International Journal of Tropical Agriculture
Volume 44, Numbers (1-2) • 2026 : pp. 143-149
ISSN: 0254-8755
https://DOI:10.47509/IJTA.2026.v44i1-2.15

Studies on Mineral Status of Godda District in Jharkhand

S.N. Kale, M.J. Aware , J.R. Khadse S.B. Gokhale and P.R. Nisal

BAIF Development Research Foundation, CRS,UruliKanchan, Pune, 412 202, Maharashtra, India

Abstract: The Soil samples, feed and fodder samples and blood samples from five location areas namely Chanda, Gorsonda, Kchowk, Lohinda and Pudiaghat from Godda district of Jharkhand were collected and analyzed for assessing the status of micronutrients in the district. The samples were analysed for assessing the status of nutrients (for feed/fodder samples DM,CP,CF,EE,ASH,SILICA, the macronutrients as Calcium and Phosphorous and micronutrients, for the soil samples E.C., pH, N,P,K,O.C. and micronutrients, for blood samples P,Ca,Total Proteins, Hemoglobin and micronutrients) in the Godda District.

Keywords: Atomic absorption spectrophotometer (AAS), DTPA,

INTRODUCTION

Chanda, Gorsonda, Kchowk, Lohinda and Pudiaghat were the five centres selected from Godda District. Centre wise Electric Conductivity, pH, Nitrogen, Phosphorous, Potassium and Organic Carbon contents in soil were analyzed. Total 85 samples were collected and analyzed. The same samples were also analyzed for the microelements content by DTPA extraction method on Atomic Absorption Spectrophotometer (AAS). Chemical analysis of feed fodder samples is done in the group like concentrate ingredients, dry fodder and green fodder were made and Organic Matter (OM), Crude Protein (CP), Crude Fibre (CF), Ether Extract (EE) and Acid Insoluble Ash Content (AIA) were estimated (AOAC (1975) *Official Methods of Analysis*.(12th Edition.). Also macro-elements like Ca and P as well as micronutrients (Copper, Iron, Zinc, Magnesium, Manganese, and Cobalt) by the Diacid digestion method on the AAS.

The various types of trees were available in the forest of these centres. Many tree leaves are the potential sources of nutrients and trace minerals and their supplementation could increase the efficiency of utilization of crop residues. They are also collected and analyzed as above.

The blood samples were collected and analyzed from these centres (170 number) for the parameters like Haemoglobin (Hb %), Blood protein (TP %), blood Calcium (Ca mg), Phosphorus (P mg) and Magnesium (Mg mg). The blood values for micro elements such as Copper (Cu ppm), Iron (Fe ppm), Zinc (Zn ppm), Manganese (Mn ppm) and Cobalt (Co ppm) were estimated with the reference of Methods of analysis of soils,plants, waters, fertilizers & organic manures by- HLS Tandon.

MATERIAL & METHODS

Soil samples from 85 farming families distributed in five location areas (Chanda, Gorsonda, Kchowk, Lohinda and Pudiaghat) of Godda district in Jharkhand were collected for analysis of soil parameters like Electrical Conductivity (EC), Soil pH (pH), available Nitrogen, Phosphorus and Potash (NPK) and Organic Carbon (OC) . From the same 85 families, 154 number of feed and fodder

Article History: Received: 10 March 2026; Revised: 09 April 2026; Accepted: 15 April 2026; Published: 20 May 2026

samples (71 dry roughage,34 green fodder & 49 concentrate) were collected for assessing the level of nutritional parameters like Organic Matter, Crude Protein, C rude Fiber, Ether Extract , Acids In soluble Ash and micro-minerals. 170 number of Blood samples from the animals of these families were also collected to estimate blood Haemoglobin (Hb), blood calcium (Ca), Phosphorus (P), Total blood proteins (Tp), and microelements in blood levels like Copper (Cu), Iron (Fe), Zinc (Zn) and Manganese (Mn).

The animal management in this area is by extensive grazing with very less supplements of concentrate such as rice bran, mustard seed, and broken rice.

