RESEARCH ACCOMPLISHMENTS AND RECOMMENDATIONS

2013

AAU

कृणवन्तो राष्ट्रं कृषिसंपन्नम्

DIRECTORATE OF RESEARCH
ANAND AGRICULTURAL UNIVERSITY
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MESSAGE

It is my pleasure to present "Research Accomplishments and Recommendations" of 2013 covering multi-disciplinary technologies developed by the scientists of Anand Agricultural University for the benefit of farming community of the state. At this juncture, I take this opportunity to express my heartfelt congratulations to those dedicated scientists who developed the technology for upliftment of socio-economic status of farmers. I compliment Dr. K. B. Kathiria, Director of Research and his team for their sincere efforts in bringing out this scientific publication in time covering all the technologies generated by the scientists of different faculties.

I hope that this booklet will serve as source of information to update the knowledge for extension workers, NGOs, private sectors, entrepreneurs, industrialists, students and others those who are directly or indirectly associated with farming community. Moreover, it will be useful to the scientists for future research strategies.

(A. M. SHEKH)
VICE-CHANCELLOR

ANAND AGRICULTURAL UNIVERSITY
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FOREWORD

I feel immense pleasure to put foreword the eighth publication on 'Research Accomplishments and Recommendations' of 2013 containing technologies developed and recommended by the Agricultural Scientists of different faculties of Anand Agricultural University for farming community of the state. I congratulate all the scientists who directly or indirectly involved in generating the new technologies in the field of agricultural sciences for enhancement of socio-economic status of farmers of Gujarat. I am thankful to all the conveners of respective AGRESCO sub-committee of Agricultural Research Council of Anand Agricultural University and staff members of Directorate of Research for preparation of this publication.

I am highly indebted to Dr. A. M. Shekh, Hon'ble Vice-Chancellor of Anand Agricultural University for his untiring constant guidance and inspiration to improve the quality and increase the quantity of research.

I hope that the technologies developed by the scientists will definitely help to improve the quality and quantity of agricultural produces for better earning and welfare of the farming community of the state.

(K. B. KATHIRIA)
DIRECTOR OF RESEARCH & DEAN
FACULTY OF PG STUDIES

PREFACE

The research work carried out in different fields of agricultural sciences during the year 2012-13 has been very well discussed by different AGRESCO sub-committees for bringing out useful and beneficial recommendations for farmers, scientific community, entrepreneurs and stake holders.

The recommendations made by different committees are listed below.

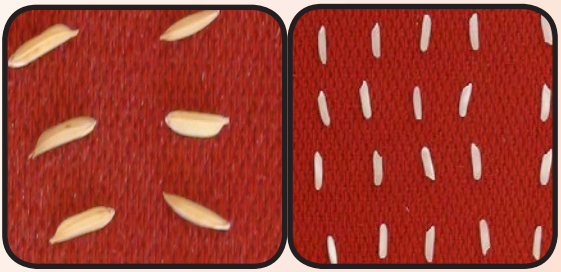
Name of the sub-committee / faculty	No. of recommendations	
	For farmers	For scientific community/ entrepreneurs
Crop Improvement	05	-
Crop Production	13	01
Plant Protection	13	19
Basic Science (Plant Physiology, Bio chemistry and Biotechnology)	01	03
Dairy, Science Food Processing Technology and Agri. Engineering	02	07
Animal Production	06	08
Animal Health	-	03
Social Science	-	01

Recommendations for farming community

I. CROP IMPROVEMENT

[A] PLANT BREEDING

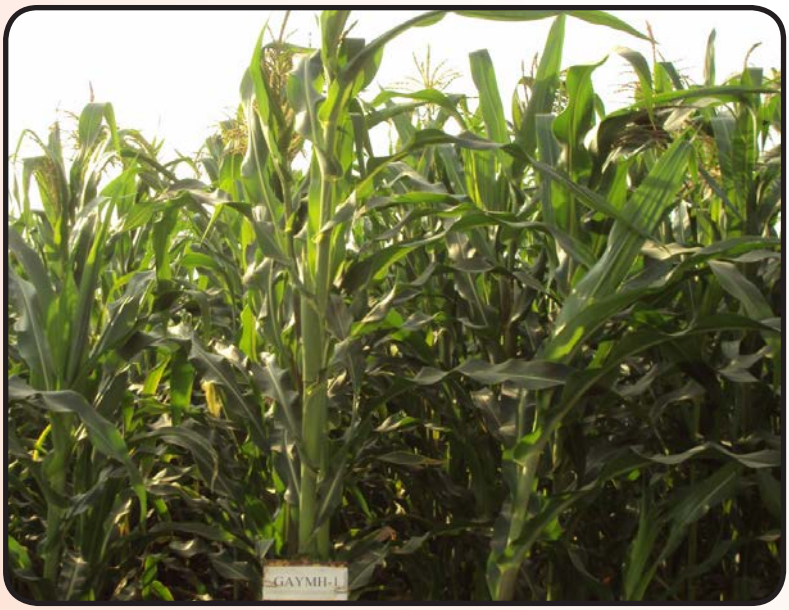
1. Crop: Rice (Variety: GAR-3)



The culture NWGR-4005 (GAR-3) derived from a cross Gurjari x IET 14714 showed an overall 11.1% yield superiority over the check variety GR-11. The culture possesses long slender grains matures earlier by 7-10 days than GAR -13. It is moderately resistant against major diseases and pests besides having better cooking and milling qualities.

(Research Scientist (Rice), Main Rice Research Station, AAU, awagam)

2. Crop: Maize (Variety: GAYMH -1)



The GAYMH -1 (Gujarat Anand Yellow Maize Hybrid 1) hybrid is the first public bred single cross hybrid with early maturity for the rainfed condition of the tribal belt of the Gujarat state. The hybrid possesses orange flint grained cob like that of the local cultivars. The hybrid revealed 12.9 and 24.2% yield superiority over HQPM-1 (single cross hybrid) and GM-2 (variety), respectively under *Kharif* rainfed conditions. The hybrid also out yielded all the national checks in Zone-V of the country. The seed of hybrid contains 70.8% starch, 12.2% protein, 3.9% oil, 0.329% tryptophan in protein and 2.855% lysine in protein.

