Recommendations for Farming Community on use of Biofertilizer/ Bioremediator/ Biodecomposer 2004 onwards

Sr. No.	Recommendations
2022-23	
01	The farmers of Middle Gujarat Agro-climatic Zone are recommended to sow castor (GCH 10) at 120 x 60 cm spacing and fertilize the crop with 120 kg N/ha and 1L/ha *Azotobacter* liquid biofertilizer mixed with500 kg FYM, besides, 40 kg P_2O_5/ha and 4.5 t FYM/ha as basal. Nitrogen should be applied in four equal splits i.e. 30 kg N/ha each as basal, at 30,60 and at 90 DAS to get higher yield
02	The farmers of Middle Gujarat Agro-climatic Zone growing summer blackgram organically are recommended to apply 1.0 L/ha Bio NP liquid biofertilizer (*Rhizobium* and PSB) mixed with 500 kg/ha vermicompost or 250 kg/ha Castor cake as basal for getting higher yield and net return.
03	The farmers of Bhal and Coastal Agro-climatic Zone growing durum wheat organically are recommended to apply about 600 kg castor cake/ha (75% RDN) before *kharif* season and seed treatment of bio NPK liquid biofertilizer (5 ml/kg seed) for obtaining higher yield and net return.
04	The farmers of Bhal and Coastal Agro-climatic Zone growing aestivum wheat organically with restricted irrigation (Two irrigations 21 DAS and 45 DAS) are recommended to apply about 1.8 t castor cake/ha (75% RDN) before kharif season and apply seed treatment of bio NPK liquid bio fertilizer (5 ml/kg seed) for obtaining higher yield and net return.
2021-22	
05	The farmers of Middle Gujarat Agro-climatic Zone growing *kharif* pigeon pea are recommended to coat seed with *Rhizobium pusense* AAU P16, 5 ml/kg before sowing and apply FYM 2 t/ha as basal for getting higher yield and net return. In addition, P_2O_5 40 kg/ha is to be applied as basal.
2020-21	
06	The farmers of middle Gujarat agro-climatic zone growing *kharif* green gram are recommended to apply either 20 kg N/ha **OR** 2 t FYM/ha + 10 kg N/ha + seed treatment of *Rhizobium selenitireducens* AAU M1 (5 mL/kg seed) for getting higher yield and net return. Besides, apply 40 kg P2O5/ha as basal.
07	The farmers of middle Gujarat agro-climatic zone growing summer green gram organically are recommended to apply 1.0 L/ha Bio NP liquid biofertilizer (*Rhizobium* and PSB) mixed with either 500 kg/ha vermicompost **OR** 250 kg/ha castor cake into the soil for getting higher yield and net return.
08	The farmers of middle Gujarat agro-climatic zone cultivating *rustica* tobacco are recommended to apply either 150 kg N/ha though chemical fertilizer and dipping of seedling root in the solution of 5 mL/L Bio NPK liquid biofertilizer for 15 minutes **OR** 100 kg N/ha through chemical fertilizer and 2 t/ha poultry manure together with dipping of seedling root in the solution of 5 mL/L Bio NPK liquid biofertilizer for 15 minutes for getting higher yield net return.
09	The farmers of middle Gujarat agro climatic zone growing isabgul are recommended to apply 4 t/ha FYM along with either seed treatment of Bio

