A Case Study on the use of Nano Structured Silicon based Bio-Stimulant (Magic Bloom Green (MBG)) for Sustainable Food Production

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ABSTRACT

The study, conducted in 2022-23 at Mittemari village in Bagepalli (TQ), Chickballapur (Dist), focused on Shri Manjunathreddy's 6-acre farmland. His dedication to organic farming aimed at meeting family needs through the cultivation of food crops. Initially, the land was prepared for in situ green manuring with Sun hemp, using 20kg seeds, which were irrigated and incorporated into the field after 50 days. Simultaneously, Pongemiya and other dried leaves were collected from the farm vicinity.To prepare compost, cow dung was procured from a neighboring village and the Malnad composting method was followed, resulting in Bio-Agro-Rich compost in 90 days. This compost, applied at 5 tons per acre 15 days before transplanting/sowing Paddy, Ragi and Turdal, Significantly enhanced soil fertility. Additionally, three sprays of Nano-structured silicon-based Bio-stimulant (MBG) were administered at critical stages, i.e., 30, 60 and 90 days after transplanting/sowing, with a concentration of 1ml/L of water and 200L of spray solution per acre. All three crops, Paddy, Ragi, and Turdal, were cultivated under Borewell Irrigation. The harvest yielded 33Qtls of Paddy (one main crop and one Ratoon), 20Qtls of Ragi (two harvests with a 15-day interval), and 10Qtls of Turdal per acre. The benefit-cost ratio stood at 1:2.8, 1:2.9 and 1:2.3 for Paddy, Ragi and Turdal respectively. The integrated approach, incorporating in-situ green manuring, enriched compost application and the use of nano structured silicon-based bio-stimulant (MBG), demonstrated comparable food crop production to traditional inorganic agriculture practices. It is recommended that, policymakers, extension workers and farmers producer organizations shift their focus from traditional inorganic agriculture to the safer food production approach of integrated natural farming.

Keywords: Comparative Benefit Cost Analysis, Returns on Investment Analysis, Organic Farming and Nano Structured Silicon based Bio-Stimulant (Magic Bloom Green(MBG))

This Case study was conducted in the year 2022-23 in Mittemari village of Bagepalli (TQ) Chikballapur (Dist) in farmers field of Shri Manjunath Reddy. Total area of the farm is 6 acres. To know the soil fertility status, soil was tested in the department of soil science and agriculture chemistry UAS Bangalore. The organic carbon content was 0.6 and ph of the soil was 6.86. NPK level was 151.7, 270 and 275 kgs per hectare respectively. Farmer is interested to grow paddy, ragi and turdal food crops under organic farming during the year 2022-23. Sun hemp in situ green manuring crop was grown in the farm and incorporated into the soil within 50 days after sowing. Simultaneously he collected Pongamia dried leaves, threshing yard waste, cow dung and tank silt were stocked to prepare compost. Compost was prepared by heaping dried leaves, cow dung, 4% Jaggery solution and thin layer of tank silt were heaped respectively and the same process is repeated till the end. Composting was done in an area of 6 x 30 feet under shade. Weekly watering was done to the heap by using about 200L of water up to 90 days. On 30th and 60th day 2 turnings were given to the heap. On 60th day 2kgs of each Azotobacter, phosphorus soluble bacteria and potash soluble bacteria and tricoderma virdae per tonne of compost were applied and incorporated into the heap. On 90th day Bio-Agro-Rich compost was ready to use and the same was incorporated 5 tons per acre in all the three cropped area.

Paddy (variety Sona Masoori) was transplanted on 04/02/2023 and first harvested on 20/05/2023. Second harvest was done 60 days after 1st harvest. Ragi (variety ML365) was transplanted on 06/05/2023 and first harvest on 02/09/2023 and

second harvest was done after 20days.Turdal was sown on 07/08/2023 and harvested on 15/12/2023. Three sprays on nano structured silicon based Bio-stimulant (MBG) was sprayed at rate of 1ml/L of water and used about 200L of spray solution per acre on 30, 60 and 90 days after transplanting/sowing. The ragi crop was completely free from pest and diseases. In paddy, stem borer problem was noticed Neem based insecticide was used and other integrated management practices were adopted to manage the same. In Turdal, Neem based insecticide was used and other integrated management practices were adopted as prophylactic measure to manage pod borer at flowering stage of crop. The same was repeated after 20 days.

Table 1
Returns on Investment Analysis of Natural organic farming by using Magic Bloom Green (MBG) in Paddy, Ragi and Turdal.

