

RESEARCH ACCOMPLISHMENTS AND RECOMMENDATIONS

2008



**DIRECTORATE OF RESEARCH
ANAND AGRICULTURAL UNIVERSITY
ANAND 388 110**

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MESSAGE

I am pleased to bring out “Research Accomplishments and Recommendations of 2007 & 2008” which include different technologies developed by Scientists of all the faculties of Anand Agricultural University considering Agro ecological conditions of jurisdiction of AAU for the betterment of farming community. This booklet will be very much helpful to the line departments, NGOs and students working for the betterment of farming community.

I take this opportunity to congratulate our scientists and associated staff who worked hard for developing these and Director of Research and his team for compilation of all these technologies in the form of booklet.

(M. C. VARSHNEYA)
VICE CHANCELLOR



FOREWORD

It gives me immense pleasure to put forward the third “Research Accomplishments and Recommendations of 2007 & 2008” covering technologies developed by Scientists of all the faculties of Anand Agricultural University.

The need based technologies for enhancing the productivity in agricultural and related fields for the welfare of farmers and rural communities of Gujarat have been developed by this University.

Technologies developed by the Scientists are enhancing the productivity in the field of agriculture and animals which will lead to upliftment of socio-economic situation of farmers of Gujarat.

I complement and congratulate all the scientists’ and co-workers of Anand Agricultural University for their sincere efforts, dedication and competent service for developing technologies in the field of Agricultural and related areas for the benefit of farming community.

(A. R. PATHAK)
DIRECTOR OF RESEARCH & DEAN
FACULTY OF P.G.STUDIES

PREFACE

Gujarat State is one of the most prosperous states as Agriculture growth rate is 12.36% at constant price of 1999-2000 against less than 2% of National growth rate in Agriculture. For this spectacular advancement, the role of newer technologies is of great importance.

Sincere, dedicated and hard efforts of our scientists resulted into valuable recommendations for farmers and scientific communities which have been confirmed through exhaustive, critical, meaningful and healthy deliberations in various research sub-committees

The total research work conducted during last three years by the scientists of Anand Agricultural University has been very well churned to bring out useful and fruitful recommendations for farmers and scientific community.

Over all, there have been heartening developments in research of certain areas such as Animal and Agril. Bio-technology, crop improvement, crop protection, fermented dairy products, pesticide residue, animal nutrition, livestock research etc.

It is a high time to intensify and diversify our research in agricultural, animal science and dairy science, so that solution to most of the burning problems can be given to farmers / animal keepers in time. Our scientists have capability to face new challenges adequately and use them as opportunity to improve the quality and capacity.

The AGRESCO sub-committees of various disciplines met to review the progress of research and scrutinized findings of experiments and finalized the new technical programmes. The recommendations made by different committees for adoption by the farmers in agriculture are listed below.

Name of the Sub-committee	No. of recommendations finalized for farmers
Crop Improvement	03
Crop Production	11
Plant Protection	07
Basic Science	01
Dairy Science, Agri. Engineering & Processing	04
Animal Production	06
Animal Health	01
Social Science	04

I CROP IMPROVEMENT

1. Anand Tobacco-10 (ABT-10)



This variety is highly resistant to root knot nematode. This genotype has given on an average 2697 kg/ha yield, showing yield increment of 17 and 3 % higher than existing check varieties A-119 and GT-5, respectively.

(Research Scientist (Tobacco), Bidi Tobacco Research Station, AAU, Anand)

2. Anand Tomato-3 (AT-3)



This variety possesses high lycopene and carotenoids with fruit yield of 326.64 q/ha, which is 31 % higher than check variety GT-2. The growth habit of this variety is determinate type and suitable for cultivation under irrigated open field condition.

