

RESEARCH ACCOMPLISHMENTS AND RECOMMENDATIONS

2008



**DIRECTOR OF RESEARCH
NAVSARI AGRICULTURAL UNIVERSITY
NAVSARI - 396 450 (GUJARAT)**

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Citation :

Research Accomplishments and Recommendations
2008,
Navsari Agricultural University,
Navsari

Edited & Published by :

Director of Research
Navsari Agricultural University,
Navsari

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Year of publication :

February 2009

Copies :

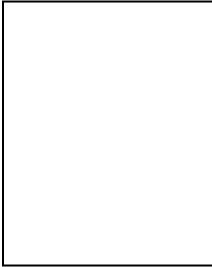
500

Printed at :



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MESSAGE

India is a vast country having 329 m ha of land, which is about 2 per cent of the geographical area of the World with a meager 4 per cent fresh water resource. However, we have to provide food and fodder to enormous human and live-stock population of 1029 and 485 million, respectively. In order to meet ever increasing demands of our fast growing population, it is essential to boost the production of food grains, and fuel for human use and green and dry fodder for livestock. This can only be achieved through evolving scale neutral technologies and their rapid dissemination to the end users.

Navsari Agricultural University is located at Navsari in South Gujarat with jurisdiction over seven districts viz., Narmada, Bharuch, Surat, Navsari, Valsad, Dang and Tapi. Cotton, Sorghum, Sugarcane, Rice and Pulses are the niche crops, while, Mango, Sapota and Banana are important fruit crops of this area, on which the Scientists of University have been concentrating to evolve location specific cost effective technologies. Due to high rainfall and high humidity this region is very congenial for insect pests and diseases. Heavy black soils also pose the problem of poor drainage, salinity and high weed infestation. Our Scientists have been focussing on these

issues to evolve appropriate production technologies. During the year 2007-08, our Scientists have evolved twenty four recommendations for farmers and six for scientific community. I am immensely glad to note that these recommendations are being published in the form of a booklet entitled "Research Accomplishments and Recommendation" by the Directorate of Research, NAU. I am sure that this booklet would serve as an extremely useful source to guide the extension functionaries of the University as well as Line Departments of Agriculture.

I appreciate the Scientists and their associates for their sincere efforts to evolve these recommendations and Director of Research and his team for compiling and bringing out this publication.

Navsari
February 03, 2009

(R.P.S. Ahlawat)
Vice-Chancellor



NAVSARI AGRICULTURAL UNIVERSITY
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PREFACE

The Navsari Agricultural University was carved out of the erstwhile Gujarat Agricultural University and came into existence in May, 2004. The University is working with the major mandates of education, research and extension education. The Scientists of this University have developed location specific and need based technologies which have played very important role in propelling the growth of agriculture in South Gujarat in particular and the state in general. During the last 4 years of its existence, the University has developed a number of high yielding and resistant varieties of niche crops, viz. cotton, sorghum, sugarcane, paddy, pigeon pea, green gram, Wal, Nagali and Vari along with their production and protection technologies. These technologies are disseminated quickly and effectively to the farming community. The University also developed technologies for enhancing production and productivity of fruit crops viz., mango, sapota and banana, including technologies on post harvest management and value addition. The work on the development of BT Cotton has also been initiated with the establishment of State of art Biotechnology Laboratory. The research work on Biofertilizers, Biopesticides and Biological control agents of

insect-pests will help reduce the cost of cultivation and make the farming more profitable. During 2007-08, recommendations proposed by Scientists of different disciplines were discussed under different Agresco Sub-Committees during February to April 2008 and Joint Agresco meeting held at Navsari on 3-5 May, 2008 and following recommendations were approved for farming and scientific community :

Sr. No.	Discipline	No. of Recommendations	
		Farmers	Scientific community
1.	Crop Improvement	4	-
2.	Natural Resource Management	13	3
3.	Horticulture & Agro-forestry	2	-
4.	Plant Protection	5	3
Total ...		24	6

I take this opportunity to express my congratulations to our Scientists for their hard and sincere works for developing the technologies and the conveners of different sub committees and ADR, Dr. G.S. Rao and other staff members of Directorate of Research for their contributions / efforts in bringing out this publication.

