SME WORLD Bureau

SAFEROCK® MINERAL (SRM) IMPACT ON PADDY RICE GROWTH

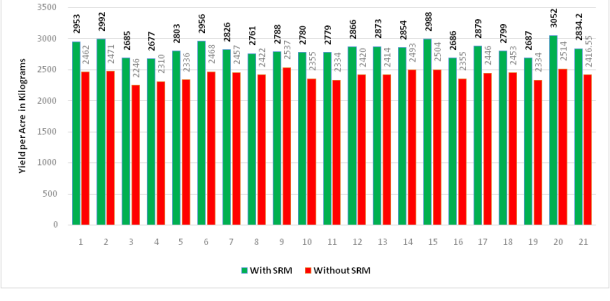
SafeRock® Minerals is a 100% natural mineral soil conditioner that re-mineralises agricultural soil and increases the efficiency of applied fertiliser treatments. Numerous crop trials to date have shown improved crop yields, reduced fertiliser applications, improved soil structure and available nutrient content, as well as higher quality, more nutritious crop produce.

The *"SafeRock® Mineral (SRM) Impact on Paddy Rice Growth"* trial was undertaken in 2015-16 atKVK (Krishi Vigyan Kendra), Sitapur, a unit of ICAR (Indian Council of Agricultural Research), Ministry of Agriculture, Government of India and the Indian Agricultural Research Institute, New Delhi (IARI). An earlier field trial, *"SafeRock® Mineral (SRM) Impact on Wheat Growth"* was also conducted in 2014-15 at the KVK research farm, which reported a 28% increase in wheat grain yield and impressive increases in the levels of soil available nutrients, and higher crop quality and nutrient content (reviewed in SME World, Sept 2015, Pages 24-25). The results of the earlier successful wheat trial impressed the research team so much, that they then expanded the field trials for paddy rice to include an additional 19 test farms as well as their own research farm.

The Efficacy

The objective of the *"SafeRock® Minerals Impact on Paddy Rice Growth"* trial was to understand the efficacy of SafeRock® Minerals(SRM) on paddy rice growth, with particular reference to its agronomical superiority in combination with normal farming practices and nutrition programs. The trial was designed, implemented and supervised by Dr. D.S. Srivastava, with Dr. Anand Singh acting as Chief Scientific Advisor at KVK, Sitapur. Soil samples from each test farm were initially taken and analysed for nutrient content, to determine the recommended application rates for fertiliser treatments such as urea, diammonium phosphate (DAP) and muriate of potash (MOP). The trial was designed to encompass variations in fertiliser treatments, soil types and pH (from 6.7 to 7.9), seed variety and seed application rates to provide a "real world" scenario of agricultural diversity. SafeRock® Minerals was applied at a consistent rate of 100 kg/acre in all test farms, tilled into the soil at the time of soil preparation.

S.N.	Name of Farmers	Address	Yield per Acre in Kilograms		Increase in Yield	
			SRM	NON SRM	Kg/acre	Percent
1	Gargi Prasad	Ghuripur, Biswan	2953	2462	**491**	**19.94**
2	Dinesh Pratap	Ghuripur, Biswan	2992	2471	**521**	**21.08**
3	Sudhakar Mishra	Ghuripur, Biswan	2685	2246	**439**	**19.55**
4	Bhagauti Prasad	Ghuripur, Biswan	2677	2310	**367**	**15.89**
5	Manoj Kumar	Ghuripur, Biswan	2803	2336	**467**	**19.99**
6	KamlaBishun	KaimharaKhurd	2956	2468	**488**	**19.77**
7	Abid Ali	KaimharaKhurd	2826	2457	**369**	**15.02**
8	Vijay Kumar	Oripur	2761	2422	**339**	**14.00**
9	Ram Singh	Oripur	2788	2537	**251**	**9.89**
10	Mansoor Ali	Tiwaripur	2780	2355	**425**	**18.05**
11	Ram Chandra	Dafara	2779	2334	**445**	**19.07**
12	Sadashiv Shukla	Shuklapur	2866	2420	**446**	**18.43**
13	Keshav Shukla	Shuklapur	2873	2414	**459**	**19.01**
14	Rajesh Kumar	Bannirai	2854	2493	**361**	**14.48**
15	Ram Babu	Bannirai	2988	2504	**484**	**19.33**
16	Sushil Tiwari	BanniGhurain	2686	2355	**331**	**14.06**
17	Pt Bhagauti	BanniGhurain	2879	2446	**433**	**17.70**
18	Anoop Kumar	Katiya	2799	2453	**346**	**14.11**
19	MdHanif	Katiya	2687	2334	**353**	**15.12**
20	**KVK-FARM**	**KVK-II, SITAPUR**	**3052**	**2514**	**538**	**21.40**
21	**Averages**		**2834.20**	**2416.55**	**417.65**	**17.29**



