FINAL REPORT AND STATEMENT OF EXPENDITURE

OF

MINOR RESEARCH PROJECT

TITLE

"Cost Effective use of Resources for Sugarcane Cultivation in WalwaTahasil of Sangli District (Maharashtra)"

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CHAPTER-I

1.1 Introduction:

The Tahsil *Walwa* is located in draught prone zone in the state of Maharashtra. However it is benefited from canal and lift irrigation on water resources from *Krishna*river.Because of this, it is famous for sugarcane cultivation since last 5 to 6 decades. Sugar industries have been instrumental in extending irrigation facilities by providing credits for lift irrigation projects.This has resulted into increasing area under sugarcane from 5 % in 1972 to 20% in 2010. The growth of sugarcane cultivation is not free from environmental impact especially in the form of soil degradation and decreasing productivity. It becomes interesting to find out input output ratio for sugarcane cultivation in present situation. The cost benefit analysis is technical which can be useful to understand intricacies of the problems and as prospects of sugarcane cultivation. Therefore, present study has major objective to carry out cost benefit analysis of sugarcane cultivation by selecting a study region of Walwa Tahsil of Sangli District in Maharashtra. It also proposes to carry out micro level study which would take into account the village level data and information procured from the farmer.

The rural economy in Maharashtra is mainly based on agriculture. The level of development of agriculture in the rural areas of the state is far lower in comparison with the urban areas. The gap between industrial growth and agricultural growth is not bridged even after 60 years of independence. This disparity ultimately affects the livelihood of people in rural to urban areas. This has led to constant flow of rural urban migration creating pressure on urban amenities. Therefore, it is essential to understand causes of low level of rural sector in spite of intervention of modern techniques development in different areas of the state. Moreover, the disparity is observed within the rural areas of the state.

The Eastern part of Sangli district is draught prone area. The Walwa tahsil is located in eastern part of *Sahyadri* ranges. The river **'*Krishna*'** originates at *Mahabaleshwar* and flows from across the tahsil. The river *Warna* flows along the southern border of the tahsil. The *Krishna*river, the *Krishna* canal and ground water are the major sources of irrigation in tahsil. The farmers are benefited from these water resources. There are three sugar factories located in the tahsil.This has been responsible for soil degradation. So there is a need of cost effective use of soil and water resources for sugarcane cultivation. Therefore it is interesting to study the cost effective use of resources with geographical approach. This kind of study may be useful to understand the causes of low production of sugarcane and increase in the production cost and thus, it may help planners for designing strategy of rural development on the basis of sugarcane cultivation and production of sugar.

This has motivated the present investigator to carry out geographical analysis at village level by selecting a tahsil from a comparatively developed region. Therefore *Walwa* tahsil have been selected for the present work. The study mainly aims differential cost structure of sugarcane cultivation in the tahsil by adopting a micro level approach. This kind of study is expected to understand the geo-environmental aspects of development and may throw light on causes and effects of socio-economic growth of the economic development in the rural sector.

1.2 Statement of Problem:

It is obvious that sugarcane cultivation in the state of Maharashtra is facing problem of soil degradation and low productivity. There are some reasons for this kind of issue. The continuous use of irrigation, chemical fertilizers and cropping pattern dominated by sugarcane cultivation are main reasons for such issues. In other words, soils have been exhausted due to long term cultivation of sugarcane. Consequently, sugarcane production and recovery have been reduced. The cost of production is increased and profitability is reduced posing threat to sustainability. It has great deal of impact on socio economic structure of the villages in the tahsil. Thus, assuming the tahsil as a representative of sugar belt in the Maharashtra State, a micro level geographical study with emphasis on cost benefit analysis may be useful to understand the grass root level problems. Thus, in turn may be useful to design strategy for maintaining sustainability in sugarcane cultivation.

1.3 Hypothesis:

The present study would attempt to analyze the problems associated with declining productivity of sugarcane in the tahsil. It is based on following assumptions:

1) The productivity of sugarcane is reduced in the last two decades
2) Cost of sugarcane production has become high so that profitability is reduced
3) High cost of input may be reduced by adopting proper strategy.

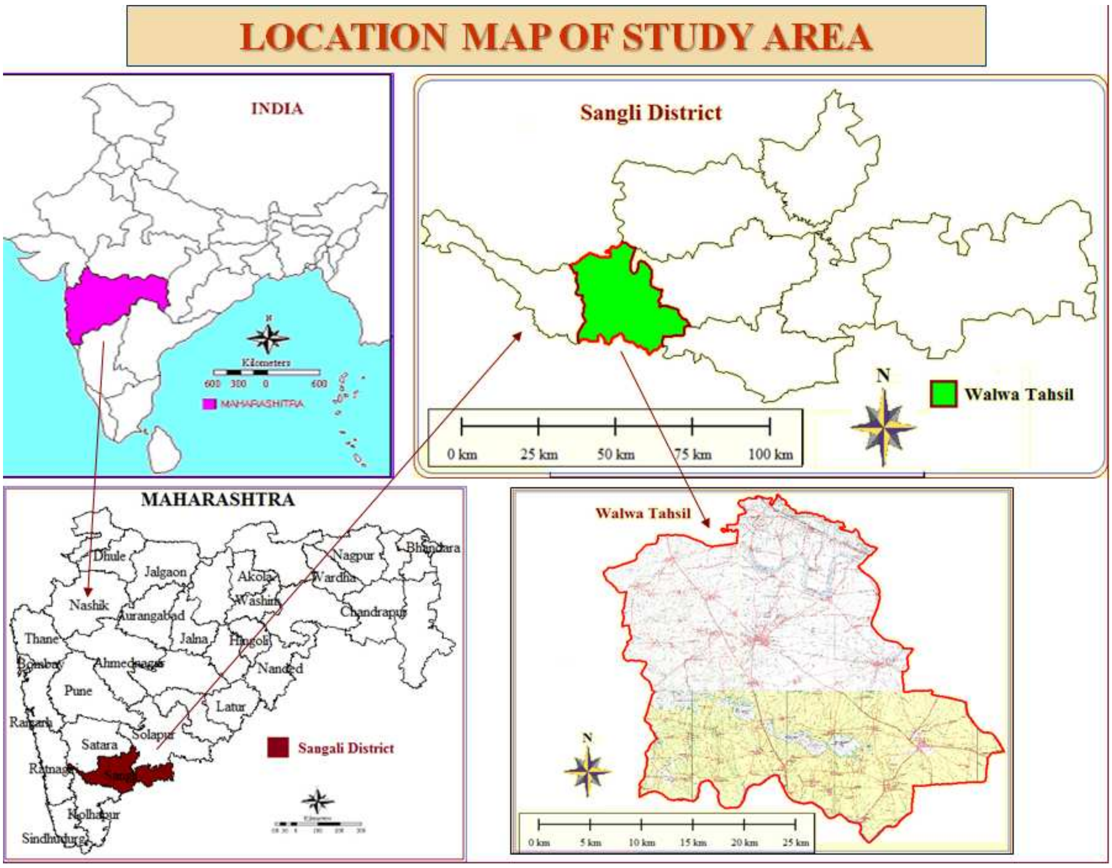
Thus, the present study can be based on following hypothesis.

''The *Walwa* tahsil is located in the sugarcane belt of Maharashtra. It has shown low productivity and hence low profitability in case of sugarcane cultivation. A proper strategy may improve sugarcane productivity if it is based on social, environmental and economic concern of the population in the tahsil''.

1.4 The Study area:

Walwa is a tahsil of Sangli district in the state of Maharashtra. The total population of *Walwa*, as per the 2001 Census is 427377. Of this, 2434 are Scheduled Tribes (STs) and 49001 are Scheduled Caste (SC). The sex ratio of the population in Walwa is 938 females per 1000 males. The literacy rate in the city is 79.37 percent, with 88.18 percent for males and 70.19 percent for females.

Map No.1.1:Location Map of Study Area



VILLAGES IN WALWA TAHSIL

Table No.1.1: Villages In Walwa Tahsil

Village Code	Village Name	Village Code	Village Name	Village Code	Village Name
1.	Kasegaon	34	Peth	67	Tandulwadi
2.	Wategaon	35	Mahadevwadi	68	Bharatwadi
3.	Bhatwadi	36	Manikwadi	69	Kanegaon
4.	Shene	37	Dhabakwadi	70	Bahadurwadi
5.	Kalamwadi	38	Surul	71	JuneKhed
6.	Kedarwadi	39	Ozarde	72	Nave Khed
7.	Yewalewadi	40	Naykalwadi	73	Shirgaon
8.	Dhotrewadi	41	Rethare Dharan	74	Walwa
9.	Tambave	42	Jambhulwadi	75	Padavalwadi
10.	Nerle	43	Maralnathpur	76	Ahirwadi
11.	Kille Machhindra Gad	44	Shivpuri	77	Gatadwadi
12.	Beradmachi	45	Waghwadi	78	Gotkhindi
13.	Kole	46	Vitthalwadi	79	Bavchi
14.	Narsihapur	47	Kameri	80	Pokharni
15.	Lavanmachi	48	Karve	81	Nagaon
16.	Bhavaninagar	49	Dhagewadi	82	Dhavali
17.	Yede Machchhindra	50	Jakraiwadi	83	Bhadkimbe
18.	Shirate	51	Vashi	84	Koregaon
19.	Bichud	52	Ladegaon	85	Pharnewadi(shigaon)
20.	Rethare Harnaksha	53	Aitavade Bk.	86	Shigaon
21.	Dudhari	54	Shekharwadi	87	Bagani
22.	Takari	55	Dongarwadi	88	Kakachiwadi
23.	Banewadi	56	Thanapude	89	Phalkewadi &Chandichiwadi

