POTENSIVENESS OF WATER RESOURCE MANAGEMENT

B.Vijaya Sekhar[1*], T.Seshaiah[2] , R. MaheswaraRao[1], SK. Sandani Basha[1], Jaya Prakash.A[1] Ayyappa.M[1]

And Narasimha Reddy.K[1]

Asst. Prof, Department of Civil Engineering, QIS College of Engineering & Technology, AP, India

[2]Assoc. Prof, Department of Mechanical Engineering, QIS College of Engineering& Technology, AP, India

* Corresponding Author: vijay,sekhar@qiscet.edu.in (B.Vijaya Sekhar)

Abstract

No living thing can thrive without water; it is the environment's lifeblood. Water has a special function in the growth of all economic sectors in every nation. Water is utilised for a variety of things, including agriculture, domestic consumption, industry, and the production of electricity. However, improper use of water resources results in extensive soil degradation, disrupts the supply of drinkable water, and produces significant economic loss. Therefore, it becomes vital to use science and technology to harness the water resources that are already present on Earth. The case study described in this article illustrates how substantial amounts of rainwater can be used to replenish groundwater supplies.Ongole is a tiny village that is 10 kilometres from District centre. It is intended to implement such biological and engineering controls that will divert this additional runoff to groundwater storage. The work's most important aspect is that, if similar technologies are created and widely used in rural areas, hundreds of villages across the nation won't need tankers to provide water to them. Additionally, this will aid in the economic development of the villagers, which is mostly brought on by water scarcity.

Keywords:
Water resources management; global wellbeing; climate change; water; scarcity

INTRODUCTION

In particular in the world's dry and semi-arid regions, rainwater, a limited and crucial resource for food production and maintaining rural populations' lives, is in risk. Rain frequently comes in the form of sudden, intense downpours in the semi-arid tropics (SAT). Most of this water evaporates as runoff, eroding a substantial percentage of the valuable top soil. At the moment, about 30 to 45 percent of rainfall is effectively utilised for crop production. Due to surface runoff or subsurface drainage, 300 to 800 mm of seasonal rainfall are lost each year.

A state or region generally experiences periodic water stress if its annual water availability is less than or equal to 1700 m3, and it experiences water scarcity if it is less than 1000 m3. In accordance with the aforementioned criteria, northern India has a water deficit, whereas southern India has a water stress.
One of the most crucial elements for the expansion of the Indian economy is the economic development and management of villages. India is an agriculturally-based nation. In India, the contribution of agriculture to GDP is over one-fifth.
For the vast majority of the local peasants, agriculture is their primary source of income. The monsoon rains were mostly dependent on for traditional agricultural techniques. Rainfall during the monsoon season typically occurs between June and September. However, despite

ISSN- 2394-5125 VOL 6, ISSUE 03, 2019

receiving enough rain, people must rely on tankers even in the summer to supply them with domestic water. Large runoff, which causes soil erosion and water loss to the land, is mostly to blame for this. When a raindrop falls down a slope, the loose dirt follows it. In this instance, the soil's uppermost layer is rapidly eroded. It is anticipated that more than 100 tonnes of soil are lost as a result of heavy rains.

This essay provides a case study of the 10-kilometer-distance Ongole settlement (Andhra Pradesh). Although there is a severe water shortage in Ongole village, there is a great demand for water for agriculture. Consequently, lower crop production and lower income from agricultural operations. Demand for food, fuel, and drinking water is rising, as is the need for fodder for cattle. People must rely on tanker deliveries of water. To improve people's quality of life, it is therefore imperative to develop methods for storing runoff and replenishing groundwater resources.

I. THEORY OF WATER RESOURCE

A watershed is the drainage basin or catchment area of a particular stream or river. Simply said, it describes the area from whence water for a certain drainage system, like a river or stream, originates. People and the environment are connected. Any changes to the environment have a direct impact on the local population. A deteriorating environment has a direct impact on people's quality of life. Because of this, initiatives to end poverty and improve people's standard of living must prioritize improving their surroundings. The term "watershed development" describes the preservation, renewal, and prudent use of all natural resources (land, water, plants, and animals) and human resources within a particular watershed resource.

