IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)
e-ISSN: 2319-2402,p- ISSN: 2319-2399.Volume 9, Issue 2 Ver. III (Feb 2015), PP 30-39
www.iosrjournals.org

A Study on Nutrient Status of Soil in Bagalkot District of Karnataka State, And Fertilizer Recommendation

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Abstract: *soil plays a very vital role as it produces food for human beings and animals. The organic matter in soil as decomposed by a host of micro organism, due to human activities, soil is the receptor of many pollutants including pesticides, fertilizers etc., Soil quality is one of the serious environmental problems. Soil contaminations influence the geochemical reactions and may change environmental behavior. The fertility of soils is dependent upon the amount of organic matter, types of clay, water holding capacity in also dependent upon the nature (texture) of soil. The study area is known for granite rocks, granite mining and granite polishing centers. Ilakal urbanized town of Bagalkot district is famous for silk saris; sugar cane is the main crop in the District. Bagalkot District is known to be second Punjab and the district is regularly affecting by flood, where the cultivated lands were completely merged in huge water table. The present study aim was to evaluate some Physico-Chemical properties, assessment of Nutrients and the variation in soil samples due to heavy irrigation of cultivated lands. The study reveals the seasonal effect on soil fertility by irrigation, fertilizers effect and agriculture practices. The effect may cause positive and negative variation of nutrients status on soil properties. For this work 18 soil samples from six villages (seasonally 3 samples each village) were collected and analyzed the Physico-chemical parameters, presence of nutrients were analyzed using respective instruments such as Nitrogen analyzer, Flame photometer, Visible spectrophotometer and Atomic Absorption Spectrophotometer as per the standard methods.*

Key Words: *soil, Nutrient status, fertilizers, recommendations, organic matter.*

I. Introduction:

Soil testing is a proven, practical method for evaluating the fertility status of soils and providing a sound basis for making recommendations in respect of fertilizers application in respect of fertilizers uses, soil amendment to farmers for increased crop production. Soil testing is of recent introduction but its importance in our agricultural program can hardly be over emphasized. Use of fertilizers in the country is now decidedly on the increase but their application must be guided on a scientific basis in a rational manner to achieve good yield. The soil testing is made significant progress and made fertilizers recommendations to farmers on the results, showing deficient and sufficient area of the major plant nutrients, to reach the desired yield levels. However, the amounts and kinds of fertilizers required for the same crop vary from soil to soil even from field to field on the same soil. The farmers should apply the proper doses of fertilizers at the right time with the recommendation based upon the soil testing. The risk of unbalanced nutrient elements and uneconomical use of fertilizers reduce the crop yields, the general impression about soil testing is that it is a rapid and too accurate method of assessing heavy elements potential on crops, plants and vegetations. The research work so far conducted on the crop in the particular soil locations, and the management practices of the concerned farmers, such as proper tillage, efficient water management, good seed, and adequate plant protection measures. Soil testing is essential, as the first step in obtaining high yields and maximum returns from the money invested in fertilizer.

II. Materials and Methods:

All the chemicals used were of analytical grade, metal salts were purchased from E. Merck. Soil samples were collected in different seasons by scrapping (Grid sampling design) using a pre-cleaned and acid washed plastic scale and immediately kept in clean polythene bags, Soil samplings and preparation of soil samples for analysis was done by reported standard methods **[1]**. Soil extract were prepared and used for the analysis of their physical and chemical properties using respective instruments, major and secondary nutrients were analyzed according to the standard procedures by using Nitrogen analyzer and Flame photometer respectively, usually organic Carbon is expressed as organic matter. Since, the organic matter on an average contains 58% Organic carbon. The Organic carbon in soils was estimated by wet oxidation method (Walkey-Black method). Available Nitrogen in soils was determined by alkaline permanganate method **[2]**. Olsen's method **[3]** is employed for the determination of available Phosphorous in soils. Available Potassium is determined by using Flame photometer[3]. and micronutrients in the soil samples. The frequency of sampling

should be once after the crops or during the season when the soil moisture is optimum. Deionized water (18 mega ohm resistivity) prepared from Millipore Milli-Q water purification system, USA, was used throughout. Nitric acid used was of pure (Merck).Hydrochloric acid (Merck) 40% Ultra pure. Metal contents were determined using Atomic Absorption Spectrophotometer (AAS-Elico) to determine the presence of metals such as Cu, Zn, Ni, Co, Fe, Boron and Molybdenum. 5 grams of soils samples were taken into 150 ml conical flask, 50 ml of 0.1 M HCl was added and flask was kept on shaker for 30 minutes. The content were filtered in to 50 ml standard flask and made up to mark with 0.1 M HCl for determination of micronutrients using Atomic Absorption Spectrophotometer (AAS).

