain rope i.e. Nara in Telugu language so the name came to be recognized as Naregudem.

The other is that 400 years ago the richest farmer of this village was named Narayya, and therefore this village might be named after his name. It receives an average rainfall of 793mm, and it lies on the southern Telangana agro-climatic region. The mean temperature is 20deg c Min to 42degc Max and the runoff is 159 mm/year/annual. This comprises of 3 habitations, 1. Masibaigudem 2. Nallakuntabollu and 3. Pandavulabai.

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Slope:

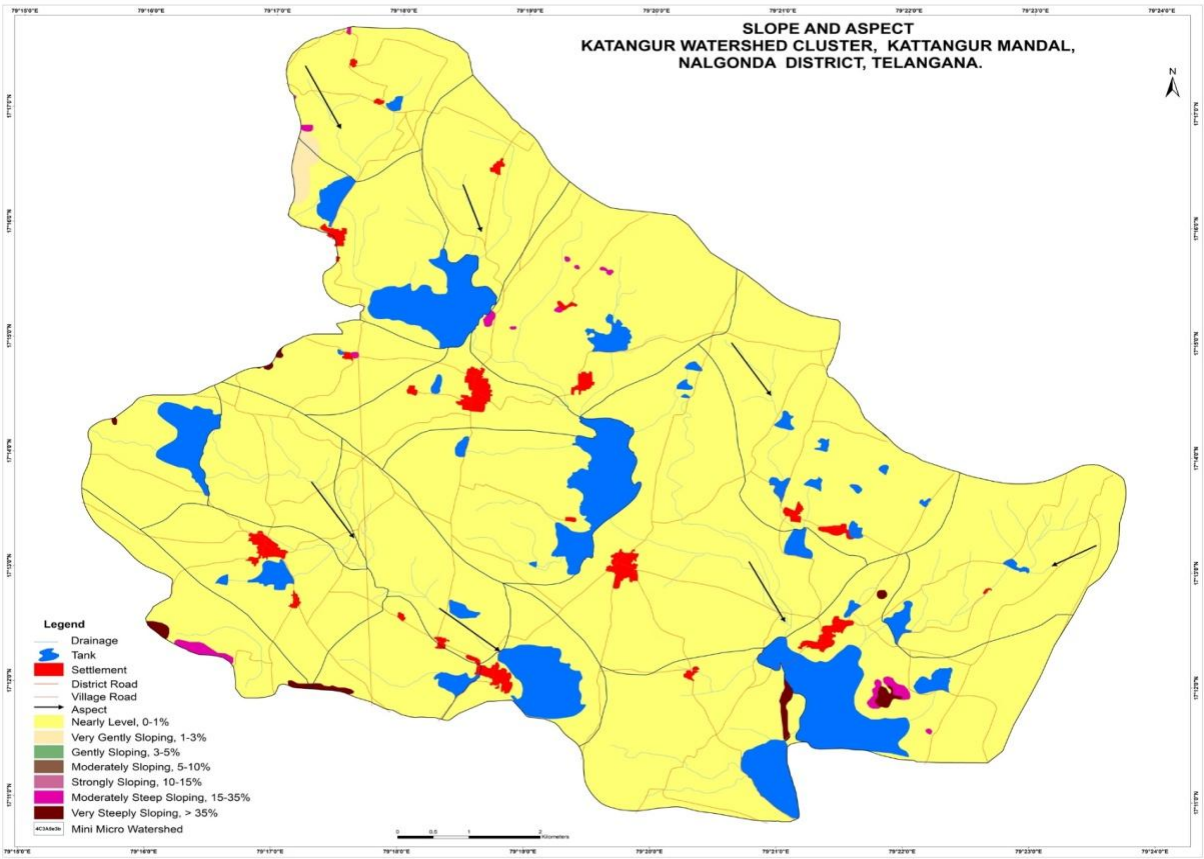

Fig 2: Slope-Aspect Map of the Study Area

Aspect-slope maps show the direction of the terrain slopes as well as the steepness. These maps use different colors to show the categories of aspects and the steepness of the slope is shown by the saturation of colors, with steeper gradients being bolder colored.
The kattangur mandal is made up of 22 villages including the hamlets, the Naregudem was experiencing almost level to strong slope. The area under the slope was divided into based on the slope.
Almost even slope (0-2): the area coverage was of 2765 acres of total geographical area.
Moderate slope (2-6): the coverage on the area was 639 acrs of total geographical area.
Strong slope (6-15): the coverage area amounted 19 acras.

Database and Methodology:
The current field of study will include both secondary and primary data.
Primary data:
The fieldwork was conducted by the verification of the area with the help of the ground-truth information and gathering of the water samples and field photographs and the interviewing farmers according to the questionnaire.

Secondary data:
Survey of India toposheets purchased at the survey of India, hyd.
The MRO office supply agriculture data and land use data.
Local watershed data of the office of watershed DWMA Nalgoda.
Population data from census

Key Factors for Watershed Selection:
- Higher Proportion of Small and Marginal Farmers
- Moisture index / DPAP Block
- More percentage of SC & ST Population
- Large extents of wastelands
- Uneven Rainfall
- Poor groundwater levels
- Soil erosion

Demographic features:

Table 1: Demographic features of Naregudem village

Sr.No	Demographic Feature	M	F	Total
1	Total Population	773	715	1488
	Scheduled Castes Population	282	265	547
	Scheduled Tribes Population	0	0	0
	Backward Classes Population	260	231	491
	Others	231	219	450
2	Child Population	116	100	216