Typically, drainage, size, shape, and patterns of land use are used to categorise watersheds.

Macro water resource (> 40,000 Hect)

Micro water resource (50 to 500 Hect)

Sub- water resource (5000 to 40,000 Hect)

Milli- water resource (1000 to10000 Hect)

Mini water resource (1-100 Hect)

This watershed's primary duties are gathering rainwater. Water can be kept for varying lengths of time and in varied volumes. Allow water to run off.

Water resource management need to be carefully safeguarded. Manage the entire watershed that drains into a lake, river, or stream to keep it safe. Watersheds that are clean and healthy depend on an informed populace making informed decisions regarding the environment and local initiatives.

Water covers 70% of the Earth's surface, however in our country, 40–50% of the water is unfit for human use. That means that none of the water's planned uses can be fulfilled by it. This could mean that it is dangerous to swim in it, to drink the water, or to eat the fish that have been caught.

The primary contributors to river pollution in our area are sediments, microorganisms (particularly E. coli), and an abundance of nutrients (such as nitrogen and phosphorus). Although nutrients appear to belong in a healthy environment, if a watershed is not

ISSN- 2394-5125 VOL 6, ISSUE 03, 2019

adequately managed, they can cause major problems. For example, silt can suffocate fish by obstructing their gills, and the mere presence of bacteria can imply the presence of other viruses and germs in the water. Numerous factors, such as erosion, animal waste runoff, and combined sewage overflow, cause these pollutants to enter our streams.

II. Significance of water resource management

The major goal of managing watershed resources is to preserve a catchment's soil, plant, and water resources while also advancing civilization. To handle watersheds holistically, all environmental, social, and economic problems are incorporated.

Through the use of watershed management, soil erosion can be stopped, large sections of eroded land can be restored, soil moisture is increased, precipitation is collected in small ponds or tanks, floods are reduced, groundwater is refilled, and vegetation is restored. It restores hospitable weather, regenerates soil, renews luxuriant vegetation, and replenishes the environment in the proper sequence. In terms of food, fat, fiber, firewood, fodder, fruit, health, and hygiene, it also helps rural residents become self-sufficient..

Providing and ensuring access to sanitary facilities; enhancing and restoring soil quality to increase productivity rates; minimizing the effects of natural hazards (particularly in light of climate change);

As a result, the rural poor's general economic growth improves, their reliance on government assistance decreases, and their farm output rises. Socioeconomic characterization (baseline survey) is crucial in this regard. Data from the baseline survey is used to identify prospective areas for focusing technology transfer for sustainable development as well as to identify current and potential production restrictions.

III. SOCIO-ECONOMIC RESEARCH

To learn more about the present state of Ongole village in relation to numerous human, social, and infrastructure elements, a baseline survey based on a questionnaire is carried out. Data on recent changes and developments in the Ongole village were to be gathered as part of this project. The ensuing survey is employed.

1. Name:
2. Address:
3. job:
4. Annual income:
5. Additional family members with their jobs and degrees:
6. Has anyone in your family moved, and if so, why?
7. A village's populace is:
8. Own a farm? If so, by how much?
9. Own wells
10. Own a borehole?
11. Number of bore wells in the village:
12. Have pets? The number?
13. Sources of water for drinking?
14. Farm-grown produce:
15. The village's main issue:
16. Farm water resources include

IV.PROBLEM IN THE AREA

Following issues were noted, as per the socioeconomic survey:

• All people are solely dependent on agriculture;

• Water resources are insufficient in the summer.

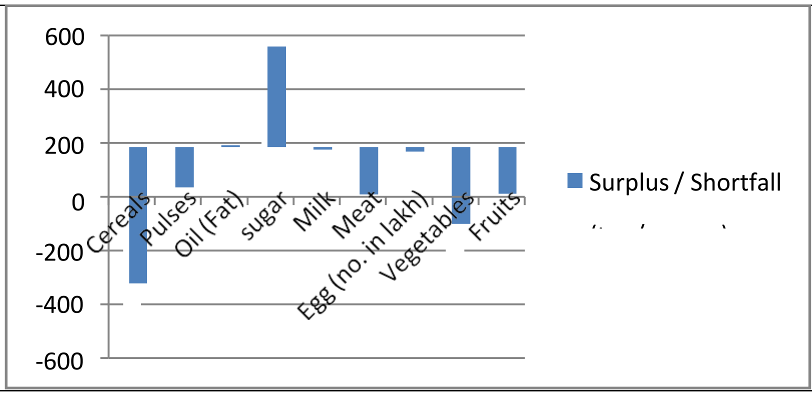
• Only one season of agricultural output • Very little land is accessible to each household (i.e. averagely 1.8 acres).