Village Code	Village Name	Village Code	Village Name	Village Code	Village Name
24.	Satapewadi	57	Chikurde	90	Rozawadi
25.	Masuchiwadi	58	Devarde	91	Mirajwadi
26.	Borgaon	59	Karanjvade	92	Mardawadi
27.	Farnewadi (Borgaon)	60	Kurlap	93	Karandwadi
28.	Kharatwadi	61	Aitavade Kh.	94	Gaundwadi
29.	Bahe	62	Itakare	95	Krishnanagar
30.	Hubalwadi	63	Yede Nipani	96	konoli
31.	Sakharale	64	Malewadi	97	Ashta
32.	Tujarpur	65	Yelur	98	Islampur
33.	Kapuskhed	66	Kundalwadi		

1.5 Aims and objectives:

The study begins with the understanding of physical and socio-economic environment. It aims at designing optimum cropping pattern for each micro region identified on the basis of physical and socio-economic parameters, in the study area, with cost effective use of available water resource. The major objectives of the study may be outlined as below:

a) To study the physiographic and socio-economic environment of the Tahsil at the village level. This is essential to understand geographical feasibility of any sugarcane cost benefit analysis of the sugarcane cultivation in the study area.
b) To apply suitable methods to evolve cost effective cropping pattern based on available land, soil and water resources.
c) To suggest a strategy for sustainable agricultural development based on optimum use of water for each micro region.
d) To understand the response of the people for the suggested cropping pattern.

1.6 Methodology:

The present work is aimed to find out that why agricultural development is not achieved even if irrigation is available after independence. It is the major task of this work to understand the flow of benefits due to sugarcane cultivation, a major cash crop in the area. The study will follow following steps.

a) Basic information regarding physiographic and socio economic set up will be collected from secondary sources.
b) Using computer and GIS techniques special analysis of village level data could be carried out to identify micro regoins within the tahsil.
c) The region is having sugarcane as a the major crop on the basis of which four sugar factories are located in this tahsil therefore cost benefit analysis of sugar cane cultivation will be carried out on the basis of primary data. For this, stratified random sampling method will be adopted to select 10% villages from different micro regions. The sugarcane cultivators and knowledgeable persons in the selected villages would provide information regarding cost of cultivation and output.
d) Thus, the grass root level issues of sugarcane cultivation in the tahsil will be understood properly and strategic planning will be prepared.
e) The region is having sugarcane as a major crop on the basis of which foursugarfactories are located in the tahsil therefore cost benefit analysis of sugarcane cultivation will be carried out on the basis of primary data. For this, Forced dispersion method is used such a way that there are no two selected villages should have common bounders or selection of villages. There are 98 villages in the Walwa tahsil. The fifteen villages selected by above method. From the selected fifteen villages 250 farmers are selected according to their size of land holdings from the each village.

Table 1.2 :Selected villages for Research in Walwa Tahsil

Sr.No.	Name of the Village	Sr.No	Name of the Village
1.	Kurulap	9.	Bagni
2.	Surul	10.	Muschiwadi
3.	Waghwadi	11.	Kharatwadi
4.	Yedemachindra	12.	Farnewadi

5.	Pokharni	13.	Kanegaon
6.	kole	14.	Karve
7.	Takari	15.	Yewalewadi
8	Islampur		

1.7 Size of Land Holdings:

For the study there is a need to decide the size of land holdings so that the conclusion of the research will be correct the land owners are classified according to following way.

Table 1.3Size of Land Holdings:

Sr.No	**Size of farm**	**No. of Farmers**	**No. of Farmers**
1.	Less than 1 hector	05	75
2.	01 to 02 hector	03	45
3.	02 hector and above	02	30
	Total	10	150

The sugarcane cultivators and knowledgeable persons in the selected villages may provide information regarding cost of cultivation and output.

1.8 LiteratureSurvey:

There is a need to study of previous literature for this research project.The problems of agriculture are studied by various scholars in the field of agriculture.

1.8.1 Drought Prone area and characteristics:

The parameter like aridity index has been used to define drought condition by Subrahmaniam and Raju (1986). Elaborating the concepts of Thornthwaite and Mather (1946) the well known Climatologists have attempted the application and computation of water balance technique for the drought prone areas. The drought prone zone of Maharahstra has been classified according to the scheme proposed by Thornthwaite and Mather (1955). Irrigation is a lifeline of agriculture especially in the drought prone zone according to many scholars and planners like Singh (1992), Saptarshi (1993), Bhagat (2002), Kadam (2002), Jadhav and Ajagekar (1993) and Mooley et al (1985) have inferred that during the years of large scale droughts over India, the production of food grains had decreased 15%, the prices of food grains increased up to 25%in the same period.

The problems of drought prone areas have been discussed by Misra (1984). He has given the techniques for measuring the water resource on the basis of rainfall data. For this, he has considered that the loss due to evaporation is roughly half of the rainfalls, if number of non-rainy days are 7330 and loss due to infiltration is one-tenth. The problems of drought prone areas have been discussed by Misra (1984). He has opined that there are 77 districts in India, which receive less than 75 cm of rainfall per annuam. These districts are classifieds as the droughts district and account for about 34 per cent of, the Net Sown Area of the country. In addition, to these, there are another 22 district in Maharashtra, Gujarat, M.P., Karnataka, Rajasthan, U. P. contributing about 9% of the cultivated area of the country which receive rainfall between 75 and 82 cm per annuam Gregory (1989). Two approaches have been suggested by Gregory to schedule years of major moisture deficit.

The first deals with the definition of drought. Which recognizes as drought years, all those with rainfall below the lowest deciles in the record i.e. 10% of the lowest deciles in the record i.e. 10% of the years. The second approach is to schedule some specific percentage deficit below the average as indicating the drought conditions.

The Fact Finding Committee (FFC) (1973) has noted in the government report that 'Water budgeting' is essential to have idea about ground water recharge and planning for water conservation. The committee has classified the present study area i.e. the eastern part of Walw*a* tahsil, as a drought prone region in the state of Maharashtra. FFC (1973) has made a clear distinction between 'scarcity' and 'droughts'. In the scarcity manual of the Government of Maharashtra 'scarcity' has been described as marked deterioration of agricultural season due to failure of rains of floods or damage to the crops from insects, resulting in severe unemployment and consequent distress among agricultural labours and cultivators. Thus the socio-economic effects of backwardness. Scarcity conditions and drought prone character are somewhat similar but causes analysis may help to identify the differences amongst such areas.

Theoretically, drought may be considered as the sum effect of precipitation, temperature, wind, sunshine, soil texture, soil moisture etc. The resultant effect of interaction of these variables is the adverse balance between available soil moisture and evapo-transpiration.

Drought is a natural part of climate, although it may be erroneously considered as a rare and random event. Drought differs from aridity, which is restricted to low rainfall regions; it can occur in any climatic zone, but its characteristics vary significantly from one region to another. A drought is a deficiency of precipitation over an extended period of time, usually a season or more, which results in a water shortage for some activity, group or environmental sectors. Droughts are classified as meteorological, agricultural, hydrological and socio-economic as suggested by the Indian Metrological Department.

Agricultural drought can be defined by the lack of availability of soil water to support crop and forage growth resulting from the lack of normal precipitation over some specified period of time. Drought is primarily an agricultural phenomenon that refers to conditions where plants are responsive to certain levels of moisture stress that affect both the vegetative growth and yield of crops. As a consequence of usual hydro-meteorological variability, drought occurs in pre-monsoon season when the potential evapo-transpiration (PET) is higher than the available moisture due to uncertainty in rainfall while in post-monsoon season drought occurs due to prolonged dry periods without appreciable rainfall (Karim et al., 1990).

In both seasons, a sudden increase in temperature coupled with a lack of rainfall causes a sharp increase in PET. The occurrence of drought may be related to certain physical observations:

- development of continually broken cracks on the dried up topsoil
- burnt-out yellowish foliage in the vegetation cover (top yellow syndrome), particularly observed in betel nut trees and bamboo groves, and
- Loosening of soil structure, ending up in the topsoil transforming into a dusty layer.

The failure of crops is the consequence of decrease in the soil moisture proportion below the wilting point. This means that drought prone areas are vulnerable to uncertainty in agricultural production. These regions generally exhibit backward economic conditions.

Definitions of droughts and famines have been put forth by many scholars. The “Drought” is a “spell of dry weather” (Tanhill, 1947). For this purpose, climatological studies based on Thornthwaite’s classification have been carried out by Carter (1954, 1955), Sanderson (1954), Gilbert (1954) and others. (cf Saptarshi, 1993)

For the identification of the moisture regimes the rainfall, temperature and evapo-transpiration data have been analyzed. The drought-prone regions show high aridity index. The drought- prone zone of Maharashtra has been classified according to the scheme proposed by Thornwaite.

According to British metrological glossary (1957) a climate in which the rainfall is insufficient to support vegetation is termed as arid and drought is the dryness due to lack of rain.

The parameters like aridity index and departure of aridity index have been used to define drought condition by Subramaniam and Raju (1986). An attempt has been made by Gregory (1989) to investigate the temporal change in the frequency of drought conditions. Sangli district is included in the region 8 i.e. North West and North-centre peninsula in which the frequency of drought has been computed to be very high.

Drought conditions must be evaluated according to the agricultural operations and on the overall ecological conditions. This agro-climatlogical approach has been adopted by many scholars like Krishnan (1969), Hussain (1970), Albrecht (1972), Subrahmanyam (1972), Rao (1976), Dixit (1984), Karim (1990), Samra, (2004),Naresh Kumar (2009).