The main objective for the paddy rice trial was not only achieved, but comprehensively demonstrated. When SRM was applied with sufficient nitrogen, the SRM rice plants outperformed their non-SRM counterparts in **every single plot, irrespective of the levels of other fertiliser treatments applied.** Considering the potential variations between the soils in 20 separate test farms, it was impressive to see increases in plant height, number of tillers (branches), as well as overall yield, across the board!

Across all 20 test farms, the final results showed: -

- the average increase in plant height (at 45 DAT) was **+23%**
- the number of tillers (branches) increased **+49%**
- the final overall rice yield averaged an extra **418 kg rice/acre**, an increase of **+17.3%**

Given the variations in soil conditions between the 20 test farms, and the different fertiliser treatment quantities and nutritional supplements added, it is a tremendous testament to the versatility of SRM that consistently better plant growth and yield resulted. In wide ranging conditions, SRM was able to support plant growth by making nutrients more plant available from the soil and fertiliser

applications. Fertiliser efficiency was increased leading to yield improvements in **every** test farm.

Additional findings from similarly treated farms within the trial were equally impressive: -

- Farm #2 compared the addition of SRM to a plot using 100% normal farming practices (100% recommended urea and DAP applications). The control plot achieved a yield of 2471 kg/acre, whilst the addition of SRM at only 100 kg/acre, boosted yield to 2992 kg/acre, **an increase of 21.1%.** Similarly, the KVK test farm itself used recommended amounts of urea and DAP in two separate one acre plots, and by adding SRM at 100 kg/acre to only one of the plots achieved an **increased rice yield of 21.4%** (3052 kg vs 2514 kg). Overall, adding SRM at 100 kg/acre alongside recommended amounts of urea and DAP within the trial, **increased paddy rice yields by over 21.2%**

- There were several farms (#1, #11 and #19) that applied recommended doses of urea plus DAP in their control plots, but in the SRM plot the DAP was completely omitted. In the SRM plot, there was only urea as a nitrogenous fertiliser. In each case, using only urea with SRM resulted in higher yields of 19.9%, 19.1% and 15.1% respectively, **an average increase of 18% yield using urea as a sole source of nitrogen.**

- In farms #7 and 12, the control plots are given **double**the recommended amounts of urea and DAP (and MOP with #7) - a common practise used by farmers to try to boost yields. In contrast, the SRM plots were given only half that fertiliser dose but still achieved increased yields of +15.0% and +18.4% respectively – an average increase of 16.7% with **HALF** the fertiliser dose! This shows the fertiliser efficiency gains possible when SRM is applied. By reducing excess urea and DAP, the farmer saves a great deal of fertiliser cost and allows SRM to efficiently provide nutrition to the crops to still increase yields by nearly 17%! **Less fertiliser with increased yield!**

Appropriate samples of soil, rice grain and rice straw were all taken from the KVK farm and sent for analysis at the Indian Agricultural Research Institute, New Delhi. The results mirrored the crop trial results from the earlier wheat trial (2014-15) in that not only were yields increased, but the available nutrient content of agricultural soil was greatly increased and the final crop harvest was more nutritious, being higher in macro and micro-nutrient content than the control crops.

