NEW TECHNICAL PROGRAMME

1.	**Experiment no. and Title**	**:**	**20.3.3.8** Effect of biochar and fertilizer application on transplanted rice – wheat cropping sequence under south Gujarat condition
2.	**Budget head**	**:**	12048
3.	**Collaborative department if Any,**	**:**	Department of Soil Science, N.A.U., Navsari
4.	**Background information**	**:**	
	Fluctuating fertilizer prices over the last decade and sharp increases in prices in 2021/22 highlight the need to develop more efficient fertilizer strategies, or alternative and less expensive sources to aid crop nutrition. In particular, usage or re-usage of waste materials such as animal manure, farm waste and treated human effluent have been considered as means to decrease the need for synthetic fertilizers. Biochar amendment has been reported to positively influence soil C stability, especially for soil that lacks organic matter. Biochar acts, therefore, as an emerging and attractive option to effectively improve fertilizer utilization performance. Clearer understanding of the effects of biochar on soil fertility and crop production is necessary to calculate the potential benefits of biochar for carbon sequestration and altered or improved fertilizer use efficiency in soil. (Lehmann, 2007). An alternative is the application of biochar, alone or in conjunction with fertilizers, as some biochars may favorably alter the chemical, physical, and biological conditions of some soils (Chan and Xu 2009; Theise and Rillig 2009). If biochar application to soil enables decreased fertiliser use, this may further reduce emissions from fertiliser manufacture. Decreased fertiliser use would also mean financial savings for farmers if the cost of biochar application is less than the value of the fertiliser saved to achieve the same grain yield. Such analysis assumes that decreased fertiliser use will not compromise long-term crop production by lowering the residual soil nutrient status. Achieving a positive gross margin over time for a 'one-off' incorporation of biochar for rainfed farming systems may be possible by (i) minimizing the application rate, (ii) making the application method most efficient for the perceived beneficial effects of biochar on soil and plant, (iii) maximizing the duration of these effects from the time of application. Major crop in *kharif* and *rabi* seasons are rice and wheat respectively, in Mangrol, therefore, present studies were undertaken to examine the yield response and residual effect of biochar on wheat.		
5.	**Objectives**	**:**	**1.** To study the efficiency of biochar and nutrient application on growth and yield of *kharif* transplanted rice - *rabi* wheat cropping sequence **2.** To study appropriate nutrient combination through biochar – nutrient application under *kharif* transplanted rice - *rabi* wheat cropping sequence

			3. To assess chemical properties of soil
6.	**Principal Investigators and associates**	**:**	**1.** Dr. R. N. Mansuri, Asstt. Res. Sci., A.R.S., N. A. U., Mangrol **2.** Dr. Narendra Singh, Asstt. Res. Sci., Dept. of Soil Science, N.A.U., Navsari **3.** Shri. K. A. Patel, Senior Res. Asst., A.R.S., N. A. U., Mangrol
7.	**Location and Agro climatic sub region**		Agricultural Research Station, N.A.U., Mangrol, Surat, South Gujarat zone
8.	**Year and season**	**:**	2024-25, *Kharif* - *Rabi*
9.	**Crop and Variety**	**:**	Rice – GNR - 3, Wheat - GW 499
10.	**Experimental details**	**:**	

	a.	**:**	**Main plot Treatments (*Kharif* – Rice crop)**				
	T_1	**:**	Biochar application 2 t/ha				
	T_2	**:**	Biochar application 2 t/ha + 75 % RDF				
	T_3	**:**	Biochar application 2 t/ha + 100 % RDF				
	T_4	**:**	Biochar application 4 t/ha				
	T_5	**:**	Biochar application 4 t/ha + 75 % RDF				
	T_6	**:**	Biochar application 4 t/ha + 100 % RDF				
	T_7	**:**	100 % RDF + Bio-compost 5 t/ha				
	Sub plot treatments (*Rabi* - Wheat crop)						
	S_1	**:**	Control				
	S_2	**:**	75 % RDF				
	S_3	**:**	100 % RDF				
	Note: This experiment will be taken on the same field for 3 years Biochar will be applied once during the experimental period Biochar will be purchase from the Danti farm						
	b.	Total treatments	**:**	For *kharif* Rice	:	Seven	
				For *rabi* Wheat	:	Twenty-one	
	c.	Experimental Design	**:**	Split plot design			
	d.	Replication	**:**	Three			
	D.	Plot size	**:**		Main plot	Sub plot	
				Gross plot	5.40 x 9.90 m	5.40 x 2.70 m	
				Net plot	4.60 x 9.30 m	4.50 x 2.25 m	
	E.	Spacing	**:**	20 x 15 cm for rice 22.5 cm apart for wheat			
	F.	Seed rate (kg/ha)	**:**	30 kg/ha for rice 80 to 100 kg/ha			
	G.	Manures and fertilizers	**:**	100 – 30 – 00 NPK kg/ha for rice 90 – 60 – 00 NPK kg/ha for wheat Seed treatment: Bio fertilizer (*Azospirillium* + PSB 10 ml each per kg seed) for rice and wheat			
	H.	Any other details if required,	**:**	**-**			

11.	**Observation to be recorded**	**:**	**For rice:** 1. Plant population 2. Plant height 3. Total number of tillers/hills 4. Number of panicles/m^2 5. Panicle length (cm) 6. Test weight 7. Grain yield (kg/ha) 8. Straw yield (kg/ha) 9. Harvest index (%) 10. Rice equivalent yield **For wheat:** 11. Plant population 12. Plant height at harvest (cm) 13. Ear head length (cm) 14. 100 seed weight (g) 15. Grain yield (kg/ha) 16. Stover yield (kg/ha) 17. Harvest index (%) **For soil analysis:** 18. pH, EC, OC % and NPK content in soil **For Plant analysis:** 19. Nutrient content and uptake by plants **Input Analysis** 20. Bio-compost and Biochar
12.	**Methodology**	**:**	**-**