The South-West Monsoon Season (June – September) is the main rainy season in India when about 73% of the country's annual rainfall is realized. Hence, the failure of South-West Monsoon manifests as drought. Around 68% of the land area in India is prone to drought of varying degrees. In the entire country, 35% of the area receiving rainfall between 750 mm and 1125 mm per annum is considered drought prone, while another 33% receiving less than 750 mm of rainfall is considered chronically drought prone. Accordingly, drought prone areas account for a total land area of 329 million hectares, which are classified into arid (19.5%), semi-arid (37%) and sub humid areas (21%).

The economy of India is greatly dependent on water resources as well as rainfall. The erratic nature of monsoon rainfall gives rise to low rainfall in some years leading to drought and normal to excess rainfall in others. Drought, which may lead to famine, is indeed one of the worst environmental hazards because its onset is slow; the affected area is quite widespread; and the adverse impacts are ruinous. Drought imparts a creeping long term setbacks to the socio-economic fabric of the society which has the misfortune to be visited by it (Kulshrestha, 1997).

The Indian Metrological Department has given the definition of drought "as a situation occurring in any area when the annual rainfall is less than 75% of normal" (1971). In terms of typologies, droughts are classified as meteorological, agricultural, hydrological and socio-economic. (Indian Metrological Department)

Meteorological drought:

It is usually defined by a precipitation deficiency over a pre-determined period of time. The thresholds chosen such as 50 % of normal precipitation over a six-month time period will vary by location according to user needs.

Agricultural drought:

Itis defined more commonly by the lack of availability of soil water to support crop and forage growth than by the departure of normal precipitation over some specified period of time. It is observed that the study area has experienced this kind of drought frequently.

Hydrological drought:

Hydrological droughtis normally defined by deficiencies in surface and subsurface water supplies relative to average conditions at various points in time through the seasons. Like agricultural drought, there is no direct relationship between precipitation amounts and the status of surface and subsurface water supplies in lakes, reservoirs, aquifers and streams because these hydrological system components are used for multiple and competing purposes such as irrigation, recreation, tourism, flood control, transportation, hydroelectric power production, domestic water supply, protection of endangered species and environmental and ecosystem management and preservation. There is also a considerable time lag between departures of precipitation and the point at which these deficiencies become evident in surface and subsurface components of the hydrologic system.

Socio-economic drought differs markedly from the other types of drought because it reflects the relationship between the supply and demand for some commodity or economic good (such as water, livestock forage, or hydroelectric power) that is dependent on precipitation. Supply varies annually as a function of precipitation or water availability.

1.8.2 Drought-prone zone in Maharashtra

The fact finding committee (1973) has made clear distinction between "scarcity" and "droughts". In the scarcity manual of the government of Maharashtra "scarcity" has been described as marked deterioration of agricultural season due to failure of rains or floods or damage to the crops from insects, resulting in severe unemployment and consequent distress among agricultural labourers and cultivators. Thus, the socio-economic effects of backwardness, scarcity conditions and drought- prone character are somewhat similar but causal analysis may help to identify the differences amongst such areas.

1.8.3 Criteria for identification of drought prone areas

Numerous attempts have been made to study drought-prone zones of Maharashtra in the last few decades. Krishnan (1969) has carried out the study of agro-climatology of arid and semi arid zones of Maharashtra. Subramanian (1975) has presented a detailed account of the official policies to cope with droughts and famines in Maharashtra in 1970-73. More useful and practical approach has been presented in the reports of the official committees of the state government of Maharashtra. These are:

1. Fact Finding Committee. (FFC) (N. S. Pardasani), 1960
2. Second Irrigation Commission, 1972
3. Fact finding committee (FFC) (S.E. Sukhankar), 1973
4. Maharashtra State Irrigation Commission (S.G. Barve), 1962
5. Eight-monthly Use Water Committee (Deuskar et al), 1979
6. Konkan irrigation development Committee (Khatal), 1980
7. Konkan Master Plan committee (Swaminathan), 1981
8. Irrigation Management Authority Committee (Suresh Jain), 1981
9. Regional Backlog in the state Committee (Dandekar), 1984
10. Study group (Kasbekar), 1984
11. White Paper on drinking water supply programme, 1995

The criteria adopted by these committees for identification of drought-prone zone of Maharashtra are slightly different. The FFC-1960 has attempted to adopt three main criteria to identify chronically scarcity affected areas. These are:

a) Rainfall
b) *Annewari* and suspension of land revenue, and
c) Declaration of scarcity in the past

The committee has considered the coefficient of variation of rainfall of each of the important months or pairs of months as one of the important tools for ascertaining the uncertainty of rainfall. *Annewari* has been taken as a fairly reliable and convenient index of the incidence of scarcity in the area. *Annewari* is a measure of success in productivity of agriculture in a year. This method of assessing the crop has been a regular feature in the state, since the British times. The most successful agriculture season is denoted by 16 *annas*. If the *annewari* is four *annas*, this means that, by and large, there is 25% of success and 75% failure of crops in a village. However, the committee relied much on *annewari* for the identification of crop conditions in the absence of any other data. The committee has also remarked that it is necessary to probe deeper into main causative factors of droughts, namely rainfall, with reference to the annual rainfall, its variability and its weekly distribution in relation to soil and cropping pattern of the area, to identify the drought-prone areas with precision.

The committee has identified about 53 tahsils including the tahsil under as the drought-prone tahsils in the state. The second irrigation commission-1972 (SIC) was set by the central Government to study the future irrigation development in the country in a more comprehensive manner. As per one of its terms of reference, the SIC has analysed the irrigation facilities available in the chronically drought affected and food deficit areas. It has set following criteria to identify chronically drought affected areas

a. Metrological data
b. Revenue remissions
c. Frequency of famine or scarcity and
d. The availability of irrigation facilities.

The commission has dismissed *annewari* as the important criterion to identify drought prone areas in the country. The commission was of the opinion that the subjective element in the assessment of *annewari* by the village officers could not be considered as an objective basis to delineate drought-prone zone.

The commission adopted the definition of "drought" set out by the Indian Metrological Department (1971). The commission has made distinction between drought areas and chronically drought affected areas. The former is one which shows 20% probability of occurrence of annual rainfall being less than 75% of normal. The chronically drought affected areas are the areas where the probability of rainfall departure by >25% is 40% or more. The commission has assumed that the areas receiving rainfall less than 750 mm are liable to drought and areas receiving rainfall between 750 mm and 850 mm are vulnerable. Adopting tahsils as a unit for identification of the drought zone, the commission has declared about 45 tahsils as a drought affected tahsils in Maharashtra. The tahsils where

30% or more of the cropped area was under irrigation in 1971 were excluded from the drought zone. Thus the commission has eliminated 8 tahsils from the list of chronically scarcity affected tahsils prepared by FCC-1960.

The FFC-1973 has identified about 83 tahsils as the drought-prone tahsils in the state on the basis of the following criteria. (Saptrashi, 1993)

1. Criteria based on causes of drought:
   a) Normal precipitation
   b) Timeliness of rainfall with reference to cropping pattern
   c) Soils
2. Criteria based on the effects of drought:
   a) *Annewari* and suspension of land revenue.
   b) Declaration of scarcity in the past
   c) Out-turn
   d) Marketable surplus.
   e) Migration
   f) Fluctuation in the prices
   g) Food grain off take, and
   h) Density of high population.

The major differences between the criteria considered by this committee and those by the previously mentioned committees rely in giving greater importance to timeliness of rainfall with respect to the agricultural operations. According to the practice followed by Agricultural Metrology Division, agricultural drought is considered to be experienced when 4 such consecutive weeks occur in the period from middle of May to middle of October. The FFC-1973 has studied weekly distribution of rainfall for the stations located in the low rainfall zone i.e. below 750 mm, for identifying drought-prone character. It was observed that crop failures were generally witnessed when 11 weeks out of 22 week from June to October were drought week. While considering drought week, the committee has followed the definition put forth by Ramdas (FFC-1973). According to him, drought is an occurrence when the normal weekly rainfall is 5 mm.

Secondly, the committee has also considered the soil characteristics, so as to understand the requirement of rainfall for maintaining soil moisture. Deep soil having depth from 60 cm to 90 cm can withstand long dry spell of one month and the crops are normal. In case of medium deep soils normal yields are observed, if the dry spell does not exceed three weeks. While shallow soils show failure of normal yields if the dry spell exceeds two consecutive weeks. Thus, some areas in the transitional zone surrounding the drought prone zone with deep black soils have been declared as free from the effects of droughts.

1.8.4 Drought Prone Zone:

The parameters like aridity index have been used to define drought condition by Subrahmaniam and Raju (1986). Irrigation is a lifeline of agriculture especially in the drought prone zone according to many scholars and planners like Singh (1992), Jadhav and Ajagekar (1993), Saptarshi (1993), Bhagat (2000), Kadam (2002) and More (2009).

Ramkrishnan (2000) has opined that 77 districts in India receive less than 75 cm of rainfall per year. These districts are classified as the droughts district and account for about 34 % of the Net Sown Area of the country. In addition to these, there are another 22 district in Maharashtra, Gujarat, M.P., Karnataka, Rajasthan, U. P. contributing about 9 % of the cultivated area of the country which receive rainfall between 75 cm and 82 cm per year (Gregory, 1989).

1.8.5 Socio economic aspects of droughts:

The drought-prone areas in context with hydroclimatic setup and agro- economic and social problems have been studied for over a century. Due to high frequency of droughts in several parts of India, researchersresearchers have undertaken studies pertaining to persistently drought-prone areas.