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

3. Anand Deshi Cotton-1 (ADC-1)



This variety is suitable for desi cotton growing area of North-west Agro climatic zone-VIII except Kutch. It has given on an average 1306 kg/ha cotton seed yield which is 27.8, 23.4 and 10.0 % higher than the check varieties V797, G. Cot-13 and G. Cot-21, respectively. This genotype also gave 25.23, 20.18 and 4.48 % higher lint yield over the check varieties V-757, G.Cot-13 and G. Cot-21, respectively, besides has big ball size and synchronism in maturity.

(Associate Research Scientist, Regional Cotton Research Station, AAU, Viramgam)

II CROP PRODUCTION

[A] CULTURAL PRACTICES

1. Response of sowing dates and spacing to *semi-rabi* castor

The farmers of Middle Gujarat Agro-climatic Zone-III (AES-II) are advised to sow semi-rabi castor (GCH-5) during 10th to 25th September with a spacing of 120 cm x 75 cm to obtain higher yield and net return.

(Prof. & Head, Dept. of Agronomy, BACA, Anand)

2. Evaluation of genotypes of rabi sorghum under different planting times



Farmers of Bhal and Coastal Zone-VIII are advised to sow sorghum variety SSG-59-3 upto 30th October to obtain higher green and dry fodder yields and higher net return under conserved moisture condition in rabi season.

In case of delayed sowing, variety Maldandi (M 35-1) should be preferred.

(Research Scientist, NARP, Arnej)

3. Studies on optimum seed rate for rustica tobacco nursery

The farmers of middle Gujarat agro-climatic zone-III (AES-II) are advised to use 8 kg seed/ha for raising rustica tobacco nursery to get more transplantable seedlings and net return.

(Research Scientist (Tobacco) Bidi Tobacco Research Station, Anand)

[B] NUTRIENT MANAGEMENT

4. Response of maize to irrigation, nitrogen and phosphorus



The farmers of Middle Gujarat Agro-climatic Zone-III (AES-II) growing maize (cv. GM-3)

are advised to apply 120 kg N + 60 kg P₂O₅ per ha (Basal- 60 : 60 kg NP /ha, Top dressing -60 kg N/ha twice) and irrigate the crop at 1.0 IW/CPE ratio (total 7 irrigations each of 60 mm depth) in rabi season for securing higher yield and net return. First irrigation should be given at the time of sowing, second at 6 DAS and remaining five irrigations at 20 days interval.

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

5. Integrated nutrient management in bidi tobacco (GTH 1)

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 ammonium sulphate and urea at the proportion of 1:3 + *Azotobacter chroococcum*, ABA-1 (4 kg/ha) or 187 kg N (AS + Urea 1:3) + *Azospirillum lipoferrenm*, ASA-1 (4 kg/ha) and FYM @ 12.5 t/ha for saving 15% N and to obtain higher yield of tobacco.

**(Research Scientist (Tobacco) Bidi Tobacco Research Station and
Research Scientist, Bio-fertilizer Project, Anand)**

[C] MICRONUTRIENT

6. Multi-micronutrient formulation in banana cv. Robusta

The farmers of Middle Gujarat Agro-climatic Zone-III (AES-II) growing banana (var. Robusta) are advised to apply multi micronutrients mixture equivalent to Govt. notified grade-V (Fe-2%, Mn-0.5%, Zn-5%, Cu-0.2% and B-0.5%) as soil application @ 20g per plant besides 10 kg FYM + 200-100-200 g NPK per plant in soil deficient to marginal in Zn and Fe for getting higher fruit yield and net return. Alternately, farmers can also apply 20 g ZnSO₄ and 40 g FeSO₄ per plant besides recommended dose of FYM and NPK for higher yield and net return.

(Professor of Horticulture, BACA, Anand)

[D] WATER MANAGEMENT

7. Conjunctive use of canal and tube well water in wheat



The farmers of Middle Gujarat Agro-climatic Zone-III (AES-III) growing wheat (cv. GW-496) in Narmada command area are advised to irrigate the crop with canal water. The schedule of irrigations (D: 60 mm) is at sowing, CRI, tillering, flowering and grain filling stages for higher yield and net return.