III. Results and Discussion:

The soil samples analysis results in the three different monitoring periods (Pre-Monsoon, Monsoon and Post-Monsoon) recorded in the **Tables 1 to 6** of all six taluks of Bagalkot district (one village from each Taluk). All the values were compared with WHO, ISI and Bureau of standards. The deficiency in the micro-nutrients, Organic Carbon in the soil samples of the Bagalkot district were showed in the District map (charts). The comparative studies between the Major nutrients of selected locations were showed in the Figures I to Figure III.

1. Determination of pH and Electrical Conductivity(EC) of soil samples:

Soil pH is a measure of the acidity or alkalinity. The optimal pH of soils should be in between 6.5 to 7.5. acidic soil effects availability of plant nutrients. Acidic soil results in an increase in an Aluminium element. Aluminium is toxic to plants; the availability of toxic metals in soils affects the activity of soil micro-organisms, thus affecting nutrient cyclining and disease risk. During the agricultural practices the soil pH is increased due to liming materials (pure $CaCO_3$ or Dolomite lime). Thus, the lime is certified Organic product don't add every year. But, 15 – 20 lbs lime per 1000 sq. ft. is recommended. Wood ashes are another product to rise soil pH (wood ashes also are a source of K, Calcium and Magnesium). Some compost also can increase the soil pH. The elemental sulphur is often recommended (50 lbs Sulphur per 1000 sq. ft.) Ammonium and Ammonium forming N-fertilizers will also result in a decrease in soil pH.

In the present investigation the pH of the soil in the location of Tungal village of Jamkhandi Taluk of the district ranged in between 7.15 to 7.33, Baragi village of Mudhol Taluk ranges in between 7.10 to 7.73, in the Galagali village of Bilagi Taluk of the Bagalkot district found in between 7.32 to 7.85, Hire Gulbal village of Bagalkot Taluk ranged in between 8.13 to 8.72, soil found to be highly alkaline in nature. This type of alkalinity should be critical for crops. The pH values of the soil sample of Lakkasakoppa village of Badami Taluk found in between 7.12 to 7.84. the pH value of the soil sample of Dannur village of Hunagund Taluk of the district found in between 8.21 to 8.50, the soils of this location found alkaline in nature. Except Bagalkot and Hunagund Taluk the cultivated lands were found be within the range of prescribed legal limit. Measurements of pH of soil samples of various selected locations seasonally from the cultivated lands were carried out as per the reported analytical standard method using a pH sensitive electrode (Elico) having combined electrode. The pH meter is calibrated with buffer solutions of known pH before the measurements of pH values of selected soil samples.

2. Measurement of Electrical Conductivity (EC):

EC values indicates the soil salinity, the salinity in the soils can come from the heavy irrigation water, fertilizers, composts and manure. Potential problem in irrigated soils due to high evaporation rates and low annual rain fall leaving salts to accumulate in the soils of cultivated lands. Salts can be leached by slowly applying excess water i.e., 3 inches removes about 50% of the soluble salt and 5 inches removes at 90% of salt

from the saline soils now a day's farmers with the financial support of Government they are installing the siphon process, a new technology to remove the salt from the soils from their heavy irrigated lands. The interpretation of soil salinity which is purely based upon the EC values in the followings:

Electrical Conductivity (EC) values in m mho/cm or ds/m	Interpretation
EC values found 4 or above in soil samples.	Severe accumulation of salts may restrict growth of many vegetables.
EC values found in between 2 – 4 in soils.	Moderate accumulation of salts will not restrict plant growth, but may require more frequent irrigation.
EC values found below 2 in soil samples.	Low salt accumulation will not affect plants and vegetations.

The amount of soluble salts in a soil samples were estimated from EC vales of aqueous soil extracts **[3].** In the present investigation the EC values found within the prescribed legal limits from the cultivated lands of Tungal village of Jamkhandi Taluk, Baragi village of Mudhol Taluk, Galagali village of Bilagi Taluk, Hire Gulbal village of Bagalkot Taluk, Dannur village of Hunagund Taluk and Lakkaskoppa village of Badami Taluk. All the values found less than 1.0 ds/m (m mho/cm). Hence, the lands in these areas found to be fit for cultivation of plants and vegetations salt accumulation will not affect the plants; salt accumulation may be washed due to the heavy rain falls or by the leaching process. The Sodium percentage found in between 0.99 % to 1.10 % from the soils of Badami location, Sodium percentage found in between 1.7812 % to 4.814 %, 1.38 % to 1.52% from the lands of Mudhol location, and 1.10 % to 1.28 % from Bilagi location. In all these cultivated lands the sodium found more than the legal limit. The accumulation of the sodium salt may cause critical to the plants but, the salt from the soil surface can be leached due to the heavy rain falls during the Monsoon season. The lands of Hunagund, Hire Gulbal villages of Bagalkot Taluk found within the legal limits. The presence of Calcium carbonate in the cultivated lands of all selected lands of the district found in medium level, this fact that the farmers were used wood ashes and some composts in the agriculture practices.