3	Sex-Ratio	1000	925	
4	Total Literacy			
	Literates	297	252	549
	Illiterates	446	491	937
5	Work force			
	Agriculture	457	508	965
	Industrial	25	12	37
	Service	38	25	63
6	Birth rate			21
7	Death rate			9

Source: Census of India

Out of these, the village population is 1488, the male population is 773 and the female population 715. The caste population is 547 in total and there are more men than women with the male population of 282 and that of women 265. Population Backward Classes 491, 260 and 231 male and female respectively. These males were 116 and female, 100 and the child population was 216 out of them.
The sex-ratio of this village is low in that there were only 925 females to every 1000 males. This is lesser than the sexratio of the state and the cause was that most of the people were uneducated and believed that the women were a burden to them. Only 549 of those males were 297 and those females were 252, which was the very low literacy rate i.e. 36.8 only. Of the village over 60 percent were uneducated; the illiterate 937 males were 446 and illiterate females were 491.

Agriculture and the related activities relied on most of the people in this village. Over 60 percent of the population only engaged in agriculture, the total number of individuals engaging in the sector was 965 males in the sector who constitute 457 and 508 females. Industrial sector was very low with only 37 males of 25 and 12. Sixty three out of these males aged 38 and females 25 in the service sector. The birth rate stands at 21 and the death rate stands at 9.

Pattern of Land Use:

Table no.2: Pattern of Land Use of the Naregudem Village in acres

s.no	Area	Forest area	Land under non-agriculture	Land under permenant Pastures	Miscellenous Tree Crops area	Uncultivated wasteland		NSWA	NSA	GCA
						Temporary fallow	Permanent fallow			
1	3200	0	717	89	34	543	423	1394	253	1647

Source: MRO office Kattangur

The total geographical area of this village was 3200 acres, non-agriculture area was 717 acr and this under forest area is zero. The permanent pasture area is 89 acres whereas the area under the Miscellenous tree crops is 34 acres. The unproductive land is sub-divided into temporary fallow and permanent fallow. A 1066 acre of this temporary fallow is equivalent to 543 acre and permanent fallow is equivalent to 423 acre. Net Sown Area(NSWA) is 1394 acres whereas a Net Sown Area(NSA) exceeds 253acr at least on one occasion; the Total Gross Cropped Area(GCA) was 1647 acres.

