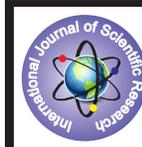


An Assessment of Water Availability and Crop Water Requirement in Kozhinjampara Area, Kerala State



Geography

KEYWORDS : Water availability, Crop water requirement, Cropping pattern, Crop calendar

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ABSTRACT

The ever increasing pressure of population on land and demand for food focus the need for scientific and judicious use of both water and the piece of land. This could be achieved only through the proper understanding of available water potential and its utilization in land use and cropping pattern and changes that have taken place in the concerned regions. Hence this paper attempts to study the water availability and crop water requirement in Kozhinjampara area of Palakkad District of Kerala State-a drought prone area. The main aims and objectives of this study are the assessment of water potential; water availability periods; crop water requirement and finally to suggest suitable crops for the study area.. Based on the analysis crop calendar and crop proposal has been made for the study area.

Introduction:

The ever increasing pressure of population on land and demand for food focus the need for scientific and judicious use of both water and the piece of land. This could be achieved only through the proper understanding of available water potential and its utilization in land use and cropping pattern and changes that have taken place in the concerned regions. Water is a prerequisite for the existence of life. The development and over exploitation of water resources in certain parts of the country have raised the concern and need for scientific water resources management and conservation. In many places, the rates of extraction of groundwater for irrigation are so high that aquifers are getting depleted. Integrated and co-ordinated development of surface and ground water resources and their conjunctive use in irrigation and their impact on existing land use and cropping pattern will give a clear picture of the relationship between the water availability and cropping pattern of the area.

Chandra. S (1987), Gupta. and Desh Pande (2004), Rao. (1997), have studied various aspects of water resources and uses. Seth. (2000) stressed the need for integrated water resource management in India. Krishnan (1966), Raj (1973), Bishnoi (1972, 1977), Nagashree (2007), Jenifa Latha (2010), Kannan (2010) have analyzed the rainfall reliability and moisture storage in different areas and in different cropping seasons. Nagarathinam (1990) have given a crop calendar for Coimbatore district on the basis of the availability of moisture and crop water requirements.

The main aims and objectives of this study are to assess the water potential, the water availability periods, crop water requirement and finally to suggest suitable crops for the study area.

Materials and Methods:

The present study is carried out mainly based on the secondary data and field verification. A data on surface water, wells, levels, ponds and tanks; rivers and streams are collected from the office of the Kerala State Land Use Board. The data on climate such as temperature, rainfall, are collected from the Integrated Seed Development Farm, Department of Agriculture, located at Eruthempathy. The data on principal crops cultivated in the region, period of cultivation, crop water requirement, and land use were collected from the Principal Agricultural Office Palakkad. The information on socio-economic data such as population, settlement, literacy, etc., for the study area was also gathered from the District Economics and Statistics office at Palakkad. The data collected were processed and analyzed using various statistical techniques such as co-efficient and co-efficient of variation. The results are cartographically represented and are interpreted to achieve the above said objectives of the study.

Study Area:

To fulfill the aforesaid objectives, Kozhinjampara region, in Pal-

akkad district, a drought - prone area identified by the Kerala State Land Use Board has been selected as the study area. The study area extends from 10° 39'30"N to 49'28"N latitudes and from 76° 48'12"E to 76° 54'29" E longitudes. It is a drought - prone area and experiences severe water scarcity and is located in the eastern part of the Palakkad district. It includes Vadakarapathy, Eruthempathy and Kozhinjampara grama panchayats of Chittur Block of Chittur taluk. It lies on the Palakkad Gap and experiences dry conditions throughout the year. The elevation ranges from 80 to 280 metres from west to east and is sloping south and south westward. The *Bharathapuzha* and its tributaries (Velanthavalam Ar, Varattayar, Koraiyar and Chittur Puzha) form the drainage system. The Moolathara regulator, Kunnampidari reservoir and many other perennial and non-perennial ponds and tanks are the important man made water bodies in this study area. As the study area is the part of Palakkad gap which is the largest convergence zone in the Western Ghats, rainfall, temperature distribution and wind pattern are orographically controlled. The rainfall is highly seasonal, low rainfall is experienced during Northeast and summer months. Agricultural land use is purely depends on the availability of rainfall. The spatial distribution of rainfall indicates that the southern parts being adjacent to the Nelliampathy plateau receive higher amount of rainfall as compared to the other parts of the area. Rainfall decreases towards north and east. The annual and seasonal rainfall, deviation (%) and co-efficient of variation in percentage contribution to the annual rainfall for 36 years average are given as Fig.1, the departure from normal are worked out and are also given in Fig.2. Co-efficient of rainfall is 24.31% and its dependability is fairly high in this area.

