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Organic Soil Nutrient Practices in Sikkim and Impact at Field Level for Tribal Farmers': A Success Story

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Abstract

Farmers of Sikkim generally don't know how the soil health can be improved. This study was conducted during the period of 2014-19. After distributing the inputs under Tribal Sub Plan (ICAR-TSP) project to tribal farmers in Sikkim the impact assessment was carried out. It was found that application of recommended dose of all the soil inputs increased nutrient use efficiency upto 8.7-12.4%, CEC upto 19.4-27.2%, soil organic carbon 2.4-5.1%, soil pH 18.5-32.3%, and crop productivity upto 18.6-27.4% along with increases in grain yields upto 10.5-14.7% in major crops of Sikkim (maize, rice, mustard, soybean, pulses). The net income (excluding cost of production) of the maize growing farmers were increased 57% (Rs. 37000 to 58090); rice growing farmers increased 37% (Rs. 25000 to 34250); pulses and oilseed growing farmers were increase 62% (Rs. 45000 to 72900) after adopting the use of different organic soil inputs.

Introduction

Farmers of Sikkim have low awareness on the use of organic inputs sources and biofertilizers. They apply nutrients at very low rate into soil which results in low production and productivity in most of the crops. Besides, they seldom use dolomite or biochar for soil acidity management which has a great role in soil acidity management as well as yields of crops. Under the project livelihood improvement of rural tribal farmers through soil health management, input support system and training different inputs *viz.*, organic biofertilizers (mixture of N fixer, P solubilizer and K mobilizer), organic plant nutrient foliar spray, dolomite, mixed compost, phospho-compost, rock phosphate, neem cake, vermicompost, sea weed extract granules and biochar were distributed among the tribal farmers of Sikkim.

Institutional Involvement

Different training programme through input support system has been organized at Singhik, North Sikkim on 28th Oct. 2014; Chungthang, North Sikkim on 30th Oct.2014; Dzumsa Lachen, North Sikkim on 30th Oct.2014; Naga, North Sikkim on 1st Nov. 2014; lower Sadam, South Sikkim on 17th Dec. 2014; Ravitar, West Sikkim on 18th Dec. 2014; Perbing, West Sikkim on 19th Dec. 2014; ICAR Sikkim Centre on 1st July and 13th Oct., 2015; Tempyem, East Sikkim on 15th Dec., 2015; Hee-Gyathang, North Sikkim during 3rd to 5th Feb., 2016; Ringhim, North Sikkim on 21st April, 2016; Salghari GPU and Poklok GPU of South Sikkim on May 10 and 11, 2016; Amba of East Sikkim during 12th July, 2016; Bakhim and Kewzing of South Sikkim during 5th August, 2016; Upper Jaubari of South Sikkim during 6th August, 2016; Ralap and Parkha of East Sikkim during 9th and 13th September, 2016. After the input distribution during 2014-16, the impact

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assessment programme was carried out during 2017-19 and statistical analysis was done to reach a final impact.

Soil organic nutrient distribution

Types of Input Distribution

Various necessary soil organic inputs like organic biofertilizers (mixture of N fixer, P solubilizer and K mobilizer) 15,000 kg, organic plant nutrient foliar spray 1000 pieces (100 ml), dolomite (8000 kg), rock phosphate 1000 kg, neem cake 2000 kg, sea weed extract granules 100 kg and vermibeds 50 nos. has been distributed among the tribal farmers of different district of Sikkim. Farmers were very much interested and expressed their thanks to ICAR for distribution of such different types of inputs. Under this project more than 2000 tribal farmers were benefited. Before using this input we have taken the feedback from the farmers regarding production status along with fertility status for their own land.

Recommended Application Dose

The different farmers community applied the soil organic inputs in the way: dolomite @1000 kg/ha as broadcast in alternate year, biochar 500 kg/ha as furrow application, biofertilizers 25 kg/ha after mixing with FYM or vermicompost, rockphosphate @ 5% with compost, foliar nutrient spray @ 3 mL/Lit, neemcake @ 100 kg/ha and sea weed extract granule @ 20 kg/ha.

Success Results of TSP and Extension Aspects

After using the organic soil inputs farmers got satisfactory results. They told that they are getting more production and productivity by using these organic soil inputs. After distributing of the organic soil input the respective scientist visited the farmer's field again, collected soil sample and analyzed. It was found that application of recommended dose of all the organic soil inputs increases nutrient use efficiency upto 8.7-12.4%, CEC upto 19.4-27.2%, soil organic carbon 2.4-5.1%, soil pH 18.5-32.3%, and crop productivity upto 18.6-27.4% along with increases in grain yields upto 10.5-14.7% in major crops of Sikkim (maize, rice, mustard, soybean, pulses). Besides all the macro and micro nutrient content also increases significantly to the extent of 8.37-25.3% after application of such soil inputs. For calculation of economics we have taken feedback from the farmer. The net income (excluding cost of production) of the maize growing farmers were increased 57% (Rs. 37000 to 58090); rice growing farmers increased 37% (Rs. 25000 to 34250); pulses and oilseed growing farmers were increase 62% (Rs. 45000 to 72900) after adopting the use of different organic soil inputs. The success of application of different organic soil input motivated many other tribal farmers.

Before applying soil organic nutrients

After applying soil organic nutrients

Special Involvement (Soil Health Card and Biochar)

Under this project 250 georeference soil samples were collected from farmers' field of different villages namely; Tempyem, Sajong, Sajong-Rumtek, Rumtek, Lossing, Samlik-marchak and Namin villages (1150-1450m above MSL) of East Sikkim District. Geo-reference soil samples were collected, processed, analyzed and soil health card prepared and distributed to the farmers.

Field survey for impact analysis

One major innovation in this project is that production of biochar from weed biomass and assessment against acidity management at farmer's field level. If biochar prepared from locally available weed biomass its cost will be zero. We have developed very simple low-cost portable biochar kiln along with smoke-free stove costing Rs. 500-550 which produces biochar during cooking and smoke is reduced by 75 per cent as against the traditional chullah. Fuel energy produced during burning of biomass used for cooking and cost of fuel energy is nullified by the labour cost and thus, the production cost of biochar depends on only biomass cost.

Outcome Aspects

From the above study, it can be concluded that by implementing such type of farmers friendly project (TSP), soil health problems in Sikkim (which is an organic state) can be managed properly.

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