I am highly indebted to Hon. Vice-Chancellor Dr. R.P.S. Ahlawat for his constant guidance and support for the publication of this valuable booklet.

Navsari
February 03, 2009

(H.C. Pathak)
Director of Research & Dean
Faculty of PG Studies

Recommendations for Farmers

I CROP IMPROVEMENT

1. Rice : NAUR-1 (NVSR-20)

This variety gave an average yield of 5998 kg/ha during *kharif* season showing a yield advantage of 21.47% over GR-7. The variety has slender grain having a length of 9.30 mm and L/B ratio of 3.48. It has non-lodging habit with



green and strong culm. The reaction to major diseases and pests is comparable to check. It is recommended for transplanted rice growing area of south Gujarat including coastal belt.

2. Sorghum : Gujarat Jowar-42 (SR 666-1)

This variety gave 23.7% and 27.8% higher grain (3108 kg/ha) as well as 7.8% and 28.2% higher dry fodder yields (10801 kg/ha) than GJ-38 and GJ-40, respectively having superior grain quality. Grains are pearly white and



attractive. The variety has non-lodging habit with optimum panicle exertion, straight peduncle and semi-loose panicle, less disease and comparable pest incidence. This variety is recommended for south Gujarat region.

3. Moong bean : GBM-1 (RTM-10)



This variety giving 930 kg/ha yield showed 27.75% yield advantage over Co-4. It is a short duration, medium tall variety having black coloured bold seeds, moderately resistant to MYMV, powdery mildew and macrophomina blight diseases and suitable for *rabi* cultivation under conserved moisture

condition. This variety is recommended for south Gujarat region.

4. Cotton : G.Cot-20 (GSHV-97/59)

This is a medium long staple hirsutum variety, having an average yield of 1760 kg/ha. It showed yield superiority to the tune of 29.2%, 30.5%, 25.1% and 50.4% over G.Cot-10, G.Cot-16, G.Cot-18 and LRA-5166, respectively under irrigated condition. It is moderately tolerant to jassid, aphids, thrips and boll worms and



moderately resistant to bacterial blight, moderately susceptible to alternaria leaf spot and free from grey mildew disease. This variety is recommended for irrigated area of Gujarat state.

II NATURAL RESOURCE MANAGEMET

[A] Cropping systems

1. Cropping systems: diversification and/or intensification

The farmers of AES-III of South Gujarat Heavy Rainfall Zone are advised to adopt the early group of Paddy (GR-3)-Fenugreek (Vegetable)-Okra (Vegetable) or Paddy (GR-3)-Onion-Cow pea (Vegetable) crop sequence for securing higher production and net return.

[B] Cultural practices

1. Effect of different land configuration and mulching on yield of mustard

The farmers of coastal belt of South Gujarat (AES-IV), growing mustard after transplanted *kharif* paddy, are advised to open 15-20 cm deep and 25-30 cm wide furrow after every 3 rows of mustard and apply 6 irrigations each of 40 mm depth in furrow to save 20% water without reduction in yield.

2. Agronomic requirement of promising newly released *hirsutum* hybrid, G.Cot.Hy-12

Farmers of South Gujarat Zone-II, growing cotton (G.Cot.Hy-12) on high P status soils under rainfed conditions, are advised to sow the crop at a spacing of 120 cm x 60 cm and apply 80 kg N/ha in 2-3 equal splits.

3. Effect of ploughing frequency on yield of paddy and subsequent groundnut crop

The farmers of AES-III of South Gujarat Heavy Rainfall Zone, adopting paddy-summer groundnut

sequence, are advised to follow 6" deep ploughing after harvest of paddy for higher yield and net return.

4. Tillage technology for rice-sugarcane cropping sequence

Farmers of South Gujarat Heavy Rainfall Zone (AES-III), adopting paddy (*kharif*)-sugarcane crop sequence, are advised to cultivate two times with tractor-drawn-cultivator before monsoon followed by just planking before transplanting paddy to get higher yield of sugarcane and net return from the sequence.