Alluvial and Black Cotton soils are the main soil types. The important soil in the study area is black soil. The natural vegetation of the study area is characteristically tropical (Tropical moist- deciduous and Southern dry - deciduous) owing to the seasonal rainfall moderate temperature and its location with respect to the Palakkad gap. Due to its periphery location this area is still under developed in many aspects especially in socio-economic sector, although it is blessed with climatic and soils for diverse cultivation. The total population according to 2001 census was 72,231 persons and density of population was 552 persons per square kilometers. The working population accounts 47.74% of the total population. Since the agriculture is the main occupation, the cultivators and agricultural workers account 69.56% of the total work force. The development of industries, markets, transportation and other socio-economic services were in various stages.

Water Resources Potential:

The water resources of the study area are found in the form of Bharathapuzha and its tributaries, ponds and tanks, rainfall and in ground water. The surface water is depends on the availability

and release of water from the Aliyar reservoir and are controlled by Moolathara and KunnamkattuPathy diversion system as well by rainfall. This area experiences high rainfall during South West Monsoon and moderate during North East Monsoon. The analysis of ground water potential and changes in levels reveals that in total ground water potentials is 36.37 mm³, and draft is 44.19mm³ is available for irrigation and domestic purposes. The net water available for exploitation is in -7.49mm³ accounts a deficit of 20 %. Hence this area is identified as one among the over-exploited areas of Kerala state. The Ombrothermaric water balance analysis gives an idea about the water availability periods. Normally the water is available from the month of June and continues up to November.

Table.1 Water potential– Kozhinjampara Area:

Sl. No	Name of panchayat	Open wells	Bore wells	Ponds & Tanks	River / Streams (in mts.)	Canals (in mts)
1	Kozhinjampara	2281	392	34	39175	70515
2	Eruthempathy	1009	372	15	35300	7400
3	Vadakarapathy	1462	452	120	67900	1925
	Total	4752	1216	169	142375	79840

As 150 tanks and ponds are located in the study area, the intensity has been derived to 1.5 ponds and tanks per sq.km. However the stream density of the study area is estimated to be 0.122 km per sq. km. To conclude the study area comparatively has high surface water density sources to other areas.

There are 2208 perennial and 2444 non-perennial wells in the study area. To understand the intensity of wells in relation to irrigated area the indices of intensity have been applied and the intensity for the entire region is calculated. The intensity of perennial wells is 16.95 wells per square Km and non-perennial wells are 18.76 wells per square Km. On an average the intensity of wells in the study area is 35.71 wells per square Km. Intensity of tube wells distribution has been worked out to be 8.94 wells per sq.km. To analyze the water level fluctuation, 37 wells have been identified in and around the study area and data on levels, depth and changes were collected. Out of 37 ground water wells, 11 sample wells including five tube wells and six open wells were taken to assess the groundwater potential in the study area. It was observed that the ground water prospects is good in valley floor and flood plains, where as it is poor in high lands. This was substantiated by the secondary data collected from ground water department and reports. The depth of dug wells in the study area varies from 5 mbgl to 13 mbgl. And the depth to water level varies from 3 mbgl to 12 mbgl during April.