Some researchers have highlighted the problems due to droughts in Maharashtra. In the report on Techno-economic survey of Maharashtra (1963), it has been suggested that irrigation facilities should be extended to water deficit areas in the state as a long-term solution of droughts.

Chaterjee (1969), Hussain (1970), Namjoshi and Sathe (1978), Brahme (1983), Saptarshi (1993), Kadam (2000), Bhagat (2003) and More (2009) have attempted to study the relationship between agricultural and allied activities with the agro-climatlogical approach in different parts of India. Subramaniam (1975) has outlined the problems of droughts in Maharashtra during 1971-73. The study records relief measures and official policies to cope with the droughts and famines in the state. Das (1983)has classified three facets of drought: strategy of agricultural development, production of food grains, and price of food grains.

Sen (1986) has urged that in the exhaustive market economy, exchange entitlement may worsen for reasons other than general decline of food supply. While discussing starvation and famines, he has stated, “famines imply starvation, but not vice versa”.

In addition to the above studies, many economists like Ghosal, (1988) Deshpande and Salunke (1988), Nadkarni (1991) have investigated the socio economic aspects of drought in India and Maharashtra. In all these studies the economic problems, the plan outlays and the cost structures have been emphasized.

1.9 Water Resources:

The values of various water balance parameters are calculated according to the procedure put forth by Mather (1961).

While suggesting the plan outlay for the agricultural development in the Bhima valley, in the areas under irrigation, it has been stated that the benefit-cost ratio is higher if proportion of area under perennials is kept low (Techno-economic survey of Maharashtra, 1963).

Reddy & Reddy (1981) have explained the technique like protective irrigation, conjunctive use of groundwater & surface water, water harvesting, optimization of cropping pattern, improved methods of irrigation etc. Naganna and Barai (1982) have suggested a strategy for drought-prone area of Kolar district of Karnataka to utilise groundwater by sinking deep bores along the lineament which carries the water across the Western Ghats from areas of surplus to an area of deficit.

Robert (1991) has remarked that water is especially significant resource for agriculture in low latitude region with markedly seasonal climatic regime.

Many researchers have used water balance technique. Musande (1992) has worked out the frequency and time of irrigation on the basis of water balance study. Deosthali and Gadgil (1992) have noted that the term water balance is very important in agricultural climatology.

Many scholars have noted that the water table is lowering due to high utilization of the water for mitigating expanded needs. It is also found that the state and the study area have been facing the problems like water scarcity and frequent crop failure, Singh (1992), Allan (1995), Choudhari (1996), Jeet (1998).

Chaudhari and Shastri (1993) have suggested the need of contingent planning for the sustainable development in agriculture with the help of water balance technique. Dhoble (1993) has calculated the moisture use efficiency for agricultural planning. Saptarshi (1993) has estimated groundwater on the basis of cropping pattern.

Sundaram (1998) and Chattopadhyay et al (1998) have explained the integrated approach of ecosystem at micro-level in the developmental process of village and farm. Chattopadhyay et al. (1998) have explained the participatory approach in the plan formation for sustainable development programme at micro-level. Sing and Julya (1998), Sanchez (1998), Jana and Lahiri-data (1999), Kumar (2000), etc. have adopted social approach in the sustainable development.

Many researchers and planners have adopted the approach of water resources for agricultural development like Rao (1983), Basu (1991), Wohlmeyer (1993), Sauza, (1993), Donald and Cheryl (1996), Kanth and Khan (1996), Ramnaiah and Chandrayudu (1996), Mehta and Sodhi (1996), Hanley et al (1997), Singh and Juyal (1998), Karvar (1998), Daniella Tilbury (1998), Roling et al (1998), Pretty (1998), Harikawa (1998), Penning et al (1998), Munton and Collins (1998), Misra (1998), Parameswaran (1998), Chattopadhya et al (1998), Sanchez (1998), Niyogi (1998), Cariglia (1999), Thompson (1999), Toman (2000), Kumar (2000), Woo (2001).

1.10 Ground Water:

Alvin S. Goodman (1984) " Principles of water Resources Planning" R.H. Brown (1972), Technical Publication (1985), Herman Bauwer (1978), Rushton (2003), Thangarajan (2004), Dhonkarikar (1992), Walton, Williamc (1970). and Tiwari et al. (1986). studied ground water management in the parts of Western Ghat in Maharashtra (Ratnagiri and Shindhudurg districts).

Sivanghanam and Kumarswamy et al (1988) studied the influence of the Management of Ground water on the agricultural activities in Vaippar basin in Tamil Nadu. From the survey of existing literature, it has been revealed that detailed study of ground water management within India is very limited (Sinha, 1971, Karanth, 1999). Ground Water

Assessment Development and Management gave a Geo interpretation of ground water management from the basaltic aquifers.

Mathuraman and Matness (1981) carried out experimental work on the water and rock interaction of thermal waters of the springs located among the western ghat of Maharashtra. Ground Water Management and Studies within the state of Maharashtra is rather in adequate. Various agencies such as Geological survey of India (GSI), General Ground Water Board (GWB), National Environment Engineering Research Institute (NEERI), Maharashtra water commission and few Educational Institutions have carried out studies towards ground water management. Dhokarikar (1992) studied ground water resource development in basaltic rock terrain of Maharashtra.

Handa (1983) studied hydro ground water zones of India and gave a broad picture of management of ground water in Deccan trap. Thigale and Pawar (1982) studied the Ground water management from Pune area of Maharashtra.

1.11 Cropping Pattern:

Chatterjee (1986), Gholap and Shinde (1987), Pawar (1989), Jadhav and Ajagelkar (1993) and Allen et al (1998) have discussed the impact of irrigation on cropping pattern and yields. Soil moisture conditions may be measured in terms of number of water surplus weeks. However, many scholars to get the knowledge of soils water availability in the pre-cropping and cropping period. Adequacy Index have been calculated by Basu (1991), Deosthali and Gadgil (1992), Gadgil and Vagdori (1996), Choudhari and Shastri (1996), Maduran and Rao (1996). Basu (1991) Malini (1992) have used daily climatological data for getting more accuracy in the analysis. Basu (1991) has adopted the meterological approach for estimating the water availability period and the judicious crop planning in the *Cooch* District of the Bihar. Gadgil at al (1986) have carried out the analysis of weekly and annual rainfall and temperature data to investigate cross multiple correlation of rainfall for predicting rainfall during the cropping season. Tamgade and Bhattacharjee (1985) have concluded that plain region have better scope for agriculture. Malini (1986) has stated that the study attempt her study to find out how soil moisture regime determines the cropping pattern. Reddy and Reddy (1981), Malini (1986), Thom and Wells (1987) have discussed the performance and problems of agriculture and the strategy for development in the semiarid tracts in India. Saptarshi and Parkhe (1993) have discussed the correlation between sugarcane and other crops.

Loknathan (1963) has highlighted the problems due to droughts in Maharashtra. In techno-economic survey report. It has been suggested that irrigation facilities should be extended to the water deficit areas in the state as a long-term solution for droughts. Chapke (1992) has worked on the cropping pattern in the command area of Jayakewadi project and suggested new profitable and suitable cropping pattern for achieving the rural development.

The socio-economic factors integrating agriculture are demographic structure, educational status, economic level of the farmer, transportation facilities and market availability etc. Datye and Gupte (1979) have worked on the slope characteristics and cropping pattern in the Pune district. They have observed that the area with slope of 3^0 is more significant for cropping than that of 5^0 sloping area. More than 5^0 sloping region is mostly used for grazing. Tamgade and Bhattacharjee (1985) have made a study of cropping pattern according to physiographic units in a district of Madhya Pradesh. The study attempts to correlate cropping pattern with soil types and geomorphic units. Niyogi (1998) has focused the water resources of the Ajay river basin for sustainable development. He has remarked that the proper design for rights of water use and river management would be supportive tools for sustainable thing has also been useful for optimum use of water planning. Ghatak (1998) has also assessed the change in the cropping pattern on the same line of thinking.

1.12. Soil Resource:

Many scientists have applied their knowledge on the work of soil fertility. Their success has bought into light the concept of fertility status of soil. The growing demand for agriculture produce has led to the mechanization of soil cultivation and hence the study of the chemical and physical properties of the soils has become necessary.

According to Gedrotz, (1917), the water absorbing power of soil was a great contribution towards the understanding of the chemical properties of soil. It helped a great deal in the study of soil formation process and rising of the fertility of soils. Gedrotz, (1917), showed that by altering the composition of the exchangeable cautions, it was possible to bring the most favourable conditions for the life of the plants rising or lowering the effects of fertilizers on the physical properties of soil.

The organic substances of soil made it possible to determine the interdependence between the chemicals of the soils and their chemical properties.

In addition to total SOC, it is also important to determine active C fractions (Lal et al 1993). Small changes in total SOC or SOM are difficult to detect because of large background levels and natural soil variability. Attempts, therefore, have been made to use sub pools of SOC as more sensitive indicators of changes in pool size. Labile C is sensitive to soil management practices and thus provides a better measurement of C dynamics in the short to medium term than total C alone and also proposed changes in the liability of soil C as a measure of sustainability.