3. Determination of Major Nutrients (N. P. K. and Organic Carbon):

Organic Carbon enters the soil through the decomposition of plant and animal residues, living and dead microorganisms and soil biota. Soil organic matter is the organic fraction of soil exclusive of non-decomposed residues. The soil OC is a heterogeneous, dynamic substance that varies in particle size. The soils are highly fertile if they possess the OC in Nano-particle size. The soil OC is the main sources of energy for soil micro-organisms. OC is an important constituent of the soil, due to its capacity to effect plant as both a source of energy and trigger for nutrient availability through mineralization. OC maintains the stability of nutrients and water holding capacity. OC in soil bind mineral particles together into micro-aggregates and stabilizers soil structure making soil resistant to erosion, porous enough to allow air, water and plant roots to move through the soil. Increase in soil Organic matter and total organic carbon leads soil with greater biodiversity and control plant diseases.

Cultivated lands were completely covered by the water table due to Flood Effect during the Rainy season in 2012-2013.

The function of OC released by soil organic manure should interact with pesticides and helps in pesticide movement through soil into ground water. The deficiency of OC in soil reduces the soil activity and nutrient mineralization process. The scare soil OC results in less diversity in soil biota with a risk of the food chain equilibrium being disrupted, which can cause disturbance in the soil quality. Hence, the plant pest and

disease, accumulation of toxic substance in soils. In the present investigation Organic Carbon found more than legal limits in the locations of five taluks except Dannur village of Hunagund & Lakkasakoppa village of Badami taluks, in these locations the OC values found in between 0.46 % to 0.80 % and 0.42% to 0.54% respectively. Indicates the uses of Organic manures in the limited condition. The maximum values of OC found in other locations due to the uses of Organic manures in their lands during cultivation and in agriculture practices. The Available Nitrogen and Total Nitrogen in the soil samples of selected locations of the district found more than the average values this is the indication that the farmers were used the urea (Nitrogen fertilizer) during the cropping periods. The Nitrogen content found maximum in the post-Monsoon periods rather than the Monsoon, this is because during the monsoon period the nitrogen may be washed out (natural purification) due to the natural rain falls and heavy irrigation processes. Available Phosphorous found 10.01 Kg/h to 18.20 Kg/h in Jamkhandi location, 11.42 Kg/h to 19.12 Kg/h in Hunagund location, 6.42 Kg/h to 9.62 Kg/h in Bilagi locations respectively, all the values were found less than the prescribed legal limit, this is the indication that minimum limit of the P should be required for proper growth of plants and vegetations [BIS, WHO standard limit 20 – 60 Kg/h]. The fertilizers recommendation and information is given to the farmers of these locations to use the DAP fertilizers during the cropping system. The P values found within the permissible limits at Badami location. The maximum P found in between 52.8 Kg/h to 71.5 Kg/h at the locations of Bagalkot Taluk and 99.2 Kg/h to 127.1 Kg/h found in the location of Mudhol Taluk. The maximum values due to the continuously farmers are using the DAP fertilizers in unlimited doses during the cultivation of their lands. The available Potassium found more in Bagalkot locations, where as the soils of other taluks contains the available K within the legal limit of permissible values [WHO, BIS: 250 – 300 Kg/h].

