

ACHIEVEMENT

1. Technology developed/Recommendation

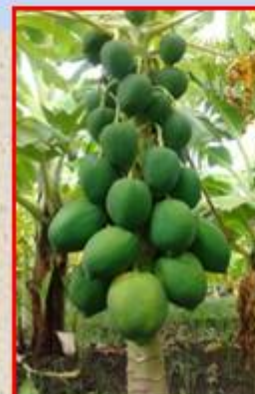
Total 20 (twenty) research recommendations were approved and emerged out till date for the farming community of the south Gujarat agro- Climatic zone out of various research activities carried out by utilizing all the components of the organic farming like crop rotation, INM, residue management, composting, green manuring, relay cropping along with cultural and biological pests-diseases management. Initially we have supplied 100% RDN to check the yield potentiality of the crop then we have to start work on resource based nutrient application and now we are working on suitable crop & variety for the organic farming.

We have tested various horticultural crops (like fruit crop: Mango, sapota, banana, papaya; vegetable crops: Okra, tomato, brinjal; tuber crops: Elephant foot yam, greater yam, sweet potato; spice crops: turmeric and bulb crops: onion, garlic) and field crops (like sugarcane, pigeon pea, paddy, sorghum, green gram, wheat) for the development of P&P to make it more adoptable on the scientific basis and best technologies are recommended to the farmers community as follow.

FRUIT CROPS

1. Papaya

- **Planting:** Prepared the pits at 2.1 m x 1.5 m distance. Apply 222 g/plant biocompost, 256 g/plant vermicompost, 76 g/plant castor cake, 1.6 g/ha *Azotobactor* and 1.6 g/ha PSB. Grow the maize as trap crop (two rows) after 4 rows of papaya and on the boarder of the field.
- **2 MAP:** Apply 111 g/plant biocompost, 128 g/plant vermicompost, 38 g/plant castor cake and drench 500 ml/plant of *Trichoderma* and *Pseudomonas* each @ 1 litre/200 litre of water.
- **4 MAP:** Apply 111 g/plant biocompost, 128 g/plant vermicompost and 38 g/plant castor cake.
- After two months of planting, apply banana pseudostem sap at the rate of 8 litre/plant in 8 equal splits.
- After 3, 6 and 9 months of planting, spray 200 litre of water containing 3 liter cow urine, 3 liter butter milk and 1 kg jaggery.



2. Relay cropping of papaya-banana-sugarcane (2015-16).

For papaya

- **Planting:** Prepared the pits at 1.5 m x 2.4 m distance. Sow plant by applying 1.7 kg biocompost, 3.1 kg vermicompost and 0.341 kg castor cake per plant along with PSB and Azatobactor @ 5kg/ha.
- **3 & 6 MAP:** Apply 0.8 kg biocompost, 1.6 kg vermicompost and 0.17 kg castor cake per plant.
- After one months of planting, apply banana pseudostem sap @ 200ml/plant in 5 equal splits at one month interval.
- In summer green manuring should be followed in wider space.
- Drench 500 ml 0.5% each of *Trichoderma* and *Pseudomonas* at the time of planting.
- Spray 0.5 % neem based solution.

For banana

- **Planting:** Prepared the pits at 1.2 m x 1.5 m x 3.3 m distance (paired row). Sow plant by applying 2.5 kg biocompost, 4.6 kg vermicompost and 0.5 kg castor cake per plant alongwith PSB and Azatobactor @ 5kg/ha.
- **3 & 6 MAP:** Apply 1.25 kg biocompost, 2.3 kg vermicompost and 0.25 kg castor cake per plant.
- After one months of planting, apply banana pseudostem sap @ 200ml/plant in 5 equal splits at one month interval.
- In summer green manuring should be followed in wider space.
- Drench 500 ml 0.5% each of *Trichoderma* and *Pseudomonas* at the time of planting.

For sugarcane

- At planting, treat two eye budded setts with biofertilizer i.e. *Acetobacter* and PSB and biopesticide i.e. *Trichoderma* and *Pseudomonas* @ 100ml each/ 50 litre of water for 20 minutes.
- **Planting:** Apply 4.15t biocompost and 3.85t vermicompost per hectare as basal.
- **3 & 6 MAP:** Apply 2.1t biocompost and 1.9t vermicompost per hector.
- After one months of planting, apply banana pseudostem sap @ 800 l/ha in 5 equal splits at one month interval.
- In summer green manuring should be followed in wider space.
- Drench 0.5% each of *Acetobacter*, *Trichoderma* and *Pseudomonas* at the time of earthing up.