Many research work have been done on salts affected soils like Hillgard, (1906), Gedroiz, (1917), Agarwal and Gupta, (1968), Kovda, (1973), Hongchum, (1988), Hendry, and Buckland**,**(1990), Sehgal and Abrol, (1994), Gupta and Gupta, (1997), Hurni, (1981), Maji (1996), Maji et al (1996), Gupta and Gupta (1997), Salama, et al (1998), Sankar (1998), Hopkin and Richardson, (1999), Mehta, et al (2000) etc. have studied the issues regarding water conservation, water logging, salinity, drainage etc. Theyplays dominant roles in determining the composition of the general soil microbial community, e.g., those fungi are favored compared to bacteria at low pH, and vice versa (e.g. Alexander1961). Also substrate quality, e.g. the C-to-N ratio, is known to be important in regulating the composition of the microbial community. This is because of the relationship between the C-to-N ratio of the decomposing micro organisms and their substrates, and the fact that fungi use substrates of wider C-to-N ratios than bacteria.

Acharya et al (1998) has carried out a farmers survey in central India. Cropping in Madhya Pradesh, Central India experiences an overall nutrient deficit of about I Mt of N, P, and K annually. In addition to increasing the supply of inorganic fertilizers, the balance between inputs and losses must also be met by indigenous organic sources such as farmyard manure. With the objectives of increasing manure production and soil nutrients used in cropping, they surveyed 100 farmers from 4 randomly selected villages in Madhya Pradesh to record perception attitudes towards farmyards manure use for crop production, estimate nutrient balances and test fields for concentrations of soil organic carbon, nitrogen, and available nutrients.

Résumé:

This chapter presented the introductory part of the study which have been used to adopt a practical approach which may be useful for the farmers.This has presented the location of study area and importance of the study.It is useful to understand nature and scope of soils and water resources. The water budget study has found majority of villages are water deficient. On the basis of this information attempt has been made to evolve the strategy with the principle that cropping pattern may adjusted so that available water resource is utilized effectively.

CHAPTER-II

PHYSICAL LANDSCAPE

2.1 Introduction:

The introduction to the study area has been discussed in the previous chapter. This chapter is related with physiographic set up of the study area. The physiography of the study is important for knowing the problems of agriculture. Physical setting plays important role to determine the development of any region. The study area is dominated by mainly plain region and hilly tracts in the north eastern part and in the middle part of the tahsil. The present chapter attempts to discuss geology, relief aspects, climate, and vegetation.

2.2 Geology:

The study area having underlain by basaltic rocks known as Deccan Trap. All these rocks are composed of different lava flows with varying thickness. The area under study is a part of the basaltic plateau of Maharashtra with an average height of 600 meters above mean sea level. The main Sahyadri range is located about 30 km west from the study area. The offshoots of it in the form of hilly zone are observed in and around study area.

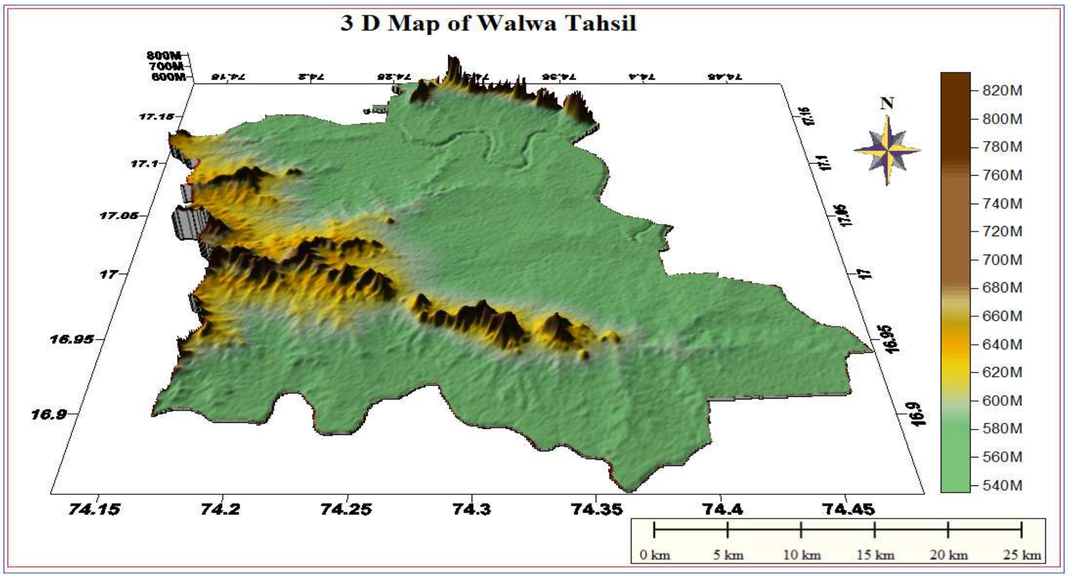
The tahsil is dominated by basaltic terrain with generalized slope from Northwest to Southeast. The depth of the rock decreases from west to east. The northern and southern areas are low lying.The hill rangesmark the north boarder of the tahsil. There are few hills are present to the western part of the tahsil. The tahsil is a part of Deccan plateau and the rocks found in the surrounding area are mainly basalt. All these rocks are the product of volcanic eruption and composed of different lava flows in different periods of volcanic eruption.

Along the bank of the Krishna and Warna river the depth of soil is good and away from the river bed basaltic rock appear closely to the surface. The depthness of the rock is around 5 to 30 feet beneath the soil. The tahsil is facing problem of shortage of water although it is surrounded by river and streams.

Thus geologically the tahsil is a basaltic plateau dissected by Krishna and Warna river systems. The interfluves between the two rivers run from west to east. The type of rock is good parent material for black cotton soils in the study area.

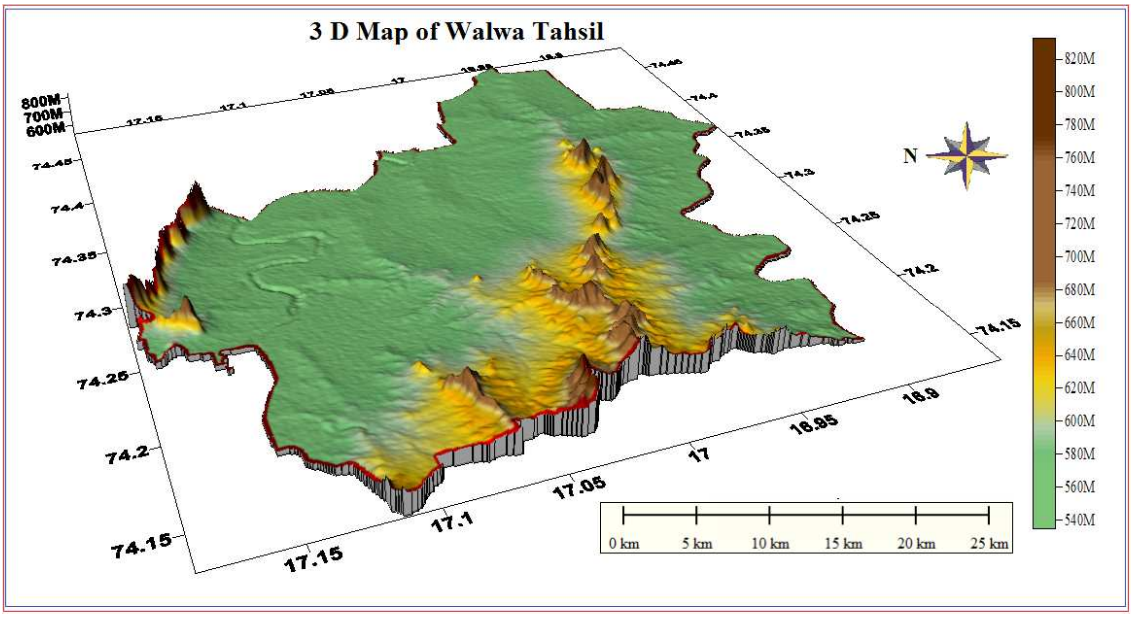
2.3 Topography:

Map No **2.1:** Map of Walwa Tahsil



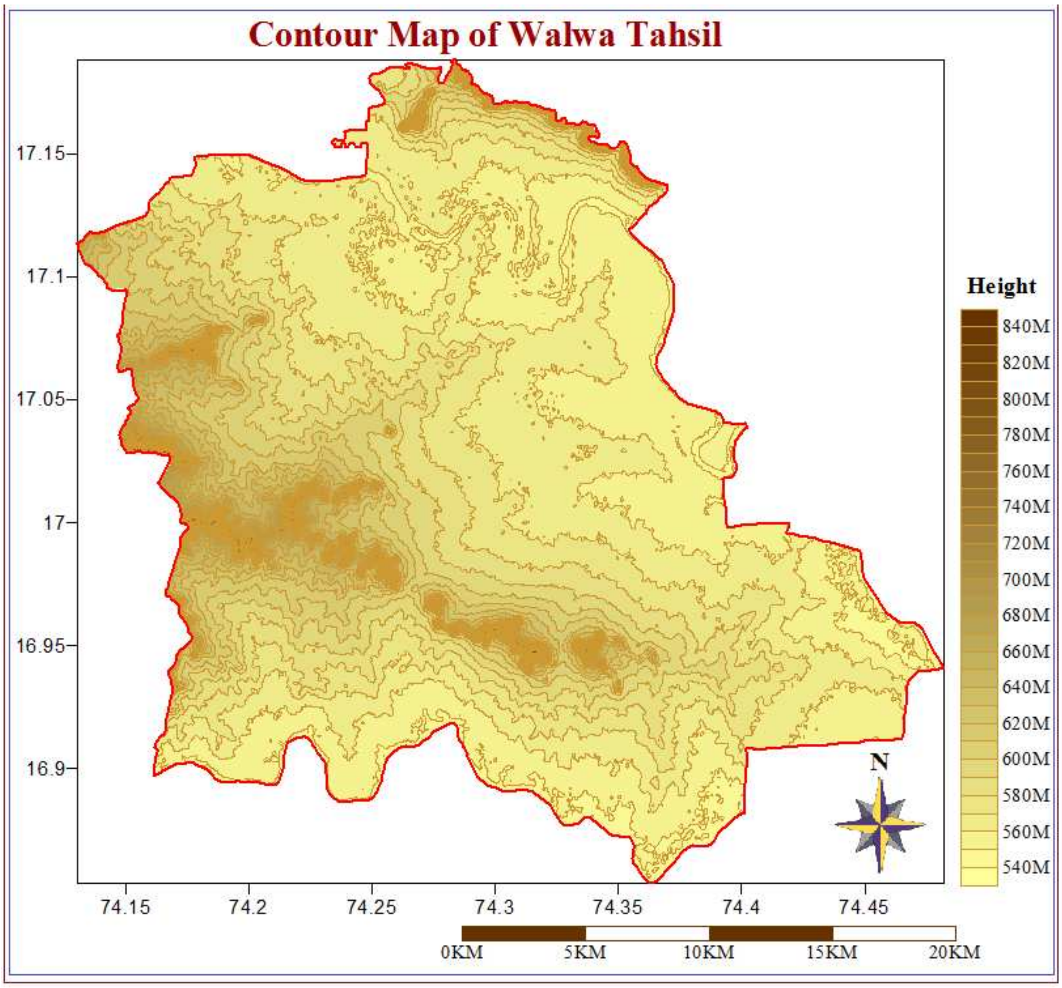
Map No **2.2:** DEM of Walwa Tahsil

Map No **2.3:** Map of Walwa Tahsil



Map No **2.4:** DEM of Walwa Tahsil

Map No. 2.5 :Topography



Topography:

Relief:

The ranges originating from western ghat follows the northern border of the tahsil (Fig. No.).The Krishna river is flowing in the north part of the tahsil,which is east flowing river.The southern part of central locally called as plain region it is the part of Warna basin.The detail understanding of relief may systematically be possible by classifying the tahsil in subdivisions Viz…

A. Northern Ranges :

These ranges are known as Deverashtra ranges scattered west to east from Karad-Killemachindragad to takari Kundal.This ranges having Reserve Forest area.In these ranges Sagreshawar Abhayarannya is developed. Along the foothills of this ranges runs the Pune Miraj Broadgauge railway.This regon having altitude from to is a narrow range running along northern boundry of the tahsil.

B. Northern plain:

This plain region formed by Kreshna river system along the main stream. It is observed that sedimentation is more along the river. The valley bottem is broad without exposed rocks. Both the side of Krishna river 17 villages located along the banks of the river towards this plain area. In this area the land is plain and fertile. The villages settled in these areas are like *Kole, Narsihapur, Shirate, Bichud, Rethare Harnaksha, Dudhari* and *Takari* are on left bank of the Krishna. The Kasegaon, Dhotrewadi,Yelewadi,Tambave,Bahe,Kharatwadi,Farnewadi,Boargaon,Banewadi,Gaundwadi , Satapewadi, *Walwa, Padwalwadi, Bavchi, Phalkewadi, Ashtas, Mirajwadi, Mardwadi, Krishnanagar* and *karandwadi*. these villages are locketed on right bank of river Krishna. This area is plain area and made up with medium and deep black soil.

C. Hilly Zone : Central and Western border.

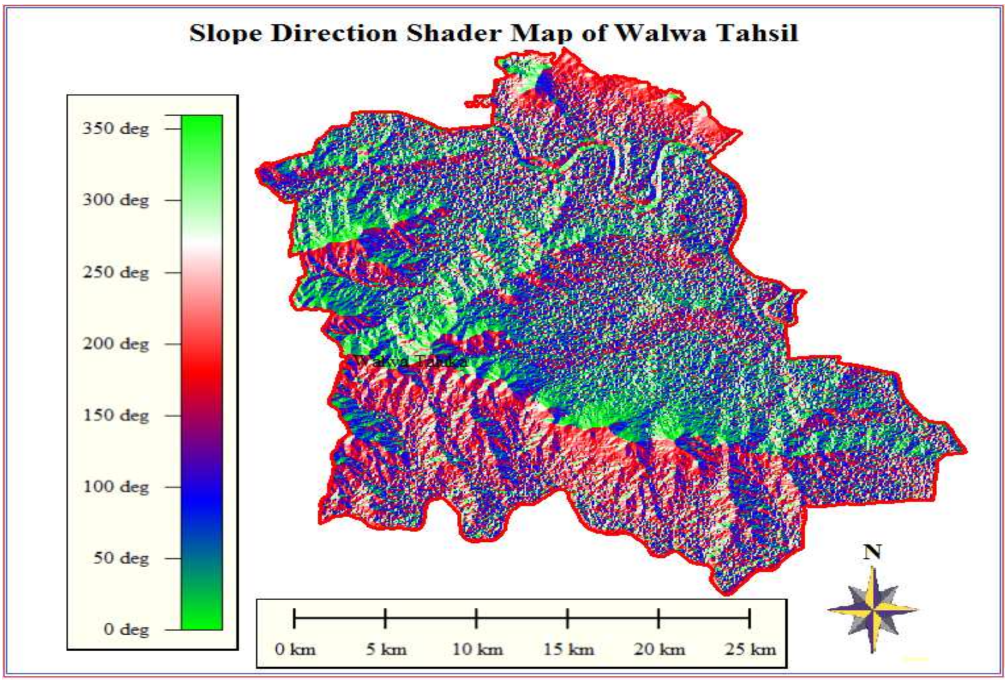
This region includes the water dividing line of Krishna river and Warna river, lots of various small streams, origin from region and they flow from northern and southern part and meet to river Krishna and Warna river. This region is hilly area is find small streams, odas and nallas. This region is occupied with plateau and hilly areas.This area is mountainous and hilly region named as Itkare Dongar (773m) , Mallikarjun Dongar (817m), Santoshgri Dongar(808m),Kameri R.F. towards west of this area about 30 m. from this area Western Ghat is located. *Kasegaon, Shene, Wategaon, Bhatwadi, Manikwadi, Surul, Ghabakwadi, Ozarde, Naikalwadi, Rethare Dharan, Maralnathpur, Karve Dhagewadi, Jakraiwadi, Aitavade Bk, Shekharwadi and Dongarwadi.*These are the some rural settlements are located in this area.

D. Southern Plain Region

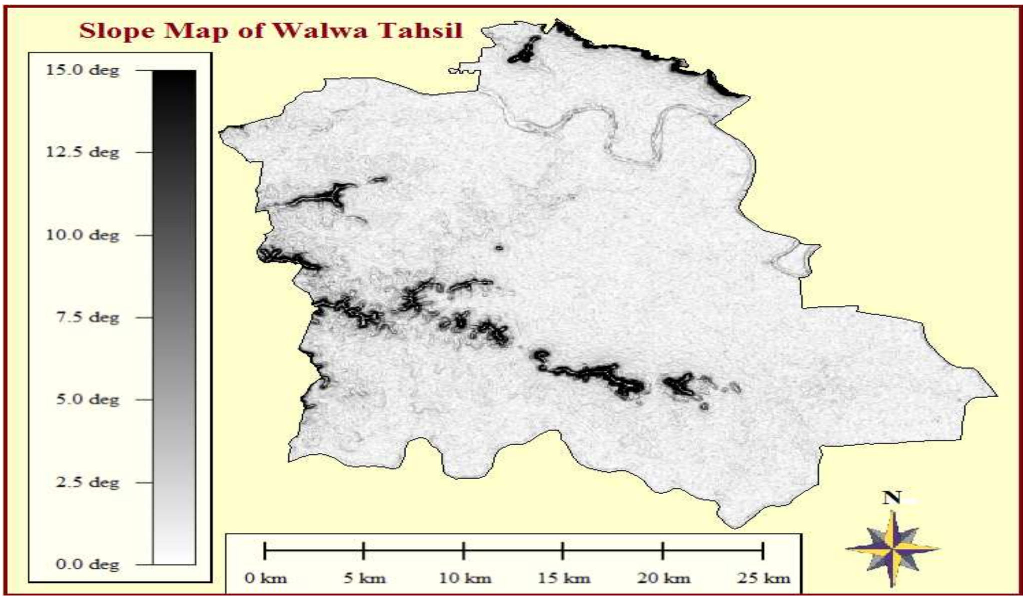
This area is plain region having deep black fertile soils upto 10 meters depth. Warna River is flowing to east direction on the south borderline of the tahsil. The black cotton soil is observed in this region. The villages settled along the left bank of Warna river are *Thanapude, Dongarwadi, Chikurde, Deverde, AitavadeBk Kundalwadi,Tandulwadi,Bharatwadi,Kanegaon,Bahadurwadi,Koregaon,Farnewadi,Shigaon,Bagani and Rojawadi.*