RESULTS AND DISCUSSIONS

Soil Analysis:- Five center areas in Godda district (Chanda, Gorsanda, K.echuachowk, Lohandia, Podaiahat) were surveyed for soil status of minerals

The means of E.C. pH, NPK and OC for each of five centres (Chanda,Gorsonda,Kechua chowk ,Lohinda and Paudiahut) covered in the District Godda are presented in Table 1 while trace elemental contents of copper (cu ppm), Iron (Fe ppm), Zinc (Zn ppm) and Manganese (Mn ppm) in soil are presented in Table 2. The average of seventeen samples collected from each centre is represented graphically. The electrical conductivity (EC) is in the range of 0.16 to 0.27 and pH in the range of 6.26 to 6.55. The NPK content and the Organic carbon % is also almost similar in all the five centres 271.11±3.73, 23.60±0.67, & 142.95±1.51 respectively. The trace elements contents are variable in the five centres. Cu content is in between 0 to 1.83 ppm. In Centres Chanda and K chowk the Copper content is very low. The elements are above the normal range and almost in the similar range which is reflected in graphical representation.

The significant differences between the Electrical Conductivity (EC) of soils of center locations in Godda district were important. After adjustment to the location differences, the mean EC was found to be 0.22 ± 0.019. Minimum EC (0.16 ± 0.019) was noted in Paudiahut location area while highest (0.27 ± 0.019) was observed in Chanda location area. The mean soil pH was 6.39 ± 0.045. Higher soil pH (6.55 ± 0.045) was noted in Lohinda location area while the lowest (6.26± 0.045) was found in Paudiahut location area. The mean Nitrogen and Phosphorus content of the soil was observed to be 271.106 ± 2.732 and 23.600 ± 0.674 respectively, the data indicated that although the location differences in soil nitrogen content were observed, they were not of much significance. However the location differences for Phosphorus content of the soil were important and Kchowk location area showed lowest (22.29±0.67) while Lohinda

Table 1: Ec,pH , NPK and OC contents in soil from district Godda

Centre	*Samples*	*EC*	*PH*	*N (kg/ha)*	*P(kg/ha)*	*K(kg/ha)*	*OC(%)*
Chanda	17	0.27 ±0.019	6.46 ±0.045	265.41 ±3.73	22.12 ±0.67	140.24 ±1.51	0.32 ±0.012
Gorsanda	17	0.21 ±0.019	6.41 ±0.045	278.29 ±3.73	23.0 ±0.67	142.94 ±1.51	0.37 ±0.012
K.echuachowk	17	0.25 ±0.019	6.28 ±0.045	266.06 ±3.73	22.29 ±0.67	143.71 ±1.51	0.27 ±0.012
Lohandia	17	0.23 ±0.019	6.55 ±0.045	273.29 ±3.73	26.29 ±0.67	144.12 ±1.51	0.33 ±0.012
Podaiahat	17	0.16 ±0.19	6.26 ±0.045	272.47 ±3.73	24.29 ±0.67	143.76 ±1.51	0.35 ±0.012
Total	85	0.22 ±0.019	6.39 ±0.045	271.11 ±3.73	23.60 ±0.67	142.95 ±1.51	0.33 ±0.012

Table 2: Trace elemental contents in soil from district Godda

Centre	***Samples***	***Cu ppm***	***Fe ppm***	***Zn ppm***	***Mn ppm***	***Co ppm***	***Mg ppm***
Chanda	17	0.074 ±0.26	37.06 ±2.95	1.18 ±0.16	34.67 ±1.13	0.20 ±0.074	3.48 ±0.074
Gorsanda	17	1.83 ±0.26	31.04 ±2.95	1.40 ±0.15	38.04 ±1.13	0.35 ±0.074	3.34 ±0.074
K.echuachowk	17	0.00 ±-----	32.11 ±2.95	0.95 ±0.15	36.52 ±1.13	0.20 ±0.074	3.29 ±0.074
Lohandia	17	1.07 ±0.26	33.02 ±2.95	0.80 ±0.15	30.47 ±1.13	0.10 ±0.074	3.05 ±0.074
Podaiahat	17	1.77 ±0.26	40.27 ±2.95	0.91 ±0.14	39.10 ±1.13	0.35 ±0.074	3.02 ±0.074
Total	85	0.95 ±0.26	34.70 ±2.94	1.05 ±0.15	35.76 ±1.13	0.24 ±0.074	3.24 ±0.074

