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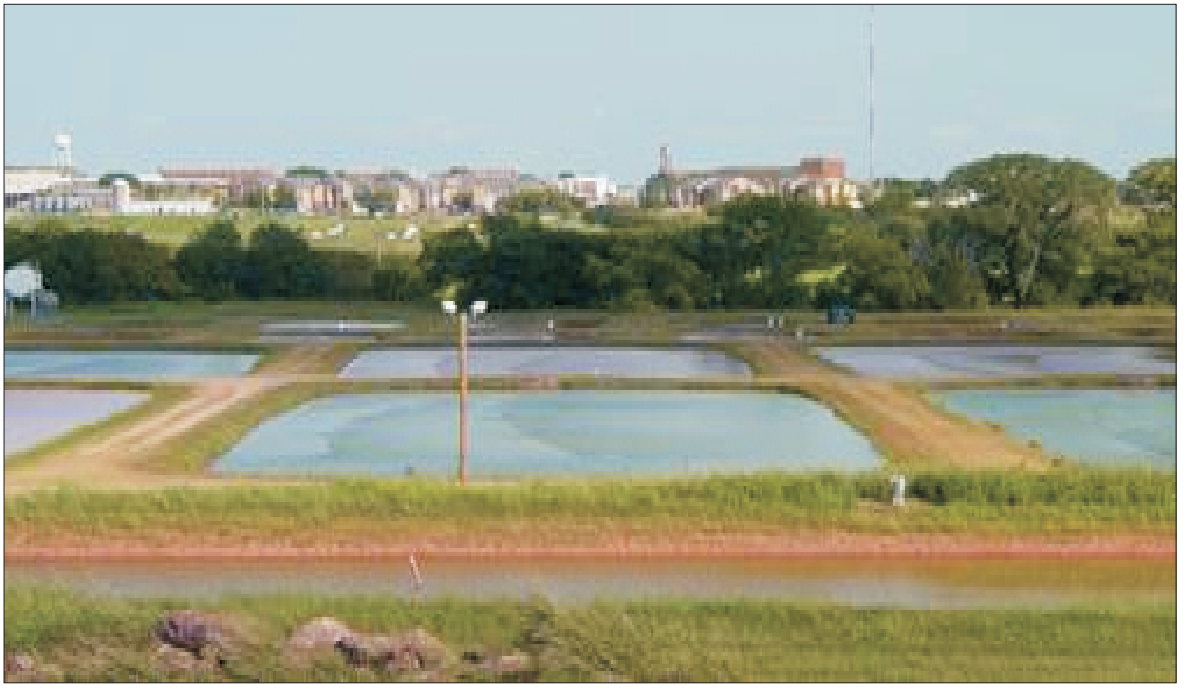
"POTENTIAL SITES FOR CONSTRUCTION OF FARM PONDS IN AMALNER TEHSIL OF JALGAON DISTRICT: A REMOTE RENSING AND GIS APPROACH"



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ABSTRACT:

A farm pond is an aesthetic and recreational amenity which is used for water sources for agricultural and other business related pursuits. The demand for water has increased tremendously in recent years, and ponds are one of the most reliable and economical sources of water. Site conditions should be considered while planning to construct a pond to ensure a suitable location which depends on physiographic factors viz. topography, drainage characteristics etc. and as well as, community demand. Present study area, Jalgaon District of Maharashtra, is very famous for horticulture activities, especially for bananas and cotton. But in the past, due to excessive and unplanned bore well irrigation and some other climatic anomalies, the study area is becoming incapable of it and therefore, there is an urgent need of some alternative water storage sources which help dry land agriculture systems. In this connection, 67 farm ponds have already been constructed under two national schemes, viz. National Horticulture Mission (64) and National Agriculture Development Programme (3).

Farm ponds contribute a significant portion to Jalgaon district's water resources. The farm ponds are lined with plastic sheets which, is used to conserve rainwater and restrict percolation. Although the ponds are well distributed in entire district, but Parola tehsil is experienced with highest number compare to other tehsil. In the study area most of farm ponds are used for irrigation purpose and rarely for fishery purpose. Mostly horticultural crops are irrigated using the stored water. The objectives of this study are to collect baseline information, to select suitable site with the help of Remote Sensing and GIS, to justify potential application and its efficiency and finally, to assess post project scenario.