3. Residue management in banana (2015-16)

- Prepared the pits at 1.5 m x 1.2 m x 2.4 m distance and apply the 2.0 kg NADEP compost in each pit along with *Azotobactor* and PSB @ 5.0 kg/ha.
- Add the farm residue @10t/ ha. in equal two splits at the time of two and four months after planting.
- Apply 400l/ha 2% banana pseudostem sap on residue and covered the residue by thin layer of soil.
- Drench 500 ml (0.5%) /plant each of *Trichoderma* and *Pseudomonas* at the time of planting



4. Banana - papaya alternate row system (2017-18)

- **Planting:** Prepare the pits at 2.4 m x 1.5 m distance. Sow plant by applying 2.4 kg of NADEP manure per plant along with PSB and *Azotobactor* biofertilizer and *Trichoderma* and *Pseudomonas* biopesticide 2 ml or g each/plant.
- **2.5 & 5 MAP:** Apply 2.4 kg of NADEP manure per plant each time.
- Apply liquid manures Jeevamrut and Amreetpani @ 400ml/plant at one month interval starting from planting in 5 equal splits.
- In banana, drench 500 ml 0.5% each of *Trichoderma* and *Pseudomonas* after one month of planting.
- In papaya, drench 400 ml 0.5% each of *Trichoderma* and *Pseudomonas* at 30 and 60 days of planting.
- For plant protection measure, use the 40 fruit fly traps/ ha for control of fruit fly in papaya and alternate spray of cow urine 2 %, neem oil 0.02%, neem extract 0.5% for control of sucking pest and disease in the both crops as per need basis.



5. Green manuring in banana (2019-20)

- **Planting:** Prepare the pit at 1.5 m x 1.2 m x 2.4 m distance and apply the first split of NADEP compost (1.02% N) @ 4.9 kg per pit along with *Azotobacter*, PSB and KMB @ 5.0 l/ha each at the time of planting. Apply second and third split application of NADEP compost @ 4.9 kg/plant at 30 and 60 DAP, respectively.
- **Grow *dhaincha*** as green manure continuously two times in between the wider spaces of banana. First at the time of planting and subsequently second after incorporation of first green manuring and incorporate it in soil at 45 DAS.



VEGETABLE CROPS

6. Tomato (2013-14)

- At the time of transplanting, 1.03 t/ha biocompost (1.54% N) + 0.44 t/ha castor cake (4.63% N) or 0.21 t/ha neem cake (4.5% N) + 2.32 t/ha vermicompost (1.32% N) should be applied.
- Apply common dose of *Azotobacter* biofertilizer @ 2 kg/ha.
- Treat the seedlings with 0.1% *Trichoderma* solution for about 5 minutes and transplant at 60 cm x 60 cm spacing.
- After transplanting apply foliar spray of vermiwash @ 0.5% and cow urine @ 1% at monthly interval.
- Maize should be grown as trap crop at the border.
- Sticky trap should be used @ 40/ha.



7. Brinjal (2014-15)

- Apply 4.5 t/ha castor cake at the time of TP and one month after TP in two equal split to supply N @ 100 kg/ha
- *Trichoderma viridi* should be applied at the rate of 5 kg/ha at the time of transplanting.
- Maize should be grown as trap crop on the border.
- Sticky trap should be used @ 40/ha.
- Tricho card should be used @ 5/ha.
- After transplanting apply foliar spray of neem based pesticide and cow urine at monthly intervals.



TUBER CROPS

8. Elephant foot yam (2011-12)

- Prepare the pit at a distance of 90 cm x 90 cm and sow 500 g tuber in each pit. Before sowing treat the tuber with slurry of 10% cow dung, 2% cow urine and 0.5% each of *Trichoderma* and *Pseudomonas*. Apply 2.5 t/ha vermicompost, 5 t/ha ash and 5 kg/ha each of *Azospirillum*, and *Phosphobacteria*.
- After one month of sowing, apply 2.5 t/ha vermicompost.
- After two months, spray 1.5% each of cow urine and butter milk and 0.5% each of *Trichoderma*, *Pseudomonas* and jaggery.



9. Greater yam (2011-12)

- Prepare the pit at a distance of 90 cm x 90 cm and sow 100 g tuber in each pit. Before sowing treat the tuber with slurry of 10% cow dung, 2% cow urine and 0.5% each of *Trichoderma* and *Pseudomonas*. Apply 2500 kg/ha vermicompost and 250 kg/ha castor cake.
- After one month of sowing, apply 2500 kg/ha vermicompost and 250 kg/ha castor cake and provide bamboo stacking and tie four plant in one bamboo.
- After two months, spray 1.5% each of cow urine and butter milk and 0.5% each of *Trichoderma*, *Pseudomonas* and jaggery.