Farmers may also apply irrigation with canal and tube well water alternatively or first 4 irrigations with canal water and one irrigation at grain filling stage with tube well water.

8. Nutrient and water management through fertigation in papaya Cv. Madhubindu

The farmers of Middle Gujarat Agro-climatic Zone-III (AES-II) growing papaya (cv. Madhubindu) under drip irrigation are advised to irrigate the crop through drip for 5 hours and 20 minutes during September to February and 10 hours and 40 minutes during March upto onset of monsoon at alternate day for 20% water saving with maximum water use efficiency. They are further advised to fertigate with N (Urea), P_2O_5 (Orthophosphoric acid) and K_2O (Muriate of potash) @ 80% recommended dose (160-160-200 g NPK/plant) in sixteen equal splits starting from 60 days after transplanting at

15 days interval to save 20% fertilizers and to get higher yield. FYM 10 kg per plant as basal should be applied.

The distance between two laterals (16 mm) should be 2.5 m and each plant having two drippers (4 LPH), installed at 45 cm distance from the plant stem on both sides and run the system at 1.2 kg/cm² pressure.

(Professor of Horticulture, BACA, Anand)

[F] HORTICULTURAL CROPS

9. Effect of NPK on growth and yield of papaya cv. Madhubindu

The farmers of Middle Gujarat Agro-climatic Zone–III (AES-II) growing papaya (cv. Madhubindu) are advised to apply 10 kg FYM at the time of transplanting and NPK fertilizers @ 200-150-200 g per plant in four equal splits at 2nd, 4th, 6th and 8th month after transplanting to obtain higher fruit yield and net return.

10. Organic farming in acid lime cv. Kagzi lime

The farmers of Middle Gujarat Agro-climatic Zone-III (AES-II) interested to grow acid lime (cv. Kagzilime) organically are advised to apply 50 kg FYM in July and 22.5 kg castor cake per plant in two equal splits i.e. in middle of July and February for getting higher net return.

11. Effect of NPK on growth and flower production of chrysanthemum cv. IIHR - 6

The farmers of Middle Gujarat Agro-climatic Zone-III (AES-II) growing chrysanthemum (cv. IIHR-6) are advised to apply 200 kg N/ha in four equal splits i.e. 1st at the time of transplanting and remaining three splits at 30, 60 and 90 days after transplanting in soil having adequate P and K for getting higher flower yield and net return.

(Professor of Horticulture, BACA, Anand)

III PLANT PROTECTION

[A] PLANT PATHOLOGY

1. Sesamum seed treatment

Farmers of middle Gujarat are advised to grow sesamum crop by treating the seeds with carbendazim 25% SD @ 3 g/kg seed followed by

spraying of carbendazim 50% WP @ 0.05% (ICBR 1:15.44) OR thiophenate methyl 70% WP @ 0.05 % (ICBR 1:8.59) OR chlorothalonil 75% WP @ 0.2% (ICBR 1:3.10) at 30 and 50 days after sowing for the management of Macrophomina leaf blight disease.

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

[B] AGRICULTURAL ENTOMOLOGY

2. Fruit fly in small gourd.

In Middle Gujarat Agro-climatic Zone, *Bactrocera cucurbitae* and *Dacus ciliatus* are only species of fruit fly damaging small gourd. Therefore, the farmers of middle Gujarat are advised not to use methyl eugenol for the control of *Bactrocera cucurbitae* and *Dacus ciliatus*. For effective and economical management of above mentioned fruit flies following strategy is recommended.

Installation of Cue-lure impregnated wood blocks @ 16/ha at the initiation of the fruiting followed by spot application of poison bait made by mixing of Jaggery at 5% and Fenthion at 0.1% in water (500 g Jaggery + 10 ml of Fenthion 85EC in 10 liter of water) @ 8 liters/ha in the form of coarse droplets undersides the foliage at weekly interval. The spots should be spaced at 7 m x 7 m distance. The traps should be placed or hung at the border of the pendal and just 1 foot below the foliage or vines. (CBR 1:17.46).