	NPK liquid biofertilizer at the rate of 5 mL/kg seeds **OR** soil application of 1 L/ha. Bio NPK liquid biofertilizer for getting higher yield and net return.
10	The farmers of middle Gujarat agro-climatic zone growing greengram during summer season are recommended to apply 20 kg N/ha and 40 kg P2O5/ha as basal dose for getting higher yield and net return. Whereas, farmers growing greengram non chemically are recommended to apply 40 kg P2O5/ha through PROM as basal dose with Liquid Bio NP Biofertilizer (*Rhizobium* and PSB) as 5 ml/kg seed treatment for getting higher yield and net return.
11	For making good quality compost from crops residues viz., banana pseudostem, pigeon pea stalk, cotton stalk and castor stalk, farmers are recommended to mix Anubhav Bacterial Biodegrader Consortium (ABBC 1.0 L/t) and cow dung slurry at 200 kg/t with shredded crop residues in the pit (as per required size) with maintaining optimum moisture in the pit (65-70%) to get finished compost within 40-45 days for banana pseudostem, 55-60 days for pigeon pea stalk, 70 days for cotton stalk and 80-85 days for castor stalk, which is 5-10 days earlier than the compost prepared without bacterial biodegrader consortium. Further, nutrient composition in finished compost is found better in pigeon pea stalk followed by banana pseudostem, cotton stalk and castor stalk
2019-20	
12	The farmers of middle Gujarat agroclimatic zone growing onion organically in sapota orchard during initial years are recommended to apply either 75 kg N/ha through FYM + bio NPK consortium 1 L/ha in soil or 75 kg N/ha through vermicompost + bio NPK consortium 1 L/ha in soil for getting higher yield and net return, and maintaining soil health.
13	The farmers of middle Gujarat agro climatic zone cultivating summer groundnut are recommended to apply 5 t FYM/ha along with seed treatment of *Rhizobium* culture (AAUGNR 2) 5 ml/kg seed to get higher yield and net return. or The farmers of middle Gujarat agro climatic zone cultivating summer groundnut are recommended to apply 12.5 kg N/ha and 50 kg P2O5/ha as basal dose as well as seed treatment of *Rhizobium* culture (AAUGNR 2) 5 ml/kg seed to get higher yield and net return.
2018-19	
14	The farmers of Middle Gujarat Agro-climatic zone growing transplanted paddy cv. Gurjari in kharif are recommended to apply 80 kg N/ha, 20 kg P2O5/ha and give treatment of methylotrophic bacterial consortium 5 ml/L water through seedling dip for 15 minutes before transplanting and foliar spray at 30 DATP for obtaining higher yield and net return. The practice saves 20 % N, 20 % P and reduces methane gas emission from paddy field in atmosphere
15	The farmers of Middle Gujarat Agro-climatic Zone- III growing desi red rose are advised to spray gibberellic acid @ 150 mg per litre at 30 and 60 days

	after pruning (in October month) along with recommended dose of manure and fertilizers(FYM 3 kg/plant as basal dose after pruning and 40:40:25 g N:P:Kalongwith 1 ml *Azospirillum* and 1 ml PSB/litre water each per plant as soil application in three equal splits during June, October and January)for getting higher yield, net realization and better shelf life.
16	The farmers of Middle Gujarat Agro-climatic Zone-III growing annual chrysanthemum are advised to apply 5 ton FYM alongwith 75 : 100 : 50 kg NPK/ha as 97 basal dose. Prior to transplanting of seedlings should be dipped in 5 ml/l of water Bio NPK consortium. The remaining 75 kg nitrogen per hectare should be applied as top dressing at 30 days after transplanting to obtain higher yield and net realization.
2017-18	
17	The farmers of middle Gujarat Agro climatic zone interested to grow banana (cv. Grand Naine) are advised to apply recommended dose of fertilizer (10 kg FYM and 300-100-200 g NPK per plant) and AAU PGPR (Plant Growth Promoting Rhizobacteria) bio NPK consortium @ 1 ml/plant near root zone after one month of planting. OR Recommended dose of fertilizer (10 kg FYM and 300-100-200 g NPK per plant) and AAU PGPR (Plant Growth Promoting Rhizobacteria) bio NPK consortium @ 1 ml/plant after one month of planting along with drenching of NOL @ 500 l/ha near root zone of plant each at 30 and 45 days after planting for getting higher yield and net return. Mix the above materials in barrel or tank and keep it for 7 days • The above mixture should be stirred two times daily RDF + FYM + Biofertilizer AAU PGPR bio NPK consortium RDF + FYM + Biofertilizer AAU PGPR bio NPK consortium + NOL Drenching @ 500 L/ha at 30 and 45 DAP
18	The farmers of middle Gujarat agro climatic zone growing summer hybrid pearl millet are recommended to apply 140 kg N/ ha (70 kg as basal + 70 kg at 30 DAS) and 40 kg P2O5 /ha as basal for securing higher yield and net return. The farmers of middle Gujarat agro climatic zone are recommended to prepare vermicompost from banana pseudostem or maize fodder using *Anubhav* bio degrader bacterial consortium @ 1 L/t along with 5 % cow dung which gives high quality compost 15 days earlier than normal vermi composting method. Method for preparation of vermicompost from banana pseudostem or waste maize fodder (100 kg) Make small pieces (5-10 cm) of banana pseudostem or maize fodder (waste) and dry it under sunlight. Put the dried pieces of banana pseudostem or maize fodder (waste) in plastic bed (size 3.0x1.0x0.6 m). Sprinkle water on pseudostem or maize fodder (waste) to get it wetted. After one week, mix the anubhav bio degrader bacterial consortium 100 ml/10 L water & spread on materials kept in the bed. Similarly, spread the slurry prepared by mixing 5 kg cow dung in 10 L water. Release 400 g

