

Watershed Development for Net Irrigation Requirement in Anteshwar Village

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Abstract—Anteshwar is a small village located at distance of 35 Kms from Nanded district, Maharashtra state, India. It lies between North latitude 19°07'55.83" and East longitude 77°07'7.36". Due to insufficient rainfall & no availability of water resource net irrigation requirement (NIR) in Anteshwar is not fulfilled. To meet this NIR some measures have been adopted to direct this extra runoff to ground water storage.

Keywords—Watershed, Drought, Irrigation, Agriculture, Crops, Farm

I. INTRODUCTION

Watershed is an area from which the runoff flows to a common point on the drainage system. Every stream, tributary, or river has an associated watershed, and small watersheds aggregate together to become larger watersheds. Water travels from headwater to the downward location and meets with similar strength of stream. Agriculture plays a vital role in India's economy. Over 58 per cent of the rural households depend on agriculture as their principal means of livelihood. Agriculture is one of the largest contributors to the Gross Domestic Product (GDP). Contribution of agriculture in GDP :

1. As per tenth five year plan from 2002 to 2007, agriculture contribution in GDP was 24%.

2. As per eleventh five year plan from 2007-2012, agriculture contribution in GDP was 19%.

3. Now as per twelfth five year plan from 2012-2017, agriculture contribution in GDP is 14%.

The GDP goes on reducing year by year because of less production from agriculture sector. This less production is due to not satisfying NIR of crops. Some watershed development techniques should be implemented in all villages in India to overcome this NIR of crops.

Drought In Maharashtra: Present drought condition in Maharashtra is worse than any other state in India. In Marathwada region water is supplied by railway & tankers to the people. The water scarcity occurs in months of January to May. To overcome this situation some engineering measures must be carried out in this region.

II. OBJECTIVE

The objectives of this study are :

- To propose the watershed development projects in Anteshwar village.
- To workout water requirement for agricultural purpose.

- To workout net irrigation requirement (NIR) for various crops.
- To make the village drought free.
- To enhance the productivity of agriculture.
- To recharge the ground water.
- To increase the ground water table.
- To increase infiltration of rainwater.

III. RESEARCH METHODOLOGY

For this project in Anteshwar village the data regarding rainfall by raingauge station at Nagapur, Nanded is collected for last 17 years. Other data of geology at site, crop pattern in Anteshwar village is also collected. Then data analysis is carried out to work out crop water requirement & for proposing watershed management projects in Anteshwar village.

IV. DATA COLLECTION

Following data is collected to workout the NIR of crops:

1. RAINFALL :

Yearwise Rainfall Data In mm is collected from raingauge Station : Nagapur, Nanded. Aaverage annual rainfall for last 17 years from 1999 to 2015 is : 866.22 mm which is very less & insufficient to crop production.

2. GEOLOGY : Geology of the site consist of -

The traverses in the area is covered by basaltic lava flows of Ananta formation of Sahyadri Group (Deccan trap) of upper cretaceous to lower paleogene age. The deccan trap mainly consist volcanic breccia, amygdaloidal basalt and compact basalt.

Upper crest of 0m to 2m consist of black cotton soil. From 2m to 5m soft murum is present. From 5m to 11m alluvial type of overburden is present. From 11m to 132m have indicated overburden followed by volcanic breccia and amygdaloidal basalt.

3. CROP PATTERN : Crop pattern in anteshwar village as shown below:

| Sr.No. | Name of Crop | Percentage | Area (Ha) |
|--------|-------------------|------------|-----------|
| A | Two Seasonals: | | |
| | 1. Chillies | 6% | 120 |
| | 2. L.S. Cotton | 9% | 181 |
| B | Kharif Seasonals | | |
| | 1. Paddy | 25% | 503 |
| | 2. Kh. Jawar | 25% | 503 |
| | 3. Kh. Vegetables | 20% | 402 |
| | 4. Kh. Groundnut | 15% | 301 |
| | Total (A+B) | 100% | 2010 |
| C | Rabi Seasonals: | | |
| | 1. Wheat | 35% | 704 |
| | 2. Jawar | 20% | 402 |
| | 3. Gram | 30% | 603 |
| | Total (A+C) | 100% | 2010 |

Crop Pattern
 Table 1

4. Evaporation Losses

Pan evaporimeter has been installed at Isapur dam site, which is located in adjacent basin. From this pan evaporimeter data average monthly depths are worked out. As per CWC (central water commission), New Delhi recommendations, pan coefficient of 0.6 & 0.8 for winter & summer respectively are applied to convert pan evaporation in to lake evaporation.