SPICE CROP

10. Turmeric (2012-13)

- **At sowing:** Prepared the ditches of 1.5 feet at 3 feet interval to make raised bed. Sow the turmeric on raised bed at 30 cm x 20 cm distance and apply 830 kg/ha bio compost or 1250 kg/ha vermicompost and 290 kg/ha neem cake with *Azotobactor* and PSB each at the rate of 5 kg/ha.
- **2 MAS:** Spray 200 litre of water containing 3 liter cow urine, 3 liter butter milk and 1 kg jaggery and drench *Trichoderma* and *Pseudomonas* each @ 1 litre/200 litre of water.
- **3 MAS:** Apply 830 kg/ha bio compost or 1250 kg/ha vermicompost and 290 kg/ha neem cake.



BULB CROPS

11. Onion (2013-14)

- After transplanting, 62.5 kg N/ ha should be applied through 1.2 t/ha biocompost (1.74% nitrogen), 0.45 t/ha castor cake (4.63% nitrogen) and 1.6 t/ha vermicompost (1.32% nitrogen). Repeat the same dose one month after transplanting.
- Foliar spray of enriched banana pseudo stem sap @ 2% should be applied after transplanting at 15, 30 and 45 days.
- Treat the seedlings with 0.1% *Tricoderma* solution for about 5 minutes and transplant at 15 cm x 10 cm spacing on raised bed.
- Marigold and maize should be grown as trap crop on the border.
- Sticky trap should be used @ 40/ha.



12. Garlic (2014-15)

- Apply 1.4 t/ha biocompost (2.45% N) and 3.3 t/ha vermicompost (1.0% N) at the time of sowing and 0.7 t/ha castor cake (4.9% N) one month after sowing.
- Apply 2000 l/ha banana pseudostem sap at 35 and 55 days after sowing.
- Apply common dose of *Azotobacter* biofertilizer @ 2 kg/ha.
- After sowing, apply foliar spray of neem based pesticide and cow urine at monthly interval.
- Maize should be grown as trap crop at the border.
- Sticky trap should be used @ 40/ha.



Sugarcane

13. Pit planted sugarcane (2012-13)

- Prepared the pits of 0.6 m x 0.6 m x 0.45 m (LxWxD) at spacing of 2.4 m x 1.2 m. Mix the manures recommended at planting and soil and fill the pit. Plant the two eye budded 8 setts/pit.
- Bio fertilizers, *Azotobacter*, PSB and *Acetobacter* were applied @ 5 kg/ha each to all the treatments at the time of planting and earthing up of sugarcane.
- Treat the setts with *Trichoderma* and *Pseudomonas* each @ 1 litre/200 litre of water at the time of planting.
- Apply organic manures in following manner,
Planting: 4.2 t/ha biocompost or 4.8 t/ha vermicompost and 1.5 t/ha castor cake or 1.4 t/ha neem cake.
Tillering: 2.1 t/ha biocompost or 2.4 t/ha vermicompost and 0.75 t/ha castor cake or 0.70 t/ha neem cake.
Earthing up: 2.1 t/ha biocompost or 2.4 t/ha vermicompost and 0.75 t/ha castor cake or 0.70 t/ha neem cake
- Give the drenching of *Trichoderma* and *Pseudomonas* @ 1 litre each/200 litre of water in each row at 45 days of planting. Spray the cow urine and butter milk @ 2% at tillering and cane development stage.



14. Sugarcane varieties (2018-19).

- Planting at 120 cm spacing and treat two eye budded sets of CoN 05072 or CoN 05071 (for Jaggery) or Co 62175 (for Jaggery) variety with biofertilizer *i.e.* 0.5 % each of *Acetobacter*, PSB, *Trichoderma* and *Pseudomonas* for 20 minutes.
- At planting: Apply 3.4 t NADEP compost and 2.4 t vermicompost per hectare.
- At 45 DAP: Apply 3.3 t NADEP compost and 2.4 t vermicompost per hectare.
- At 90 DAP: Apply 3.3 t NADEP compost and 2.3 t vermicompost per hectare.
- Spraying of 0.5 % *Acetobacter* should be done at 30 and 45 days after planting.
- Apply 900 l/ha of jeevamrut with irrigation water in three equal splits at 45, 90 and 120 days after planting.
- Apply 5 kg or l per hector each of *Trichoderma* and *Pseudomonas* at the time of earthing up.



CoN. 05072



CoN 05071



Co 62175

15. Pigeon pea (2014-15)

- Sow the crop either 90 cm x 20 cm or 60 cm x 20 cm x 120 cm (paired row).
- Apply 0.8 t/ha bio-compost (1.5% N) and 1.0 t/ha Nadep compost (0.8% N) at the time of sowing.
- Soil application of *Trichoderma* and *Pseudomonas* @ 2.0 kg / ha at the time of sowing.
- Spray 5% Neemastra and neem oil at 15 days interval starting from flowering.
- Kept 50 bird percher / ha and 40 pheromon trap (*Helicoverpa*) / ha at equidistance.
- Grow marigold as a trap crop in the field.