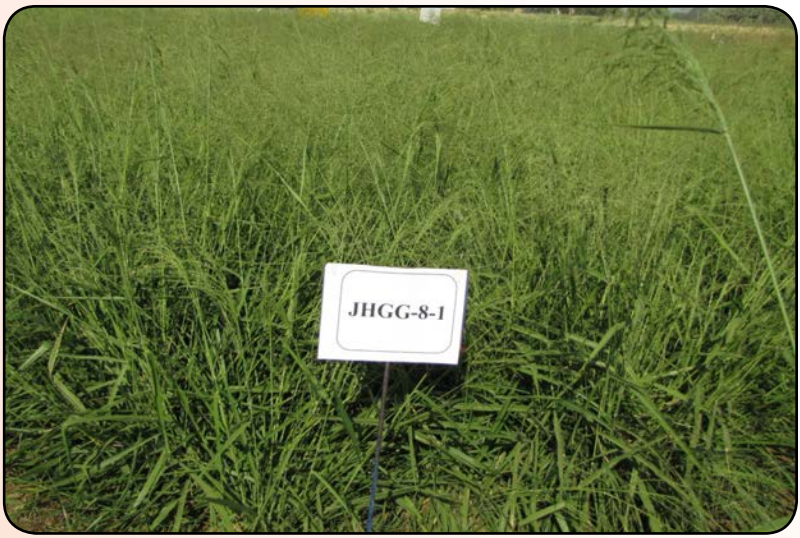
(Research Scientist (Maize), Main Maize Research Station, AAU, Godhra)

3. Forage crops: Fodder Sorghum (variety : CoFS-29)

The culture Coimbatore Fodder Sorghum-29(CoFS-29) is a multicut, profusely tillering perennial grass called as grassy sorghum. It has tall plant stature with more leaf number. It revealed higher green fodder, dry matter and crude protein yield than the national check variety SSG-59-3. It is a highly palatable culture showing very less disease incidence. It is recommended for endorsement in Gujarat.

(Research Scientist (Forage), Main Forage Research Station AAU, Anand)

4. Forage crops: Guinea Grass (variety JHGG – 8-1)



Guinea grass variety JHGG – 8-1 is a tall growing, high tillering and newly introduced forage crop showing very quick and fast regeneration ability after every cut. It revealed 28.8, 71.0 and 47.1 per cent higher green forage yield and 16.9, 59.7 and 43.2 per cent higher dry matter yield over the national check varieties Bundel Guinea-1, PGG 616 and Riversdale, respectively. It is recommended for endorsement for irrigated conditions of the Gujarat state.

(Research Scientist (Forage), Main Forage Research Station, AAU, Anand)

5. Vegetable Crops: Brinjal (Variety: GAOB-2)

Brinjal variety Gujarat Anand Oblong Brinjal -2 (GAOB-2) exhibited 35.73 and 28.74 per cent higher fruit yield over the check varieties GOB-1 and GJB-2, respectievly. The variety contained higher vitamin C, anthocyanin and total soluble sugars, with lower amount of total phenols as compared to the check variety GOB-1. It also revealed lower incidence of little leaf disease and low population of whitefly as compared to both the checks. It is recommended for cultivation in the Middle Gujarat conditions.

(Research Scientist (Veg.), Main Vegetable Research Station, AAU, Anand)

II CROP PRODUCTION

[A] CULTURAL PRACTICES

1. **Yield of soybean as influenced by dates of sowing and cultivars**

The farmers of middle Gujarat agro climatic zone - III growing soybean are advised to sow NRC 37 at onset of monsoon to get higher yield and net return.

(Unit Officer, TRTC, AAU, Devgadhbaria)

[B] NUTRIENT MANAGEMENT

2. **Efficacy of NADEP compost in agro-climatic zone-III in improving yield and quality of pigeonpea**

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 yield, net return and better quality besides maintaining soil health.

(Research Scientist, Pulse Research Station, AAU, Vadodara)

3. **Agronomic managements of pigeon pea for yield maximization**

The farmers of middle Gujarat agro climatic zone – III growing pigeon pea (var. AGT 2) are advised to apply 20 kg S/ha in the form of gypsum (150 kg/ha) in addition to recommended dose of fertilizer (25:50:0 N:P:K kg/ha) for obtaining higher seed yield, net profit and better quality.

(Research Scientist, Pulse Research Station, AAU, Vadodara)

4. **Assessment of organic farming and inorganic nutrient supply system on yield and quality of pigeon pea**

The farmers of middle Gujarat agro climatic zone - III growing vegetable pigeon pea (var. Gujarat Tur 1) are advised to apply 25 kg N/ha through FYM at sowing for getting higher yield, net return and better quality of green pods besides maintaining soil health.

(Research Scientist, Pulse Research Station, AAU, Vadodara)

5. **Response of *bidi* tobacco variety ABT 10 to nitrogen and topping**

The farmers of middle Gujarat agro climatic zone - III growing *bidi* tobacco (var. ABT 10) are advised to apply 180 kg N/ha, 45 kg N as basal through ammonium sulphate and remaining N through urea in 3 equal splits at 20, 40 and 60 DATP and topping the crop after 24th leaf to get higher cured leaf yield and net return.

(Research Scientist (Tobacco), BTRS, AAU, Anand)

6. Effect of integrated nutrient management on productivity of transplanted pearl millet in summer season

The farmers of middle Gujarat agro climatic zone - III growing hybrid transplanted pearl millet during summer season are advised to apply vermicompost @ 2 t/ha and 120 kg N/ha in two equal splits i.e. at transplanting and 30 DATP for securing higher yield, net return and better quality.

(Professor & Head, Dept. of Agronomy, BACA, AAU, Anand)

7. Effect of multi-micronutrients mixture grades on seed yield of lucerne

The farmers of middle Gujarat agro climatic zone - III growing lucerne (Anand 2) on soils with marginal Zn and deficient Fe status are advised to apply 25 kg $ZnSO_4$ and 50 kg $FeSO_4$ per ha every year besides application of 20:40:40 kg NPK/ha to obtain higher seed yield and net return.

