Studies of Soil and Water Quality Parameter in Relation to Agricultural Practices and Cropping Pattern in Chambali River Basin in Purandar Tehsil, Maharashtra

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Abstract:

The majority of the country's population depends on agriculture for their livelihood. Agriculture is the source of food and it is source for raw material for industry. Although agriculture is major contributor in Indian economy still it faces many challenges. Dependency on rainfall, land ownership, fragmentation of holding, land tenure, labours, manures, fertilizers and biocides, meagre irrigation facilities, lack of mechanisation, agricultural marketing, transport facilities, decreasing production are the challenges faced by Indian agriculture. In which agriculture production mainly affects due to agricultural practices and cropping pattern. To know the agricultural system in the area Soil and water samples from Chambali river basin in Purandar are collected. With the help of questionnaire and interviews information about the farming practices in the area is collected.

Keywords: Agricultural Ppractices, Cropping Pattern, Soil Samples, Water Sampls

Introduction:

India is known for its agricultural economy and it plays a crucial role in Indian economy which provides employment opportunities to rural agricultural and non-agricultural labourers. The majority of the country's population depends on agriculture for their livelihood.

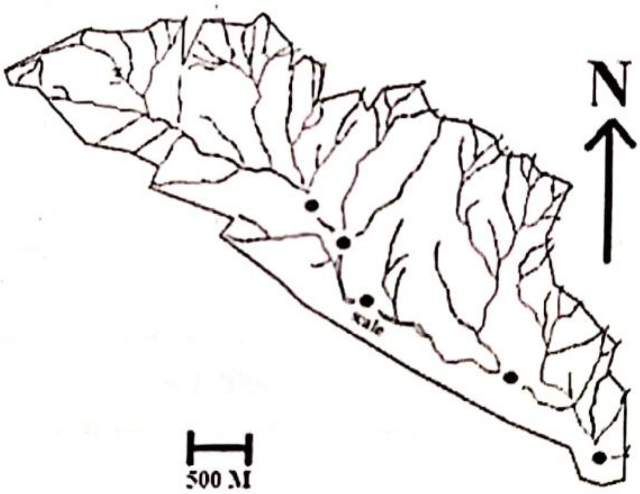
The Indian Economy holds the sixth position in the world's top economies. Agriculture has major contribution to the country's GDP. It provides employment and it is largest employee sector. Agriculture is the source of food and it is source for raw material for industry. Agro-products such as tea, coffee, sugar, cashew nuts, spices, etc., which are edible and textile products such as jute, cotton, and others contribute 50% and 20% respectively to the total export of the total country. Agriculture is the most significant source of income for the central and state governments. it is clear that agricultural growth is a necessary precondition for sectoral diversity and economic development.

Although agriculture is major contributor in Indian economy still it faces many challenges. Dependency on rainfall, land ownership, fragmentation of holding, land tenure, labours, manures, fertilizers and biocides, meagre irrigation facilities, lack of mechanisation, agricultural marketing, transport facilities, decreasing production are the challenges faced by Indian agriculture. In which agriculture production mainly affects due to agricultural practices and cropping pattern.

With the aim of study of agriculture in Chambali basin in Purandar we have taken two major effects on production are agricultural practices and cropping pattern with special reference to soil and water analysis. Following aims and objectives for the study are taken into consideration. The article provided assessment of agricultural practices and cropping pattern in Chambali Basin.

Study Area:

A Study area is small river basin in a Purandhar Tehsil of Pune District of Maharashtra State. Total area covered by Purandhar Tehsil is 110200 heaters. Administratively Purandhar Taluka is in the southern region in Pune District. It has a total of 108 villages and 3 towns (Jejuri, Sasvad, Nira). The Chamabli River is tributary of river Karha originates in the Bopdev Ghat at the elevation of 1012 m and meets Karha near Saswad at the elevation of 780m. The length of the river is 16 km and Askarwadi, Bhivri, Bopgaon, Chambali, Hivre are the villages on the bank of river Chambali.



Aims and Objectives:

1. To study the chemical characteristics of soil and water for agricultural use in the basin
2. To study the agricultural practices and cropping pattern in the basin.

Methodology:

To study the agricultural practices and cropping pattern as well as soil and water characteristics in the area primary and secondary methods of data collection are adopted. Soil and water samples are collected from several points. The samples were used for chemical analysis to measure the Soil pH, Electrical conductivity (EC), Organic matter (OM), Calcium (Ca) and Magnesium (Mg), Alkalinity, Moisture content (Mc) Sodium (Na) and Potassium (K). The information regarding the agricultural practices and cropping pattern collected from farmers through the questionnaire and interview methods. Maps are prepared using global mapper software and SOI toposheet 47F/16 and 47 J/3 are used for preparation of map.