[C] Nutrient management

1. Integrated nutrient management in paddy-sugarcane (2 years) cropping sequence

The farmers of South Gujarat Heavy Rainfall Zone are recommended to adopt following nutrient management package for *kharif* paddy-sugarcane (2 years) sequence for realizing higher yield and net return.

Option-I : Based on soil test values

Paddy : 110-30-00 NPK kg/ha
Sugarcane (Plant) : 280-125-45 NPK kg/ha
Sugarcane (Ratoon) : 310-125-75 NPK kg/ha

Option-II : For improving soil fertility

Paddy : FYM 6.0 t/ha + Poultry manure 1.5 t/ha
+ 60 kg N/ha
Sugarcane (Plant) : FYM 12.5 t/ha + Poultry manure 3.12 t/ha
+ 125 kg N/ha
Sugarcane (Ratoon) : FYM 15 t/ha + Poultry manure 3.7 t/ha
+ 150 kg N/ha

2. Nitrogen and phosphorus requirement of rainfed soybean

The farmers of AES-II of South Gujarat Heavy Rainfall Zone, growing rainfed soybean (Gujarat Soybean-2), are advised to apply 60 kg N and 30 kg P₂O₅ to realize higher seed yield and net return. The 50% N and 100% P₂O₅ are to be applied as basal and remaining 50% N is to be applied at 30 days after crop emergence.

In the event of monetary constraint, they are advised to apply only P @ 30 kg P₂O₅/ha.

[D] Water Management

1. Irrigation and integrated nutrient management in *rabi* niger and its residual effect on succeeding summer green gram under South Gujarat conditions

The farmers of South Gujarat Heavy Rainfall Zone (AES-III) intending to grow *rabi* niger are advised to give 4



irrigations for getting higher seed yield and net return. The first irrigation should be given at the time of sowing, second at 18-20 days after sowing and remaining 2 at an interval of 24-25 days. The crop should be fertilized with either RDF (40-20-00 NPK kg/ha) or FYM @ 5 t/ha + 50% RDF (20-10-00 NPK kg/ha) for obtaining higher seed yield and net return.

They are further advised to grow summer green gram as succeeding crop without applying any fertilizer for obtaining higher net return.

2. Response to different levels of irrigation by sorghum varieties grown on clay soils in *rabi* season



The farmers of AES-III of South Gujarat Heavy Rainfall Zone, growing sorghum in *rabi* season, are advised to prefer BP 53 or GJ-38 variety and irrigate at 0.6 IW/CPE ratio which requires six irrigations. The schedule of irrigation is first at sowing, second at 8 to 10 days after sowing and remaining four irrigations at 20-24 days interval.

3. Study on irrigation and nitrogen management in palmarosa grass

The farmers of AES-III of South Gujarat Heavy Rainfall Zone intending to grow palmarosa are advised to irrigate the crop at 0.6 IW/CPE ratio (14 irrigations). First irrigation should be



given at transplanting or at cutting after monsoon, subsequent 7 irrigations at an interval of 18-20 days during winter and remaining 6 at 12-14 days interval during summer. The farmers should also apply N @ 100 kg/ha (20 kg/ha as basal, 16 kg/ha after 30 DAP, 16 kg/ha after first cut, 16 kg/ha after 30 days of first cut, 16 kg/ha after second cut and 16 kg/ha after 30 days of second cut) besides basal doses of P_2O_5 @ 60 kg/ha, K_2O @ 40 kg/ha and $ZnSO_4$ @ 10 kg/ha every year.

4. Irrigation scheduling in summer paddy



The farmers of South Gujarat Heavy Rainfall Zone (AES-III), growing summer paddy, are advised to adopt puddling with power tiller and reirrigate the crop 3 to 5 days after disappearance of standing water.

5. Scheduling of irrigation in *rabi* castor in presence and absence of mulches



The farmers of coastal area of South Gujarat (AES-IV) are advised to apply 6 irrigations to *rabi* castor (GCH-4) sown before 15th November *i.e.* after *kharif* paddy. The

first irrigation should be given at sowing and the remaining five irrigations at 20-25 days interval. It is further recommended to mulch the crop with grass @ 5 t/ha for realizing higher seed yield and net return.