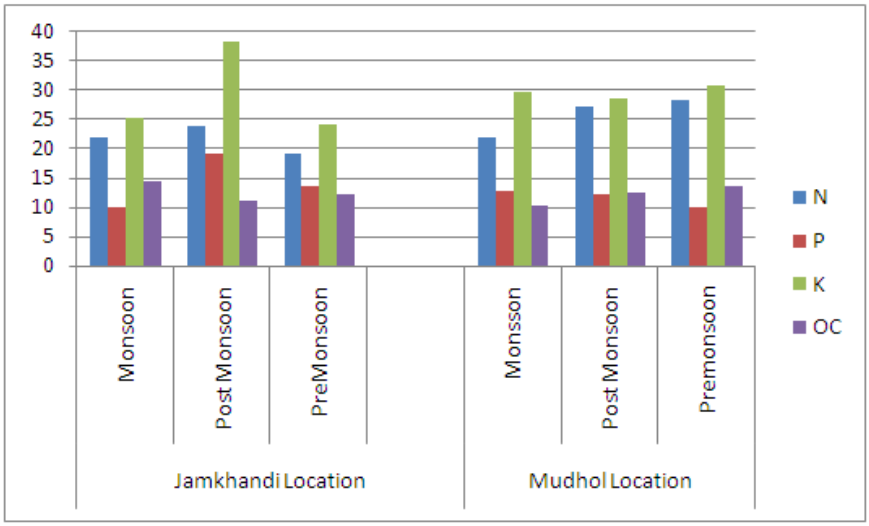

Figure I. Major Nutrients in the soil samples of Jamkhandi and Mudhol locations. A comparative study.

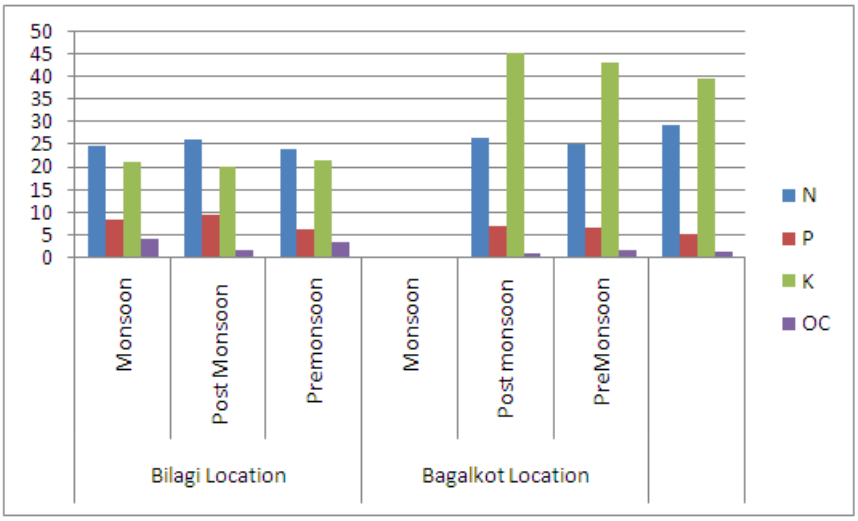

Figure II. Major Nutrients in the soil samples of Bilagi and Bagalkot locations.

A comparative study.

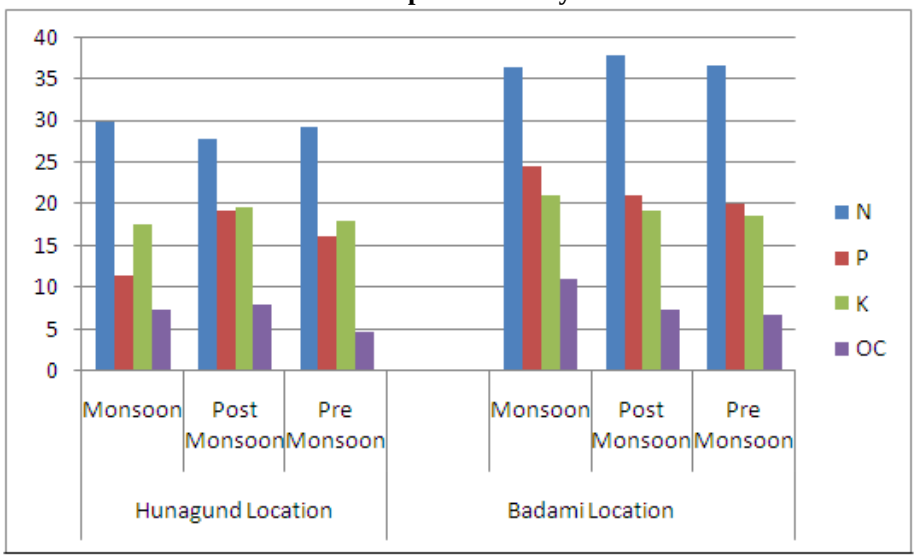

Figure III. Major Nutrients in the soil samples of Hunagund and Badami locations. A comparative study.