	earthworms (*Eiseniafetida*) in 100 kg pieces of banana pseudostem or maize fodder (waste) in bed. Cover the bed with old gunny bags till the compost is ready by sprinkling the water. Sprinkling of water is discontinued when compost is ready. Vermicompost is collected after 8-10 days, thereafter sieve the material for use. The vermicompost will be ready within 70 to 75 days.
19	The farmers of middle Gujarat agro climatic zone growing summer sesame (Gujarat Sesame 2) are recommended to sow the crop adopting paired row (30-30 cm x 15 cm : 60 cm) in last week of February and adopt drip irrigation at 0.8 PEF and fertilize with 40 kg N/ha i.e. 10 kg N/ha as basal and 30 kg N/ha in 5 equal splits at weekly interval starting from 25 DAS and 25 kg P as basal and liquid biofertlizer*, Azospirilium* and PSB, *Bacillus coagulans* @ 1 L/ha for getting higher yield and net return.
2016-17	
20	The farmers of middle Gujarat agro climatic zone growing rabi fennel are recommended to apply recommended dose of fertilizer (90-45-00 kg NPK /ha) along with application of FYM @ 10 t/ha and seed treatment with AAU PGPR (Plant Growth Promoting Rhizobacteria) consortium @ 5 ml/kg of seed and apply NOL @ 500 l/ha drenching near plants as well as foliar spray of NOL @ 50 l/ha at 30 and 45 days after sowing for getting higher yield and net return.
2015-16	
21	The farmers of middle Gujarat Agro-climatic zone III growing summer groundnut are recommended to apply RDF (25-50-00 NPK kg/ha) along with application of FYM @10 t/ha and seed treatment with AAU PGPR consortium* @ 5 ml/kg of seed for securing higher yield and net return. Note: *PGPR Consortium : [*Azotobcater choococcum (*ABA-1) + *Azospirillum lipoferum*(ASA-1) + *Bacillus coagulans*(PBA-16) + *Bacillus* sp.
22	Farmers of middle Gujarat Agro climatic Zone-III interested to raise good quality brinjal seedlings are recommended to apply 70 kg FYM and 75 % RD of chemical fertilizer (Basal @ 375 g N+ 375 g P2O5 ; Top dressing @ 375 g N at 15 DAS) in soil per guntha (100 m 2) along with seed treatment @ 5ml/kg of biofertilizers viz. Nitrogen fixer *Azospirillum lipoferum* (ASA-1) mixed with Phosphate solubilizer *Bacillus coagulans* (PBA-16), followed by foliar application @ 5 ml/l of water of each biofertilizer at 15 DAS to reduce fertilizer by 25 %.
23	Farmers of Middle Gujarat Agro climatic Zone-III interested to raise good quality chilli seedlings are recommended to apply 70 kg FYM and 75 % RDF chemical fertilizer (Basal @ 375 g N+ 375 g P2O5 ; Top dressing @ 375 g N at 15 DAS) in soil per guntha (100m2) along with seed treatment @ 5 ml/kg of biofertilizers viz. Nitrogen fixer *Azospirillum lipoferum* (ASA-1) mixed with Phosphate solubilizer *Bacillus coagulans* (PBA-16), followed by foliar application @ 5ml / lit. of water of each biofertilizer at 15 DAS to