Discussion and Analysis –

Soil and water are the essential elements in plant growth. To achieve sustainable crop production and to improve soil health soil and water testing is necessary. N,P,K, Ca, Mg and s are the essential elements for plant growth as well as F, Mn, Zn, Cu, Cl are recognized as micronutrients. Total five soil and water samples are collected in the Chambali river basin area.

Soil analysis helps to provide a basis for fertilizer recommendations for a given crop and to evaluate the fertility status of the soil and plan a nutrient management program.

Soil Analysis:

Sample	Location	PH Value	Ec	Nitrogen (N)	Phosphorus (P)	Potassium(K)	Sodium (Na)	Organic car.	Lime
A	18°23'05.34"N 73°57'58.08 E	7.95	0.31	137.00	16.84	209.00	2.16	0.57	14.28
B	18°22'56.18"N 73°58'05.33"	7.86	0.31	159.00	17.83	323	2.13	0.66	22.95
C	18°22'11.52"N 73°59'02.86 E	7.81	0.49	137.00	18.00	412.00	1.58	0.57	1.58
D	18°21'48.27"N 73°59'53.59"E	7.67	0.42	178.00	12.54	558.00	1.86	0.74	1.86
E	18°21'46.35"N 73°59'02.86"E	7.89	0.23	81.94	11.91	200.00	2.12	0.34	13.77

Soil pH – soil pH measures alkalinity or acidity of soil. Correct pH is important for healthy plant growth and agricultural practices can alter the pH of soil. It has impact of biological activities of the plant and mineral nutrient quality. The pH observed in collected samples ranges from 7.67 to 7.95. No significant variation in pH is observed in the soil.

Electrical Conductivity - Soil electrical conductivity (EC) is a measure of the amount of salts in soil (salinity of soil). It is shows nutrient availability and loss, soil texture, and available water capacity. Crop yields, the suitability of the soil for certain crops, the amount of water and nutrients available for plant use, and the activity of soil micro-organisms depends on electrical conductivity. The range observed for collected sample is from 0.23 to 0.49 and is seen normal.

Natural Organic Carbon - Soil organic carbon is a measureable component of soil organic matter. Organic matter makes up just 2–10% of most soil's mass and has an important role in the physical, chemical and biological function of agricultural soils. The range observed for collected sample is 0.34% to 0.74%. At the location of A5 it is generally less and at A4 the percentage of organic carbon is good.

Nitrogen - Nitrogen is found in all soils, and is required by all living creatures. Nitrogen is an essential nutrient for plant growth, development and reproduction. At the location of A5 Nitrogen is less 81.94 hec/kg. but at A4 nitrogen is high 178 hec/kg. At a4 it is very less but at A4 it is also less.

Phosphorous - Phosphorus in plants is Key in capturing, storing, and converting the sun's energy into biomolecules. Phosphorus plays a major role in the growth of new tissue and division of cells. Plants perform complex energy transmissions, a function that requires phosphorus. At A5 it is 11.91 which is less than standard and high at A3 is 18.00 but moderate than standard.

Potassium - Potassium is associated with the movement of water, nutrients and carbohydrates in plant tissue. In the collected samples at A4 and A1 it is 200 Hec/kg which is moderate and at A2, A3, A4 it is in very high quantity.

Sodium – Sodium is not an essential element for plants but can be used in small quantities, similar to micronutrients, to aid in metabolism and synthesis of chlorophyll. In some plants, it can be used as a partial replacement for potassium and aids in the opening and closing of stomates, which helps regulate internal water balance. In the collected samples at A3 it is 1.58 is very less and at A1, A2, A5 it is 2.12 which is very high.

Lime- Lime is suggested to enhance soil health status through improving soil physic-chemical properties and neutralize the acid produced in the soil. At A3 A4 is very less but at other places it is high in percentage.

Water Analysis:

Water is an important resource for every type of cultivation. The analysis of agriculture water quality stands valid for plant growth and as the water for irrigation comes from variety of sources. The agriculture water is tested for PH, alkalinity sodium, potassium, nitrogen etc. Residential water testing must do frequently as it helps in deciding the choice of fertilizers for plant growth.

Sampling station	Hivare	Chambhuli	Ramwadi	Near Bhopgaon	Khapurwadi
source	Farm pond	Well	Well	Borewell	Well
pH	8.19	7.59	7.71	8.09	7.97
Ec	1.37	1.81	0.94	0.74	0.78
Na	3.39	4.2	2.19	3.17	2.4
Percent sodium	46.50	50.0	31.33	38.80	43.63
SAR	2.43	2.93	1.42	1.99	1.93
Ca	0.3	0.4	0.3	0.6	0.6
Cl	5.8	7.0	2.6	2.0	2.4
Mg	3.5	3.8	4.5	4.5	2.5
Co3	-	-	6.0	5.6	6.2
Hco3	5.2	7.0	2.6	2.0	2.4

Water pH- Alkalinity and pH are two important factors in determining the suitability of water for irrigating plants. pH is a measure of the concentration of hydrogen ions (H+) in water or other liquids. In general, water for irrigation should have a pH between 5.0 and 7.0. Hivare 8.19 Chambali 7.59

Ec- The conductivity of water is a measure of the capability of water to pass electrical flow. Significant changes (usually increases) in conductivity may indicate that a discharge or some other source of disturbance has decreased the relative condition or health of the water body and its associated biota. Near Bhopgaon it is 0.74 that is normal but at other places it is high.