OR

Spot application of poison bait made by mixing Jaggery at 5% and Fenthion at 0.1% in water (500 g Jaggery + 10 ml of Fenthion 85EC in 10 liter of water) @ 8 liters/ha in the form of coarse droplets undersides the foliage at weekly interval starting from initiation of fruits. The spots should be spaced at 7 m x 7 m distance (ICBR 1:12.79).

OR

Installation of cue lure impregnated wood block trap @ 16/ha at equal distance. The traps should be placed or hung at the border of the pendal and just 1 foot below the foliage or vines (ICBR 1:7.45). If fenthion is not available, dichlorvos 76% @ 5 ml/10 litres should be used.

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

3. Okra seed treatment

The farmers of middle Gujarat growing okra crop are advised to treat the seeds with imidacloprid 70 WS (ICBR 1:125.21) OR thiamethoxam 70 WS (ICBR 1:52.24) @ 5 g/kg seeds for effective and economical control of jassid, whitefly and shoot borer.

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

4. IPM in Cotton



Farmers of middle Gujarat region growing cotton hybrid - 10 are advised to adopt following measures to enhance the activity of natural enemies and thereby to suppress the incidence of insect pests of cotton.

Interspersing of one row of *Cassia occidentalis* L. after every six rows of cotton and sowing of maize and planting of Zinnia (*Zinnia elegans*) @ 10% of total plant population of cotton plants (ICBR 1: 20.85).

OR

Interspersing of one row *Cassia occidentalis* after every six rows of cotton, sowing of maize and planting of Zinnia (*Zinnia elegans*) @ 10% of total plant population of cotton plants' and one release of *Trichogramma chilonis* @ 1.5 lacs/ha + *Chrysoperla carnea* @ 5000 larvae (2-3 days old)/ha, coinciding with the appearance of pests (ICBR 1: 07.95).

Note : *Cassia occidentalis* should be harvested before ripening of the pods.

(Research Scientist, Bio-control Research Project, Anand)

5. Herbicide residues in cotton

Application of quizalofop ethyl @ 50 g a.i./ha in cotton as post-emergence herbicide (30 days after sowing) did not result in its residue in oil, oil cake, fodder and soil; and therefore application of this herbicide is safe from the view point of residue.

6. Herbicide residues in groundnut

Application of quizalofop ethyl @ 50 g a.i./ha in kharif groundnut as post-emergence herbicide (30 days after sowing) did not result in its residue in oil, oil cake, fodder and soil; and therefore application of this herbicide is safe from the view point of residue.

(Assoc. Res. Sci., AINP on Pesticide Residue, Anand)

7. Fruit fly in bitter melon



The farmers of middle Gujarat are advised to execute male annihilation technique using Cue-lure impregnated

wood blocks @ 10/ha OR bait application technique using 3% protein hydrolysate poison bait as wide area/village level control of fruit fly in bitter gourd. If protein hydrolysate is not easily available, jaggery 3% bait can be used.

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

IV BASIC SCIENCE

1. Effect of plant growth regulators on seed yield and quality of okra

Farmers of Middle Gujarat Agro-climatic Zone-III, growing okra var. Parbhani Kranti for seed production purpose, are advised to spray GA3 @ 50 mg/l (ICBR 1:10.5) at 30 days (vegetative stage) and 50 days (onset of flowering stage) after sowing for getting higher seed yield, better seed quality and net return.

(Assoc. Res. Sci., Pl. Physiology, Main Vegetable Research Station, Anand)

V DAIRY SCIENCE, AGRIL. ENGINEERING AND PROCESSING

[A] DAIRY SCIENCE

1. Continuous basundi making machine

The continuous basundi making machine developed by AAU, Anand is recommended for manufacturing good sensory and hygienic quality basundi at economical cost as compared to traditional method.