[E] Precision Farming

1. Large scale testing of precision farming technologies for brinjal on research farm



The farmers of South Gujarat growing brinjal (Variety Surati Ravaiya) are recommended to adopt following package of practices for higher yield and net return.

- 1) Paired row planting (0.6 m x 0.6 m x 1.2 m)
- 2) System details : lateral spacing 1.8 m, dripper spacing 1.0 m, dripper discharge 8 lph. Operate the system for 1.5 hrs during November to January, 2.5 hrs during February to March and 3.0 hrs during April to June on alternate day at 1.25 kg/cm² pressure.
- 3) Fertigation schedule : 80-50-50 NPK kg/ha (*i.e.* 80% N of RD) of which 16:50:50 NPK kg/ha as basal and remaining 64 kg N/ha to be applied in 4 equal splits through fertigation at monthly interval from date of transplanting.
- 4) Black plastic mulch : 25 μ (45% coverage).

III HORTICULTURE AND AGRO-FORESTRY

[A] Fruit Crops

1. Performance of mango cv. Kesar raised by approach graft, softwood graft and softwood graft *in situ*



Kesar mango raised through softwood graft *in situ*

The farmers of Gujarat desiring to establish new orchard of mango cv. Kesar are advised to adopt softwood graft *in situ* for higher yield and net return.

[B] Flower Crops

1. Effect of different edible dyes on flower colouring of tuberose cv. Single Local and Double Local

For value addition in tuberose, colouring technique can be adopted by using edible dyes. The tuberose cut spikes can be immersed in edible dyes *viz.*, carmosine red, sunset yellow and tetrazine blue solution at 0.3% concentration (3 g/l water) for one hour separately to obtain



desired colour shades of red, yellow and blue, respectively. Further, to improve floret opening and vase life, vase solution, 8-HQ at 300 ppm (300 mg/l) + 4% sucrose (40 g/l) can be used in both the Single Local and Double Local cultivars of tuberose.

IV PLANT PROTECTION

[A] Plant Pathology

1. Control of bacterial leaf blight of rice

Farmers growing bacterial leaf blight susceptible rice varieties in endemic area are advised to spray 1 g

streptocycline (98% WP) + 10 g Copper oxychloride (50% WP) in 20 litres of water (CBR 1:3.8) **OR** 50 g Copper hydroxide (54% DF) in 20 litres of water (CBR 1:1.64) to manage bacterial blight effectively and to get more yield and income.

[B] Agricultural Entomology

1. Management of rice sheath mite

Farmers of South Gujarat are advised to spray propargite 0.05% (CBR 1:7.24) or dicofol 0.05% (CBR 1:6.03) twice; first at the initiation of infestation and subsequent spray at 15 days after first spray for the control of rice sheath mite, *Steneotarsonemus spinki* Smiley.

2. IPDM module for management of pest and disease complex of paddy

Paddy growers of South Gujarat are advised to apply IPDM practices as under to get more grain and straw yield (CBR 1: 25.75) :

- 1) Removal of dead hearts from seedlings
- 2) Root dip treatment in *Azospirillum* (2×10^8 CFU/g) @ 200 g/20 lit of water for 15 minutes
- 3) Cleaning of bunds
- 4) Make 30 heaps of 60 kg straw on bund and broadcast 60 kg straw in field (per ha)
- 5) Apply carbofuran 3G @ 10 kg/1000 m² in nursery after 15 days of sowing followed by spraying of monocrotophos 0.036% (15 and 40 DAT) and imidachloprid 0.005% (65 DAT)
- 6) Spraying of mancozeb 0.3% at panicle emergence.

3. Spot application of insecticides for control of insect-pest complex of paddy

Paddy growers of South Gujarat are advised to give spot application of recommended insecticides viz., carbofuran, monocrotophos, imidachloprid (CBR 1: 19.46) for effective and economical management of stem borer, blue beetle, hoppers and ear head bug.

