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Ayacut Map Preparation By Google Earth & Irrigation Scheduling Using Cropwat 8.0 Model

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Abstract— The study is focused on the gross ayacut area map preparation using GOOGLE EARTH PRO, crop water requirement and irrigation scheduling of major crops in Thoothapuzha river basin using CROPWAT 8.0 The site is located in Thiruvegappura panchayat near Pattambi at Palakkad district, Kerala. Canal alignment is tracked and gross ayacut map is drawn by GOOGLE EARTH PRO. The ayacut map area is also computed. It is obtained as 141.06 Ha. CROPWAT 8.0 software has been used for estimation of potential evapotranspiration and crop water requirement of each crop by considering meteorological data viz. effective rainfall, temperature etc. Required data are collected from Indian Meteorological Department (IMD) and Regional Agricultural Research Station, Pattambi (RARS). The major cultivated crops are rice, coconut, arecanut, banana, etc. The total water requirements for these crops in basin area are computed. This is added to the drinking water requirement of 35000 consumers of Thiruvegappura panchayat.The total water requirement is obtained as 1.785 Mm^3. This study shows a more important intimation that the CROPWAT irrigation management model could be used effectively and efficiently to estimate the agricultural water requirements of different types of crops.

Index Terms— Ayacut; CROPWAT; Crop water requirement; evapotranspiration; Effective rainfall; GOOGLE EARTH PRO; Irrigation scheduling

INTRODUCTION

Due to the increase of population in the world, the demand of water is increasing and in many parts of the world there are major concerns regarding the sustainability of water resources for irrigated agriculture. Hence, the necessity for conservation of water resources increases, particularly in countries with limited water supply. Since the past decades, irrigation has traditionally been the major source of water usage for agriculture. To cope with shortage of water, it is necessary to adopt water saving agriculture counter measures. The main objective of irrigation is to apply water to soil to meet crop evapotranspiration requirement when rainfall is insufficient, to raise crop till harvesting. Irrigation includes application of the right quantity or amount of water at the right time to the soil for plant growth. Hence estimating ayacut area and crop water requirements is crucial for water resources management and planning in order to improve water-use efficiency. Area served by an irrigation project such as canal, dam or a tank is known as ayacut area. Ayacut map is prepared using GOOGLE EARTH PRO. The term crop water requirement means the total amount of water required by the crop and the way in which it requires water from the time of being planted till the crop has been harvested. The objective of this study is to determine ayacut area computation and crop water requirement for different crop such as paddy field, banana, coconut, areconut, black pepper, vegetables. The irrigation water provided to various crops is based on the crop water requirement of respective crop. The crop water requirement (CWR) is one of the most important aspects of water management in a command area. The main functions of CROPWAT are to calculate reference evapotranspiration, crop water requirements, crop irrigation requirements and to develop irrigation schedules under various management conditions. The CROPWAT software developed by the FAO Land and Water Development Division (FAO, 1992) includes a simple water balance model that allows the simulation of crop water stress conditions and estimations of yield reductions based on well-established methodologies for determination of crop evapotranspiration (FAO, 1998) and yield responses to water (FAO, 1979). Hence, in this paper an attempt has been made to compute the ayacut area, prepared ayacut map using GOOGLE EARTH PRO and crop water requirements of major crops using CROPWAT 8.0 (FAO 2009) and comparing the same with the available water resources in that region to assess the current status and future demand, which is essential for planning.

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2 PROCEDURE

2.1 Study Area

The study area is around Thuthapuzha river in Thiruvegapura panchayath, which lies between $10^0$86‘74” North latitude and $76^0$10‘90” East longitudes. It is situated in

Palakkad district. Thuthapuzha River is one of the main tributaries of the Bharathapuzha River, the second largest river in Kerala, south India. Kunthipuzha that flows through the silent valley national park is one of its tributaries. Elamkulam, Thiruvegapura and Pulamanthole are places of importance situated on the bank of this river. The location map of the proposed area is shown in Fig.1.

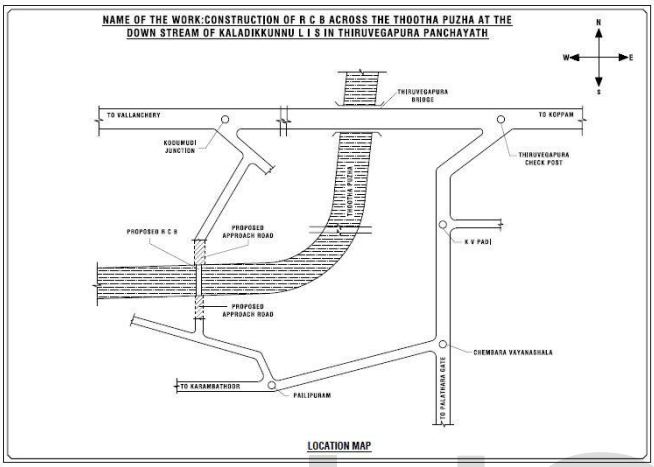

Fig.1. Study area

2.2 Methodology

Field survey of the proposed area is conducted. Canal alignment is tracked using GEO-TRACKER software (fig 2.). It works on the concepts of GPS and gives the line maps showing speed, direction of movement, and kilometers travelled.