(Prof. & Head, Dept. of Dairy Engineering, Dairy Science College, Anand)

2. Scraped surface heat exchanger for continuous Shrikhand Thermization Machine

The continuous Shrikhand Thermization Machine consisting of SSHE, Teflon scrapper blades, variable frequency drive is recommended for the thermization of Shrikhand under optimum conditions. The thermization of Shrikhand gives superior quality products with enhance shelf life and the estimated cost of Shrikhand Thermization process is Rs.0.65/kg.

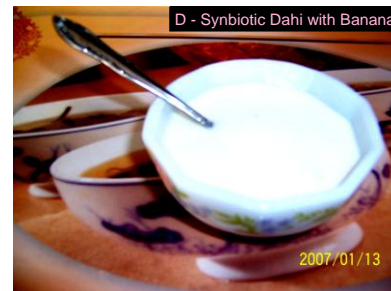
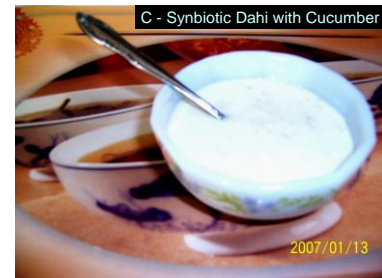


(Prof. & Head, Dept. of Dairy Engineering, Dairy Science College, Anand)

3. New functional dairy products Symbiotic dahi

Milk containing probiotic culture, *Lactobacillus acidophilus* LBKV3 (@ 2.0% v/v) and *probiotic inulin* (@ 5.0% w/v) can be fermented to Synbiotic dahi (Blend A), and to this fruits/vegetables can be blended as follows :

- (1) Tomato @ 14%, salt @ 0.8% and black pepper @ 0.3% to Blend-A (Blend-B).
- (2) Cucumber @ 14%, salt @ 0.8 %, sugar @ 3.5 % and jeera powder @ 0.35% to Blend-A (Blend-C).
- (3) Banana @ 22%, sugar @ 14.6% and vanilla flavour @ 0.04% to Blend-A (Blend-D).
- (4) Sapota @ 22%, sugar @ 14.6% and cocoa powder @ 4.0% to Blend-A (Blend-E).