• They must take a crop three times a year to meet their annual food needs. However, because water is scarce from February to May and the coming of the monsoon is unpredictable, they can only harvest crops twice a year at the moment. Because of this, there is poverty in the community and poor per capita income for the populace.

Low income also translates into low living standards.

• There is a sizable slope, and heavy rains cause high degrees of

ISSN- 2394-5125 VOL 6, ISSUE 03, 2019



Surplus / Shortfall Situation of Food for People

V. THERMAL CONDITION

Climate: Tropical humid with good monsoon rainfall (973mm on average yearly) from June to September, comfortable winters with temperatures between 270 and 300 °C, and reasonable summers with 150 days of splendid sunshine. Despite the fact that it rains frequently, there is a water deficit since there aren't any bunds or boundary plantings, improper rainwater collection practises, or even a watershed strategy to increase crop yields.

Contour survey and soil studies are carried out to comprehend the drainage pattern and soil characteristics of the watershed area. Through that, the following arrangements for maintaining watersheds were suggested:

Small water harvesting facilities called "farm ponds" are used to collect and store runoff water. Farm ponds are built in various sizes to accommodate various farm demands, including the supply of water for crop irrigation, the production of fish, and other agricultural activities that serve to boost crop yields and raise farm profitability. Both places with high and low rainfall can build them. The trenches are built along the contours and are broken up.

The gully stopper is a simple method for preserving soil and water. From the top to the bottom of the pit, these little structures built of concrete, brick, or rubble are organized in a sequence. To inhibit erosion, barriers or plugs constructed of various materials are positioned across the gully at regular intervals.

• Check dams: These are weir structures placed in the beginning of the stream to measure the gradient and the rate of surface runoff. Some straightforward methods should also be used in addition to these measures.

• Cropping pattern: Farmers in the Ongole community typically follow a single agricultural strategy. This pattern, which employs intercropping, must be changed. Following a conversation with an agriculture officer, suggestions were made to intercrop pulse and vegetable crops with cereal crops 50%–50% in ratios of 2:1 and 3:1, respectively. Intercropping ratios for cereal and pulse crops with oil crops are 1:1 and 2:1, respectively. Green fodder output on fallow land is increased by up to 50% more by maintaining it

ISSN- 2394-5125 VOL 6, ISSUE 03, 2019

properly through two rounds of grass cutting and bund cultivation on almost 3 Ha (5% of farmed lan

IMPACTS

a) Water recharge is required after the building of these structures, 11.35 Mcum (71% of runoff).

b) According to Table 1, there has been an increase in 280% of the vegetable crop area and close to 90% of the grain and pulse crop areas. Benefits include a near 80% increase in agricultural productivity.

b) The needs of the villagers are satisfied. Additionally, the income from agricultural activity for village residents has increased as a result of inter treading crop output.

d) Additionally, higher crop output, bund cultivation, and efficient fallow land care lead to a 50% rise in concentrates, 50% increase in dry fodder, and 50% increase in green fodder for cattle. This satisfies the cattle feed.

Actual land use (Ha)	Suggested intercropping pattern	Change in landuse (Ha)	Total change inland use (Ha)	% Increasein land use
130.5 (pulse crop)	cereal + pulse2:1 cereal + vegetable 3:1	160.7 (Cereal) 37.6 (Pulse) 25.1(Vegetables)	205.4 (Cereal crop)	85%
115 (cereal crop)	pulse + cereal1:2 pulse + vegetable3:1	26.2 (Cereal) 105 (Pulse) 17.5(Vegetables)	301.5 (Pulse crop)	90%
263.5 (oil.crop)	oil crop + cereal 1:1 oil crop + pulse 2:1	237.4 (Oil crop) 118.7 (Cereal) 59.3 (Pulse)	137.4 (Oil crop)	---
20 (vegetables)	---	15 (Vegetable)	57.6 (vegetable)	280%

A CASE STUDY ON THE EFFICIENCY OF WATERSHED MANAGEMENT

PRIOR TO AND POST-CONCEPT

The years 2011–12 and 2012–13 are used as the starting points to explain "Before watershed management work" and "After watershed management work," respectively. This idea is used to a small-scale farmer in the village Ongole.