Fig. 2. Canal alignment

The area served by an irrigation project such as a canal, dam, or a tank is known as ayacut area. This involoves ayacut area map preparation using GOOGLE EARTH PRO (fig 3.). It is a mapping software that stitches together satellite imagery and air photos in to map that overlay each other which can be seen in various imagery modes. Canal alignment is tracked using GEO- TRACKER software and ayacut map prepared using GOOGLE EARTH PRO software. Ayacut area computed from the ayacut map.

Cropwater requirement is defind as the depth of water needed to meet the water consumed through evapotranspiration by a disease free crop, growing in large fields under non-restricting soil conditions including soil water and fertility, and achieving full production potential under the given growing environment. Crop water requirement is computed using CROPWAT 8.0 software. Crop water requiremet of each crop can be computed by considering meteorological data viz, effective rainfall, soil group, temperature, wind speed, sunshine, relative humidity etc. Required data are collected from Indian Meteorological Department (IMD) and Regional Agricultural Research Station (RARS) ,Pattambi.

Datas required are climatological data, soil data and crop data

- Climatological data (obtained from Indian Meteorological Department, IMD) - Max & min temperature, humidity, wind speed, sunshine, effective monthly rainfall
- Soil data (obtained from Regional Agricultural Research Station pattambi, RARS) – Soil type, available water capacity of soil
- Crop data (obtained from Food and Agricultural Organization)- crop coefficient, crop factor for soil moisture depletion, effective rooting depth

CROPWAT software includes 5 data input modules (climate, rain, soil, crop & crop pattern) and 3 calculation modules (crop water requirement, schedules & schemes).

The total water requirement is estimated considering the following consumptive use:

a) The monthly potential evapo-transpiration (ET_o) for each crop computed from CROPWAT 8.0 software.

b) Datas of calculating Evapo-transpiration needs temprature maximum and minimum, humidity, windspeed, and sunshine hours.

c) 30 years Rainfall datas collected from IMD department.

d) The Crop co-efficient is also taken from IMD station for Agro climatic zone-VIII.

e) Effective rainfall datas are calculated from according to the FAO guidelines.

3 Results And Discussions

From the ayacut map, ayacut area of different crop can be identified (fig 2). Paddy field (99.8 Ha), Banana (7.17 Ha), coconut (13.64 Ha), arecanut (8.52 Ha), black pepper (2.73 Ha),

vegetables(9.2 Ha).

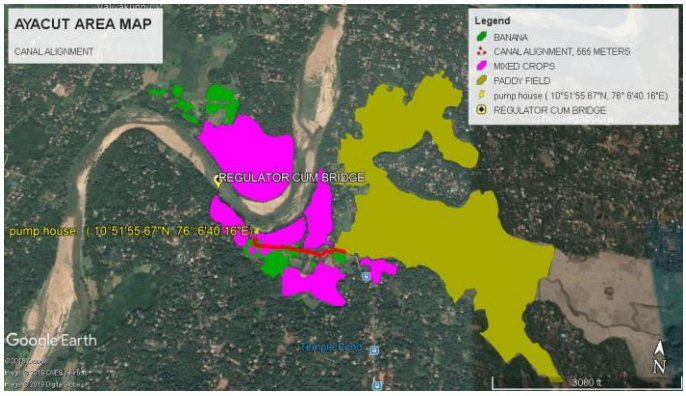

Fig.3. Ayacut area

The CROPWAT Software is generated for predicting the Crop Water Requirements of the different types of Crops like paddy field, banana, coconut, arecanut, black pepper, vegetables and for that metrological parameters like maximum Temperature, minimum Temperature, wind speed, relative humidity, sunshine hours are used. The metrological parameters are considered as input and reference crop evapotranspiration is considered as output. The data sets are converted on monthly basis. The trends over study period of 1 year of all the meteorological parameters are observed in all months in with the help of CROPWAT.

The crop water requirement of various crops obtained using CROPWAT is shown below in table 1.

Crops	Area in Ha	Water required in Mm^3
Paddy	99.8	1.26
Banana	7.17	0.06
Coconut	13.64	0.15
Arecanut	8.52	0.09
Black pepper	2.73	0.07
Vegetables	9.2	0.15
	Total	1.78

The total cropwater requirement simulated using CROPWAT software is found to be 1.78 Mm^3. To this, a drinking water allowance of 135 lpcd for 35000 consumers is also added. So the net water requirement calculated is 1.784725 Mm^3.

4 Conclusion

An attempt has been made to compute the crop water requirements of major crops in thiruvegappura panchayath using CROPWAT 8.0 model of FAO and comparing the same with the available water resources of the district.The major cultivated crops are paddyfield, banana, coconut, arecanut, black pepper, vegetables.The total water requirement for these crops in various agro-ecological zones has been computed. Using the evapo transpiration (ET0) and effective rainfall in each agro-ecological unit (AEU), a climatic water balance has been worked out. The net irrigation demand, the gross irrigation demand and irrigation interval for the various crops have been computed. The gross irrigation demand is 1.784725 Mm^3. In canal irrigated area precisely calculated crop water requirement will lead the conservation of water in the command area. This helps in reducing problem of water logging in canal irrigated area. The applied irrigation management model could exactly evaluate the agricultural water requirements. The ayacut map preparation using GOOGLE EARTH PRO software is a viable option since it reduces tedious field works . Ayacut area computed from the ayacut map. This study shows a more important intimation that the CROPWAT irrigation management model could be used to effectively and efficiently to estimate the agricultural water requirements of different types of crops.

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