Na- Sodium is not an essential element for plants but can be used in small quantities. In normal condition Sodium ranges in between 0 to 4. In case of water samples collected it is within normal range.

Percent Sodium – Percent Sodium is in normal range in all collected samples.

SAR – The sodium adsorption ratio (SAR) is an irrigation water quality parameter used in the management of sodium-affected soils. It is an indicator of the suitability of water for use in agricultural irrigation. It is inbetween 1.42 to 2.99 and shows no hazards for the irrigation water.

Ca – Ca in water is seen normal at all places which is in between 0.3 to 0.6. Chloride is a naturally occurring element that is common in most natural waters and is most often found as a component of salt (sodium chloride) or in some cases in combination with potassium or calcium. The normal range of Chloride in water is 0 to 6. In case of collected samples it is high at Chambali. Magnesium in the water is seen in normal range in all collected samples.

Co3 -Carbonates in water is present in the form of hardness and it needs to be removed as it can prove to be dangerous to human beings as well as affect the conveyance system. In the collected samples carbonate in water is in high range at all places. But Hco3 is seen in normal range in every collected sample. Bicarbonate has hazard of irrigation water. High carbonate ($CO_3^{=}$) and bicarbonate (HCO_3^{-}) increases SAR index. In all collected samples HCO3 is in normal range.

Agricultural Practices and Cropping Pattern:

Implementation of good agricultural practices is extremely necessary to improve the food supply chain. It helps in making farming easy and efficient. Landscape management, preparation of soil, sowing, Manures and fertilizers, irrigation, weeding, harvesting, storage are the agricultural practices used traditionally. Crop rotation, planting cover crops, integrated pest management and agroforestry are the practices must be implemented for the sustainable agriculture. Cropping pattern is also important in crop production. The study of cropping pattern helps to increase soil fertility, increase crop yield, soil nutrients, reduce soil erosion, improve soil structure, and reduce cost of production. With the help of questionnaire questions regarding agricultural practice and cropping pattern are included. The analysis of the data shows the diversity in agriculture. It is seen that 31.03% land is under the dry farming, 53.44% land is under the Horticulture and 15.51% are under the both dry and horticulture agriculture. The source of irrigation is available at the Hivare village are wells, borewells, and monsoon. The most common irrigation sources available at the Hivare village i.e. well that is 50% of the total irrigation sources. 18.96 agriculture is depending on well and borewell. Nearly 25.58% Agricultural area is fed by monsoon. Traditional agricultural practices used and only 22% agricultural land is under drip irrigation, 5% is under sprinkler and 8% is under both drip irrigation and sprinkler. 23% farming is fed by traditional methods like (patpani). It is seen that most of the farmers use traditional methods for agriculture. Seeds are the important components in the agriculture. Use of hybrid seeds is more common in the area. Commercial and subsidence agriculture are seen along the Chambhali substream area.50 percent farmers are engaged in commercial farming, 25 percent are in subsidence farming and remaining 18.96 percent are engaged in both commercial and subsidence farming. Most farmers are used their capital for the agriculture. But some are taken loan from bank and cooperative society. Among these 24.12% farmers have taken loan from bank, 10.34% from cooperative societies. There is diversity is crop types 39.65% farmers take 2 crops, 22.39% are take 4 crops per year. Only 8.62% farmers take 4 to 5 crops per year. Peas, groundnut, carrots are most common crops in the area. The farmers in this region are taking the crops in monsoon season. In winter season wheat, bajra, cereals crops are taken by the farmers.

Summary and Conclusion:

The study area includes the small River basin area of sub Stream of Karha River in Purandar Taluka. Agriculture is important economic activity in the area. The agriculture is depends on monsoon mainly. The area experiences drought conditions in summer season. Main crops groundnut, peas and carrots are seen in the area. Traditional agricultural practices used and only 22% agricultural land is under drip irrigation, 5% is under sprinkler and 8% is under both drip irrigation and sprinkler. In the present study pH and electric conductivity found

Moderate percentage of organic carbon is normal but Nitrogen content is less at all places. Phosphorous in the soil is seen average in all collected samples. Lime is seen very high at three places. On the basis of data collected in the area agricultural practices and cropping pattern should be considered and soil and water management for sustainable agriculture should be practised.

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