Water table is up to 1 m was observed in the southern parts of the study area, whereas, water table between 3m to 7.5m was observed in the adjacent areas of Chittur Puzha and along the irrigation canals. These two zones belong to the intensively irrigated parts of the study area. In the eastern, northern and north eastern areas the depth to water table is below 7.5 m and the same may be accorded for an acute shortage of water during summer season. The same problem was also encountered in the north eastern part due to rugged topography. Water table at a depth of more than 10 m is observed in the Eastern parts of Eruthempathy and Vadakarapathy where deep black soils are largely found.

Seasonal Distribution of Rainfall:

The rainfall is highly seasonal. Among the seasons Southwest monsoon contributes the maximum quantity of rainfall (781.166 mm) and the Northeast monsoon is (203.8mm), accounting

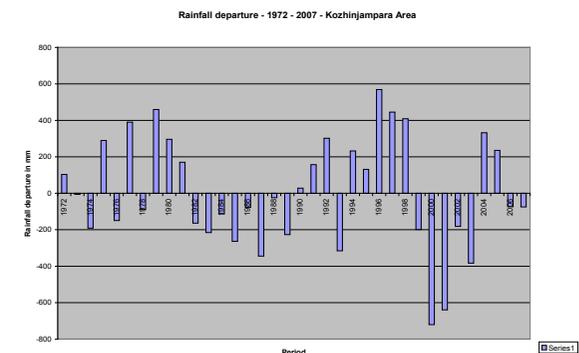
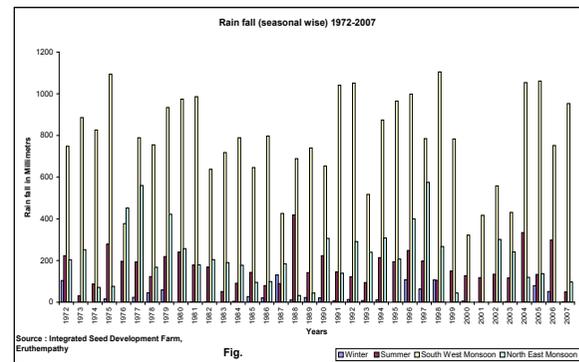
66.49% and 17.35% percent of total rainfall respectively. The rest of rainfall is received in summer (13.93%) and winter (2.1%). The Co-efficient of variation (CV) is maximum during winter i.e. 136%. The variability is 67.83% in North-East Monsoon, 52.38% in summer and 27.60% in Southwest monsoon season. The value clearly indicates that the rainfall during Southwest and summer are highly dependable followed by North East Monsoon. It may be noted that lower is the co-efficient of variation and higher is the dependability. Fig.2 depicts seasonal rainfall and Fig.3 represents the departure of rainfall from normal.

General Land Use and Agriculture

The term land use means the different ways by which a piece of land is put to use over a period of time or at a part of time. Campbell (1987) defines land use as “use of land by humans, usually with emphasis on the functional role of land in economic activities”. The land use of a region is dependent on many factors such as water availability, soils, temperature, topography, socio-economic- technological conditions and reflects the interaction between the society and environment.

Six broad land use classes were identified from the Panchayat Resource Map Reports of the study area, prepared by the Kerala State Land Use Board.

* mbgl-metres below ground level



The principal crops cultivated in the study area are paddy, coconut, sugarcane, cotton and pulses. Paddy, sugarcane, coconut and vegetables are cultivated in the study area with irrigation facilities. The dry crops like millets, pulses, cotton and tapioca are cultivated in the un- irrigated areas. The coconut plantation and cotton cultivation need irrigation during the dry months for good yield.

Coconut is the important crop cultivated in the study area and covers almost 35.913% of the total cropped area. The mixed crops of the area accounts 25.697% followed by paddy with

13.622%, sugarcane with 7.092%, vegetables with 5.577%, groundnut with 3.117%, maize 2.130%, cotton 1.968 % and plantain 1.090% of the area. Vegetables are cultivated under irrigation and covers 5.577% of the total cropped area. Tree crops and perennial crops dominated by coconut accounts for 35.913% of the total cropped area. Distribution of these crops varies from panchayat to panchayat according to availability of irrigation and other economic influences. However coconut is predominant in all the panchayat. Mixed crops, vegetables, groundnut, cotton, maize, sugarcane and plantain are widely cultivated in almost all panchayats. Minor crops of this area and their share to the total cropped area are, fodder (0.974%) cashew nut (0.754%), mango (0.492%), tapioca (179%) and areca nut (0.147%).