	reduce fertilizer by 25 %.
24	The farmers of middle Gujarat Agro-climatic zone III growing wheat are recommended to apply RDF (120-60-00 kg NPK / ha) along with application of FYM @10 t/ ha and seed treatment with AAU PGPR consortium @ 5 ml kg^{-1} of seed for securing higher yield and net return. Note:*PGPR Consortium : [*Azotobacter choococcum*(ABA-1) + *Azospirillum lipoferum* (ASA-1) + *Bacillus coagulans* (PBA-16) + *Bacillus* sp.
25	The farmers of middle Gujarat Agro-climatic zone III growing potato are recommended to apply RDF (220-110-220 kg NPK ha^{-1}) along with application of FYM @ 20 t ha-1 and seed treatment with AAU PGPR consortium @ 1 lit/ha of seed for securing higher yield and net return. Note: *PGPR Consortium : [*Azotobcater choococcum* (ABA-1) + *Azospirillum lipoferum* (ASA-1) + *Bacillus coagulans* (PBA-16)+ *Bacillus* sp.
2014-15	
26	The farmers of middle Gujarat agro-climatic zone-III intending to grow determinate tomato organically are advised to apply NADEP compost @ 7 t mixed with castor cake @ 350 kg/ha and 1 litre *Azotobacter c*ulture at the time of transplanting for securing higher yield with better quality, more net return and maintaining soil fertility.
27	The farmers of middle Gujarat agro-climatic zone-III growing potato are advised to apply 1 lit. of potash mobilizing bacteria- *Frateuria aurentia* or native strain- KMBW1-Enterobacter (tuber treatment or soil drenching) for obtaining higher yield and saving of 25 % potash (application of 165 kg K_2O/ha instead of 220 kg K_2O/ha). Beside this, N and P should be applied as per recommendation
28	For obtaining higher yield and net return from durum wheat grown on conserved moisture, in Bhal and Coastal agro-climatic Zone –VIII are advised to apply NADEP compost @ 2.6 t fortified with castor cake (80 kg/ha) at onset of monsoon in place of recommended N fertilizer and follow seed treatment of *Azospirillum* (5 ml/kg seed).
2013-14	
29	The farmers of middle Gujarat agro climatic zone – III growing vegetable pigeon pea (var. AVPP 1) are advised to apply 2 t/ha NADEP compost fortified with 500 kg castor cake along with 1 litre *Rhizobium* culture at sowing to meet the nitrogen requirement as well as getting higher green pod yield, net return and better quality, besides maintaining soil health.
30	The farmers of middle Gujarat agro climatic zone – III growing vegetable cow pea (var. AVCP-1) in *Kharif* season are advised to apply 5 tons FYM/ha along with basal fertilizer 10:20:00 N:P:K Kg/ha with seed treatment of *Rhizobium* (cow pea AAU isolate) and PSB culture (PBA-16) each 5 ml/kh seed and sow the seed at 45 x 45 cm spacing to obtain higher grain pod yield and maximum net return

2012-13	
31	Farmers of Bhal area growing chickpea under limited irrigation facility are advised to apply *Rhizobium* as a seed treatment (30 g/kg seed) and 20 kg N + 20 kg S/ha as a basal and remaining 20 kg N/ha at the time of first irrigation to obtain higher seed yield and net return
32	The farmers of middle Gujarat agro climatic zone-III (AES-II) growing soybean (*kharif*) are advised to apply 50% of RDF i.e. 15 kg N and 30 kg P2O5 / ha along with seed treatment with PSB + *Rhizobium* (each of @ 5 ml/kg) to get higher yield and net return.
33	The farmers of middle Gujarat agro climatic zone III (AES-II) having assured irrigation and drainage facility are advised to grow rice var. GR 12 in *kharif* season by adopting SRI/Modified SRI technique for obtaining higher yield and saving of 50% chemical fertilizer over conventional practices. The farmers should adopt either one of the following two modified SRI techniques. <u>Nutrient management</u> FYM@ 5 t/ha as basal *Azotobacter chroococcum* ABA 1 +PSB *Bacillus coagulans* PBA 16 (108 cfu/ml) each @ 1 litre/ha at the time of seeding along with well sieved FYM (50 kg/ha) Fertilizers 40-12.5-0 NPK kg/ha (a) Basal: 40% N & 100% P2O5 (16-12.5-0 NPK kg/ha) (b) At the tillering stage: 40% N (16 kg N/ha at 30 DAS) (c) At Panicle initiation (PI) stage: 20% N (8 kg N/ha one week before PI stage) *ZnS04 @ 25 kg/ha should be given as basal dose.
34	The farmers of middle Gujarat Agro Climatic Zone-III (AES-II) growing Deshi Red Rose are advised to apply 40 g nitrogen (87 g urea), 40 g phosphorus (250 g single super phosphate) and 25 g potash (42 g murate of potash) per plant in three equal splits from third year onward in June, October and January and after two days of fertilizers application 1 ml/plant each in 3 equal splits of *Azospirillum* and PSB (*Bacillus coagulans*) should be applied as soil treatment mixing in 200 ml of water for getting higher flower yield, maximum shelf life of flowers as well as higher net realization.
2011-12	
35	Integrated nutrient management in rustica tobacco GCT- 3 The farmers of AES II of middle Gujarat agro climatic zone growing rustica tobacco (GCT 3) are advised to apply 85% of recommended dose (200 kg N/ ha) of fertilizer [170 kg N/ha (25% from A. S. + 75% from Urea)]. The bio-fertilizer *Azospirillumlipoferum*ASA-1 @ 5ml/litre of water should be applied by root dipping of seedlings for 15 minutes which saves 15% nitrogen without affecting quality, yield and net realization.
2008-09	
36	The farmers of Middle Gujarat Agro-climatic Zone-III growing bidi tobacco (Var. GTH-1) are advised to apply 187 kg N in form of ammoniaum sulphate