Crop	Area	Practices adopted	Total Yield	Cost of Cultivation (INR)	Total Income (INR)	B C ratio
Paddy	1 acre	Land preparation practices: In-situ green manuring with Sun hemp, Application of bio agro rich compost @5 tonnes per acre, 3 sprays of Nano structure silicon based bio stimulant at concentration of 1 ml / litre of water - 200 ml in 200 liters of water was mixed to prepare spray solution integrated plant protection practices were adopted to manage paddy stem borer	Grain yield: 33 quintals per acre Straw yield : 6 tonnes per acre	43010	119100	1:2.8
Ragi	1 acre	Land preparation practices: In-situ green manuring with Sun hemp, Application of bio agro rich compost @ 5 tonnes per acre, 3 sprays of nano structure silicon based bio stimulant at concentration of 1 ml / litre of water - 200 ml solution per acre with 200 liters of spray solution	Grain yield: 20.32 quintals per acre Strawyield: 6 tonnes per acre	32588	92921	1:2.91
Tur dal	1 acre	Land preparation practices: In-situ green manuring with Sun hemp, Application of bio agro rich compost @5 tonnes per acre, 3 sprays of nano structure silicon based bio stimulant at concentration of 1 ml / litre of water - 200 ml solution per acre with 200 liters of spray solution Plant protection measures: Neem oil was used toto manage pod borer as a prophylactic measure at flowering stage of crop. The same was repeated after 20 days.	Grain yield: 10 quintals per acre Strawyield: 1 tonne per acre	45375	105000	1:2.3

Source: author calculation

From Table1, It is observed that by adopting In-situ green manuring, application of enriched compost and three sprays of Magic Bloom Green (MBG) has yielded on par with inorganic agriculture practices i.e. 33, 20, and 10 Qtls of Paddy, Ragi and Turdal respectively. Benefit cost ratio is 1:2.8, 1:2.9 and 1:2.3 of paddy, ragi and turdal respectively. This indicates that with organic practices like In situ green manuring, application of enriched compost at the rate of 5 tons / acre and 3 sprays of nano structured silicon based bio-stimulant (MBG) has benefited the farmer on par with use of chemical fertilizers in paddy, ragi and turdal.

Table 2
Comparative cost analysis of recommended dose of chemical fertilizer with Magic Bloom Green(MBG).

Sl.no	Crop	Recommended dose of NPK kgs/hectare	Cost in INR	Recommended dose of MBG per hectare	Cost in INR
1	Paddy	N 100	1150	1st spray 500ml	850
		P 50	2450	2nd spray 500ml	850
		K 50	1300	3rd spray 500ml	850
		Total:	4900	Total:	2550
2	Ragi	N 100	1150	1st spray 500ml	850
		P 50	2450	2nd spray 500ml	850
		K 50	1300	3rd spray 500ml	850
		Total	4900	Total	2550
3	Turdal	N 25	288	1st spray 500ml	850
		P 50	2450	2nd spray 500ml	850
		K 25	650	3rd spray 500ml	850
		Total	3388	Total	2550

Source: author calculation

Inference can be drawn from Table2 that the cost of NPK fertilizer in case of paddy and ragi is Rs. 4900 and the cost for 3 sprays of MBG is Rs. 2550. There is a net savings of Rs. 2350. In case of turdal, the net savings were Rs. 838. Apart from financial benefits use of MBG nano structured silicon based bio-stimulant promotes soil health and growth of beneficial microorganisms in the soil. Thus improves soil productivity and helps in disease free crop production.

CONCLUSION

The study conducted at Mittemari village in Bagepalli has shed light on the success and viability of Shri Manjunath Reddy's 6-acre farmland dedicated to organic farming. The integration of in-situ green manuring, enriched compost application and the use of nano structured silicon-based bio-stimulant (MBG) showcased impressive results in terms of crop yield and economic returns. The meticulous preparation of the land with Sun hemp and the adoption of the Malnad composting method resulted in Bio-Agro-Rich compost, significantly enhancing soil fertility. The application of MBG at critical stages during crop development further contributed to the success of the cultivation. The yields of Paddy, Ragi, and Turdal per acre under borewell irrigation were noteworthy, with a benefit-cost ratio favouring organic farming. The results indicate that the integrated approach is a sustainable

and economically viable alternative to traditional inorganic agriculture practices. The shift towards safer food production through integrated natural farming, as demonstrated by this study should be considered by policymakers, extension workers and farmers' producer organizations. This approach not only meets family needs but also promotes environmentally friendly and economically sound agricultural practices for a more sustainable future.

Field level Photos:Sun hemp, compost preparation and Final compost

Field level Photos: Different crop stages of Paddy and its Ratoon

Field Level Photos : Different crop stages of Ragi and Tur