Remote Sensing and GIS are the latest tools in this kind of studies, which have been widely used to understand various dimensions of natural resources development and management in order to carry out development plans without affecting the present state of environment. The methodology for suitable site selection for this project begun with acquisition and processing of satellite data of IRS, LISS-III, dated November 2007 and then, georeferenced to generate further spatial information like LULC, slope, soil etc.

Agro-hydrological evaluation of on-farm runoff storage systems entailed field survey, monitoring of water losses, analysis of rainy seasons and dry spell occurrence, soil moisture and water balance, estimation of supplemental irrigation requirement (SIR) and farm-level cost-benefit analysis. These informations have been collected as a baseline survey for this project.

Farm ponds are expected to have an impact on cropping pattern, productivity, employment and income of the farmers in this area. The improved crop management practices compared with change in cropping pattern have contributed for providing additional employment among farmers. In addition to this, during off-season, construction of farm-ponds is also contributed to increasing employment among the farmers who have farm ponds. The yield and net returns of all the crops are greatly affected with farm-pond over without farm pond. Although there are so many bureaucratic, technological problems including no proper support from farmers related to this issue but a lot of scope is there for development of farm ponds in the district.

KEY WORDS: Remote Sensing, GIS, Farm Pond, Potential Sites.

INTRODUCTION:

Conservation and utilization of water on a sustainable basis to all people of the world without affecting the ecological balance lies in the adoptation of new research tools, particularly from remote sensing, and combining them with conventional as well as frontier technologies like geographic information systems (GIS). Sustainable agricultural development is one of the prime objectives in all countries in the world, whether developed or developing. The broad objective of sustainable agriculture is to balance the inherent land and water resource with crop requirements, paying special attention to optimization of resource use towards achievement of sustained productivity over a long period (Lal and Pierce, 1991). Farm ponds are now an important source of irrigation water, particularly for small farms with permanent crops like brambles, fruit trees, trellised fruits, and nurseries. Field crops and vegetables can also be irrigated with pond water during dry seasons. Irrigation is critical to meeting high yield goals and should be employed to meet the crop's peak water use rate. In this study an attempt has been made to identify the potential sites for establishing farm ponds in Jalgaon District using remote sensing and geographical information system. It covers irrigation and water conservation methods appropriate to Jalgaon, and also contributes to the goal of rehabilitation of its natural biodiversity and ecosystems.

AIM AND OBJECTIVES:

Aim

The aim of the present work is to identify the potential sites for farm ponds construction in Amalner tehsil of Jalgaon district by using remote sensing and GIS approach

Objectives

- To increase the storage of rain water
- To improve ground water table and increase recharge of Bore wells
- To provide irrigation facility for crops during crucial period
- In situ moisture conservation

REVIEW OF LITERATURE:

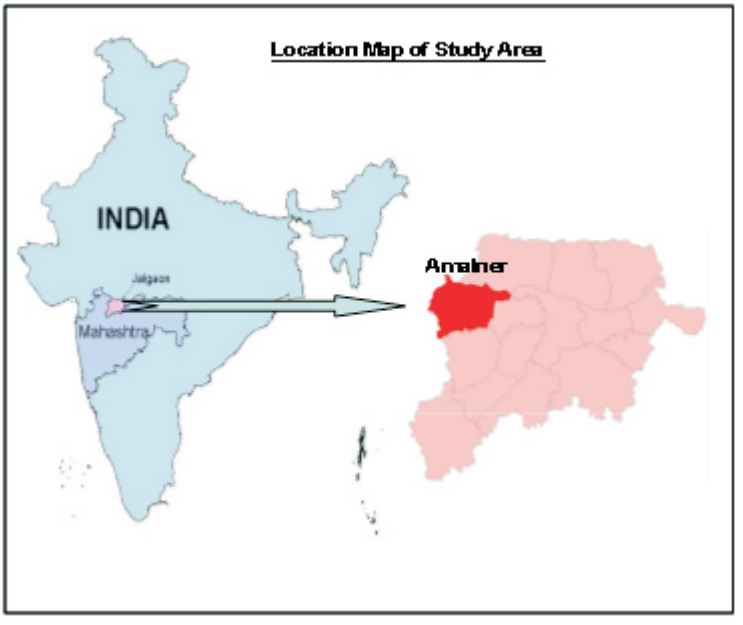
According to Gebeyehu 2006, Agriculture is the most water-demanding sector, in addition to being a major source of employment and a major contributor of the national gross domestic product (GDP) of many developing countries in Africa. Agriculture in Ethiopia provides 86 percent of the country's employment and 57 percent of its GDP. Rain fed crop cultivation is the principal activity and is practiced over an area of 27.9 million hectares (ha) of land (Gebeyehu, 2006). Some empirical studies suggest that irrigation has shown some positive impacts in increasing agricultural productivity and thereby increase the income of farm households, who participate in the irrigation schemes (FAO, 1993). In the context of farm households living in the Sub-Saharan African countries, irrigation has, however, proved costly and can only benefit farm households with large plots in addition to concerns related with the environmental and health side effects of the schemes.