(Research Scientist, Main Forage Research Station, AAU, Anand)

8. Varietal response of pigeon pea to organic manures

The farmers of middle Gujarat agro climatic zone - III those who are interested to grow pigeon pea organically are advised to prefer mid late variety BDN 2 and apply either vermicompost @ 1 t/ha or pressmud @ 5 t/ha or FYM @ 5 t/ha to get higher yield and maintain soil health.

(Research Scientist, Agricultural Research Station, AAU, Derol)

[C] WATER MANAGEMENT

9. Effect of irrigation schedules and nitrogen levels on seed production of oat

The farmers of middle Gujarat agro climatic zone - III growing oat (Kent) for seed purpose are advised to apply six irrigations(each of 50 mm) i.e. first five irrigations at 15-20 days interval and 6th irrigation at 13-15 days interval after fifth irrigation. Further, they are advised to apply N @ 75 kg/ha (50 % N at the time of sowing and remaining 50 % N in two equal splits at 30 and 60 days after sowing in equal splits) for getting higher seed yield and net realization.

(Research Scientist, Main Forage Research Station, AAU, Anand)

[D] WEED MANAGEMENT

10. Weed management in *Bt* cotton

The farmers of middle Gujarat agro climatic zone - III growing *Bt* cotton are advised to carry out inter - culturing (IC) and hand weeding (HW) at 15, 30 and 45 days after sowing. Under labours shortage situation, pre-emergence application of pendimethalin @ 900 g/ha followed by IC+HW at 30 and 60 DAS or post emergence application (15-20 DAS) of either fenoxaprop-p-ethyl or quizalofop-ethyl @ 50 g/ha followed by IC+HW at 30 DAS for effective weed management.

(Agronomist, DWSR, BACA, AAU, Anand)

[E] HORTICULTURE

11. Response of plant density and integrated nutrient management in cowpea cv. AVCP-1

Farmers of middle Gujarat Agro climatic zone-III growing vegetable cowpea (AVCP – 1) in *kharif* season are advised to apply 5 tonnes FYM per hectare along with basal fertilizer 10:20:0 NPK kg/ha with the seed treatment of *Rhizobium* (cowpea AAU isolate) and PSB culture (PBA-16) (each at 5 ml per kg seed) and sow the seed at 45 X 45 cm spacing to obtain higher green pod yield and maximum net return.

(Professor & Head, Dept. of Horticulture, BACA, AAU, Anand)

12. Response of plant growth retardants and pinching on growth, flowering and flower yield of African marigold (*Tagetes erecta Linn*)

The farmers of middle Gujarat Agro-climatic zone III growing African marigold are advised to spray the foliar application of cycocel 750 mg/l in two intervals (first spray at 30 days after transplanting and second at 45 days after transplanting) for getting higher flower yield per hectare, enhancing vase life of flowers and higher net realization.

(Professor & Head, Dept. of Horticulture, BACA, AAU, Anand)

13. Nutrient and water management through fertigation in potato

The farmers of middle Gujarat Agro-climatic zone III growing potato are advised to irrigate the crop through drip for 21 minutes during November to January and 32 minutes during February to March at an alternate day for getting higher potato tuber yield and net income with saving of 28% water.

For drip irrigation potato crop should be planted in pair row (60 x 30) x 10 cm. The system should be laid out with lateral distance of 90 cm (in pair row) and dripper (4 LPH) spacing of 30 cm. The system should be operated at a pressure of 1.2 kg/cm^2.

(Professor & Head, Dept. of Horticulture, BACA, AAU, Anand)

III PLANT PROTECTION

[A] AGRICULTURAL ENTOMOLOGY

1. Pest control in mustard

Farmers of middle Gujarat growing mustard are advised to spray any of the following insecticides twice, first at 1.5 aphid index and second after 15 days.

a. Dimethoate 30 EC @ 0.03% (10 ml/ 10 litre of water) [150 g a.i./ ha]

b. Imidacloprid 70 WG @ 0.014% (2 g/ 10 litre of water) [70 g a.i./ ha]

c. Thiamethoxam 25 WG @ 0.01% (4 g/ 10 litre of water) [50 g a.i./ ha]

The pre-harvest interval of 30 days is recommended for imidacloprid and thiamethoxam. As per CIB recommendation, dimethoate is safe at harvest from residue point of view.

(Professor & Head, Dept. of Entomology, BACA, AAU, Anand)

2. Sucking pests control in *Bt.* Cotton

The farmers of middle Gujarat growing *Bt* cotton are advised to spray any of the following insecticides on initiation of sucking pests (aphid, leafhopper, whitefly and thrips) and subsequently two sprays at 15 days interval.

a. Imidacloprid 17.8 SL @ 0.009 % (5 ml/ 10 litre of water) (44.5 g a.i./ha)

b. Diafenthiuron 50 WP @ 0.05% (10 g/ 10 litre of water) (250 g a.i./ha)

The pre-harvest interval of 30 days is recommended for imidacloprid and diafenthiuron.

(Professor & Head, Dept. of Entomology, BACA, AAU, Anand)

3. Pest control in Black gram

The farmers of middle Gujarat growing black gram are advised to spray emamectin benzoate 5 WG @ 0.0025 % (5 g/ 10 litre of water; 7.5 g a.i./ha) or flubendiamide 480 SC @ 0.01% (2 ml/10 litre of water; 28.8 g a.i./ha) at the initiation of pest incidence for the control of pod borers.

The pre-harvest interval of 20 and 11 days is recommended for emamectin benzoate and flubendiamide, respectively.

(Professor & Head, Dept. of Entomology, BACA, AAU, Anand)

4. Termite control in wheat

The farmers of middle Gujarat growing wheat are advised to treat the seeds before 12 hours of sowing with any one of the following insecticides for the control of termite.

a. Chlorpyriphos 20 EC @ 4 ml in 50 ml water /kg seed (0.8 g a.i./ kg seed)

b. Fipronil 5 SC @ 5 ml in 50 ml water /kg seed (0.025 g a.i./ kg seed)

(Professor & Head, Dept. of Entomology, BACA, AAU, Anand)

5. Control of mango hopper

For the control of mango hoppers, the farmers of middle Gujarat are advised to spray any one of the following insecticides at 5 nymphs per inflorescence.

a. Imidacloprid 17.8 SL @ 0.009 % (5 ml/ 10 litre of water)

b. Acetamiprid 20 SP @ 0.01% (5 g /10 litre of water)

c. Thiamethoxam 25 WG @ 0.0125% (5 g /10 litre of water)

The pre-harvest interval of 45 days is recommended for imidacloprid, acetamiprid and thiamethoxam.