V. DATA ANALYSIS

Data analysis is carried to workout the NIR of each of crop as shown in crop pattern.

Crop water requirement (NIR) :

$$NIR = C_u - R_e$$

Here, C_u = Consumptive irrigation requirement is equal to evapotranspiration losses.

R_e = Rainfall excess.

The average fortnightly rainfall from year 1999 to 2015, is considered to workout net irrigation requirements of crops (NIR).

1. Chillies : NIR for 120 Ha Area in Ha.mm= 26576.4
2. L.S.Cotton: NIR for 181 Ha area in Ha.mm= 64814
3. Paddy: NIR for 503 Ha area in Ha.mm= 167091
4. Kharif Jawar: NIR for 503 Ha area in Ha.mm= 18148
5. Kh. Vegetables: NIR for 402 Ha area in Ha.mm= 22522
- 6.Kh. Groundnut: NIR for 301 Ha Area in Ha.mm= 9691
7. Rabi Wheat: NIR for 704 Ha area in Ha.mm= 299649
8. Rabi Jawar: NIR for 402 Ha Area in Ha.mm= 81348
9. Rabi Gramme: NIR for 603 Ha area in Ha.mm= 207943

Total NIR for all above area of crops is 897782.4 Ha.mm (i.e. 8977824m³)

VI. PROPOSED WORKS

To fulfill the demand of NIR watershed management plays an important role, as the rainfall in drought prone areas is highly erratic, so water harvesting is necessary in these areas. Storage should be made in ponds, reservoirs, rivers. Proposed works in Anteshwar village are :

1. Anteshwar high level barrage:

Anteshwar Barrage is proposed to be constructed across River Godavari near village Anteshwar Tq. Loha, Dist. Nanded. It is located 23 Km Downstream of confluence of Purna and Godavari Rivers.

The Anteshwar High Level Bandhara envisages the construction of high level barrage in the river portion with earthen approaches on both sides. For this barrage 14 gates of 15 m x 9 m are proposed to impound 21.16 Mm³ water. This Barrage is located at 3km from Anteshwar village.



Toposheet of Anteshwar
 Photo 1



Weir body wall & piers of Anteshwar barrage
 Photo 2

2. Afforestation:

On slopes greater than 25% water flows at a great speed, cutting through the soil as it goes down and carrying away the rich top soil. Protecting local vegetation and planting trees native to the area help check the speed of flowing water and hold the soil in place, reducing the tendency of soil erosion.

3. Contour trenches:

Where the slope of land is between 10-25%, rows of trenches are dug along contour lines in a staggered fashion. They hold water flowing down the slope and help improve local soil moisture and trap silt.

4. Contour bunding:

On slopes less than 10%, contour bunds are constructed. These are mud structures which help check the velocity of water and soil erosion, much like the trenches but on gentler slopes.

Between successive bunds a "tooth" made of loose rocks and boulders is constructed perpendicular to the bund. This prevents any breach in the bund by flowing water due to faulty contouring.

5. Boulder checks:

These are small dams made of loose angular rocks and boulders, built on seasonal streams with a catchment area less than 50 hectares and on slopes less than 20%. In a long series, they help arrest the unbounded flow of water as well as trap silt and prevent soil erosion.

6. Farm ponds:

Farm ponds are small dugout ponds constructed on the farmer's fields that harvest rainwater that flows out of farms. Most farm ponds have a capacity of 1000 cubic meters of water. They mainly serve

as a means of protective irrigation for the kharif crop during dry spells in the monsoons.

Excavation details : Top dimensions of pond = 15m x 15m,

Bottom dimensions of pond = 9m x 9m,

Depth of pond = 3m,

Side slope to excavation = 1:1

7. Farm bunding:

Farm bunding is carried out on fields to prevent rainwater from cutting through the field and forming gullies through which water flows out of the field, carrying the top soil with it.

It protects the field from this cutting action of water and retains the top soil in the field itself.

VII. CONCLUSION

Due to irregular, insufficient rainfall & no availability of water resource drought occurs in Anteshwar village. Water scarcity occurs in months of November to May. Hence the NIR (8.977824Mm³) in Anteshwar village can not be fulfilled.

To fulfill this NIR above proposed works i.e. watershed development projects should be implemented in Anteshwar village in good manner. Hence it will increase water table & water storage in Anteshwar village.

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