Takele, 2002 suggested that Large-scale dam and irrigation projects have not been widely implemented in Ethiopia as they have often proved to be too expensive and demanding in construction and maintenance. Therefore, water harvesting tanks and ponds at the village or household level are proposed as a practical and effective alternative to improve the lives of rural people at little cost and with minimal outside inputs. In theory, household water harvesting can be done mainly through the effort of the individual farmer. Use of stored rainwater could supplement natural rainfall and make farming families less vulnerable to drought and therefore less dependent on outside help in harder times (Takele, 2002)

Rami, 2003 studied that the success in attaining the planed amounts of tanks and ponds to be constructed and the perceptions of the beneficiaries are found mixed. Shortages of required construction raw materials, lack of timely dispersal of finance and shortage of skilled labor have been among the factors inhibiting the attainments of the stated goals. This is evident from Amhara region where it once was planned to construct 29005 tanks made of cement and plastic and 27955 wells were excavated for the purpose but only 12614 tanks were constructed. Furthermore, the tanks constructed so far are found to be substandard, many collapsed and majority leak and seep water, the main factor being lack of experienced masons and supervisors and mismatch between the type of soil in the area and the tank construction method. The tanks were first tested in Adama area and implemented in the two regions, with basically different soil structures from Adama area, without-taking into account the specificities of the two regions (Rami, 2003). In addition, most of the construction was assigned to each Woreda as a quota resulting in less attention being paid to quality as compared to number. Further, the implementation tended to be top-down approach, particularly in Amhara region, and this has also contributed its share to the problems.

LOCATION OF STUDY AREA:

Amalner Tehsil is lies in Jalgaon district and famous as a Khandesh region Maharashtra state, India. Geographically Amalner Tehsil is located between 200 and 210 North latitude and 74^0 55' and 76^0 28'East longitude.



DATA BASE AND METHODOLOGY:

Remote Sensing has essentially come to be exploited for inventory mapping &monitoring of earth resources .The information so generated is extremely important for resources managers & decision makers. Major elements are:

1. Data acquisition
2. Data processing & analysis

DATA ACQUISITION PROCESS:

- Source of energy
- Energy in EM radiation
- Propagation of radiation through earth station
- Sensors (Active &Passive)
- Platform (Air borne, Space borne & Ground borne)
- Recording of Sensors either in picture form or electronically, numerical form e.g.Magnetic tapes, cct, cd, decks etc.
- Transmission of data in India at Shadnagar, Hyderabad.
- MCU (Master Control Unit) at Lucknow.

INPUT:

GIS offer to input data in both geographic and tabular way. You can enter data into the computer in any of the following ways:

- Digitize a map or scanned image

- Scan a hard copy of a document
- Convert an ASCII formatted file
- Convert digital data from other formats
- Buy commercial available data, such as tapes and CD-ROMs

a) MANIPULATION AND ANALYSIS:

You can manipulate and analyze data to obtain following:
That is easier to work with

- More useful data
- Answer to particular questions
- Solutions to particular problems

b) MANAGEMENT:

- For small projects files are sufficient to store information.
- For large data volumes and more users DBMS is often best to store organize, and manage data.
- Most of GIS packages have linkage to DBMS like dBase, FoxBASE, SQL databases and so on.

ANALYSIS:

The integration of different data layers involves a process called overlay.