16. Pigeon pea varieties (2018-19)

- Sow the pigeon pea (*Vaishali*) crop at 60 cm x 20 cm x 120 cm (Row x Plant x Pair). Apply 1.6 t/ha vermicompost in two equal splits at the time of sowing and one month after sowing.
- Soil application of *Trichoderma* and *Pseudomonas* @ 2.0 kg/ha each at the time of sowing.
- Inoculate seeds with *Rhizobium* @ 10 ml/kg seed before sowing.
- Grow marigold plant as a trap crop in the surrounding of the field.
- Keep 12 pheromone trap/ha to control *Helicoverpa armigera*.
- Spray 4% neem extract, 0.2 % neem oil and 2 % cow urine alternatively at 15 days interval from the flowering. Keep 50 bird perch/ha to control the insects.



18. Sorghum (2018-19)

- Sow the *rabi* sorghum crop at 60 x 15 cm and apply 4.2 t/ha of NADEP compost.
- Apply 2 kg or l/ha each of *Azospirillum*, PSB, *Trichoderma* and *Pseudomonas* in soil at the time of sowing.
- Apply 900 l/ha of jeevamrut with irrigation water in three equal splits at 15 days interval starting from sowing.
- Need based alternative spray of 0.20 % neem oil, 4 % neem extract and 2 % cow urine should be done to control sucking pests.



19. Green gram (2019-20)

- Sow green gram at 45cm x 10cm spacing and to supply 20 kg N/ha, apply 2.2 t/ha NADEP compost (contains 1.1% N) at the time of sowing.
- Inoculate seeds with *Rhizobium*, PSB and KMB bio-fertilizer each @ 10 ml/kg seed before sowing.
- Spray 1% of Enriched banana pseudostem sap three times (30, 45 and 60 DAS).
- As a preventive measures and need based alternative spray of 0.20% neem oil, 4% neemastra and 5% agniastra should be done to control sucking pests.



20. Paddy varieties (2020-21)

- Before transplanting rice (variety GNR-7 or GNR-3), apply 100 kg N/ha through NADEP compost (apply 8.9 t/ha NADEP compost containing 1.12%N).
- Before transplanting, give root dipping treatment to the seedling with *Azospirillum* and PSB each of 0.5% and then transplant seedling at 20cm x 15cm spacing.
- Spray of noval organic liquid nutrient @ 1% in three times at 15, 45 and 60 DAT.
- As a preventive measures and need based, alternative spray of 0.20% neem oil and 4% neemstra should be done to control disease and pests.



2. Awards

| SN | Name of Awards, Medals and Recognition | Year | Awarding institute/ Agency |
|-----------|---|-------------|--|
| 1 | Best Oral Paper Presentation | 2013 | National on Tropical and Subtropical Fruits Organized by NAU, ACHF, THSG, and CHAI during January 9-11, 2013 at Navsari |
| 2 | Young Scientist Award | 2017 | National Conference on Doubling Farmers Income for Sustainable and Harmonious Agriculture ' DISHA-2017, 9-10th September, 2017 at Sri Venkateshwara University , Tirupathi, Andhra Pradesh |
| 3 | Young Scientist Award | 2018 | International Conference on Food and Agriculture" ICFA-2018, 29-31 March, 2018 at Dhanbad, Jharkhand |
| 4 | Best Oral Paper Presentation | 2018 | International Conference on Food and Agriculture" ICFA-2018, 29-31 March, 2018 at Dhanbad, Jharkhand |
| 5 | Best Oral Paper Presentation | 2018 | Technologies and Sustainability of Protected Cultivation of Hi-Valued Vegetable Crops" held at ASPEE College of Horticulture and Forestry, NAU, Navsari, Gujarat, India during February 01-03, 2018. |

3. Create Awareness

To create awareness and provide technical knowledge, the organic farming cell, NAU, Navsari organizes training, demonstrates the organic package and practice of organic farming on farmers' field, publishes folders for different crops, publishes research papers, review articles, books etc., delivers lectures to farmers and guides the farmers to participate in seminars, *krushi mahotsav etc.*

Provides technical assistance and creates awareness on organic farming to the member farmers of NOFCo (Navsari district Organic Farmers Cooperative Society Ltd., reg. No. NVS/SE. 42701, 2017).

Awareness creates to farming community, scientific community, in-service trainees, Agro-input dealers and Govt. officials etc. The faculty members make aware the farmer communities on organic farming by participating in *Krushimela* and seminars. The team of organic farming cell, NAU, Navsari provides technical assistance to farmers for the construction of model organic farm.

Organized national seminar on Organic farming: A national seminar on "*role of organic farming in climate and sustainable agriculture*" was jointly organized and successfully completed in the year 2014.

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| Books- 4 | Book chapters- 11 |
| Research papers- 31 | Lead papers- 11 |
| Folders- 19 | Lectures delivered- > 115 |