(Professor & Head, Dept. of Entomology, BACA, AAU, Anand)

6. Pest management in chickpea

Farmers of middle Gujarat growing chickpea are advised to follow below mentioned Bio-Intensive Pest Management module for the management of pod borer and wilt disease.

a. Seed treatment with *Trichoderma viride* (2 x 10^6 cfu /g) @ 8 g / kg seed at the time of sowing against wilt disease.

b. Use of FYM @ 1 ton/ha enriched with *T. viride* (2 x 10^6 cfu /g) (2 kg/ ton of FYM) for wilt disease.

c. Planting marigold (*Tagetes erecta*) on the borders of chickpea field as trap crop for *Helicoverpa armigera*

d. Installation of pheromone traps @ 40 traps/ha at 15 days after sowing for trapping *H. armigera* moths

e. Installation of 'T' shaped bird perches @ 100 /ha at 15 days after germination.

f. Alternate spray of HaNPV @ 250 LE/ha and Neem Seed Kernel Extract @ 5 % during vegetative stage, at flowering stage and at pod formation stage for the suppression of *H. armigera.*

(Principal Research Scientist, Bio-control Research Laboratory, AAU, Anand)

7. Pest management in okra

Farmers of middle Gujarat growing okra are advised to follow below mentioned Bio Intensive Pest Management module for the management of pests of okra.

a. Sowing of the crop during first week of May.

b. Soil application of *Paecilomyces lilacinus* (2×10^6 cfu /g) @ 25 kg /ha (Talc base formulation)

c. Seed treatment with thiamethoxam 70 WS @ 2.8 g/kg seed (2 g a.i./kg seed).

d. Installation of pheromone traps @ 60 /ha for mass trapping the moths each of *Helicoverpa armigera* and *Earias vittella.*

e. Regular clipping of the shoots infested by spotted bollworm.

f. Need base alternate spray of NSKE @ 5 %, *Bt* [5×10^7 spores /mg] @ 1.5 kg /ha and *Beauveria bassiana* (2×10^8 cfu /g) @ 30 g /10 litre water.

(Principal Research Scientist, Bio-control Research Laboratory, AAU, Anand)

8. Pest control in cowpea

Farmers of middle Gujarat growing cowpea are advised to spray any one of the following insecticides for the control of pod borer, *Maruca vitrata* at the initiation of flowering and subsequent two sprays at 15 days interval.

a. Flubendiamide 480 SC @ 0.014 % (3.0 ml/ 10 litre water)

b. Chlorantraniliprole 18.5 SC @ 0.006 % (3.0 ml/ 10 litre water)

The pre-harvest interval of one day is recommended for flubendiamide and chlorantraniliprole.

(Asstt. Res. Sci., Main Vegetable Research Station, AAU, Anand)

9. Control of thrips in chilli

For the control of thrips in chilli up to 45 days after transplanting, the farmers of middle Gujarat are advised to treat the seeds with imidacloprid 70 WS @ 7.5 g /kg (5.25 g a.i. /kg seed) before seeding in nursery and dipping roots of the seedlings in imidacloprid 17.8 SL @ 10 ml /10 litre water or thiamethoxam 25 WG @ 10 g /10 litre water for two hours before transplanting.

(Asstt. Res. Sci., Main Vegetable Research Station, AAU, Anand)

10. Control of pod borers in pigeon pea

The farmers of middle Gujarat growing pigeon pea are advised to give any of the following insecticides on initiation of lepidopteran pod borers and subsequently two sprays at 20 days interval.

a. Chlorantraniliprole 18.5 SC @ 0.006% (3 ml/ 10 litre water)

b. Emamectin benzoate 5 WG @ 0.0025% (5 g/ 10 litre water)

c. Flubendiamide 48 SC @ 0.01% (2 ml/ 10 litre water)

The pre-harvest interval of 29, 14 and 10 days is recommended for chlorantraniliprole, emamectin benzoate and flubendiamide, respectively.

(Asstt. Res. Sci., Agricultural Research Station, AAU, Derol)

11. Pest control in paddy

Farmers of middle Gujarat growing paddy are advised to apply cartap hydrochloride 4G @ 25 kg /ha (1 kg a.i. /ha) and monocrotophos 36 WSC @ 0.04 % (10 ml /10 liter of water) alternately in infested spot /patch for the control of yellow stem borer and leaf folder.

As per the CIB recommendations, both the insecticides are safe from residue point of view.

(Asso. Res. Sci. (Ento.), Main Rice Research Station, AAU, Nawagam)

[B] PLANT PATHOLOGY

12. Management of reddening of leaves and physiological wilting of *Bt* cotton

The farmers of middle Gujarat growing *Bt* cotton are advised to apply 280 kg N/ha in four equal splits i.e., 70 kg N as basal application at the time of sowing and at 30, 60 and 90 days after sowing. In addition foliar spray each of 50 g urea, $FeSO_4$, $ZnSO_4$ and $MgSO_4$ in 10 litre of water is also suggested for the management of reddening of leaves and physiological wilting of *Bt* cotton.

(Professor & Head, Dept. of Plant Pathology, BACA, AAU, Anand)

13. Nematode management in vegetables

The farmers of middle Gujarat growing vegetables in nematode sick fields are advised to grow root knot resistant varieties i.e. cowpea variety - Anand Vegetable Cowpea-1 in *Kharif* and tomato variety Hisar Lalit in *Rabi* for three years to manage root-knot nematode population.

(Professor and Head, Dept. of Nematology, BACA, AAU, Anand)

IV BASIC SCIENCE

1. Effect of growth regulators on fodder quality and yield in lucerne (*Medicago sativa* L.) var. A-2

The farmers of middle Gujarat Agro-climatic Zone III are advised to spray gibberellic acid (GA_3) @ 40 milligram/litre to the lucerne (var. Anand-2) crop at 30 days after sowing for achieving higher forage yield, better quality and more net realization.