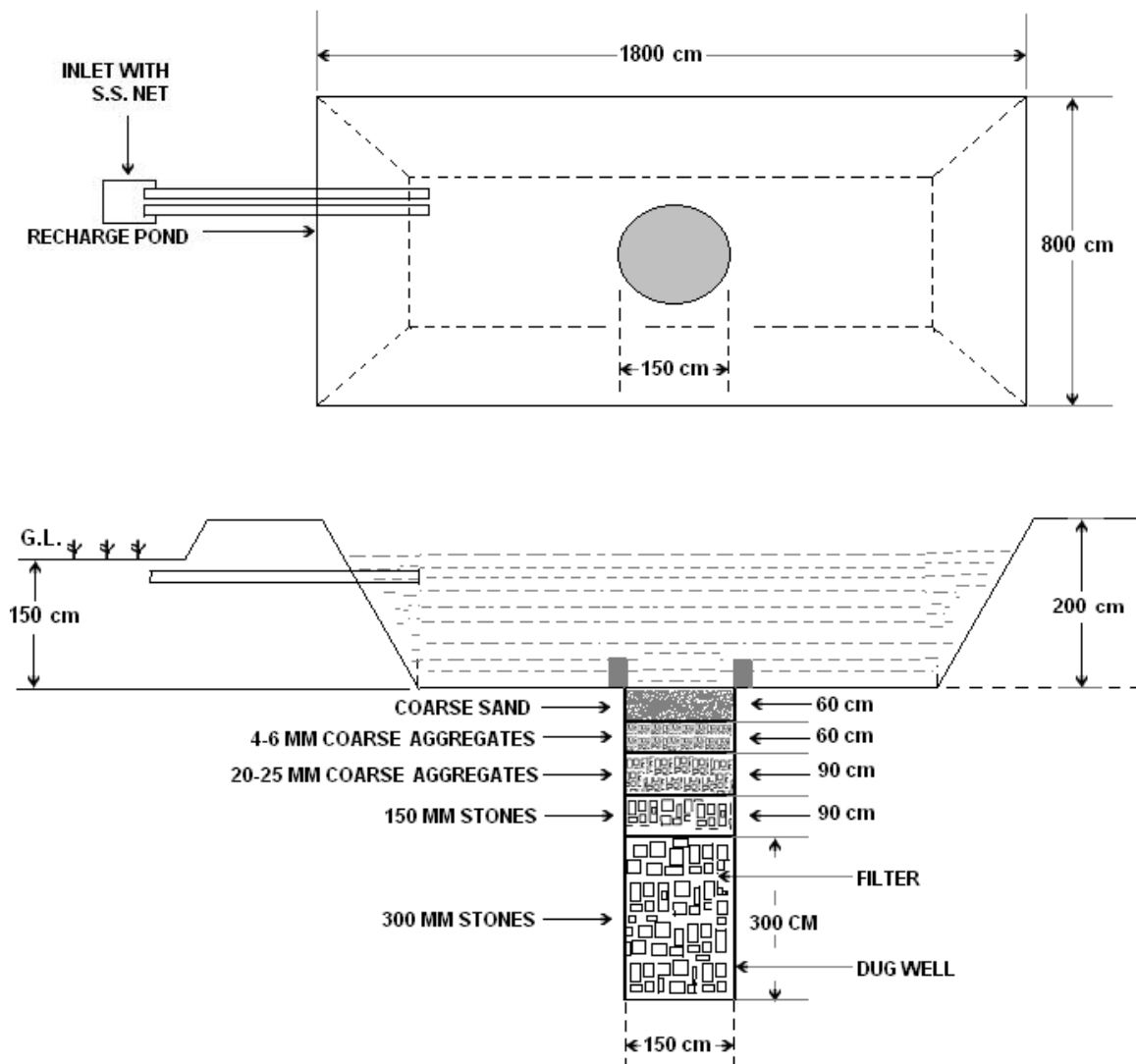


(Prof. & Head, Dept. of Dairy Microbiology, Dairy Science College, Anand)

[B] AGRICULTURAL ENGINEERING

1. Ground water recharges system for Bhal region

Construction of recharge well of 150 cm diameter and depth up to water bearing sandy strata with sand filter in ponds or natural depressions is recommended for the farmers of Bhal area for early drainage of stagnated water from the fields, This will also facilitate better recharging of the underground water.



(Asstt. Res. Sci. Agricultural Research Station, Arnej)

VI ANIMAL PRODUCTION

1. Cross bred : K x HF & K x J

Crossbred cattle with 50% Kankrej and 50% exotic (HF and Jersey) inheritance, developed at LRS, Anand are well adapted to agro-climatic condition of middle Gujarat. Under optimum feeding and management, production of 2500 kg and even higher milk per standard lactation (300 days), birth weight of around 23 kg, growth rate of 450 g/day, age and weight at first calving, 41 months and 315 kg, respectively, and service period and calving interval of 125 and 407 days, respectively, were observed and thus, these crossbreds are recommended as suitable dairy animals for farmers of middle Gujarat.

(Research Scientist, LRS, Vet. College, Anand)

2. Concentrate Mixtures

The farmers of Panchmahal district are advised to feed daily additional compound concentrate mixture 1.25 kg and 2.0 kg to indigenous cows (receiving 1.70 kg) and buffaloes (receiving 2.00 kg) producing up to 5 kg and 6-10 kg (cows receiving 2.20 kg and buffaloes 2.9 kg) milk/day respectively, during winter.