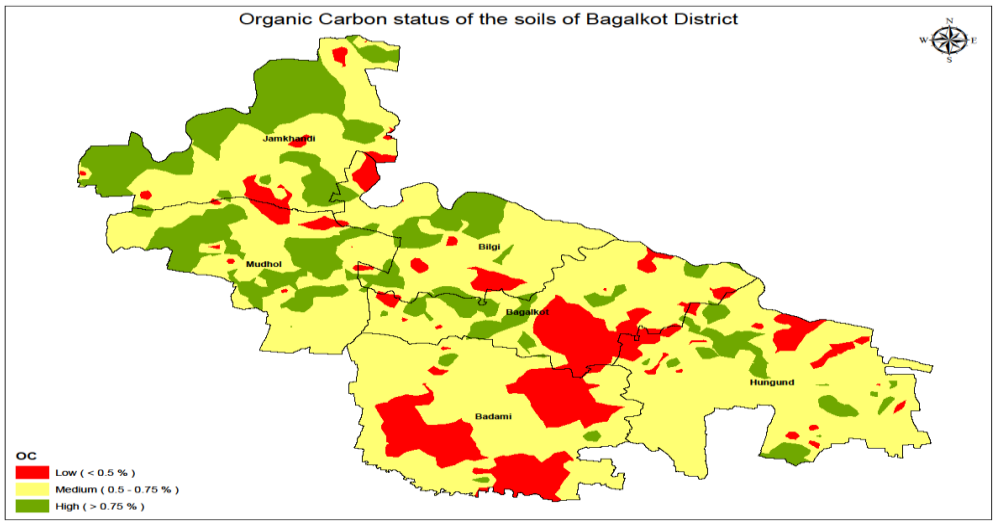

Chart showing the deficiency of OC and its status in the soils of Bagalkot District. Jamkhandi and Mudhol locations having higher percentage of OC, where as the Badami cultivated lands found deficiency in OC.

4. Determination of secondary Nutrients (Calcium, Magnesium and Sulphur):

The secondary nutrients such as Calcium (%), Magnesium (%) and Sulphate (ppm) are also quite essential for the plants, vegetations growth. Most nutrients are cations: Ca^{+2}, Mg^{+2}, K^{+}, NH_4^{+}, Cu^{+2}, Mn^{+2}, the cations are in the soil solution are in dynamic equilibrium with the Cation absorbed on the surface of the clay and Organic matter. The CEC is dependent upon the amount of Organic Matter and types of clay in soils. Available Sulphur in soil refers to mainly SO4 – S, both exchangeable and water soluble. The determination of available Sulphur includes extraction using appropriate reagent and estimated by turbid metric method **[4].** The same extract used for estimation of available Potassium, Calcium and Magnesium under working standards **[5].** In the present investigation Calcium in the lands of Jamkhandi location found within the prescribed limit, where as the calcium % found more than the legal limit in all the locations of district except Jamkhandi location. This is because of availability of lime stone, granite, alkaline soils in the areas of the district. Mudhol Taluk is covered with the maximum quantity of Dolomite rocks. Hence, the probability of finding the Calcium Carbonate in the soil samples.

5. Determination of Micro-Nutrients (Fe, Mn, Zn, Cu, Boron and Molybdenum):

The availability of heavy metals in ppm values of soil samples of different locations during the monitoring periods found in the order of Fe < Cu > Zn > Mn. In case of Copper the values ranged from 0.74 ppm to 2.74 in Jamkhandi soil sample, 3.28 ppm to 3.94 ppm at Mudhol soil sample, 1.46 ppm to 1.84 ppm in the soil samples from Bilagi location, 0.72 ppm to 0.82 ppm in Bagalkot locations, 0.61 ppm to 0.72 ppm in Hunagund location and 1.29 ppm to 1.92 ppm of copper found in the soil samples of Badami Taluk. Fe in the soil samples of selected locations during the monitoring periods ranged in between legal and normal limit as prescribed by BIS standards. In case of Mn the values ranged in between 0.75 ppm to 6.81 ppm during Monsoon season, 0.63 ppm to 5.92 ppm during Post-Monsoon and 0.54 ppm to 6.12 ppm during pre-monsoon periods. All values found average to maximum in the soil samples of the study areas in the district. Zinc and Boron the micro nutrients found more than normal in all the soil samples, they are quite essential for the growth of plants and vegetables. The presence of Boron and Zinc may not cause any critical for crops and plants. The micro-nutrient such as Molybdenum was found in normal permissible limits as prescribed by the international standards. The availability of micro-nutrients found agreeable amount, hence, the soil in the study area found more fertile from the cultivated lands.

IV. Conclusion:

The conclusion is drawn that the effects of the heavy irrigation on the conditions for agricultural production in the cultivated lands of the Bagalkot District (128 Km^2area). The total soil evaluation is recorded as the fertile land with high production potential has been reduced. Major Effects on the heavy irrigation were the direct crops losses and the destruction of agricultural infrastructure. However, given the major damage to leaving beings and social casts the heavy irrigation caused in the entire catchment area.