location area showed the highest (26.29 ±0.67) level of soil Phosphorus. The mean potash (K) level was observed to be 142.95 ±1.51 and the variations between location areas were small and not of much importance. The mean Organic Carbon (OC) was observed to be 0.33 ±0.012. The highly significant location differences in soil Organic Carbon indicated necessity of their consideration while planning mineral management. The lowest value of 0.27 ±0.012 was noted in Kchowk location area while the highest of 0.370 ±0.012 was found in Gorsanda location area.

The mean Copper (CU) content of the soil in district was found to be 0.95 +0.26. Copper content of the soils of different location areas are significantly different. The highest level of 1.83 ±0.26 was observed in Gorsonda location area while it was found absent in the soil of Kchowk location area. The mean iron (Fe) content of the soil in district was observed to be 34.70±2.94. Although the levels among different locations in the district ranged from 31.04 +2.95 in Gorsonda location area to 40.27 ± 2.95 in Paudiahat location area, these differences were not found important requiring any specific considerations. The mean Zinc (Zn) content of the soil of district was noted to be 1.05 ± 0.15. The locational variations in values have been presented in Table 2. The large variations in values as observed by the larger Standard error indicated necessity of estimating these values on a larger sample for confirmation.

Feeds and Fodders offered by the Farmers of Five Districts in Jharkhand

District	*Centre*	*Dry Roughage*	*Green*	*Concentrate Ingredient*
Godda	Chanda Gorsonda K. Chowk Lohinda Podiahat	Paddy Straw Dry grass Dry fodder	Para grass, guinea grass, Hybrid Napier, Local Mixed grass	Rice bran, Mustard seed cake, Broken rice

Paddy straw, forest grass and some concentrate ingradients were available for feeding the animals. Mostly the animals are left for grazing in the forest. The sesaum cake and rice polish is also fed to the animals when ever available. Dube grass and green forest grass is fed to the animals. At some places maize bharada is fed to the animals for milk production.

In centre Lohinda barseem is available with some farmers which is fed to the animals. Wheat flour is fed as a concentrate ingredient to the animals at some farmers level.

The tree leaves of Peeple, Koinar, Kathal, Karanj, Mahua, Bell, Berrier, Jamun etc. exist in the forest and nearby villages which could be used for dairy animal feeding. Further studies on areas like their availability, acceptability, palatability, seasonal nutritional status, digestibility will help in optimally utilizing these resources for animal feeding besides reducing the cost of milk production.

Calcium

Calcium content in concentrate of samples collected and anlaysed from Kehuwa Chowk was significantly higher (0.72± 0.03) than that observed in Chanda center (0.55± 0.03) and Goreanda (0.62 ± 0.03). Significantly lower value was noted in the samples of Podaiva Haat (0.43 ± 0.03)The values noted in Goreanda, Kechua Haat were similar and did not differ significantly. In dry fodder calcium value in the samples from K.Chowk were significantly higher than those at other centers. The values at Chanda and Goreanda were similar while those at Lohanda center were significantly lower than other centers except at Podiahat. In green fodder, the value at K.Chowk were highest, generally the difference in values between the centers were not significantly different.

