



Dynamics of Soil Health Status Under Continuous Sugar Cane Based Cropping in Shree Datta Shetakari Sahakari Sakhar Karkhana Ltd. Shirol, Operating Area of Kolhapur District

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ABSTRACT

Sugarcane is grown on an area of about 1 million hectares in Maharashtra producing about 80 million tons of millable cane and 8 million tons of sugar annually. Since last few decades due to assured returns sustainability to climate changes, farmers are growing intensive sugarcane crop. and there is misunderstanding that continuous growing sugarcane leads to soil degradation keeping this background in view soil health parameters were analyzed in two tahasil Shirol, Hathkalangale Kolhapur district of Maharashtra from 2016-2021. Our results revealed that there is conspicuous upward trend in available plant nutrients and soil organic carbon contents for reducing trend in pH and EC of the soil during 5 years. A total of 22253 soil samples were analyzed and compared with the base year 2016-2017. The committed vision for farmers welfare of the factory administration and farmer centric concerted and sincere efforts towards implementing soil health mission mode smart programme with active participation of farmers has been reflected in the results of the study.

Keywords : Soil degradation , SOC, available plant nutrients.

INTRODUCTION

Sugarcane is one of the most important cash crop in Maharashtra. Now a days it is becoming popular all over where availability of water for irrigation is available soil type and climate. Sugarcane crop requires minimum 12 months and maximum 18 months period depending on planting season and during the life period it requires lot of nutrients from the soil. Due to continuous use of soil there is continuous degradation of soil organic carbon and thus the soil health degrades. But in sugarcane crop it is very easy to maintain soil health dynamics if proper packages of practice would be followed and this will definitely helps to improve the soil organic carbon and hence soil health parameters.

The soil was very deep, black fine textured, montmorillonite type, vertisols having high WHC with low infiltration rate. The average available nitrogen, phosphorus and potassium content is 250kg N, 20kg P, and 360kg K/ha and organic carbon ranges between 0.5 -0.75 with pH above 7.5. Sugarcane crop is grown in three season adsali (16-18 months), pre-season (15 months and 12 months) majority of the sugarcane is under flood irrigation and due to lack of proper drainage, surface as well as sub surface for a years together the salts deposition is increasing due to which fertile soils are becoming non fertile and now a days the rate is increasing very fast, due to which there is rapid soil health degradation is reported.

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MATERIALS AND METHOD

The total cultivated cane area is about 18000 - 20,000 ha every year in area of operation, out of which about 10-12,000 ha area is under the cane development scheme of Shree Datta SSSK Ltd. where soil health improvement mission mode program is scrupulously implemented. Trash mulching was followed after crop rotation specially with soybean and black, gram subsoiling once in three years and for biological health, use of fresh cowdung slurry or bio-fertilizers or both continuously from year 2016-17 and soils random samples were analyzed. Every year upto 2020-21 in all 22253 were analyzed in each category of all parameters was work-out year wise as well as for average of 5 years, to asses trend of the soil health parameters over 5 years considering the base years

data. The location of the study uses Panchaganga and Dudhganga at the river banks of Krishna.

RESULTS AND DISCUSSION

The soil health data presented in Table 1 revealed that 38% samples from Shirol, Hatkanangale Taluka field soil samples showed 38,46 samples below 7.5 pH and 62, 54 percent samples had above 7.5 pH category, respectively indicating that the soils mostly alkaline in nature. The 5 years average data revealed an increased average number of samples below 7.5 pH category as compared to the base years (2016-17) test values revealing gradual decline in the pH of these soils. This could be attributed to increased awareness among farmers to use liberal amounts of organic manures to the crop, green manuring, incorporation of trash and

Table 1 : Percent soil samples in various categories of soil health parameters (mean for 5 years from 2016-17 to 2020-21) in comparison to base year (2016-17) status in 6 factory command talukas of Shree Datta Shetkari Sahakari Sugar Factory, Shirol, District Kolhapur

Soil health parameter	Status (% sample) in base year (2016-17)		Mean Status of over 5 years (%samples)	
	Shirol (2028NO)	Hathkalangale (440)	Shirol (12351)	Hathakalangale (2536)
1 pH				
Below 7.5	28	34	38	46
Above 7.5	72	66	62	54

stubbles into the soils as also application of sulphur and sulphur containing fertilizers and application of bio-fertilizers to the crop.