The crossbred cows of Panchmahal district producing 5-15 kg (receiving 2.6 to 4.6 kg) and more than 15 kg (receiving 5.3 kg) milk daily, should be fed additional 2 and 3 kg compound concentrate mixture, respectively during winter. However, during monsoon, cows producing daily 5-15 kg milk (receiving 3.6 to 5.5 kg), should be fed additional 1-1.5 kg compound concentrate mixture.

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

3. Economic Ration for bullocks

Compared to conventional feeding system, bullocks can be maintained at 15% less feed cost on complete feed comprising of Bajri straw, 70%; Corn steep liquor, 15%; Deoiled Ground nut cake, 3%; Wheat bran, 2%; Deoiled Rice Bran, 3%; Molasses, 5%; Mineral mixture as per BIS specification, 1%; Salt, 0.5%; Urea, 0.5% and Vit. A @ 3000 I.U./kg and Vit. D3 @ 1000 I.U./kg

4. **Economic Ration for growing calves**

In growing crossbred calves feeding of 60% bajra straw based feed block (Bajra straw, 60%; Deoiled GNC, 18%; Maize, 5%; Rice polish, 5%; Molasses, 10%; in. Mix. as per BIS specification, 1%; Salt, 0.5%; Urea, 0.5 % and Vit. A @ 3000 I.U./ kg and Vit. D3 @ 1000 I.U./kg) can support daily gain of 380 g similar to conventional feeding system with 25.2% saving in feed cost.

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

5. **Economic alternate roofing for sheep**

Shelter through Asbestos sheet/agronet (75%) roofing during intense summer reduces the thermal stress, water requirement (10-29%) and increases dry matter intake (4-7%) in adult Marwari and Patanwadi sheep.

(Prof. & Head, LPM, Vet. College, Anand)

VII ANIMAL HEALTH

1. **Recommendations for farmers/pet owners**



Pet-dog should be subjected to professional periodontal therapy at least once in a year after three years of age.

(Professor & Head, Dept. of Surgery, Veterinary College, Anand)

VIII SOCIAL SCIENCE

[A] Messages recommended for farming community

The farmers of Middle Gujarat are advised to sell the paddy directly to rice millers instead of selling to other intermediaries to get higher prices.

(Assoc. Res. Sci., Dept. of Agril. Economics, BACA, Anand)

[B] Messages recommended for extension machinery

1. Indigenous and scientific knowledge of the farmers about various agricultural uses of neem

The results of the study indicated that though there are several scientific usages of each part of neem; there was poor knowledge among majority of the farmers about it. Thus, extension agencies involved in the development of eco-friendly agricultural practices should motivate farmers to grow more neem trees and convince them to make best usages of all the parts.

2. Study on constraints faced by the farmers in adoption of recommended practices of paddy in Anand district

The results of the study indicated that there are some critical recommended practices of paddy cultivation which were not adopted by the majority paddy growers. Thus, extension agencies involved in the development of paddy needs to convince paddy growers to adopt following two critical production technologies.

- 1) The paddy growers should be encouraged to maintain proper recommended distance of plants while transplanting paddy.
- 2) The use of untreated urea in top-dressing by paddy growers should be discouraged. They should be encouraged to use neem oil coated urea to slow down release of nitrate in order to minimize loss of nitrogen.

(Prof. & Head, Dept. of Extension Education, BACA, Anand)

3. Overall perception of farmers of Middle Gujarat about Krushi Mahotsav-2007

The results revealed that Krushi Mahotsav-2007 organized by the Govt. of Gujarat was perceived as the most useful and timely intervention in acquiring the latest agricultural knowledge by majority of the farmers. Therefore, it is suggested to organize "Krushi Mahotsav Programme" in order to accelerate the pace of transfer of new agricultural technologies.

(Associate Extension Educationist, EEI, Anand)

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