(Research Scientist (Forage), Main Forage Research Station, AAU, Anand)

V DAIRY SCIENCE, FOOD PROCESSING AND AGRICULTURAL ENGINEERING

1. To study feasibility of most suitable mechanical power sources for farm operations in Panchmahal district

Small and medium farmers of Panchmahal district are recommended to use mini tractor (15 hp) for seed bed preparation using rotavator (0.8 m) to save 35 per cent fuel per ha as compared to medium size tractor (30-40 hp) operated rotavator (1.6 m).

(Professor and Head, Dept. of FMP, CAET, AAU, Godhra)

2. Adaptive research oriented comparative evaluation of mechanical crop harvesting through on-farm investigation in Panchmahal district of middle Gujarat region

The farmers of Panchmahal and adjoining region are recommended to use mini tractor front operated reaper as first choice or self propelled reaper as second choice for timely harvesting of paddy and fodder sorghum as compared to manual harvesting to save cost and man-hours during the soil moisture condition of 13.50 and 10.50 per cent for paddy field and sorghum field, respectively.

(Professor and Head, Dept. of FMP, CAET, AAU, Godhra)

VI ANIMAL PRODUCTION

1. Reproductive behavior in goats along with ethology study in goats and hormonal profile

Goats are more comfortable under tree shade during daytime in the summer season as compared to agro net (95% density) or asbestos shed roofed housing system.

(Research Scientist, RBRU, Vet. College, AAU, Anand)

2. Effect of feeding bypass fat on milk production from buffaloes of tribal areas of Panchmahal and Vadodara districts

In tribal areas like Kadana taluka of Panchmahals and Chhotaudaipur taluka of Vadodara district during 90 days of early lactation, inclusion of bypass fat @ 15 g/kg milk yield in the ration of buffaloes yielding 6 to 7 kg results in improvement in yield of whole milk, percentage of fat and the efficiency of feed conversion and increase in income by 21 to 23%.

(Research Scientist, ANRS, Vet. College, AAU, Anand)

3. Effect of feeding bypass protein on milk production from buffaloes of tribal areas in Panchmahal and Vadodara districts

In tribal areas like Kadana taluka of Panchmahals and Chhotaudaipur taluka of Vadodara district during 90 days of early lactation, inclusion of concentrate mixture with bypass protein in the ration of buffaloes yielding daily 6 to 7 kg milk, results in improvement in yield of whole milk, percentage of fat and the efficiency of feed conversion and increase in income by 40 to 42%.

(Research Scientist, ANRS, Vet. College, AAU, Anand)

4. Animal Nutrition Survey in Vadodara district

In Vadodara district the farmers are advised to feed additional daily 1 to 1.25 kg compound concentrate mixture to buffaloes in order to fulfill their nutrient requirement.

(Research Scientist, ANRS, Vet. College, AAU, Anand)

5. Animal Nutrition Survey in Vadodara district

The farmers of Vadodara district are advised to feed additional daily 500 g compound concentrate mixture or 3.0 kg leguminous fodder for working bullocks during summer and winter in order to fulfill their nutrient requirement.

(Research Scientist, ANRS, Vet. College, AAU, Anand)

6. Draftability assessment of Kachchhi camel under middle Gujarat agro climatic condition

It is advisable to give 1 hour rest to Kachchhi camels after every 2 hours work under 2500 kg pay load.

(Professor and Head, Dept. of LPM, Vet. College, AAU, Anand)

Recommendations for scientific community and entrepreneurs

I CROP PRODUCTION

NUTRIENT MANAGEMENT

1. Effect of K, Mg and S on growth and yield of *Bt* Cotton

The *Bt* cotton crop grown on medium K and deficient S status soil may be fertilized with 100 kg K (KCl), 100 kg $MgSO_4$ and 30 kg S (gypsum) per hectare each in two equal splits at 30 and 60 DAS besides recommended dose of N.

(Associate Research Scientist, Micronutrient Research Project, AAU, Anand)

II PLANT PROTECTION

ENTOMOLOGY

1. Preharvest intervals (PHI) of acephate on brinjal

Two foliar sprays of acephate in brinjal at 10-day interval @ 560 g a.i./ha starting from fruiting stage resulted in its residue below Maximum Residue Levels (MRL) 0.1 µg/g Limit of Quantitation, LOQ in brinjal if fruits are harvested 10th day after the second spray. Therefore, PHI of 10-day could be suggested if acephate is recommended on brinjal.

(Residue Analyst, AINP on Pesticide Residue, AAU, Anand)

2. Preharvest intervals (PHI) of profenophos on brinjal

Two foliar sprays of profenophos in brinjal at 10-day interval @ 500 g a.i./ha starting from fruiting stage resulted in its residue below European Union (EU) MRL of 0.05 µg/g in brinjal fruits if harvested 15th day after the second spray. Therefore, PHI of 15-day could be suggested if profenophos is recommended on brinjal.

(Residue Analyst, AINP on Pesticide Residue, AAU, Anand)

3. Preharvest intervals (PHI) of triazophos on brinjal

Two foliar sprays of triazophos in brinjal at 10-day interval @ 500 g a.i./ha starting from fruit initiation stage resulted in its residue below the MRL of 0.05 µg/g (LOQ) in brinjal if fruits are harvested 15th day after the second spray. Therefore, PHI of 15-day could be suggested if triazophos is recommended on brinjal.

(Residue Analyst, AINP on Pesticide Residue, AAU, Anand)

4. Preharvest intervals (PHI) of chlorpyriphos on cabbage

Two foliar sprays of chlorpyriphos in cabbage at 10-day interval @ 300 g a.i./ ha starting from head formation stage resulted in its residue below EU/Codex MRL of 1.0 µg/g in cabbage if harvested even one hour (0-day) after the second spray. Therefore, PHI of 1-day could be suggested if chlorpyriphos is recommended on cabbage.