Ec (ds/m)

The Ec of soils above 1 ds/m was observed in 5 to 14.4% soils of different Talukas, lowest being in Hatkanangale, whereas the percent samples above 1 ds/m is more in Shirol (12%), the high percentage in this category appears to be due to heavy clay soils with restricted drainage and excess use of chemical fertilizers

and use of ground water containing carbonates and bicarbonate as well as limited application of organic manures to the crop over long period coupled with no incorporation of trash. Obviously, green manuring, liberal use of organic manures and compost along with bio-fertilizers is required in these talukas, along with sub surface drainage system to lead out salt eastern talukas. Incorporation in combination with decomposing culture and other bio-fertilizers application program needs implementation on mission mode in these talukas.

Soil health parameter	Status (% sample) in base year (2016-17)		Mean Status of over 5 years (%samples)	
2. EC (ds/m)				
Below 1	85	88	88	93
Above 1.1	15	12	12	7

Organic carbon (%)

The organic carbon content was recorded highest, i.e. above 0.75 % in 62 % soil samples of Hatkanangale and Shirol areas increase in average organic carbon was greater than 0.75% has been evident over base year (2016-17) in Hatkanangale. The medium O.C. test category (0.5 to 0.7S) soils was remained unchanged in Hatkanangale area. In fact, the low O.C. (below 0.5%) category soils showed declining trend by about 10%. This indicated that there is gradual build up of organic

carbon in the sugarcane fields over 5 years period of monitoring of soil O.C. %, in factory operating area which is an index of soil nitrogen status, physical and biological conditions and over all soil health of the soils. Sugarcane crop supplemented about 5 to 7 tons/ha of root and stubble biomass and an equal amount of incorporated trash biomass (10.4% of cane yield) every year to soil which in turn coupled with green manures, organic manures, rotations and intercrops could be attributed to this rise in organic carbon.

Soil health parameter	Status (% sample) in base year (2016-17)		Mean Status of over 5 years (%samples)	
O.C (%)				
Below 0.5	11	11	9	8
0.5 to 0.75	27	29	22	29
Above 0.75	62	60	69	63

Phosphorus (kg/ha)

The mean phosphorus content was observed above 21kg/ha in 55 to 57% soil samples in the factory operating area. The data revealed that there was build up natural in soil phosphorus content of 21kg /ha category as compared to the base year (2016-17) in all the talukas. This was also evident from the

consequent decline in soil samples testing medium (15 to 21kg/ha) and low (below 15kg/ha) categories. The regular annual applications of fertilizer phosphorus ,its fixation, increased organic carbon lowering pH and resultant enhanced biological activities might have helped build up available phosphorus of sugarcane soils in the factory command (Table 1 and 2).

Soil health parameter	Status (% sample) in base year (2016-17)		Mean Status of over 5 years (% samples)	
4.Phosphorus (kg/ha)				
Below 15	58	64	35	30
15 to 21	18	21	10	10
Above 21	24	15	55	60

Potassium (kg/ha)

The soils testing demonstrated that potassium was above 360kg K /ha in 5% samples at Shirol and 80% at Hatkanangale tehsils which comes under high potassium category. The mean of 5 years indicated

upward trend in high K category and obvious declining trend in the medium and low category (below 250kg/ha) when evaluated against base year test data except Kagal and Karvir tehsils where there was decline in high K testing soils in the factory command area.

Soil health parameter	Status (% sample) in base year (2016-17)		Mean Status of over 5 years (% samples)	
4.Phosphorus (kg/ha)				
Below 250	4	5	2	4
250 to 360	15	23	13	19
Above 350	81	72	85	77

CaCO₃ (%)

The CaCO₃ did not change appreciably soil samples as evident from the mean of five years test sample percentages in comparison to respective percent test samples in different categories of low and high CaCO₃, (below and above 6%) of base years percent samples. Eventually, this showed that Kagal and Karvir tehsil soils had less amount of CaCO₃ than Shirol, Athani

and Hatkanangale taluka soils. The downward trend of pH as evidenced by increased average percent soils with test below 7.5 pH in Shirol. The marginal change in CaCO₃ content is may be due to Increased O.C.% improved biological activity producing organic acids might result in more and more dissolution of CaCO₃ eventually bringing down percent soils testing low in CaCO₃. Here again the indirect role of O.C. is evident.

Soil health parameter	Status (% sample) in base year (2016-17)		Mean Status of over 5 years (% samples)	
CaCo ₃ (%)				
Below 6	39	37	33	37
Above 6.1	61	63	67	63

CONCLUSION

Result of present study clearly demonstrated that proper crop rotation, trash mulching use of manuring crop had great potentials for the restoration of soil health and productivity under continuous sugar cane growing farms these practices.

Attributed to improve soil, pH organic carbon ,total nitrogen, available phosphorous and Potassium. Soil properties improvements increased as period increases.

Similar to present result, Kuz and mina (2011) observed that the practices said above to improve soil organic carbon led to improve chemical properties of soil like pH, EC.

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