- This could be a visual operation, but analytical operations require or more data layers to be joined physically.
- This overlay, or spatial join, can integrate data on soils, slope, and vegetation, or land ownership with tax assessment

OUTPUT:

We can display geographic data as any following ways listed below:

- Screen displays on graphics terminals
- Plots- hard copy made using a plotter
- Screen dumps –hard copy made using a rasterizer
- Plots Script files –hard copy made using a laser printer

MATERIALS AND METHODS:

- Software used: ArcGIS Desktop 9.2
- Toposheet of Amalner Taluka

SURVEY OF INDIA (SOI) topographical map is used in the preparation of the base map into which the interpreted thematic details are transferred.

LISS- III data of Amalner Taluka:

The ground data under study is IRS LISS-III(November- 2007) standard for false color composite (FCC) imagery by combining three spectral band 3,2 &1 with a 23.5 mts resolution selected for generation the FCC print to identify the forest, agriculture land, harvested land, water bodies, open/barren ,scrub land ,settlements.

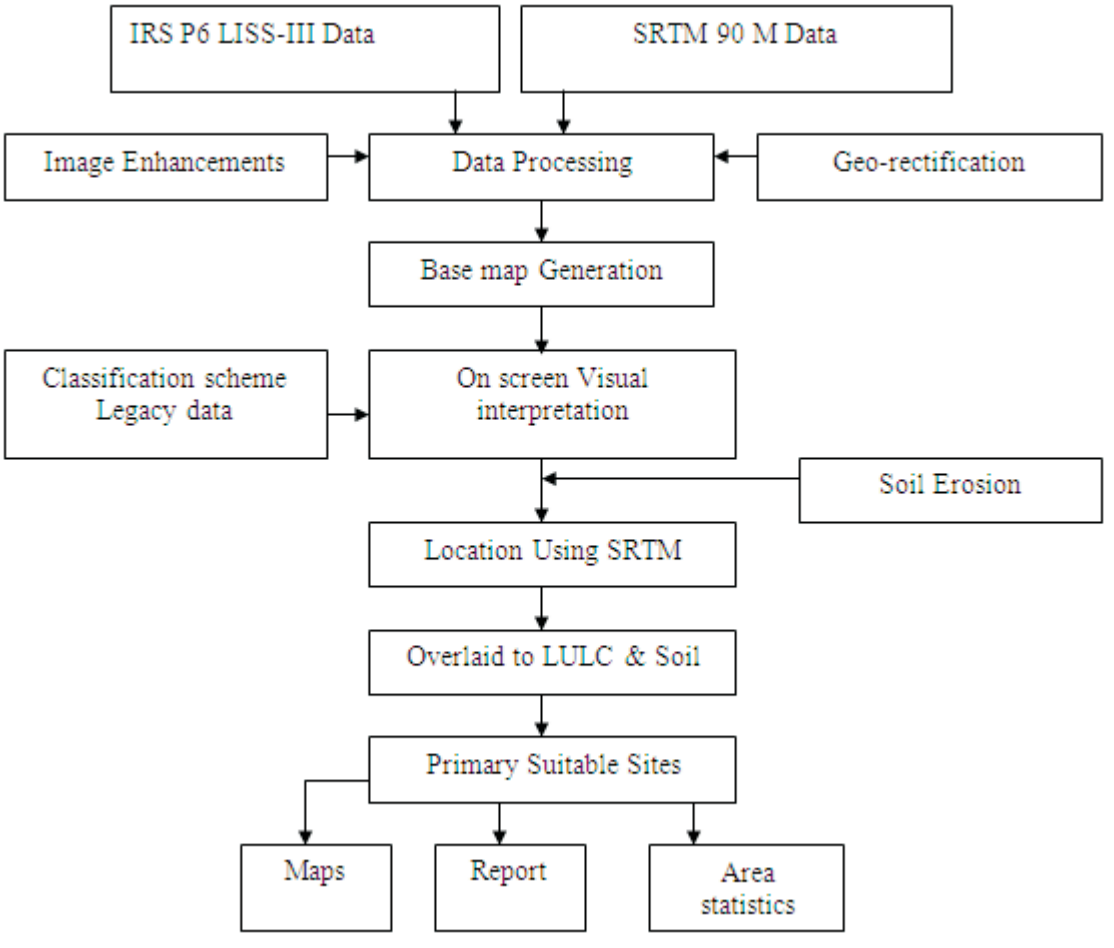
Data of Amalner Taluka:

The Shuttle Radar Topography Mission (SRTM) data (November- 2007) of Parola taluka having 90m resolution is used to locate potential sites for construction of farm pond.