(Residue Analyst, AINP on Pesticide Residue, AAU, Anand)

5. Preharvest intervals (PHI) of profenophos on cabbage

Two foliar sprays of profenophos in cabbage at 10-day interval @ 500 g a.i./ha starting from head formation stage resulted in its residue below EU MRL of 0.05 µg/g in cabbage if heads are harvested 7th day after the second spray. Therefore, PHI of 7-day could be suggested if profenophos is recommended on cabbage.

(Residue Analyst, AINP on Pesticide Residue, AAU, Anand)

6. Preharvest intervals (PHI) of acephate on capsicum

Two foliar sprays of acephate in capsicum at 10-day interval @ 560 g a.i./ha starting from fruit initiation stage resulted in its residues below MRL of 0.1 µg/g (LOQ) in capsicum fruits if harvested 15th day after the second spray. Therefore, PHI of 15-day could be suggested if acephate is recommended on capsicum.

(Residue Analyst, AINP on Pesticide Residue, AAU, Anand)

7. Preharvest intervals (PHI) of profenophos on capsicum

Two foliar sprays of profenophos in capsicum at 10-day interval @ 500 g a.i./ha starting from fruit initiation stage resulted in its residue below 0.05 µg/g (LOQ) in capsicum if fruits are harvested from 10th day after the second spray. Therefore, PHI of 10-day could be suggested if profenophos is recommended on capsicum.

(Residue Analyst, AINP on Pesticide Residue, AAU, Anand)

8. Preharvest intervals (PHI) of quinalphos on capsicum

Two foliar sprays of quinalphos in capsicum at 10-day interval @ 250 g a.i./ha starting from fruit initiation stage resulted in its residue below EU MRL of 0.05 µg/g in capsicum if fruits are harvested 1 day after the second spray. Therefore, PHI of 1-day could be suggested if quinalphos is recommended on capsicum.

(Residue Analyst, AINP on Pesticide Residue, AAU, Anand)

9. Preharvest intervals (PHI) of triazophos on capsicum

Two foliar sprays of triazophos in capsicum at 10-day interval @ 500 g a.i./ha starting from fruit initiation stage resulted in its residue below the MRL of 0.05 µg/g (LOQ) in capsicum if fruits are harvested 7th day after the second spray. Therefore, PHI of 7-day could be suggested if triazophos is recommended on capsicum.

(Residue Analyst, AINP on Pesticide Residue, AAU, Anand)

10. Preharvest intervals (PHI) of chlorpyriphos on cauliflower

Two foliar sprays of chlorpyriphos in cauliflower at 10-day interval @ 300 g a.i./ha starting from curd formation stage resulted in its residue below EU MRL of 0.05 µg/g in cauliflower if harvested 15th day after second spray. Therefore, PHI of 15-day could be suggested if chlorpyriphos is recommended on cauliflower.

(Residue Analyst, AINP on Pesticide Residue, AAU, Anand)

11. Preharvest intervals (PHI) of cypermethrin on cauliflower

Two foliar sprays of cypermethrin in cauliflower at 10-day interval @ 50 g a.i. /ha starting from curd formation stage resulted in its residue below EU MRL of 0.05 µg/g in cauliflower curd if harvested 5th day after the second spray. Therefore, PHI of 5-day could be suggested if cypermethrin is recommended on cauliflower.

(Residue Analyst, AINP on Pesticide Residue, AAU, Anand)

12. Preharvest intervals (PHI) of profenophos on cauliflower

Two foliar sprays of profenophos in cauliflower at 10-day interval @ 500 g a.i./ ha starting from curd formation stage resulted in its residue below EU MRL 0.05 µg/g in cauliflower curd if harvested 7th day after the second spray. Therefore, PHI of 7-day could be suggested if profenophos is recommended on cauliflower.

(Residue Analyst, AINP on Pesticide Residue, AAU, Anand)

13. Preharvest intervals (PHI) of acephate on chilli

Two foliar sprays of acephate in chilli at 10-day interval @ 560 g a.i./ha starting from fruiting stage resulted in its residue below the Codex MRL of 5.0 µg/g harvested one hour after application. Therefore, PHI of 1-day could be suggested if acephate is recommended on chilli.

(Residue Analyst, AINP on Pesticide Residue, AAU, Anand)

14. Preharvest intervals (PHI) of cypermethrin on chilli

Two foliar sprays of cypermethrin in chilli at 10-day interval @ 50 g a.i./ha starting from fruit initiation stage resulted in its residue below EU MRL of 0.5 µg/g in chilli if fruits are harvested on even 1 hour (0-day) after the second spray. Therefore, PHI of 1-day could be suggested if cypermethrin is recommended on chilli.

(Residue Analyst, AINP on Pesticide Residue, AAU, Anand)

15. Preharvest intervals (PHI) of profenophos on chilli

Two foliar sprays of profenophos at 10-day interval @ 500 g a.i./ha starting from fruit initiation stage resulted in its residues below the MRL of 0.05 µg/g (LOQ & EU MRL) in chilli fruits if harvested 10th day after the second spray. Therefore, PHI of 10-day could be suggested if profenophos is recommended on chilli.

(Residue Analyst, AINP on Pesticide Residue, AAU, Anand)

16. Preharvest intervals (PHI) of cypermethrin on tomato

Two foliar sprays of cypermethrin in tomato at 10-day interval @ 50 g a.i./ha starting from fruiting stage resulted in its residues below EU MRL of 0.5 µg/g in tomato if fruits are harvested even one hour (0-day) after the second spray. Therefore, PHI of 1-day could be suggested if cypermethrin is recommended on tomato.

(Residue Analyst, AINP on Pesticide Residue, AAU, Anand)

17. Preharvest intervals (PHI) of profenophos on tomato

Two foliar sprays of profenophos in tomato at 10-day interval @ 500 g a.i./ha starting from fruit initiation stage resulted in its residue below EU MRL of 10.0 µg/g in tomato even if fruits are harvested one hour (0-day) after the second spray. Therefore, PHI of 1-day could be suggested if profenophos is recommended on tomato.

(Residue Analyst, AINP on Pesticide Residue, AAU, Anand)

18. Preharvest intervals (PHI) of triazophos on tomato

Two foliar sprays of triazophos in tomato at 10-day interval @ 500 g a.i./ha starting from fruit initiation stage resulted in its residue below the MRL of 0.05 µg/g (LOQ) in tomato if fruits are harvested 10th day after the second spray. Therefore, PHI of 10-day could be suggested if triazophos is recommended on tomato.