Phosphorus

Phosphorus content in samples from concentrates, dry or green fodder from all five centers of Godda district were similar and in concentrates, it ranged from 0.22 ± 0.011 in Lohinda area to 0.25 ± 0.011 in Podiahat for dry fodder and for green fodder from 0.29 ± 0.02 in Gorsonda to 0.34± 0.02 in Kochea Haat

Table 3: Chemical composition of feed and fodder (%DM basis) fed to the animals by farmers in Godda

Centre	*Sample No.*	*Feed ingredient*	*OM %*	*CP %*	*CF %*	*EE %*	*AIA %*
Chanda	12	Dry roughage	84.96 ±0.18	5.21 ±0.25	28.14 ±1.048	2.04 ±0.14	8.61 ±0.36
	6	Green fodder	86.91 ±0.32	9.11 ±0.60	15.20 ±0.754	4.36 ±0.42	2.33 ±0.24
	11	Concentrate	90.92 ±0.33	19.31 ±0.94	9.49 ±0.294	3.86 ±0.20	2.84 ±0.14
Gorsonda	12	Dry roughage	85.00 ±0.18	5.0 ±0.25	27.14 ±0.778	2.15 ±0.14	9.35 ±0.36
	7	Green fodder	88.12 ±0.48	8.56 ±0.56	9.42 ±0.305	3.82 ±0.39	3.56 ±0.23
	9	Concentrate	90.81 ±0.37	17.75 ±1.04	7.91 ±0.222	4.02 ±0.21	2.49 ±0.16
K.Chowk	15	Dry roughage	84.69 ±0.16	5.43 ±0.23	28.57 ±0.913	1.8 ±0.12	8.69 ±0.32
	7	Green fodder	87.92 ±0.48	7.07 ±0.56	27.14 ±1.406	3.41 ±0.39	3.33 ±0.23
	9	Concentrate	90.54 ±0.37	16.32 ±1.04	8.23 ±0.259	3.35 ±0.22	2.28 ±0.16
Lohinda	16	Dry roughage	85.09 ±0.15	5.25 ±0.22	27.3 ±1.065	2.02 ±0.12	8.96 ±0.31
	7	Green fodder	86.84 ±0.48	8.23 ±0.56	26.92 ±1.016	3.78 ±0.39	2.48 ±0.23
	11	Concentrate	90.75 ±0.33	18.59 ±0.94	9.21 ±0.492	3.44 ±0.20	2.22 ±0.14
Podiahat	16	Dry roughage	84.53 ±0.15	4.80 ±0.22	28.04 ±0.898	1.93 ±0.12	8.81 ±0.31
	7	Green fodder	84.63 ±0.48	9.62 ±0.51	9.87 ±0.351	3.55 ±0.39	2.96 ±0.23
	9	Concentrate	90.42 ±0.37	17.41 ±1.04	8.07 ±0.309	4.14 ±0.22	2.44 ±0.16
Total	71	Dry roughage	84.91 ±0.16	5.14 ±0.23	27.85 ±0.422	1.99 ±0.13	8.88 ±0.33
	34	Green fodder	86.88 ±0.49	8.52 ±0.56	17.78 ±1.438	3.78 ±0.39	2.93 ±0.23
	49	Concentrate	90.69 ±0.35	17.88 ±1.01	8.64 ±0.175	3.76 ±0.21	2.43 ±0.16

area. The differences between the centers in this respect were not of much significance.

Copper

Copper content in the concentrate, dry fodder and green fodder did not differ very significantly. The highest value was recorded in Chanda area (10.60 ± 0.65) while lowest values at Goreanda 8.79 ± 0.72). In dry fodder, the values at Podevia Haat was significantly higher than those recorded at other centers in the district. The values of copper element varied amongst centers for green fodder.

Table 4: Trace elements of feed and fodder (%DM basis) fed to the animals by farmers in Godda