Crops and cropping pattern

Table 3: Cropping pattern for Kharif and rabi of Naregudem village

Seasons	Type of Crop	Area under Rain-Fed		Area under Irrigation		Total	
		Coverage (Acres)	Productivity (Ton/yr)	Coverage (Acres)	Productivity (Ton/yr)	Coverage (Acres)	Productivity (Ton/yr)
KHARIF	Cotton	492	196.8			492	196.8
	Paddy			170	297.5	170	297.5
	Red gram	174	69.6			174	69.6
	Green gram	145	50.75			145	50.75
	Castor	213	53.25			213	53.25
	Horticulture			150	1800	150	1800
RABI	Paddy			153	244.8	153	244.8
	Horticulture			150	1800	150	1800
Total		1024	370.4	623	4142.3	1647	4512.7

source: MDO office Kattangur Mandal

Rainfed covers 1024 acres and irrigated 623 acres and this implies 1647 acres o of total geographical area. Rainfed and irrigated production were 370.4 tons / year and 4142.3 tons/ year respectively.
The table displayed the cropping pattern of Kharif and rabi. During the Kharif season, cotton, paddy, Red gram, Green gram, Castor and horticulture crops had been cultivated. Among these crops, cotton needs the largest area coverage; it covers 492 acres in Rainfed and productivity of 196 tons per year; it is planted to be the most covered as there is a low supply of water and this village is located near nakrekal town which is experiencing a large cotton market. Paddy covers 170 acres only and total production of 297.5 tons per year, Red gram crop covers 174 acres and total production of 69.6 tons per year. Green gram crop and Castor occupy 145 and 213 acres respectively and horticultural occupy 150 acres. During the rabi season, it was only paddy and the horticultural crops that were cultivated and only 253 acres and 2044.8 tons covered annually

Socio-economic data:

Table 4: Socio-economic data of the Naregudem village

s.no	Pension schemes	Number of persons
1	Old age pensions	75
2	Widow pensions	54
3	Physically handicapped pensions	29
4	Toddy tappers pensions	10
5	OntariMahila Pension	3
6	Total	171

Source: IKP office Kattangur mandal

This village had a total of 171 pensions. It has 5 pensions which consist of old age pension, pension widows, physically handicapped pensions and toddy tapper pensions. Telangana state prestigious single women pension scheme(ontari Mahila pension). They had a total of 75 pensioners under old age, 54 widow pension, 29 physically handicapped pension. The number of toddy tapper pension members was 10, and ontari Mahila pension 3 members.

Interventions carried out:

Table 5: Watershed Works Carried Out

Project name	Micro-watershed name	No.of structures	Name of the structures	Unit cost
Eduloor	Naregudem	3	Check dams	968000

Source: Watershed Office, Nalgonda

The watershed project name was Eduloor, and it contains 7 micro watersheds out of this naregudem. There are 3 conservative water structures constructed. All of them were check dams, and these were constructed in different areas of the village where there were low groundwater levels due to scanty rainfall

Reasons to Execute Watershed activities in Villages

The key activity that was encouraged by watersheds was to increase agriculture and associated activities through water conservation. Since majority of the residents depend on agriculture as a means of livelihood, management of watersheds is important in promoting agriculture. Although dairy farming is very important, the primary source of income in the region is agriculture. In the absence of agricultural improvement, there is little likelihood of changes in per capita income, nutrition, quality of produce, productivity and the general economic growth. The project would adjust the cropping trends to ensure that there are more seasons as well as the affordability of the disadvantaged populations who do not have basic amenities. The fact that the area is susceptible to water scarcity and frequent droughts indicates that something must be done. The project is expected to create sustainable livelihoods among the poor households which would eventually improve their economic conditions, assets, self esteem and social interactions. The main aim of the watershed promotion is to encourage economic development in the region with a greater benefit on the bottom of the pyramid, that is, below poverty line (BPL) families.