(Residue Analyst, AINP on Pesticide Residue, AAU, Anand)

PLANT PATHOLOGY

19. Multiple resistant rice genotypes

Rice genotypes viz., IET- 21267, IET- 20937, IET- 20594, IET-20923, IET- 21463, IET- 20235, IET- 20334, IET- 21176, IET-21216, CB 05-031, CB-07-115, NWGR-5072 and CR-2428-9 were found to have multiple resistant reaction against bacterial blight (*Xanthomonas oryzae pv. oryzae*), blast (*Pyricularia grisea*) and sheath rot (*Sarocladium oryzae*) diseases under artificial inoculation and high disease pressure conditions in the field. These genotypes can be used in breeding programme for developing resistant varieties.

(Associate Research Scientist (Plant Patho.), MRRS, AAU, Nawagam)

III BASIC SCIENCE

1. Effect of different nitrogen levels on green leaf yield, protein and phyto-chemicals of different tobacco varieties and their residual effects on wheat (Joint study with Agronomy Department)

Bidi tobacco variety MRGTH 1 transplanted during 2nd week of September and fertilized with 220 kg N/ha and harvested at 90 DAT produced high protein yield from green leaf of tobacco. This system found suitable to cultivate wheat crop during 3rd week of December with recommended dose of fertilizers.

(Research Scientist (Tobacco), BTRS, AAU, Anand)

2. Evaluation of different genotypes of brinjal for their biochemical traits

Brinjal cv. Doli-5 has higher amount of vitamin-C and anthocynin and lower amount of phenol and glycoalkaloids and AB-09-1 has higher total carbohydrates as well as total soluble sugars. Both the genotypes are more suitable for consumers use as compared to other brinjal genotypes.

(Research Scientist & Head, Dept. of Biochemistry, BACA, AAU, Anand)

3. Tetraploid cotton derived SSR markers that can be exploited for marker assisted breeding for enhancing fibre quality.

Tetraploid (*G. hirsutum*) derived SSR markers showed transferability in diploid cotton (*G. herbaceum* and *G. arboreum*) and thus can be successfully utilized for marker assisted breeding in diploid cottons for fibre quality enhancement

(Professor & Head, Biotechnology, AAU, Anand)

IV DAIRY SCIENCE, FOOD PROCESSING AND AGRICULTURAL ENGINEERING

1. Shelf life study of *Thabdi* employing different packages

Shelf life of *Thabdi* can be extended 15-20% by filling the product in a PVC tray, inserting in Met-Polyester/PE pouch (106 µm) or Polyester/PE pouch(74 µm) followed by heat sealing the pouches. Under the ambient storage (30±2^{0}C), the *Thabdi* packaged as above gives shelf life of 10 days, while under refrigeration temperature (7±2^{0}C), the product can be safely stored for almost 49 days.

(Professor and Head, Dept. of Dairy Technology, DSC, AAU, Anand)

2. Shelf life study of *Halvasan* employing different packages

Shelf life of *Halvasan* can be extended by 15-20% by filling the product in a PVC tray, inserting in Met-Polyester/PE pouch (106 µm) or Polyester/PE pouch (74 µm) followed by heat sealing the pouches. Under the ambient storage (30± 2^{0}C), the *Halvasan* packaged as above gives shelf life of 10 days, while under refrigeration temperature(7± 2^{0}C), the product can be safely stored for almost 42 days."

(Professor and Head, Dept. of Dairy Technology, DSC, AAU, Anand)

3. Enhancement of Shelf life of paneer

It is recommended to dip paneer in vinegar or lactic acid (4%) for 30 minutes, followed by partial removal of moisture under vacuum (36-38^{o}C) as per AAU protocol and packaging in LDPE bags of 90 µm thickness, could enhance the shelf life of paneer up to 90 days under refrigerated (7±2^{o}C) storage. Upon rehydration in warm water (55-60^{o}C), the paneer obtained had similar rheological properties compared to that observed in fresh paneer. This paneer is suitable for use in various Indian cuisines.

(Professor and Head, Dept. of Dairy Proc.Operations, DSC, AAU, Anand)

4. Standardization of technology for manufacture of "Low Fat" and "Sugar Free" shrikhand

A process is standardized to manufacture low fat, sugar free Shrikhand as per AAU protocol with sucralose as intense sweetener and using either Isomalt or Fructo-oligosaccharide (FOS) as bulking agent. The Shrikhand thus obtained has better sensory attributes.

(Professor and Head, Dept. of Dairy Proc.Operations, DSC, AAU, Anand)

5. Production technology of freeze dried aonla slices

The entrepreneurs and food processors interested in production of dried aonla slices are advised to use freeze drying protocol developed by Anand Agricultural University. The technology enables production of ascorbic acid rich (above 90% retention) dried aonla slices.

(Professor and Head, Dept of Post Harvest Engg. FPT&BE, AAU, Anand)

6. Production technology of vacuum dried ginger flakes

The entrepreneurs and food processors interested in production of dried ginger slices are advised to follow the vacuum drying protocol developed by Anand Agricultural University. The technology enables production of *gingirol* rich dried ginger flakes.

(Professor and Head, Dept of Post Harvest Engg. FPT&BE, AAU, Anand)

7. Supercritical Fluid Extraction of Volatile Oil from Basil Leave

For production of superior quality volatile oil rich in eugenol and higher yield from basil leaves, the super critical fluid extraction technology developed by Anand Agricultural University is recommended.

(Professor and Head, Dept. of FQA, FPT&BE, AAU, Anand)

V ANIMAL PRODUCTION

1. To study the effect of hormonal and managemental factors on reduction in age at first calving in heifers under field conditions

In anestrous crossbred cow heifers CIDR application results in estrus induction and successful conception.