4. Impact of abiotic factors on abundance of male fruit fly population in mango



Farmers of South Gujarat are advised to monitor fruit fly in mango orchard during April to July in general and second fortnight of June to second fortnight of July in particular. Prevalence of low sunshine coupled with high humidity, higher rainfall with more rainy days and higher wind velocity during the fruiting and late harvest period of the crop (third week of June to fourth week of July) may result in high population of fruit fly, therefore, the farmers of South Gujarat are suggested to adopt recommended measures (installation of methyl eugenol impregnated wood block traps @ 10/ha and collection and disposal of fallen fruits).

Recommendations for Scientific Community

I NATURAL RESOURCE MANAGEMET

1. Preparation of nutrient enriched organic manure through vermicomposting



It is advised to prepare enriched vermicompost by using dung and sugarcane trash (70:30 w/w) in south Gujarat by adopting the procedure given below :

Procedure for 1 ton of raw material :

- 1) Select a suitable place under shade of trees (or so) at slightly elevated position. Make one layer (10 m x 5 m) with 140 kg of cattle dung and above that one layer with 60 kg of Sugarcane trash.
- 2) Sprinkle water sufficiently to moist the material up to around 60%.
- 3) Make slurry with 1 kg decomposing culture of microorganisms (VSI, Pune), 8 kg urea, and 10 kg SSP and 100 kg cow dung. Add 1/5th of this slurry thoroughly on the trash layer.

- 4) Continue the above steps to have 5 alternate layers of cattle dung and sugarcane trash.
- 5) Seal the upper surface of heap with a thin layer of semi-solid cattle dung and then cover with gunny bag (jute). Allow to decompose the heap for about a month maintaining optimum moisture (around 60%) with two intermittent turnings.
- 6) Incorporate 2.5 kg earthworms (preferably *Eudrilus enginae* of medium size) in the moist zone of the heap making small holes at 14/15 places.
- 7) Continue to sprinkle water at 2 to 3 days interval to maintain moisture (around 60%). Material is ready when brownish dark colour appears after about 75 to 80 days. Stop watering at least 6 days before harvesting and harvest vermicompost gradually from the surface of the heap.

2. Green house cultivation in South Gujarat - A survey



Based on the information of survey of green house cultivation, following conclusions have emerged.

- 1) Green house cultivation of gerbera, rose, carnation and capsicum crops is economically viable under South Gujarat. Among the crops, floriculture crops were found more remunerative than capsicum.
- 2) The major problems encountered by the farmers are :
 - No erection company in Gujarat
 - No information available from Govt.
 - No training centre in Gujarat.
 - Planting material not available locally
 - Pest and diseases
 - High summer temperature
 - High power charge
 - High cost of fertilizer
 - High cost of planting material.

3. Patchouli cultivation in South Gujarat - A survey



From the information generated through survey, following conclusions have emerged.

- 1) Patchouli cultivation is economically viable under South Gujarat conditions.

- 2) Problems experienced by the growers are :
- Water stagnation during monsoonic months
 - Pests and disease
 - Weed problem
 - Absence of improved varieties(high oil content)
 - Water and nutrient management
 - Poor awareness about cultivation practices among the farmers
- 3) Other problems
- Unavailability of quality planting material
 - High cost of planting material
 - Inadequate extraction unit
 - Lack of marketing net work

II PLANT PROTECTION

[A] Agricultural Entomology

1. Impact of abiotic factors on abundance of sucking pests in mango

There is need to monitor the hopper and thrips population on mango during flowering and fruit setting in general and pea cum marble stage of fruits in particular as the prevalence of high humidity (>70%) increases the population of mango hopper under South Gujarat condition.



2. Screening of paddy varieties against sheath mite

Out of 8 early (GR-3, GR-4, GR-5, GR-6, GR-7, IR-21, IR-28, IR-50) and 9 mid-late to late (GR-11, Jaya, Gurjari, GR-10, Narmada, GR-101, GR-102, GR-103 and Masuri) genotypes of paddy, screened against rice sheath mite, *Steneotarsonemus spinki*. IR-50 and Masuri were found tolerant, whereas GR-6, Jaya and Gurjari were found highly susceptible.

3. Mechanism of resistance of okra varieties to spider mite

Mite population was low in varieties of okra having low hair density. AOL-04-02 and JOL-05-07 were found less susceptible, while Parbhani Kranti, GO-2 and JOL-05-03 were found highly susceptible.