IMPACT ASSESSMENT:

Table 6: Impact of the Watershed

1	**2**	**3**	**4**	**5**
S. No.	**Item**	**Unit of measurement**	**Pre-project Status**	**Post-project Status**
1	Ground Water level	Meters	9	7
2	Ground water structures repaired/ rejuvenated	No.	5	0
3	Drinking water Quality	Description	Satisfactory	Safe drinking water
4	Drinking water availabilty	Description	Satisfactory	Sufficient water availability
5	Increase in irrigation potential (Ayakut)	Ac	370	444
6	Land Use type	Description	More rain fed and food-grain crops, No fodder crops	Uncultivated Waste land to be turned into cultivatable land, Cultivation of fodder crop
7	Coverage of Agricultural Crop	Ac	926	1018
	i Area under single crop	Ac	758	833

	ii	Area under double crop	Ac	168	185
	iii	Area under multiple crop	Ac	0	0
8	Net increase in crop production area		Ac	1094	1203
9	Increase in area under vegetation		Ac	0	35
10	Increase in area under horticulture		Ac	150	328
11	Increase in area under fuel		Ac	42	85
12	Increase in area under Fodder		Ac	9	18
13	Increase in milk production		Litres/day	258	387
14	Increase in no. of livelihoods		No.	6	10
15	Increase in income		Rs.	13,600	16,320
16	Migration		No.	42	0

Source: Compiled in study

Ground water status:

The depth of the water table had gone down to 60-65ft prior to the initiation of the project, and it would have kept on decreasing. Many of the wells were drained, and water could only be availed until mid-winter after the monsoon season. Check dams and water harvesting buildings gradually raised the level of water to 50-55 ft, guaranteeing the water supply during the two seasons. The horizontal water seepage by the check dams revitalized the wells that were again put into operation.

Agricultural Practices and Land Utilization:

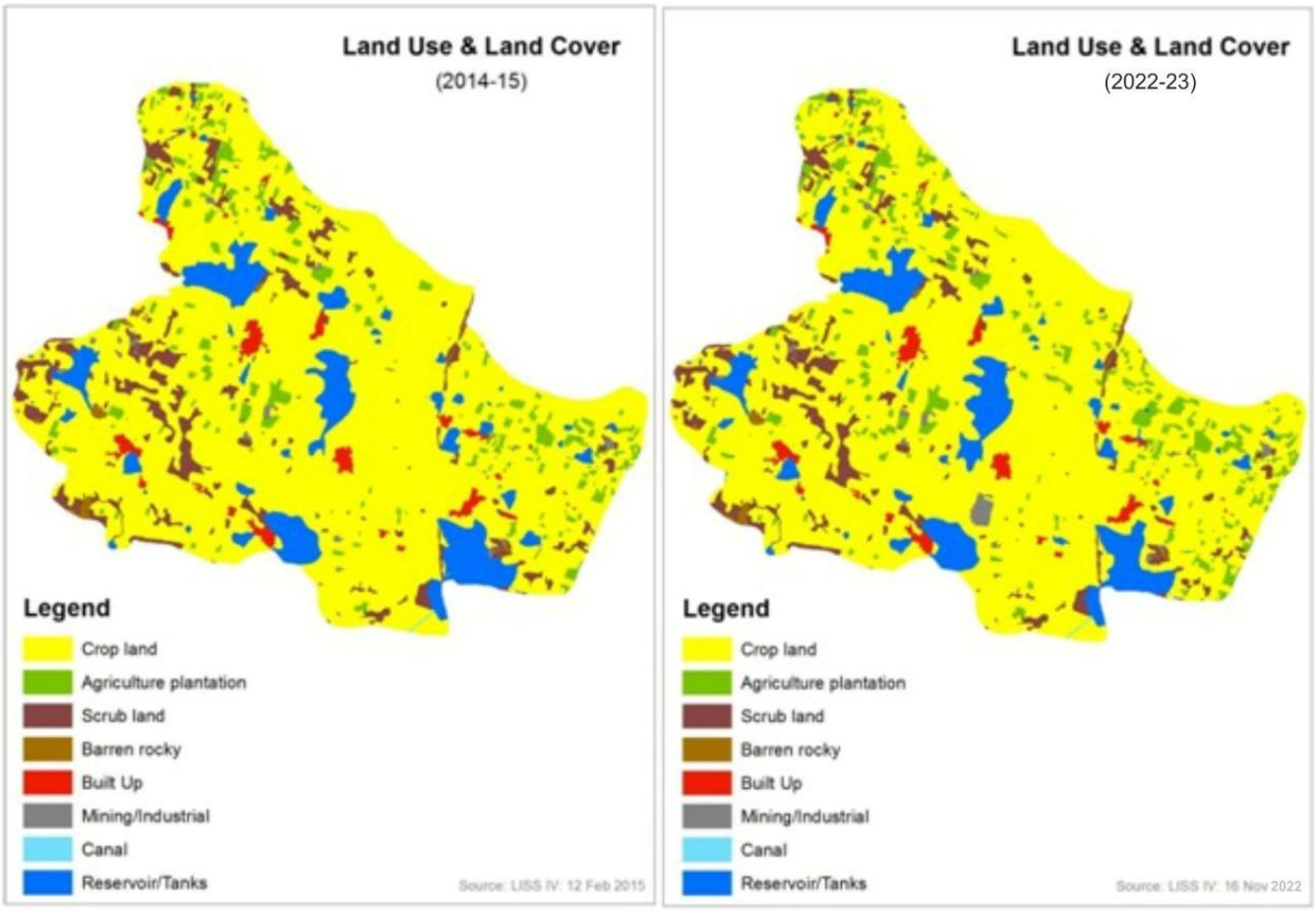

Fig 3: land use and the land cover of Kattangur Mandal 2014-15 to 2022-2023

potential shifts in agricultural practices, urbanization, and possibly industrial or mining activities over the approximately nine-year period. The extent of crop land remains high, but changes in other categories like built-up areas and mining/industrial land indicate developmental pressures and altered land management strategies

In the past, the cultivation of tobacco and bajra used to be dependent only on rain. After the check dam walls and recharge structures were introduced, previously unproductive land was converted to farmland. Circa 200-250 hectares is already under conserved water used in cultivation during lean season. Diesel-powered engines are used by farmers to irrigate their farms at crucial periods when the crop is growing

Potable Water Quantity and Quality:
Although the quality of water was satisfactory, its supply was seasonal. In summer, the water table would go down to 65-70 ft and disrupt extraction with the help of hand pumps. A new solution was that water in a nearby canal can be directed into a low flow stream via gravity and a suction pipe. The result of this intervention was that there was a perpetual supply of water throughout the year, which ensured that there was an unending supply of potable water even in summer season.
Increased Irrigation Capacity:
At very beginning, there were 25-30 hectares of irrigation. The benefits of irrigation are now being spread to almost all inhabitants with 200-250 hectares of land getting water at the off-season. This augmented irrigation possibilities are because of the presence of water in harvesting constructions.

Accessibility of Fodder and Dairy Product:
After the rainy season, and the mid winter, there was a shortage of green grass in the project villages. Nevertheless, the water storage of check dams during off seasons enabled the cultivation of fodder, which was enough to meet the needs of wild animals in terms of food. The situation also allowed the harvesting of grass and their conservation as dry fodder to be used during the summer. Two milk collection plants were opened. The availability of green fodders has improved the quality and quantity of milk as seen in the improved fat content and SNF. The yield of buffalo milk has increased twofold 4.5liters to 9liters per day and the daily collections of buffalo milk are 250-350liters in these villages.