(Research Scientist, RBRU, Vet. College, AAU, Anand)

2. Detection of early pregnancy in goats by using Ultra sonography and to develop package of practices

Using Ultra Sonography (USG) with 3.5 MHz rectal, trans abdominal transducer as a tool following ultra sonographic findings can be observed with the progress of gestation period in goats:

Gestational days	USG Findings
19-30 days	Gestational sac
22-25 days	Area of heart beats
31 days	Fluid filled sac surrounding conceptus
42 days	Area of heart, neck, thorax
64 days	Fore limb, hind limb buds
84 days	Vertebral column and rib cages

(Research Scientist, RBRU, Vet. College, AAU, Anand)

3. Development of area-specific mineral mixture formulations for Kheda district

Based on the prioritization of limiting minerals in Kheda district, the area specific mineral mixture has been formulated which would makeup the deficiency when fed @ 30g/head/day to adult dairy animals in addition to the current feeding practices.

Sr. No	Mineral element	Requirement (%)	Mineral salt	Quantity (kg)
1	Calcium	20.000	Calcite powder	14.53
2	Phosphorus	12.010	Di Calcium Phosphate	66.72
3	Magnesium	4.890	Magnesium oxide	9.06
4	Sulphur	1.000	Sodium thiosulphate	2.56
5	Copper	0.100	Copper sulphate	0.40
6	Zinc	1.400	Zinc sulphate	4.24
7	Manganese	0.332	Manganese sulphate	1.07
8	Iron	0.400	Ferrous sulphate	1.33
9	Cobalt	0.012	Cobalt sulphate	0.06
10	Iodine	0.026	Potassium iodide	0.03
			Total	**100.00**

(Research Scientist, ANRS. Vet. College, AAU, Anand)

4. Study on compensatory growth in crossbred calves fed crop residue based total mixed ration (TMR) with strategic approach using bypass fat.

Restricted feeding to 8 to12 months old growing crossbred calves at the rate 75% of NRC (1989) standard for 60 days followed by re-alimentation of 60 days at the rate of 125% of requirement, the calves gains higher rate (646.56 g/d) as compared to the calves fed 100% (595.89 g/d) of requirement during re-alimentation.

(Research Scientist, ANRS. Vet. College, AAU, Anand)

5. To study the effect of Solid State Fermented (SSF) biomass supplementation on growth performance of weaner Surti kids

Supplementation of Solid State Fermented (SSF) Biomass @ 4% in Jowar straw: Amul dan (50:50) based Total Mixed Ration improves feed efficiency by 16 % in weaner Surti kids."

(Research Scientist, ANRS. Vet. College, AAU, Anand)

6. Draftability Assessment of *Kachchhi* Camel under Middle Gujarat Agro climatic Condition

Kachchhi camel generates 0.58 and 0.69 horsepower under 2000 and 2500 kg payload as compared to 0.50 at 1500 kg payload during work.

(Professor and Head, Dept. of LPM, Vet. College, AAU, Anand)

7. Draftability Assessment of *Kachchhi* Camel under Middle Gujarat Agro climatic Condition

The speed (m/sec.) and stride length (m) of *Kachchhi* camel remains same under 2000 and 2500 kg payloads in work (W)-rest (R) cycle [(1h(W)-15 min (R) -1h (W)-15 min (R)- 1h(W)-1h(R)- 1hr(W)-15 min (R)- 1h(W)-15 min (R)- 1h(W)].

(Professor and Head, Dept. of LPM, Vet. College, AAU, Anand)

8. Draftability Assessment of *Kachchhi* Camel under Middle Gujarat Agro climatic Condition

GPx and TBARS biomarkers levels *Kachchhi* camel remain high during hot and humid season as compared to summer and winter seasons suggestive of stress the animal.

(Professor and Head, Dept. of LPM, Vet. College, AAU, Anand)

VI ANIMAL HEALTH

1. Use of recent molecular techniques to reduce economic losses incurred due to bovine mastitis by evolving diagnostic, therapeutic and preventive measures

Intramammary infusion of 10 ml of 1% *Prosopis juliflora* alkaloids formulation in normal saline once a day for 5 consecutive days is an effective treatment for bovine sub-clinical mastitis.

(Professor and Head, Dept. of Medicine, Vet. College, AAU, Anand)

2. Etiopathological studies on mortality in broilers

Adulteration of melamine in broiler feed for 21 days at the level of 0.25 and 0.50% was found nephro-toxic causing 4 and 16% mortality, respectively, with deposition of melamine uric acid crystals in the kidneys. Dead birds had yellow turbid bile with presence of melamine crystals. Field veterinarians should be aware of intentional adulteration of melamine as a protein in the poultry feed and feed ingredients.

(Professor and Head, Dept. of Pathology, Vet. College, AAU, Anand)

3. Etiopathological studies on mortality in broilers

Ketoprofen administered orally to broiler chicks @ 5, 15 and 25 mg/kg body weight for 21 days was found nephrotoxic causing 8, 20 and 40% mortality, respectively by inducing lesions of visceral gout.

(Professor and Head, Dept. of Pathology, Vet. College, AAU, Anand)

VII SOCIAL SCIENCE

1. Scale to measure attitude towards farmers' training programmes

The following scale to measure attitude towards farmers' training programmes organized by SAUs of Gujarat State is recommended.

Scale to measure attitude towards farmers' training programmes organized by SAUs of Gujarat State

No.	Final format of selected Statement	SA	A	UD	DA	SDA
1 $^{+}$	I think that farmer's training programmes organized by SAUs help in increasing confidence among farmers.					

2 +	In my opinion the training programmes provide the needful information regarding improved agricultural practices.					
3 -	I recognize that hand out provided during training programme are difficult to understand the agricultural practices					
4 +	In my belief, off campus training programmes organized by SAUs are more beneficial to rural women.					
5 -	I think that for progressive farmers attaining of training programmes organized by SAUs are wastage of time.					
6 -	In my belief farmer's training programmes organized by SAUs are not advisable for experienced farmers					
7 +	I agree that conducting of visit of successful organization during training provide adequate information to the farmers.					
8 +	I think that vocational training programmes conducted by SAUs develop skilled entrepreneur.					
9 +	Information given during training programmes build innovative ideas among farmers.					
10 +	SAUs training programmes create interest among farmers regarding modern farming technology.					

The reliability of above scale was calculated to understand consistency; it was 0.74 in the previous year and 0.76 during last year.

(Director, Institute of Distance Education, AAU, Anand)