Features	Details
Name	Mr. B. APPALARAJU
Age	46 years
Family details	05
Land owning	2.5Ha. (rainfed)
house	Tiled roof

Picture 1: Built Farm Pond and Gully Plugs

Photo 2: Inter-cropping Pattern and Constructed Contour Trenching

The outcome of the water resource management technique that was built

Recharge Structure	Water Recharged	Cost of Construction
Field Pond (15mX15mX3m)	1726 Cu.m.	only Rs. 25,000
Cutting a contour	1126 Cu.m.	
Earthen Bunds as well as Gully Plug		
Complete Water Refill	2852 Cu.m.	

CONSEQUENCES OF WATER RESOURCE MANAGEMENT

According to respondent data on the effects of watershed management, the irrigation situation has significantly improved. The area is rainfed in 2011–2012, and after watershed

ISSN- 2394-5125 VOL 6, ISSUE 03, 2019

management work, it becomes irrigated in 2012–2013. The acreage of various crops, both before and after water resource management. Table 5 demonstrates an increase in productivity.

Crops	Watershed Management Prior		following the watershed	
	Area (Ha.)	%	Area (Ha.)	%
Jowar	0.1	10.0	1.0	50.0
corn	0.2	20.0	0.3	30.0
tur	0.1	0.0	0.3	30.0
rice	0.3	30.0	0.4	40.0
Ground nut	0.5	50.0	0.8	80.0
Fallow land	0.5	50.0	0.55	55.0
Area managed by watershed techniques	0.5	10.0	1.0	50.0

Prior to and Following Watershed Management in Crop Production

Crops	Quantity-Before Watershed Management, in quintals	Quantity-After Watershed Management (quintal)
Jowar	1.65	5.25
Corn	-	1.75
Tur	-	1.75
Rice	2.65	2.75
Groundnut	5.55	6.55

Each crop's value is calculated based on the market price in effect at the time of the study, both in the "before" and "after" conditions. When computing total income, expenses are not taken into consideration. The position of the farmer's per capita income is shown below. It's intriguing to think back on that earlier. Due to the impact of the watershed management technique, the per capita income increased from Rs. 16928 to Rs. 17806.

Description	Water resource Management Prior	following the water resource
Total Revenue	65712.00	78225 .00
members of the family	04	04
Per Capita Income (Rs.)	16928.00	17806 .00

CONCLUSION

By using watershed management choices, a total of 71% of runoff, or 11.03 M.Cum. was stored, which satisfies the watershed area's entire need for water. Additionally, 280% of the vegetable crop area and close to 90% of the grain and pulse crop area have increased. Benefits include a near 80% increase in crop production. The needs of the villagers are being met. Additionally, intercropping increases the income from agricultural activity for village

ISSN- 2394-5125 VOL 6, ISSUE 03, 2019

residents. Through the case study, it was discovered that 3060 cum were actually used to manage watershed choices such farm ponds, gully plugs, and contour trenching. Describes the availability of water for irrigation on a farmer's own land following watershed management alternatives. According to research conducted after the intercropping pattern was implemented, the overall crop production from farmers' land changed from 15 tonnes per year before watershed management to 20.75 tonnes per year after. The per capita income of farming families grew after the water resource management strategy was put into place, it is finally learned.

Water resouce management may change Ongole village by raising per capita income and enacting other policies like growing agro-based enterprises, tourism centres, etc. by making the best use of the available natural resources. Water resource management will enable the residents of Ongole village to become self-sufficient. Additionally, this will help with the existing problem of urban overpopulation. Thus, the final inference is that water resource management enables economic development for village residents.

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