The objective of our present investigation was to determine the impact of the heavy irrigation on Physico- chemical properties and nutrients status of soils of cultivated areas in order to provide a quick estimate of heavy irrigation and fertilizers effects on the conditions for agricultural production in flooded and heavy irrigated area. The possible effects were observed to be heavy metal ions (micronutrients) enrichment in the soil samples, and the change of the nutrient status of the soils. The concentration of heavy metals in the soil samples of the study area from the irrigated lands found more or less below legal limits. The nutrient status such as Zinc, Boron and the major nutrient Organic Carbon were shown in the table 1 to table 6. of the soils, the normal values in available Phosphorus in soil samples, and the percentage of Magnesium (Mg) found more or less within the permissible limits, and increase in Potassium contents were measured in the soils (152.0 kg/h to 450.0 kg/h) in the soil samples of study area during the monitoring periods. The pH values recorded in almost all spots of selected area were more than the legal limits. The relative contribution of protons to the CEC was also reduced. The mineral nitrogen content was appreciably decreased in the area of heavy irrigated soils. This effect could most probably be related to denitrification processes as result of anaerobic conditions during the heavy irrigation and water spreading factor.

Acknowledgements:

The authors are thankful to Dr. N. Gopukumar, Deputy Secretary, UGC, and South Western Regional Office Bangalore for their help and encouragement by funding the financial assistance in term of Minor Research Project. Authors express their sincere thanks to Dr. C.N.R.Rao, FRS National Research Professor, Chairman Vision Group on Science and Technology, Bangalore for providing financial support in terms of Major Projects. The authors are also thankful to Dr. B.G.Mulinami Vice- Chancellor and chief Administrative Officer & S.H.Lagali, Administrative Officers BLDE'S Association Bijapur and Principal Dr. S. S. Suvarnakhandi for providing necessary facilities required to carry out this research work.

Table 1.
SOIL ANALYSIS REPORT
Address: Sangamesh Biradar
Survey No. 239/2 Post: Tungal, Tq: Jamkhandi,Dist: Bagalkot.
(Soil Analysis-Sept 13 to Feb 14 & Sediment Analysis – June 13 to May 14)

No.	Parameter	UNIT	Soils Analysis			Legal limit
			Monsoon	Post-Monsoon	Pre-Monsoon	
I	Physical-Parameters					
	Bulk Density	g/cc	1.10	1.08	1.09	
	WHC	%	58	57	56	
	Texture		Sandy	Clay Loam	Clay Loam	
II	Chemical Parameters					
	pH		7.21	7.33	7.15	6.5-7.5
	EC	ds/m	0.14	0.24	0.45	<1
	Sodium	%	4.814	2.328	1.7812	<0.1
	Calcium Carbonate		Medium	Low	Medium	

III	Major Nutrients					
	Organic Carbon	%	1.44	1.11	1.21	0.5-0.75
	Avail.N	Kg/h	213.2	238.3	188.16	250-280
	Total N	%	0.3	0.6	0.3	0.03-0.06
	Available P	Kg/h	19.11	13.65	18.20	20-60
	Available K	Kg/h	380	240	330	250-300
IV	Secondary Nutrients					
	Ca	%	0.88	0.88	0.98	<1
	Mg	%	0.55	0.33	0.78	<0.5
	SO4	Ppm	5.82	3.73	1.30	10-20
V	Micro Nutrients					
	Iron (Fe)	Ppm	1.89	0.86	0.96	Min.4.50
	Manganese	Ppm	0.75	0.63	0.54	Min.2.00
	Zinc (Zn)	Ppm	1.86	1.33	1.88	Min.0.75
	Copper	Ppm	0.74	2.74	2.65	Min.0.60
	Boron	Ppm	0.82	0.35	0.10	Min.0.50
	Molybdenum	ppm	0.05	0.08	0.07	0.05-0.2

Table 2.
SOIL ANALYSIS REPORT
Address:Gurappa Nandeppa Kumbar
Survey No.109/B Post: Baragi, Tq: Mudhol, Dist: Bagalkot.
(Soil Analysis-Sept 13 to Feb 14 & Sediment Analysis – June 13 to May 14)