2.4 Slope:

Map No. 2.5: Slop Direction Shader Map of Walwa Tahsil



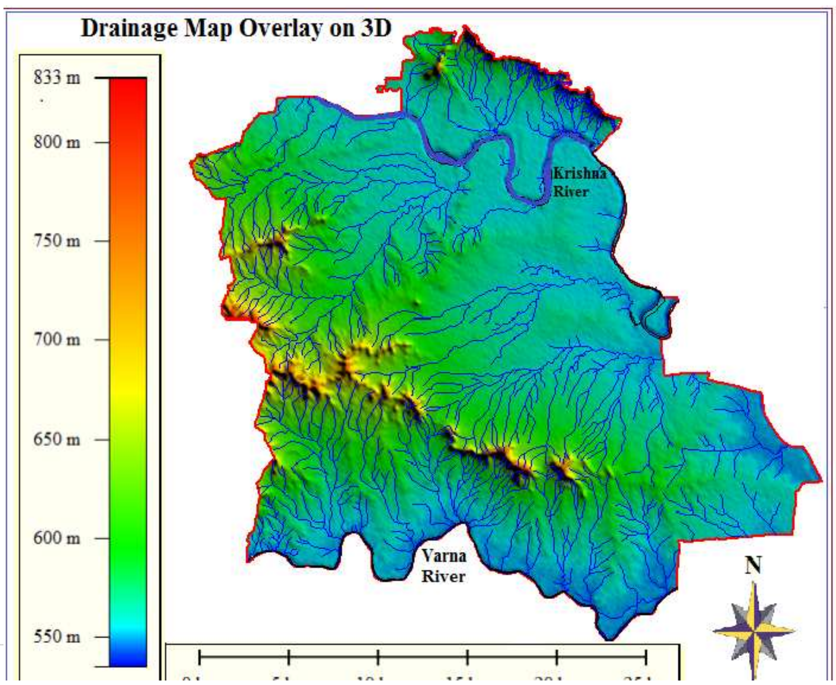
Map No. 2.6: Slop Map of Walwa Tahsil



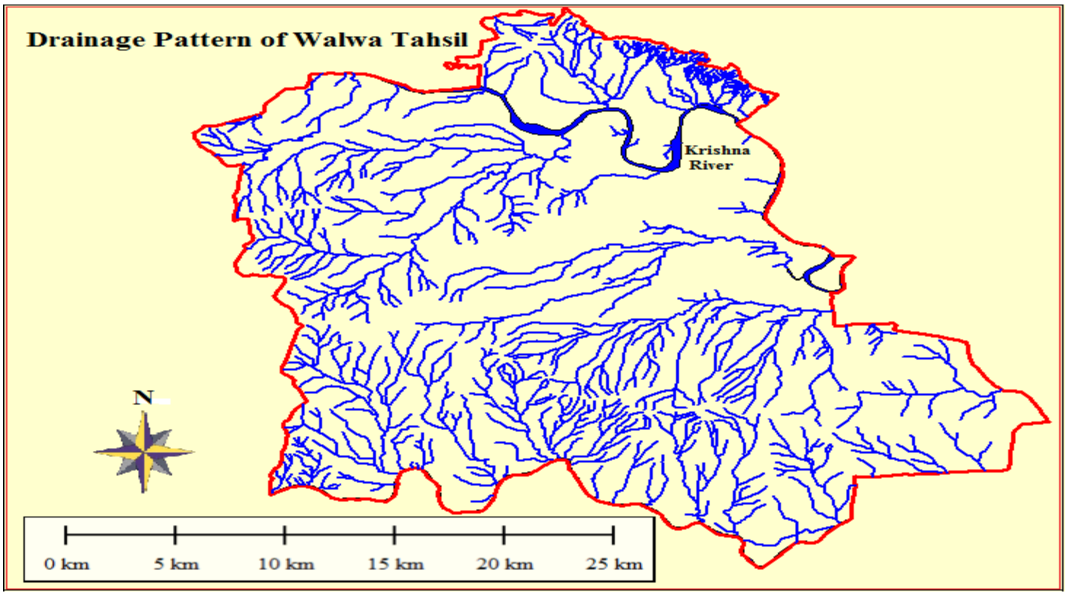
2.4 Slope:

The steep slopes in the hilly region are not used for sugarcane cultivation due to poor soils and absence of irrigation faculties. Agriculture has shown close relationship with the slope as stated by Symon (1967), Datye (1971) and Saptarshi (1993). The slope plays important role in agriculture productivity, as it is a vital factor influencing negatively on landuse capability.

Map No. 2.7: Drainage Map of Overlay



Map No. 2.8: Drainage Pattern of Walwa Tahsil



2.5 Drainage:

The drainage of the area is well developed and geared to the base level of the Krishna and Warna. The entire area is located in the upper basin of river Krishna. The Krishna rises to the east of the Western Ghats at Mahabaleshwar in the north- western corner of the study area and drains in to Bay of Bengal. The Warna is it's source in the western Ghats, flows the taluka of *Shirala, Shahuwadi, Panhala,* and flows towards to south east from south border of Walwa tahsil and joins to Krishna near Sangli. The entire tahsil is drained by the small tributaries of the Krishna River, of which Warna is its main tributary.

1) Krishna river:-

Krishna river is one of the major river of India with its meandering course. The Krishna flows between the north part of the tahsil Kole , Narsihapur, Shirte, Bichud, Rethare Harnaksha,Dudhari and Takari these villages are located along the left banks of the river. At the right banks of the river Kasegaon Dhotrewadi,Tambave,Bahe,Kharatwadi,Pharnewadi,Borgaon,Banewadi,Gaundwadi,Satapewadi,Musuchiwadi,Junekhed, Navekhed,and Walwa villages are located.

2) Warna river:-

Warna river is flowing from west to east with it's meandering cource from south border of study area. On it's left bank *Thanapude Chikurde,Deverde,Aitwade,Kundalwadi,Tandulwadi,Kanegaon,Shigaonand Bagani* villages are located.

2.5 Soils:

The alluvial type of soil is observed around the courses of Krishna and Warna Alluvial soils and water supply are devoted to cane cultivation. The sugarcane be grown in various types of soils right from sand to heavy clays provided the climate , water , drainage in nutrient states to soils texture and depth of soils .

Sugarcane required a well prepared structured soils profile to a depth of at least 40 to 60 cm . (Zende ,1991).

The Walwa tahshil is leading in producer of sugarcane .The area has shallow to medium black soils coming from the well known basalt of Deccan track . Types of soils have been distinguished here with varying fertility and management practices. (Yadava .R .L - Agronomy of Sugarcane First Edition P.26)

Soil is the very important factor affecting the growth of sugarcane . It is a storehouse of plant food on which depends the survival of plant life. it is a natural medium through which different nutrients are supplied to growing the plants ,the study of physicochemical composition of soils is essential which determines the fields and quality of sugarcane .The Present explanation deals with the soils types and their attributes in the study area. Problems pertaining to sugarcane soil are also highlighted.

The study area is located in upper Krishna basin the soils in this area of generally of trap origin. This region is a part of 'Deccan Trap ' Composed of Pre-Cambrian crystalline rocks which supported a variety of soils (Roy Choudhary 1960).The Soil may be Classified as follows :

a. Black Soils
b. Coarse Shallow Soils
c. Literate soils

a) Black Soils :

This group of soils occupying roughly 3/5 Part of region The River tracts are largely occupied by black soils which fall under the following two groups as suggested by Ray Choudhary , 1955 black cotton soils or regures. alluvial soil. based on depth, region has two types of black soils

Deep Black Soils :

These soils are confined closely to river courses, particularly in the flood plains of river Krishna and Warna, They get, nutrients every year during floods plains of river Krishna and Warna . Every Year , These Soil are reinforced by flood waters during rainy season. Thus narrow strips of deep alluvium have been formed. Alluvium which ranges from 6 to 8, meters in depth from surface. Thus ,the humus content is high in this soil group (I C A R , 1971)

Medium Black Soils :

This type of soils occurs in the *Patches* of various villages near the bank of the rivers. Near the river Krishna and the Warna the fertile soil is observed during the field survey.

These are situated mainly away from the rivers and its streams and the gently sloping. This soil generally are loamy to clay in texture and are suitable for growing sugarcane it is provided with adequate irrigation facilities.

The average PH value of medium black soil is about 7- 8, The clay content ranges from 55 to 70 percent and soils are however, deficient in nitrogen i.e 0.07 percent . The proportion of phosphate (P2 O5) Potassium (K2O) and Magnesium is not favorable as indicated and it's sufficiently found in these soils. The black color of the presence of titanium ferrous magnetite iron , black constituents of parent and humus content.

b) Coarse Shallow Soils :-

The hill topped hills forming interfuse between mountains ranges shallow soils are confined to hill ranges formed by the eastward projecting offshoots of the western Ghats, A zone of shallow soil is observed to words northen part of region , particularly northern part of *Yedemachindra , Bhavaninagar , Ratherearanaksha, Dhodhari . and Takari* Vaillages

c) **Laterite Soils:**

This type of soils are occur in western parts of the tahsil, particularly *Wategaon, Bhatwadi, Sural ,Ghabakwadi, Mahadevwadi* and *Rethere Dharan.*These soils are poor fertility and are mainly suitable for cultivation of rice, sugarcane if irrigation system is available.

]

2.6 Soil analysis:

Since last more than 50 years the sugarcane is cultivated in the region. Farmers were using wrong methods of cultivations misuse of water, soil andfertilizer resources due to this productivity of agriculture decreased. To overcome this problemthere is a need of soils analysis. Some Farmers from study area had tested the soils in the laboratories. The following soils testing data is available from soils testing laboratories of sugar factories.