Financial Status:
The economic status of the villagers has also changed positively because of agricultural output and agricultural activities especially animals farming. Prior to the implementation of the IWMP program, the bajra output was 10 quintals which has improved to about 15 quintals signifying an improved land productivity. The market value of Bajra has also gone up to 1800 rupees per quintal as compared to 1200 rupees per quintal. There has been significant increase in the production of tobacco and milk. As noted earlier, availability of fodder in lean seasons has increased the rate of milk production which has had a direct effect on household per capita income. This development is an indicator that the income of villagers has improved significantly which has resulted in high living standards.

Employement Opportunities:
The watershed interventions have increased the livelihood opportunities which had been limiting due to rain based farming. The residents of the town have traditionally practiced farming during rainy seasons and sought farm labor in their adjacent villages during off seasons. Due to introduction of irrigation systems, farmers have currently been in a position to practice various crop patterns all year round.

Agricultural Insights:
Akula Shankaraiah is a local farmer who supports the growth of check dam infrastructure and says that his agricultural performance has increased two times, and that he no longer needs to spend money on animal food. There would be additional check dams that would further enhance our farming conditions.
The ability to pump water to irrigate our crops at the most crucial times of growth, which is made easy by diesel-driven pumps, has greatly minimised our exposure to crops failure, as Katta Yadaiah, another farmer in the area puts it.
One of the other agriculturists, Yarramadha Venkatareddy, is pleased: "The restoration of my well means that the household will have water until late in February so that they can grow summer vegetables. The advantages of check dams have never been so evident as they are to-day.
Duppelli Yallamma tells, "The dairy farming is a possible alternative to toiling in the farms of others. It is now possible to grow fodder to our animals in lean seasons, and have green feed all year round.

Conclusion:
Watershed management techniques can successfully resolve this problem of water storage in rural areas. This does not only boost the water level on the ground, which means that there will be sufficient water to farmers during the hot seasons, but also minimizes on reliance on government-financed water tankers, which can be very expensive. The process is cost effective and offers jobs to the locals in the village. Also, it is helpful to fight soil erosion and to improve the growth of trees and fodder; this also has more advantages to farmers. Through the strategies of watershed management, farmers are able to produce crops throughout the year which results into higher income and better living conditions of rural people. Therefore, the watershed management is considered to be the viable solution to the water shortage in rural areas and, at the same time, to improve the economic welfare of the population. The concerned area falls in a semi arid region. Pre-monsoon showers usually come in May, and this too is not very consistent. Hot summer and cool winters characterize the climate. The increase in temperature starts in February, and peaks in May, after which the temperature gradually decreases up to December. The hottest month is May and the temperature is 40degC to 42degC and the lowest temperature is between 10degC to 20degC in the winter. The temperature in this area is rather high, and the surface water bodies, subsurface sources, and groundwater reservoirs evapotranspire significantly and reduce throughout the rainy season to the summer. The mean precipitation of the region is 793 mm. in summer the

temperature may reach to 42degC and in winter, it may drop to 20degC. The southwest monsoon coincides with rainfall which takes place between June and October. The monsoon period is known to have very high humidity and it is 60 to 80 percent. June to September normally records the highest rain fall. Crop rotation is also one way to rehabilitate soil fertility and is already practiced in villages to a certain degree. This farming method helps in the suppression of weeds, some pests of crops, and diseases, besides increasing the functionality of manure and chemical fertilizers. It is important to inform farmers on the benefits of correct crop rotation by giving them practical demonstrations.

Recommendations:

- The management of watershed project is supposed to reside within the community. Provided that they are well trained in maintaining, different elements of watershed management programmes may be transferred to the community organizations in the long run.
- Policies that can lead to even allocation of costs and benefits that can enhance the overall socio-economic status of the beneficiaries.
- Economic and optimal water purchases and water affluence avoidance at individual and community levels may be prevalent in water management in the future.
- Priority is accorded to rejuvenation of the village level water bodies like ponds and tanks and ground water recharge.

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