Sl.No.	Parameter	UNIT	Soils Analysis			Legal limit
			Monsoon	Post-Monsoon	Pre-Monsoon	
I	Physical-Parameters					
	Bulk Density	g/cc	1.12	1.20	1.21	
	WHC	%	56	56	55	
	Texture		Red-Clay	Black-clay	Red-clay	
II	Chemical Parameters					
	pH		7.68	7.10	7.42	6.5-7.5
	EC	ds/m	0.70	0.58	0.36	<1
	Sodium	%	1.52	1.48	1.38	<0.1
	Calcium Carbonate		Medium	Medium	Medium	
III	Major Nutrients					
	Organic Carbon	%	1.01	1.25	1.34	0.5-0.75
	Avail.N	Kg/h	216.8	268.9	281.2	250-280
	Total N	%	0.112	0.084	0.106	0.03-0.06
	Available P	Kg/h	120.8	99.2	105.2	20-60
	Available K	Kg/h	295	285	306	250-300
IV	Secondary Nutrients					
	Ca	%	19.8	10.2	10.4	<1
	Mg	%	11.2	11.5	12.5	<0.5
	SO4	Ppm	12.02	14.10	15.12	10-20
V	Micro Nutrients					
	Iron (Fe)	Ppm	4.12	2.42	2.02	Min.4.50
	Manganese	Ppm	6.81	5.92	6.12	Min.2.00
	Zinc (Zn)	Ppm	1.98	1.96	2.28	Min.0.75

Table 3.
SOIL ANALYSIS REPORT
Address: Avanawwa y. Jambagi
Survey No. 9. Post:Galagali , Tq: Bilagi ,Dist: Bagalkot.
(Soil Analysis-Sept 13 to Feb 14 & Sediment Analysis – June 13 to May 14)

Sl.No.	Parameter	UNIT	Soil Analysis	Soils Analysis			Legal limit
				Monsoon	Post-Monsoon	Pre-Monsoon	
I	Physical-Parameters						
	Bulk Density	g/cc	1.12	1.14	1.16	1.12	
	WHC	%	56	58	56	52	
	Texture		Sandy	Sandy	Sandy	Black	
II	Chemical Parameters						
	pH		7.61	7.32	7.85	7.58	6.5-7.5
	EC	ds/m	0.55	0.56	0.98	0.62	<1
	Sodium	%	1.10	1.28	1.18	1.21	<0.1
	Calcium Carbonate		Medium	Medium	Medium	Medium	
III	Major Nutrients						
	Organic Carbon	%	1.74	2.12	0.74	1.52	0.5-0.75
	Avail.N	Kg/h	265.2	243.4	258.5	238.6	250-280

	Total N	%	0.085	0.065	0.086	0.078	0.03-0.06
	Available P	Kg/h	8.30	8.52	9.62	6.42	20-60
	Available K	Kg/h	240	210	190	215	250-300
IV	Secondary Nutrients						
	Ca	%	14.8	15.9	16.4	14.4	<1
	Mg	%	1.8	2.6	2.8	2.9	<0.5
	SO4	Ppm	20.13	12.44	14.32	13.80	10-20
V	Micro Nutrients						
	Iron (Fe)	Ppm	5.72	4.81	2.68	1.83	Min.4.50
	Manganese	Ppm	1.98	2.01	1.82	1.64	Min.2.00
	Zinc (Zn)	Ppm	1.37	1.55	1.10	1.39	Min.0.75
	Copper (Cu)	Ppm	2.10	1.52	1.46	1.84	Min.0.60
	Boron	Ppm	0.86	0.58	0.62	0.76	Min.0.50
	Molybdenum	ppm	0.19	0.18	0.10	0.12	0.05-0.2

Table 4.
SOIL ANALYSIS REPORT
Address: Ramachandra Walikar
Survey No. 40/1 Post: Hire Gulbal, Tq: Bagalkot,Dist: Bagalkot.
(Soil Analysis-Sept 13 to Feb 14 & Sediment Analysis – June 13 to May 14)

Sl.No.	Parameter	UNIT	Soil Analysis			Legal limit
			Monsoon	Post-Monsoon	Pre-Monsoon	
I	Physical-Parameters					
	Bulk Density	g/cc	1.11	1.10	1.12	
	WHC	%	58	55	56	
	Texture		Red-clay	Red-clay	Red-clay	
II	Chemical Parameters					
	pH		8.13	8.25	8.72	6.5-7.5
	EC	ds/m	0.62	0.42	0.32	<1
	Sodium	%	0.28	0.22	0.20	<0.1
	Calcium Carbonate		Medium	Medium	Medium	
III	Major Nutrients					
	Organic Carbon	%	0.71	0.83	0.71	0.5-0.75
	Avail.N	Kg/h	263	249	293	250-280
	Total N	%	0.027	0.029	0.056	0.03-0.06
	Available P	Kg/h	71.5	67.2	52.8	20-60
	Available K	Kg/h	430	425	395	250-300
IV	Secondary Nutrients					
	Ca	%	24.3	23.9	19.7	<1
	Mg	%	0.36	0.35	0.55	<0.5
	SO4	Ppm	15.52	14.21	14.48	10-20
V	Micro Nutrients					
	Iron (Fe)	Ppm	2.94	3.98	2.81	Min.4.50
	Manganese	Ppm	0.98	0.52	1.14	Min.2.00
	Zinc (Zn)	Ppm	0.53	0.41	0.55	Min.0.75
	Copper (Cu)	Ppm	0.72	0.82	0.78	Min.0.60
	Boron	Ppm	0.39	0.76	0.42	Min.0.50
	Molybdenum	ppm	0.20	0.18	0.19	0.05-0.2