Land use land cover data of Amalner Taluka:

The LULC data (November- 2007) of Parola taluka showing well distribution of agriculture crop, non agriculture crop, settlement, water bodies, open scrub, forest, and fallow is used to give final location for farm pond building.

Flow-chart of methodology



SITE SELECTION CRITERIA:

When planning to construct a farm pond, site selection is extremely important. Consider the following site characteristics before you design and construct your pond:

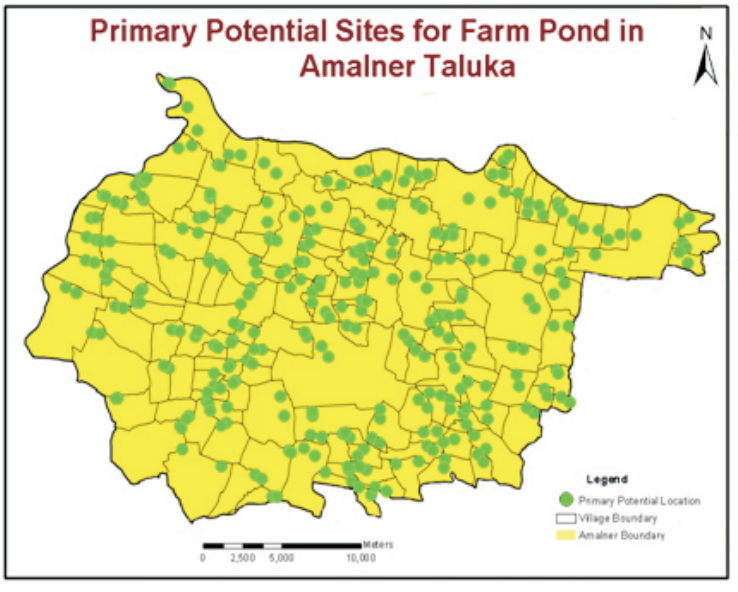
(1)Topography,
(2)Water supply,
(3) Soil type.
(4) Safety .

A power supply for aeration equipment must also be available. If possible, consider more than one location and study each one to select the most practical, aesthetic, and economical site

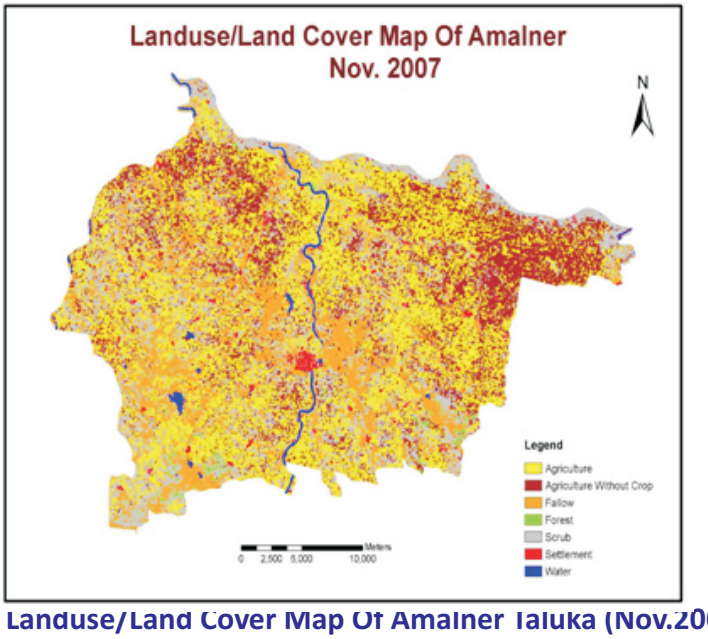
RESULT & CONCLUSION:

Result:

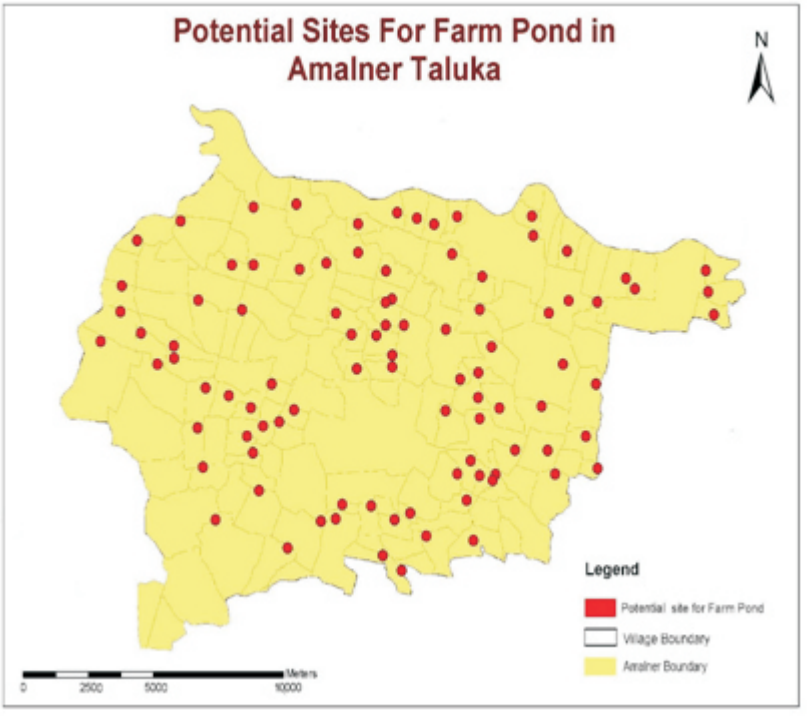
There are near about 145 villages in Amalner tehsil. After processing the whole data and getting the two to three lowest pixel locations from each village and overlaying on the Land use / Land cover and Soil. Thus final 93 sites in 93 villages are selected. These final sites occurs within the agriculture area or near to it, so because of ease in irrigation. The Map of primary potential sites for farm pond construction in Amalner taluka is as follow.



Map 1: Primary potential sites for farm pond in Amalner taluka.



Map 2: Landuse/Land Cover Map Of Amalner Taluka (Nov.2007)



Map 3: Final Potential Sites for Farm Pond Construction in Amalner Taluka

CONCLUSION:

Although farm ponds are typically constructed for various purposes like, to sup¬ply agricultural lands with water for irrigation, fire control, or live¬stock watering, they, provide recre¬ational opportunities, and They can also enhance the aesthetic qualities of a landscape and as well as supply habitat for wildlife. Farm ponds help to increase the overall health of the watershed, and can contribute to soil and water con¬servation. If a farm pond is managed properly, it also can provide valuable fish and wildlife habitat, while fulfill¬ing other farm needs for many years. Although there are so many bureaucratic, technological problems including no proper support from farmers related to this issue but a lot of scope is there for development of farm ponds in Amalner.

Farm ponds have an impact on cropping pattern, productivity, employment and income of the farmers in Amalner taluka The improved crop management practices compared with change in cropping pattern have contributed for providing additional employment among farmers. In addition to this, during off-season, construction of farm-ponds and later maintenance of farm pond is also contributed to increasing employment among the farmers who have farm ponds.

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Photographic Plates

Pic.1: Farm pond with polythene lining
This Farm Pond is located in the Dahiwad village of Amalner Taluka. This Farm Pond is used for irrigation purpose and lined with polythene lining to prevent water percolation.

Pic.2: Farm Pond without Polythene lining
This farm Pond is located in Amalner Taluka. It used to Recharged ground water level, therefore polythene linings are not placed in the Farm pond.

Pic.3 : Water supply to the Farm Pond From wells

This Farm Pond is located in the Dahiwad village of Amalner Taluka. It shows the water supply to fill the Farm pond using big water pumps from the wells and Drainages present near to the Farm Pond.

Pic.4: Farm Pond used for Fishary Purpose

This Farm pond is located in Takarkheda village of Amalner Taluka. This Farm pond shows that, this Farm pond is being used for Fishing as well as irrigation purpose.

Pic.5: Crops cultivated under drip irrigation through farm pond
The crops shown in picture are of the Cotton which are cultivated by using farm pond water by drip irrigation in the Takarkheda village of Amalner taluka.