Centre	*Fl*	*Ca%*	*P%*	*Mg%*	*Cu ppm*	*Fe ppm*	*Zn ppm*	*Mn ppm*	*Co ppm*
Chanda	D 12	0.33 ±0.02	0.22 ±0.014	0.26 ±0.01	8.05 ±0.35	315.25 ±21.159	50.55 ±3.37	86.64 ±5.92	0.23 ±0.01
	G 6	0.41 ±0.02	0.31 ±0.022	0.26 ±0.01	6.48 ±0.43	454.70 ±53.065	42.57 ±5.28	67.18 ±8.83	0.23 ±0.01
	C 11	0.55 ±0.03	0.40 ±0.031	0.26 ±0.01	10.60 ±0.65	304.63 ±29.289	33.31 ±2.84	45.50 ±4.14	0.28 ±0.01
Gorsonda	D 12	0.35 ±0.02	0.23 ±0.014	0.26 ±0.01	7.93 ±0.35	379.41 ±32.277	45.63 ±3.37	49.60 ±5.92	0.23 ±0.01
	G 7	0.43 ±0.019	0.29 ±0.020	0.26 ±0.01	7.83 ±0.40	377.25 ±39.111	46.32 ±4.89	48.49 ±8.18	0.24 ±0.01
	C 9	0.62 ±0.03	0.42 ±0.035	0.27 ±0.01	8.79 ±0.72	411.88 ±43.556	36.70 ±3.14	82.13 ±4.58	0.29 ±0.01
K.Chowk	D 15	0.44 ±0.019	0.25 ±0.012	0.26 ±0.01	8.16 ±0.31	434.73 ±29.969	40.38 ±3.03	77.26 ±5.30	0.24 ±0.01
	G 7	0.46 ±0.019	0.33 ±0.02	0.22 ±.0.01	7.74 ±0.40	399.7 ±40.910	31.95 ±4.89	43.21 ±8.18	0.26 ±0.01
	C 9	0.72 ±0.03	0.49 ±0.035	0.28 ±0.01	9.60 ±0.72	344.82 ±35.744	31.82 ±3.14	43.74 ±4.57	0.26 ±0.01
Lohinda	D 16	0.30 ±0.018	0.22 ±0.011	0.25 ±0.01	8.32 ±0.30	386.34 ±34.911	32.33 ±2.92	45.11 ±5.13	0.24 ±0.01
	G 7	0.39 ±0.019	0.32 ±0.02	0.22 ±0.01	8.25 ±0.40	373.29 ±45.828	35.90 ±4.89	60.70 ±8.18	0.25 ±0.01
	C 11	0.65 ±0.03	0.47 ±0.031	0.28 ±0.01	8.86 ±0.65	445.91 ±32.277	49.10 ±2.84	77.10 ±4.14	0.28 ±0.01
Podiahat	D 16	0.39 ±0.018	0.25 ±0.011	0.23 ±0.005	8.32 ±0.30	403.06 ±27.166	39.36 ±2.92	74.96 ±5.13	0.23 ±0.01
	G 7	0.39 ±0.019	0.34 ±0.02	0.27 ±0.01	9.09 ±0.40	365.6 ±32.008	38.70 ±4.89	65.19 ±8.18	0.24 ±0.01
	C 9	0.43 ±0.03	0.50 ±0.035	0.27 ±0.01	9.22 ±0.72	322.16 ±35.522	31.70 ±3.14	77.63 ±4.57	0.27 ±0.01
Total	D 71	0.36 ±0.019	0.32 ±0.020	0.25 ±0.01	8.33 ±0.32	387.15 ±13.867	41.63 ±3.08	66.71 ±5.42	0.23 ±0.01
	G 34	0.42 ±0.019	0.32 ±0.009	0.25 ±0.01	7.92 ±0.222	392.33 ±18.478	38.09 ±4.96	56.95 ±8.29	0.24 ±0.01
	C 49	0.59 ±0.03	0.45 ±0.034	0.27 ±0.01	9.41 ±0.70	366.65 ±17.008	35.53 ±3.05	65.22 ±4.44	0.28 ±0.01

The normal standard values of the elements in feed and fodder are indicated below

	Cu	Fe	Zn	Mn	Ca%	P%
Critical level	<8.0 ppm	<50.0 ppm	<30.0 ppm	<40.0 ppm	<0.30	<0.25

Blood Analysis

The blood samples were collected from the five districts of Jharkhand and brought to CRS for further analysis. The Trace elemental analysis and Hemoglobin and total protein and Major elements as Calcium and Phosphorus was carried out. The analysis results are presented graphically as well as in tables. The data was analyzed statistically. About thirty four samples were collected from each centre and total of seven hundred and eighty two total samples were collected.