	and urea at the proportion of 1:3 + *Azotobacter chrococcum*, ABA-1 (4 kg/ha) or 187 kg N (AS + Urea 1:3) + *Azospirillum lipoferum*, ASA-1 (4 kg/ha) and FYM @ 12.5 t/ha for saving 15% N and obtain higher yield of tobacco.
2007-08	
37	The farmers of middle Gujarat Agro-climatic zone -III (AES-I & II) growing maize cv. GM-3 in *Rabi* season are advised to treat the seeds with *Azospirillum lipoferum* culture having 108 C.F.U. per ml at sowing and apply 120 kg N/ha splitting 25 per cent N at basal (30 kg/ha), 50 per cent N at knee high stage (60 kg/ha) and 25 per cent N at tasseling stage (30 kg/ha) for securing higher grain yield and net realization. Whereas, marginal farmers are advised to apply 60 kg N/ha to the maize
2006-07	
38	Farmers of middle Gujarat Agro climatic zone-III (AES-III) growing *kharif* maize (GM-4) are advised to inoculate seeds with *Azospirillum lipoferum* (ASA-1) and *Torulospora globosa* (PBA-22) or *Bacillus coagulans* (PBA-16) having 10^8cfu/gm of carrier @ 30 g culture / kg seed before sowing along with soil application of 40 kg N/ha and 20 kg P_2O_5/ha to save 20 kg each of N and P for higher yield and economic return.
39	Farmers of Middle Gujarat Agro-climatic Zone-III (AES-III) growing pigeonpea (BDN-2) in *kharif* are advised to use (i) RDF + *Rhizobium* (RBA-5) + *Azotobacte*r (ABA-1) OR (ii) RDF + *Rhizobium* (RBA-5) + *Azotobacter* (ABA-1) + phosphorous solubilizer (PBA-22) through either seed treatment (30 g/kg seed) or soil application (5kg/ha) for getting higher yield and net return
2005-06	
40	The farmers of Middle Gujarat Agro-climatic zone –III cultivation gram crop (GG-2) are advised to apply 75 % of recommended phosphorus fertilizer @ 30 kg/ ha and phophobacteria culture with adequate organic manure as a basal treatment in conjunction with irrigation in two stages (i.e. branching and pod formation) for getting higher yield as well as higher net profit

Scientific Information on use of Agriculturally Beneficial Microorganisms

Sr. No.	Information
2021-22	
01	For making good quality compost from crop residues viz., paddy, wheat, maize and pearlmillet, farmers are recommended to mix Anubhav Bacterial Biodecomposer Consortium II (ABBC II) 1.0 L/t shredded crop residues and 200 kg cow dung slurry/t (Cow dung and water in 1:2 ratio) of shredded crop residues in the pit (as per required size) to obtain the compost having optimum C:N (<20:1) from maize and pearlmillet residues in 75 days, from paddy residues in 100 days and from wheat residues in 150 days, which is relatively 5 to 10 days earlier than the compost prepared without mixing of ABBC II. Further, mixing of ABBC II with crop residue provides better decomposition of the residues, and there by concentrate the nutrients content in final product. * Composition of ABBC II: Pseudomonas stutzeri BDCT 1; Bacillus velezensis BDCT 2; *Lactobacillus plantarum*; *Pseudomonas* spp.; *Bacillus subtilis*; *Cellulomonas* spp.
02	Good quality compost can be obtained from weed biomass *viz., Trianthema monogyna* (Carpet weed), *Digera arvensis* (False amaranth), *Amaranthus spinosus* (Spiny pig weed) and *Parthenium hysterophorus* (Carrot grass), by mixing Anubhav Microbial Biodecomposer Consortium I (AMBC I) 1.0 L/t and 200 kg cow dung slurry/t (cow dung and water in 1:2 ratio) with maintaining optimum moisture (~ 60%) in the pit. Finished compost with higher nutrient content can be obtained within 65-70 days from *Parthenium hysterophorus* and 70-80 days from *Trianthema monogyna, Digera arvensis* and *Amaranthus spinosus*, which is 10-20 days earlier in comparison to decomposition with cow dung slurry alone. Further, under weed seed bank studies, viable weed seeds were observed in finished compost of all weed biomass. * Composition of AMBC I: *Pseudomonas stutzeri* BDCT 1; *Bacillus velezensis* BDCT 2; *Streptomyces rochei* AAUBDM 10 and *Streptomyces chartreusis* AAUBDM 16
2020-21	
03	Multi-bacterial consortium (combination of *Pseudomonas azotoformans*, *Bacillus infantis, Bacillus megaterium* and *Micrococcus terreus*) was found beneficial to alleviate the adverse effect of heavy metals in soil and plant thereby, improving growth, dry matter yield and root growth of multi cut forage sorghum.