Crop Water Requirement:

Coconut is the main crop and its water requirement is 7.175 mm/irrigation per plant (5 or more year old) at an interval of 7 days. The mean water requirement for rice is 1200 – 1500mm at an interval of 4 – 5 days with 50 mm per irrigation, for 80-100 days. Sugarcane is another important crop which is widely cultivated in the study area and it needs high amount of water that is 2000mm at the rate of 50 mm/ irrigation in 7-8 days interval. Ground nut is another important crop cultivated in the study area and is a low water requirement crop, since its total requirement is just 450-550mm for the whole span at the rate of 50 mm per irrigation at an interval of 10-12days. Vegetables are 5th most important crops in the study area and are more water oriented crops. Their overall water requirement ranges from 650-800mm and irrigation interval is 3-8days at the rate of 50 mm per irrigation. It is cultivated throughout the region both as rain fed and irrigated conditions. The study area is the only region in Kerala where cotton is cultivated and is a medium water requirement crop as its demand is 600mm at an interval of 10-12 days at the rate of 50 mm per irrigation.

Table .2 Crop Calendar:

Sl No.	Crops	Period	Duration in days
1	Paddy (i).Crop Virippu (ii)Crop (Mundakan) (iii) Crop (Puncha)	15 th April to 15 th Sep. 15 th Sep. to 15 th Jan Feb – April	135 120 120
2	Groundnut 1 st Crop 2 nd Crop	April – July Sep – November	110 90
3	Cotton	Aug – Jan	180
4	Sugar Cane	Perennial Crop (12 months)	360
5	Tapioca	June – Jan	240
6	Vegetables	1 st season April – Jun 2 nd season Nov – Feb	75 to 180 120
7	Pulses	Dec – Feb	95

Crop proposed

To increase the cropping intensity, with available water resources in the study area, Kozhinjampara a new crop calendar is prepared by taking in to the various aspects like major crops, crop water requirements, soil condition and their suitability and water availability in different crop seasons and is given as follows.

Table .3 Proposed cropping pattern for Kozhinjampara area.

Sl. No	Soil Series Name	Existing cropping pattern	Water and Soil suitability for Crops		
			1 st Priority	2 nd Priority	3 rd Priority
1.	Moolathara	Rice and Pulses	Rice (Short Duration) 2 Crops	Rice, Vegetable	Rice & Groundnut
2.	Valialampathy	Rice and Pulses	Rice	Sugarcane inter-cropping with pulses	Vegetable, groundnut, Tapioca and sunflower
3.	Korayar	Sugarcane, Cotton, Jowar, Maize, Horse Gram	Rice (2 Crops),pulses	Sugarcane	Cotton, Groundnut, sunflower
4.	Nilipara	Sugarcane, Cotton, Groundnut and millets	Sugarcane intercropped with pulses	Groundnut and cotton	Coconut inter-cropped with Banana and Tapioca
5.	Go-palapuram	Cotton, Sugarcane, Groundnut, Millets and coconut	Rice or Coconut with Mixed crop	Cotton, Vegetables	Fruit Gardening (Grape, Mango, Guava)
6.	Elappully	Rice	Rice (Short Duration) - 2 Crops, vegetables	Sugarcane ,pulses	Cotton or coconut with mixed cropping
7.	Kozhipathy	Groundnut, sugarcane, Millets and Rice	Ground nut and vegetables	sugarcane	Coconut
8.	Nalleppilly	Sugarcane, cotton	Groundnut, pulses, Maize and Jowar	Sugarcane relay cropped with oil seeds	Pulses and vegetables
9.	Thekkedesam	Rice	Rice or plantation	Groundnut	Vegetables and rice

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