Status of Nutrients in Rice Soil in the KVK Farm in Sitapur

Nutrients	With SRM	Without SRM
Organic C (g/kg)	6.9	4.8
N (mg/kg)	106.3	90.6
P (mg/kg)	13.2	10.1
K (mg/kg)	162.5	106.7
S (mg/kg)	10.8	8.7
Zn (mg/kg)	1.12	0.91
Cu(mg/kg)	0.92	0.83
Mn (mg/kg)	8.64	7.22
Fe (mg/kg)	5.38	4.07
Ca (mg/l)	4251	3921
Mg (mg/l)	619	557
B (mg/kg)	0.46	0.38

For the soil samples, use of SafeRock® Minerals resulted in higher concentrations of ALL tested available nutrients compared with the control plot. There was a very significant increase in organic carbon (44%), available phosphorus (30.7%), potassium (52.3%), nitrogen (17.3%), calcium (8.4%), magnesium (11.1%), sulphur (24.1), zinc (23.1%), copper (10.8%), manganese (19.7%), iron (32.2%) and boron (21.1%) content over control. This is due in part to the micronutrient content of SafeRock® Minerals itself. However, more importantly, the clay minerals within SafeRock® Minerals demonstrate their effectiveness as a nutrient holding and exchange matrix – the nutrients within the soil and applied by fertilisers, are held ready and available for plant uptake. The clay minerals within SafeRock® Minerals efficiently increase the **availability** of nutrients within the soil, and this is clearly visible in the figures above.

Status of Nutrients in Rice Grain& Straw in the KVK Farm in Sitapur

	Grain		Straw	
Nutrient	With SRM	Without SRM	With SRM	Without SRM
Protein %	8.45	7.91	-	-
N %	1.42	1.33	0.72	0.56
P %	0.26	0.23	0.21	0.18
K %	0.28	0.21	0.86	0.73
S %	0.067	0.054	0.082	0.061
Zn (mg/kg)	35.4	33.2	21.3	19.3
Cu(mg/kg)	19.3	17.7	8.4	7.9
Mn (mg/kg)	78.2	76.3	96.1	90.7
Fe (mg/kg)	53.7	51.2	106.4	96.5
Ca (mg/kg)	1056	995	3647	3287
Mg (mg/kg)	312	298	553	487
B (mg/kg)	0.96	0.91	2.42	2.13

Again, we can see that the use of SafeRock® Mineralshas increased the nutritional value of rice grain AND rice straw produced versus the control crops. Higher concentrations of ALL tested nutrients were found in rice grains and rice straw grown with SafeRock® Minerals. This is due to more efficient uptake of nutrients from the soil, and as a result of increased availability of nutrients within the soil.

The results of applying SafeRock® Minerals are seen not only with significant yield increases, but also with improved soils and more healthy and nutritious produce grown.

Trail with SRM

During the trial, another beneficial property of SafeRock® Minerals was demonstrated. Many farms in India have a problem with high levels of iron in their soils, and some of the trial farms were no exception. The iron latches onto developing root systems and can result in toxicity and root rot, consequently leading to crop damage and poor yields. Trial agronomists highlighted the difference between the developing root systems in plots of rice grown with and without SRM. Photographs taken show that rice cultivated without SRM had the distinctive red colouration of iron and reduced root development. However, rice grown in SRM plots had white, healthy and more fully developed root systems, aiding more effective nutrient uptake.

A major benefit of SafeRock® Minerals, particularly when applied to the paddy rice environment, is that SafeRock® Mineralsis not water soluble and so is not leached from the soil.

This impressive visual aid shows the nutrient exchange matrix within SafeRock® Mineralsat work. The clay minerals within the natural resource show how efficiently **SRM is able to buffer chemical imbalances** within agricultural soils, to the benefit of better root development and hence increased nutrient uptake, plant growth and drought resistance.

Another major benefit of SafeRock® Minerals, particularly when applied to the paddy rice environment, is that SafeRock® Mineralsis not water soluble and so is not leached from the soil. Repeated applications build up the available nutrient status and soil organic carbon levels,improving long term soil structure and water holding capacity. Microbes and earthworms thrive in re-mineralised soil which in turn also increases aeration, nutrient and organic matter processing, and increased long term soil quality.

SafeRock® Mineralsis currently undergoing numerous field trials all over the world at the highest levels of educational, governmental and corporate involvement. We look forward to sharing the results of these trials in due course.

For more information on SafeRock® Minerals, and to request full trial information please visitwww.saferockminerals.com or contact **SafeRock® Minerals India Pvt. Ltd**., on +91 9810469993, +91 9811142568 and +91 7838090707 or email saferock-india@saferockminerals.com

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