Fig. No.2.1: Soil analysis

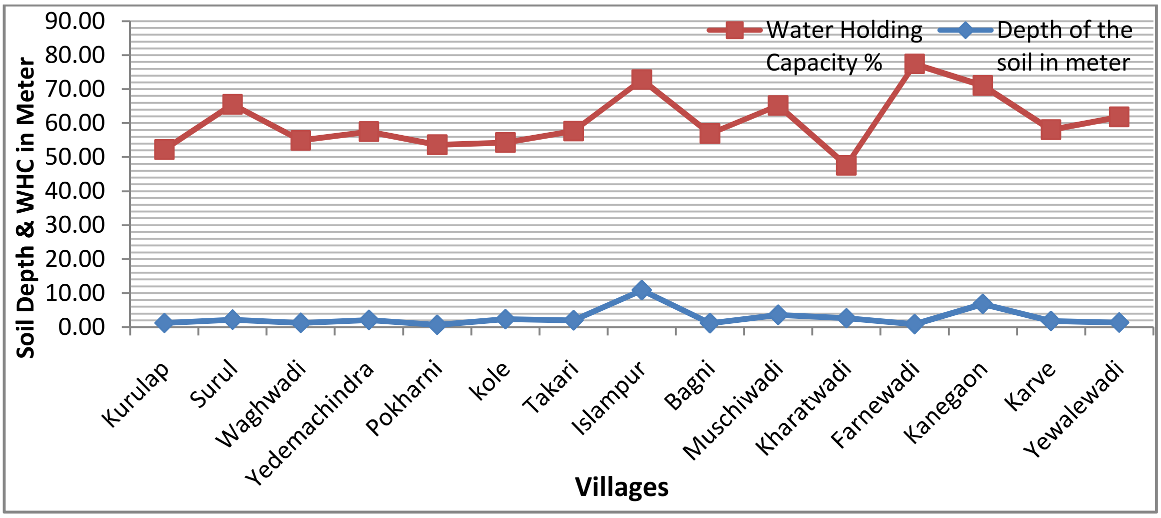


Table No. 2.1: Soil Depth & WHC of soil

Sr No.	Name of the Village	Depth of the soil in meter	Water Holding Capacity %
1.	Kurulap	1.20	51.05
2.	Surul	2.18	63.33
3.	*Waghwadi*	1.24	53.71
4.	*Yedemachindra*	2.10	55.43
5.	*Pokharni*	0.67	53.00
6.	*kole*	2.34	52.00
7.	*Takari*	2.03	55.66
8.	*Islampur*	10.88	61.95
9.	*Bagni*	1.18	55.80
10	*Muschiwadi*	3.60	61.62
11	*Kharatwadi*	2.63	45.00
12	*Farnewadi*	0.90	76.50
13	*Kanegaon*	6.83	64.25
14	*Karve*	1.80	56.28
15	*Yewalewadi*	1.35	60.51

Source:*Rajarambapu Sakhari Sakhar Kharna Sakharale.Tal Walwa.*

2.6 Soil analysis:

2.6.1 Soil depth and its water holding capacity(WHC):

It is observed that from Fig No.1 the percentage of water holding capacity(WHC) of *Surul , Islampur ,Musuchiwadi, Kanegaon, Karve, Yewalewadi and Farnewadi* villages has very high(greater than 50%) water holding capacity. *Kharatwadi* has low water holding capacity (less than 50%) that might be influence on growth of the sugarcane.

The village *Islampur* has soil depth is very high (10.88 meter) it may be influence on sustainable productivity of the sugarcane.

Fig. No.2.2: pH& EC of soil

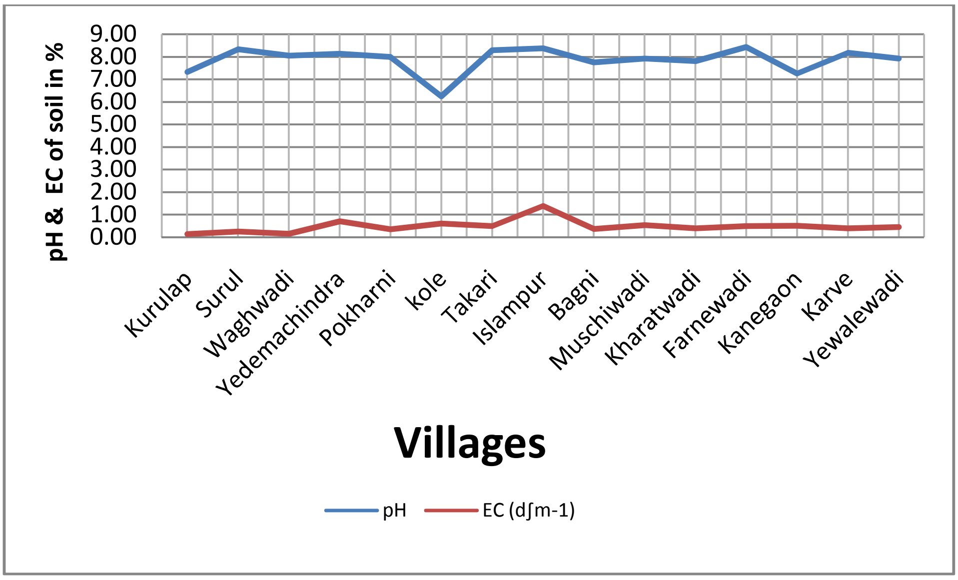


Table No.2.2: pH &EC of soil

Sr No.	Name of the Village	pH	EC(dʃm^{-1})
1.	Kurulap	7.32	0.14
2.	Surul	8.33	0.25
3.	Waghwadi	8.05	0.15
4.	Yedemachindra	8.13	0.71
5.	Pokharni	7.99	0.35
6.	kole	6.25	0.61
7.	Takari	8.28	0.49
8.	Islampur	8.36	1.38
9.	Bagni	7.75	0.36
10.	Muschiwadi	7.91	0.54
11.	Kharatwadi	7.81	0.40
12.	Farnewadi	8.43	0.50
13.	Kanegaon	7.26	0.50
14.	Karve	8.18	0.39
15.	Yewalewadi	7.92	0.45

Source :*Rajarambapu Sakhari Sakhar Kharna Sakharale.Tal Walwa.*

2.6.2 pH and electrical conductivity (EC) :

pH and electrical conductivity (EC) of the soil is shown in the Fig No. 2. The average pH of *Kurlap, kale* and *Kanegaon*(is between 6.5 to 7.5) is very good. In other villages i.e. *Surul, Waghwadi, Yedemachindra, Pokharni, Takari, Islampur, Bagni, Muauchiwadi , kahratwadi, Farnewadi, karve and Yewalewadi*

the value of pH is greater than 7.5 so these soils are alkaline soils. It influences the growth of sugarcane.

The average electrical conductivity (EC) of the village *Kurlap, Surul, Waghwadi, Yedemachindra, Pokharni, kole, Takari, Bagni, Musuchiwadi, kharatwadi, Farnewadi, Kanegaon, Karve, Yewalewadi* is less than 1dS/m(decisiman per meter) is very good and the average yield of sugarcane in these areas is about 72mt/hectare. The EC of soil of *Islampur* is more than 1.38 dS/m is high, it means the EC is increasing in the soil it will be declining the production of the sugarcane.

Fig. No.2.3: CL andOC Content in soil :

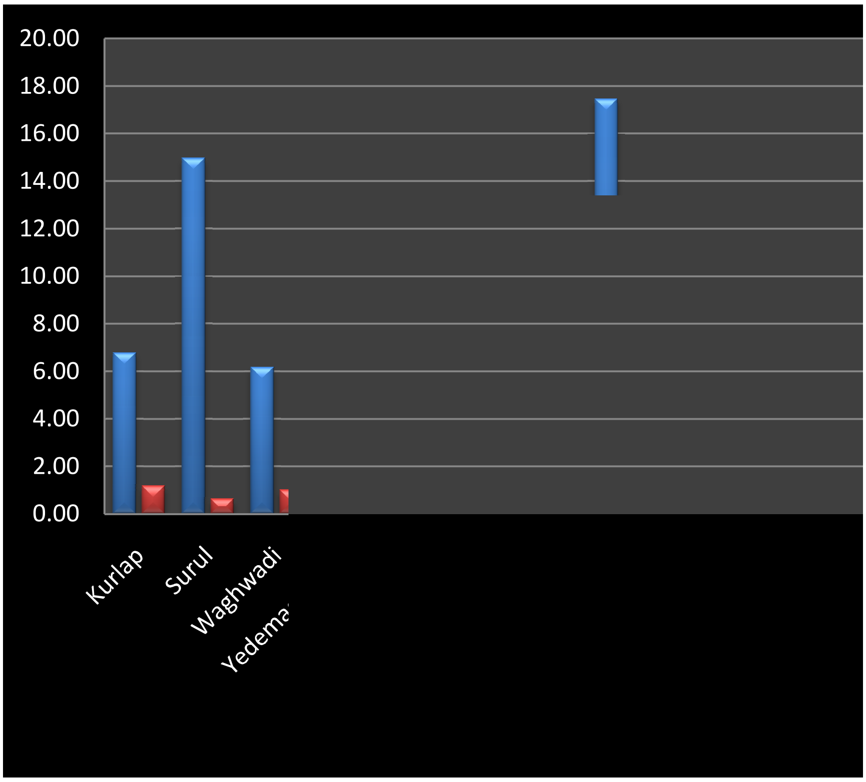


Table No.2.3: CaCO3and OC Content in soil :

Sr. No.	Name of the Village	Free lime Cl %	Org
1.	Kurlap	6.78	
2.	Surul	14.97	
3.	Waghwadi	6.17	
4.	Yedemachindra	10.59	
5.	Pokharni	6.00	
6.	kole	6.40	
7.	Takari	6.80	
8.	Islampur	17.46	
9.	Bagni	6.10	
10.	Muschiwadi	8.12	
11.	Kharatwadi	6.51	
12.	Farnewadi	18.15	
13.	Kanegaon	9.34	
14.	Karve	13.62	
15.	Yewalewadi	11.90	

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