Dist: Godda

The Hemoglobin estimation of the five centres shows slight variation. Hb % is more in Gorsonda as compared to other centres. While the total protein % is higher in Lohinda compared to other centres. The trace element contents as Cu,Fe,Zn,Mn and Co is as represented in the graph. The contents are almost similar except in Kchowk and Lohinda where the contents are slightly lower. The Calcium, Phosphorus and Magnesium contents are almost similar in all the centres as represented in the graph.

Table 5: The Hemoglobin, Calcium, Phosphorus and Total Protein in district Godda

Centre	*No. of blood Samples*	*Hb*	*TP*	*Ca*	*P*	*Mg*
		%		mg%		
Chanda	34	8.99 ±0.54	6.73 ±0.29	9.11 ±0.29	5.44 ±0.32	1.88 ±0.045
Gorsonda	34	9.87 ±0.50	6.68 ±0.27	9.07 ±0.27	5.39 ±0.30	2.22 ±0.044
K.Chowk	34	9.00 ±0.54	6.84 ±0.29	9.15 ±0.29	5.28 ±0.33	2.16 ±0.50
Lohinda	34	9.40 ±0.52	7.13 ±0.28	9.27 ±0.28	5.06 ±0.31	2.24 ±0.044
Podiahat	34	9.16 ±0.51	6.66 ±0.149	9.09 ±0.27	5.24 ±0.31	2.19 ±0.045
Total	170	9.29 ±0.33	6.67 ±0.062	9.14 ±0.18	5.28 ±0.20	2.14 ±0.036

Table 6: The Trace mineral content as Cu,Fe,Zn, Mn in District Godda

Centre	*Samples*	*Cu ppm*	*Fe ppm*	*Zn ppm*	*Mn ppm*
Chanda	34	0.24 ±0.072	6.58 ±0.066	2.22 ±0.146	1.18 ±0.088
Gorsonda	34	0.34 ±0.111	6.52 ±0.124	1.88 ±0.131	1.55 ±0.078
K.Chowk	34	0.09 ±0.008	6.75 ±0.062	1.85 ±0.083	1.23 ±0.078
Lohinda	34	0.11 ±0.036	6.73 ±0.081	1.85 ±0.129	1.09 ±0.059
Podiahat	34	0.28 ±0.081	6.57 ±0.074	1.56 ±0.065	1.20 ±0.064
Total	170	0.21 ±0.032	6.63 ±0.036	1.57 ±0.053	1.25 ±0.035

CONCLUSIONS & RECOMMENDATIONS

In this district, the Copper (CU) content is varying. In Chanda centre area, Cu content is very less in soil which is also reflected in Blood. Cu content in feed and fodder is also low. All other elements are in a normal range. At Gorsonda centre, Cu content is 1.828 ppm in soil which is higher than required, but the fodder as well as blood plasma are showing low levels. All five centres of Godda the blood

plasma levels of animals are showing low Cu content. All other elements are above the minimum critical level in soil, fodder and animals. Zinc Content is slightly lower than minimum critical level (0.725 ppm) at centre Lohinda. The Zn Level in soil and fodder are normal. It was concluded that variability observed among centers studied within district for mineral status indicate that micro level planning will be necessary for arriving at combination of mineral supplementation for the district.

ACKNOWLEDGEMENTS

The financial assistance from State Government of Jharkhand for undertaking this work is gratefully acknowledged. The authors are grateful to President BAIF, Pune and Vice President, BAIF, Central Research Station, Uruli Kanchan for permitting publication of this article. Help of Mr. N. L. Phadke for providing assistance in statistical analysis of data is acknowledged.

REFERENCES

Methods of analysis of soils, plants, waters, fertilizers & organic manures by- HLS Tandon.

AOAC (1975) *Official Methods of Analysis* (12th Edition.) Association of Official Analytical chemists, Washington DC, USA

Vansoest, P.J., Robertson, J.B.1991. Methods for dietary fiber, neutral detergent fiber and non starch polysaccharides in relation to animal nutrition. *Journal of Dairy Science,* 74: 3583-3597.