Table 5.
SOIL ANALYSIS REPORT
Address: Maheshgouda Shivanagoud Goudar.
Survey No.26. Post: Dannur, Tq: Hunagund, Dist: Bagalkot.
(Soil Analysis-Sept 13 to Feb 14 & Sediment Analysis – June 13 to May 14)

Sl.No.	Parameter	UNIT	Soils Analysis			Legal limit
			Monsoon	Post-Monsoon	Pre-Monsoon	
I	Physical-Parameters					
	Bulk Density	g/cc	1.10	1.12	1.14	
	WHC	%	55	56	54	
	Texture		Black-clay	Black-clay	Black-clay	
II	Chemical Parameters					
	pH		8.41	8.30	8.50	6.5-7.5
	EC	ds/m	0.34	0.32	0.25	<1
	Sodium	%	0.09	0.08	0.10	<0.1
	Calcium Carbonate		Medium	Medium	Medium	

III	Major Nutrients					
	Organic Carbon	%	0.73	0.80	0.46	0.5-0.75
	Avail.N	Kg/h	298.3	276.5	291.1	250-280
	Total N	%	0.072	0.878	0.985	0.03-0.06
	Available P	Kg/h	11.42	19.12	16.20	20-60
	Available K	Kg/h	175	195	180	250-300
IV	Secondary Nutrients					
	Ca	%	12.3	14.3	12.8	<1
	Mg	%	3.2	4.2	3.7	<0.5
	SO4	Ppm	13.60	14.12	16.12	10-20
V	Micro Nutrients					
	Iron (Fe)	Ppm	6.75	5.89	9.12	Min.4.50
	Manganese	Ppm	0.81	0.98	0.65	Min.2.00
	Zinc (Zn)	Ppm	0.62	0.67	0.78	Min.0.75
	Copper (Cu)	Ppm	0.62	0.61	0.72	Min.0.60
	Boron	Ppm	0.52	0.37	0.46	Min.0.50
	Molybdenum	ppm	0.12	0.10	0.14	0.05-0.2

Table 6.
SOIL ANALYSIS REPORT
Address:Basappa Dyawappa Mustigeri.
Survey No. 52/1. Post: Lakkasakoppa, Tq: Badami,Dist: Bagalkot.
(Soil Analysis-Sept 13 to Feb 14 & Sediment Analysis – June 13 to May 14)

Sl.No.	Parameter	UNIT	Soils Analysis			Legal limit
			Monsoon	Post-Monsoon	Pre-Monsoon	
I	Physical-Parameters					
	Bulk Density	g/cc	1.12	1.12	1.14	
	WHC	%	54	55	54	
	Texture		Red-clay	Red-clay	Red-vlay	
II	Chemical Parameters					
	pH		7.12	7.34	7.48	6.5-7.5
	EC	ds/m	0.42	0.54	0.32	<1
	Sodium	%	1.05	1.06	0.99	<0.1
	Calcium Carbonate		Low	Medium	Low	
III	Major Nutrients					
	Organic Carbon	%	0.48	0.54	0.42	0.5-0.75
	Avail.N	Kg/h	364.1	378.3	366.4	250-280
	Total N	%	0.053	0.066	0.547	0.03-0.06
	Available P	Kg/h	24.41	21.12	19.85	20-60
	Available K	Kg/h	210	191	185	250-300
IV	Secondary Nutrients					
	Ca	%	14.5	13.3	15.8	<1
	Mg	%	1.5	2.6	1.8	<0.5
	SO4	Ppm	10.44	10.54	9.12	10-20
V	Micro Nutrients					
	Iron (Fe)	Ppm	2.44	3.54	3.62	Min.4.50
	Manganese	Ppm	0.92	0.85	0.65	Min.2.00
	Zinc (Zn)	Ppm	0.92	0.85	0.56	Min.0.75
	Copper (Cu)	Ppm	1.58	1.29	1.92	Min.0.60
	Boron	Ppm	0.59	0.52	0.54	Min.0.50
	Molybdenum	ppm	0.15	0.20	0.12	0.05-0.2

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